Ground Systems Engineering (GSE) (4)
TP - GSE (12)

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THE GROUND SEGMENT ENGINEERING PROCESS FOR SPORT CUBESAT MISSION OPERATION

Abstract

This paper describes the short engineering process developed by Brazil's National Institute for Space Research (INPE) to provide the ground segment for operating the small satellite named SPORT, a scientific CubeSat-based mission . The Scintillation Prediction Observation Research Task (SPORT) mission is an international partnership between Brazil's Space Agency (AEB) and U.S.'s National Aeronautics and Space Administration (NASA), involving many institutions under the two agencies, to address understanding of the preconditions leading to the equatorial plasma bubbles, using a combination of ground-based and in-orbit instrumentation. INPE's responsibilites in the mission include the ground segment, mission operations and data management, which count on existing consolidated infrastructure and software systems that need to be tailored for CubeSat-based missions. Operation of the spacecraft will be done at INPE's Satellite Control Center in São José dos Campos, using a tailored version of a proprietary satellite control framework named Satellite Control System (SATCS) which will remotely operate three TTC Ground Stations that will communicate with the spacecraft using UHF/VHF bands. Science data will be downloaded to two Payload Reception Ground Stations through X-band, installed in in different regions of the country. Data storage and distribution will be done using INPE's EMBRACE (Brazilian Monitoring and Studies of Space Weather) system, a data center for space weather forecasting. To define the operation plan and procedures, the Mission Operations Concept Document (MOCD) has been developed by the team at INPE based on the ECSS-E-ST-70C standard. From a simplified version of MOCD template, the strategy is to evolve the document items in an incremental way to produce a solid reference document for mission operators based on internal practices and procedures, which will then guide the definition of low-level operation procedures and the operations engineering plan.