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MISSION OPERATION PLAN FOR SEMI-AUTONOMOUS CONTROL OF A REMOTE SENSING LEO STUDENT MICROSATELLITE

Abstract

Mission operation planning and mission design are one of the most critical multi-disciplinary features in conducting the satellite missions. The satellite operations can be divided into three phases: initial phase, operational or nominal phase, and disposal. Initial orbital phase include, separation from launch vehicle, orbit commissioning, health checking, testing and calibrating the satellite components (if necessary). The satellite nominal phase covers subsystems health monitoring, managing main mission features such as capturing and sending images from specific areas, Telecommunication with ground station and users, and managing contingency conditions. All the above tasks might be handled onboard, using a specified level of autonomy. In other words, they might be managed autonomously onboard, or a combination of onboard management and satellite control by ground station via telecommands. The proper level of in-orbit autonomy enables the satellite to perform mission-specified tasks, when out of ground station coverage. Determining a proper level of onboard autonomy for a satellite is a complicated systems engineering activity confined by mass-power budget constraints of microsatellite missions and LEO orbit characteristics. Many different automated and semi-automated planning scheduling tools have been developed for space applications. In the present work, a mission operation plan is been developed for a student LEO microsatellite using the semi-automated method, covering all operational phases of the satellite. In this paper, first the microsatellite's operational architecture for all in-orbit phases is presented. Then, a basic timetable of the on-board control procedure will be described which represents the satellite's mission tasks and their sequence. In the last section, the microsatellite's contingency plan with regard to mission priorities and electrical power constraints is explained.