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INTENSIVE CARE FOR PREMATURE SATELLITES

Abstract

The German Space Operations Center (GSOC) as part of the German Aerospace Center (DLR) gained a lot of experience with “premature satellites” in space. In this paper a premature satellite is a satellite that has been launched although its development was not completely finished and the test program with the satellite could not be fully achieved. Expectations are that this can be caught up on once the satellite is in orbit. Typical consequences are a series of software uploads, flexible commanding, tests on short notice and completing the documentation. On this basis, validated flight procedures and operation rules are then established in parallel to prepare for further tests and routine operations.

This paper presents the GSOC experience on how to approach such projects based on the small satellite mission “Firebird”. If the control center can only partially prepare for the LEOP, Commissioning and Routine operations, many tasks of these phases are shifted to after launch. It is then crucial to adapt the operations plan. In order to ensure the success of the mission, the control center must therefore adapt its operations management and tailor their quality assurance processes specifically to this new scenario. Control centers have standards for management, quality assurance and operation processes either from in-house or derived from standards like the European Cooperation for Space Standardization (ECSS). But there is a high risk of failure when trying to apply the same standards and rules to such a premature satellite project. Moreover, the increased effort for the operations team to support this “In-Orbit Development” and to fulfill the client’s requests must be kept under control by taking into account the limited budget and resources. Therefore, rethinking and tailoring established standards or in-house processes is required to maintain safe, effective and efficient satellite operations.

Dealing with these kinds of delayed projects from an operations point of view is a phenomenon which is becoming increasingly common. Limited resources for satellite manufacturing, more requirements to fulfill, technical challenges to overcome and tight schedules to make are reasons for this trend. The paper presents lessons learned at GSOC to turn these types of missions into a success, in particular by diminishing the possible negative effects on mission operations during the early stages of such a project.