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PROJECT LIFE-CYCLE AND WORKFLOW IN A UNIVERSITY CUBESAT PROJECT

Abstract

In this paper we present a development workflow tailored for a extracurricular student CubeSat team. Use of the workflow is demonstrated in Orbit NTNU, applied on the SelfieSat project, which is a 2U CubeSat scheduled for launch in the summer of 2022.

The project life-cycle described by the CCSDS and ECSS standards are made to be of use in all types of space activities. These standards are generic and comprehensive, and therefore require tailoring for use in specific missions. Since extracurricular student projects are inherently inexperienced, they may not have the requisite experience to effectively tailor these life-cycles to fit their mission. They often depend on frequent trial-and-error development which lasts throughout the project life-cycle, and project phases commonly overlap to a significant degree. Subsystems on the satellite also tend to be at different stages of maturity, leaving the project team unable to cleanly transition through project phases. Orbit NTNU experience high turnover of personnel since team members are voluntary students, thus leading to a risk of losing knowledge throughout the project.

In inexperienced teams, validation through prototyping is important since they commonly lack the experience to define correct requirements for their system. Verification without proper validation can therefore lead to a false sense of security. The paper therefore propose a project life-cycle and development workflow that accommodates a trial-and-error based approach by introducing a circular and rapidly iterative workflow within the project phases described in ECSS. Additionally, this framework mitigates the effects of varying degrees of maturity in the system development, thus reducing the risk of system-level failures through validation. This paper propose a workflow based on the ECSS project life-cycles tailored for use in student projects. This paper includes lessons learned from developing and applying the workflow in the SelfieSat project.