

IAF SPACE SYSTEMS SYMPOSIUM (D1)
Space Systems Engineering - Methods, Processes and Tools (2) (4B)

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FROM DESIGN TO DELIVERY IN THREE MONTHS: THE FAST DEVELOPMENT OF A 3U
CUBESAT

Abstract

The System and Technologies for Aerospace Research (STAR) group from Politecnico di Torino is about to reach Earth's orbit for the third time by launching a 3U CubeSat. The CubeSat, mostly developed by students, has the main purpose to complete a communication mission. In addition to that, the CubeSat is also equipped with several temperature sensors and an IMU to make measurements in the space environment. However, the real peculiarity of this CubeSat has been its very fast production cycle:

only three months from the first contact with the customer to the delivery of the spacecraft to the launch provider. Multiple concurrent engineering work sessions, supported by a model-based system engineering approach, made it possible to develop an entire CubeSat in such a short time through a multi-V process pushed to the extreme.

The project management extensively implemented agile methodologies to organise the teamwork: tasks were assigned to small groups of students following a simple schedule and reviews of the expected results were performed frequently. At the end of each working day, the team was engaged in a quick recap meeting to address issues risen during the day and to prepare for the tasks that had a high priority for the next day. Most of the tasks were completed in concurrent engineering work sessions, where students assigned to different areas of product development could constantly exchange information and opinions with their colleagues. Furthermore, the concurrent engineering sessions served the purpose to keep the team always updated with product changes and evolution. Another key element was the reduction of documentation reports. Information was exchanged across the team through schematic presentations enriched with technical drawings and lists of specifications. Additionally, a Valispace model was created to keep track of the system's requirements. Since the hardware procurement had to start at the beginning of the project, different mission phases constantly overlapped during the product lifecycle. Quick and frequent iterations between design choices and verification by analysis, following a rapid multi-V approach, assured an organic spacecraft development and supported the hardware procurement.

The delivery process of this CubeSat has been quite extraordinary. The ambition of this paper is formalising the process and methodologies used in this project to propose an alternative way to address the development of a CubeSat, moving towards a low complexity, very fast delivery model.