

IAF SPACE SYSTEMS SYMPOSIUM (D1)

Lessons Learned in Space Systems: Achievements, Challenges, Best Practices, Standards. (5)

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BEST PRACTICES AND LESSONS LEARNED ON PRODUCT AND QUALITY ASSURANCE
ACTIONS ON CUBESAT MISSIONS: THE SAPIENZA S5LAB STUDY CASE

Abstract

CubeSats have gained significant popularity in recent years due to their small size, low cost, and capability to be fitting to a wide range of scientific, commercial, and educational missions. The main driving factors for the growth of CubeSats are affordability and versatility, which makes this kind of platform available to a larger number of entities (such as universities and research institutions) and applicable to a wide range of missions. These factors are contributing to the rise of large constellations composed of CubeSats able to provide new services in the framework of the so-called New-Space Economy. With the industrialization of the CubeSats development, Product Assurance (PA) and Quality Assurance (QA) become critical to ensure the well-functioning and quality of the products, together with the success and safety of the mission. PA and QA aspects, together with guidelines for testing and qualification of space products are defined by different standards, such as ECSS, ISO, and NASA, which are easily applicable to large spacecraft but may require some adaptation for CubeSat missions in several instances. As an example, guidelines and success criteria for environmental testing and mission tests, or test flows for CubeSat constellations may vary with respect to the general criteria defined in the international standards. In most cases, a more accurate tailoring of the guidelines for CubeSat constellations is mandatory to both achieve mission qualification, launch acceptance and to ensure the future success of the newly constituted space services. In this framework, the Sapienza Space Systems and Space Surveillance Laboratory (S5Lab) at Sapienza University of Rome has gained experience in developing CubeSat missions and in ensuring adequate PA/QA levels on the space platforms to achieve launch acceptance. The laboratory team has been launching 5 different CubeSats, with the coordination of ASI and other eminent institutions, since 2017 and the gained know-how could be applied to the process of tailoring the existing standards to the specific case of CubeSat missions. The paper explores the critical role of product assurance in space missions, including the various standards and guidelines developed and it examines how these standards are currently applied in space missions. Employing experience gained and lessons learned from previous CubeSat, the paper proposes potential PA/QA tailoring guidelines to better meet the unique requirements of CubeSat missions, with focus on the CubeSat functional and environmental qualification, and with the perspective of the new constellations that are facing first operations in these years.