32nd IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Access to Space for Small Satellite Missions (5)

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EARLY VALIDATION OF A SMALL SATELLITE DESIGN GUIDELINE FOR EFFICIENT STACKING IN HEAVY LAUNCHERS

Abstract

The rapidly evolving space ecosystem has positioned small satellites as key enablers of innovation, affordability, and accessibility for space missions. By leveraging novel approaches and cost-efficient solutions, small satellites facilitate access to space for a diverse range of end users, including academic, governmental, and commercial sectors. Moreover, small satellite constellations are expected to play a critical role in the Earth observation and telecommunications markets, with deployments ranging from a few satellites to thousands. Despite the growing number of dedicated rideshare missions, deploying large numbers of small satellites remains a logistical and financial challenge. Utilizing multiple launches on heavy launchers with large fairings present a promising solution to significantly reduce launch costs per satellite. However, to achieve the maximum cost savings and increase the cadence of satellite deployment requires a well-designed stacking concept that maximizes the number of satellites accommodated per launch, efficiently using the launcher's fairing volume and payload mass capacity. OHB Czechspace is leading an ESA-funded project to develop and experimentally validate a universal Small Satellite Design Guideline that enables efficient stacking across a wide range of global launch vehicles. This guideline is developed for small satellites up to 150 kg, with potential scalability to larger platforms. It provides a structured framework for satellite design, collective integration, and on-orbit deployment, catering to the needs of both small and mega-constellations. Additionally, by standardising satellite size and interfaces, the guideline facilitates multi-manufacturer integration within a single launch, further enhancing cost savings for smaller constellations and individual missions. This paper presents the Small Satellite Design Guideline, along with early verification and validation results from simulations and breadboard testing. The validation process assesses key aspects such as launcher compatibility, structural performance, and deployment dynamics of satellite stacks built according to the guideline specifications.