

26th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)  
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IMPACT OF MODULARITY AND MISSION FLEXIBILITY ON OPERATIONS OF A CONCEPTUAL  
SMALL SATELLITE

**Abstract**

In recent years the number of small satellites in orbit has significantly increased, primarily driven by new commercial ventures. The advantages of small satellites with respect to lower cost and shorter development cycles, make them preferred choice for many commercial start-ups entering the space market.

In order to meet the always evolving commercial needs of lower cost and to reduced time-to-market, many small satellite providers offer flexible and modular platforms which can be easily and quickly adapted for various missions and customers. This trend focuses primarily on the satellites themselves, with majority of the research addressing impact of modularity and mission flexibility on the small satellite design, performance and cost; however, surprisingly little research is available about the impact of modularity and mission flexibility on mission operations. Since mission operations over the complete lifetime of the satellite can amount to a significant expense, understanding the impact of modularity and flexibility is important for estimating the total life cycle cost.

This paper aims to identify and quantify impacts of modularity and flexibility on the mission operations of satellites in 100kg to 500kg range. A remote sensing mission in Low Earth Orbit (LEO) is used as a reference to evaluate operations during Launch and Early Operations (LEOP), routine operations, anomaly operations and decommissioning operations. Different type of satellite architectures – standard, semi-modular, and highly flexible, are compared to identify and quantify differences in a systematic approach.