

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Interactive Presentations - IAF MATERIALS AND STRUCTURES SYMPOSIUM (IP)

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DESIGN PROCESS AND NEW MATERIALS IN SMALL SATELLITE STRUCTURES

Abstract

The main objective of the structural system is to mechanically support and protect all the subsystems of the spacecraft during the different phases of the mission and, in the case of the CubeSat, to provide a mechanical interface to the deployment system. From the manufacturing phase to the end of the mission, the satellite faces different environments and different loads. The structure must guarantee the correct interface with the launch vehicle which, in the case of the CubeSat, is partially determined by the selected launcher. The CubeSat standard specification document gives a clear description of the limitations that the satellite must address to be considered a CubeSat. However, some of the limitations that dictate the structural design stem from the mission and requirements of the system. Traditionally, the design of space systems makes a distinction between primary structure, defined as the one that carries the greatest loads, and the secondary structure, defined as the one that supports components of less than 5 kg. When considering CubeSat, in particular 1U structures, this distinction does not make sense in terms of the weight to be considered, but it can still be significant in terms of the function of the structure. The primary structures of CubeSat are those designed to transmit loads through the spacecraft to the interface of the launch and deployment system and those that serve as a mechanical interface with the other bus systems, payloads and their associated components. The function of secondary structures, on the other hand, is only to support themselves. Its failure does not necessarily result in a catastrophic event as in the case of a primary structure failure. A typical example of a primary structure is the satellite chassis. This research work gives an idea of how developers should guide themselves to optimize the design of the mechanical structure, giving suggestions and indications from practical experiences, it also addresses a step-by-step approach to help the CubeSat designer: from the definition of requirements up to design and analysis, manufacturing and eventually testing for verification and validation, to finally talk about new materials in small satellite structures.