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Space Systems and Architectures Featuring Cross-Platform Compatibility (7)

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MASS: A MODULAR ASSEMBLY SATELLITE STANDARD FOR 3U CUBESATS

Abstract

Standardization is an excellent way to reduce the cost of production and increase accessibility. In fact, the standardization of space technology has enabled an exponential increase in exploration and knowledge. Over the past decade, building CubeSats has become more common among university students. However, designing a 3U CubeSat can still be challenging, taking a long time to qualify for flight. Conforming to stringent launch requirements is the most difficult part of a CubeSat project. Consequently, students building CubeSats have to learn about the space environment and work with the resources they have, while ensuring that payloads and support systems are able to complete a mission. A standard design will serve to accelerate this process, greatly improving the accessibility of future student CubeSat projects.

A Modular Assembly Satellite Standard (MASS) is a mechanical design that simplifies the satellite building process, while allowing different users to adapt and integrate their own modules. Being open-source, this standard provides students around the world with a comprehensive template to facilitate building a 3U CubeSat in a much shorter timeframe. By providing an adaptable and configurable design, inner modules can be fit without changing the core mechanical features. For example, a payload module of up to 1 kg can be fit in a 10 cubic centimeter area at the bottom of the satellite as well as an attitude control module of up to 1.4 kg in a 10 cubic centimeter area at the center of the satellite. Using this MASS will allow students to concentrate on other aspects of their satellite, such as the scientific payload.

The MASS structure offers mechanical design template for new spacecraft teams, offering design solutions, as well as documented analysis and vibration testing results. As qualification testing progresses, documentation will be released to reflect the major milestones leading to full qualification with a launch provider. Currently, the focus of the MASS structure is to pass vibration testing with multiple modular configurations, complying with the CubeSat Design Specification and the most restrictive launch requirements. The initial steps involved in building a CubeSat is often unclear and daunting. This MASS will simplify the process, enabling future projects to focus on scientific experiments rather than structural design. Further, making the project open-source will encourage more engineering students to pursue space engineering.