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SPACE SYSTEMS SYMPOSIUM (D1)
Hosted Payloads - Concepts, Techniques and Challenges, Missions and Applications (7)

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DESIGN OF A MODULAR NANOSATELLITE SYSTEM FOR T-SAT3

Abstract

In this paper, we describe the motivation, design and analysis for a modular method of nanosatellite system design. This modular method was developed for T-SAT3 by the University of Manitoba Space Applications and Technology Society (UMSATS). The motivation behind a modular system design in the need for the university based competition setting with accessibility to individual sub-systems. The design consists of independent modules for each sub-system such as: On-Board Computer, Communications (OBC-COMS), Power Control, Attitude Determination and Control (ADC), and Payload. Using standardized module interface designs, these sub-system modules are connected electrically and secured mechanically to each other. A modular design permits individual access to every module for development, testing and implementation. The choice of this modular method allows access to individual systems outside of the nanosatellite frame, therefore aiding development, testing and validation. Since these modules can be used independently of the nanosatellite frame, the scope of use is increased allowing for use in other student driven applications and competitions such as: weather balloon experiments, rocketry, and scientific experiments. The mechanical structural design of the modules created large mass concentrations to which all components were mounted, thus minimizing vibrational effects. Additionally, each module allows for quick assembly and disassembly reducing the time required for making changes and fixing problems. The modular systems uses a single connector interface for internal sub-system data communications and system wide nanosatellite power transmission. The single connector interface allowed for an external method to easily be deployed with the use of only one connector to provide power, debugging and command control of separate modules, or connected modules. This modular system is compared to other nanosatellite systems, including ITU-pSAT II, T-SAT2, and ISIS CubeSat structures. In comparison to T-SAT2, improvements in student driven development have been observed through the use of individual modules for testing and development. As a result, the modular system allowed for a more rapid development cycle, faster system modifications, and mission flexibility by allowing for many possible combinations to be created, including 1U, 2U, and 3U versions. This satellite design is within the Cubesat standard created by Cal Poly State.