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SPARTAN: A HIGH-PERFORMANCE NEXT-GENERATION NANOSATELLITE PLATFORM FOR DEMANDING NEWSPACE APPLICATIONS

Abstract

With the current rise of small satellite constellations, there is an ever-increasing demand for advanced capability from small mass-producible spacecraft designs. The Space Flight Laboratory (SFL) has established itself as a leader in the field through the success of multiple highly capable spacecraft on-orbit. This paper will present a new bus design from SFL that aims to meet the demands of the modern commercial constellation. The new bus, dubbed "SPARTAN," is a 6U XL form factor and features sun-tracking deployable and articulating solar arrays to provide high power generation in a small stowed volume. The overall system capability is enabled by multiple technological advances at the subsystem level. Mechanical advances have been made in the design of lightweight, low profile deployable arrays and the mechanisms to actuate them. Electrical advances have been made in the design of integrated PCB-style arrays and miniaturized power subsystem electronics to efficiently manage power generation and distribution. In guidance, navigation, and control (GNC), advances have been made to enable agile multibody control of the bus attitude and its solar-tracking appendages. For the thermal design, the challenge of accommodation of high-power payloads in a small platform has resulted in new design solutions. Overarching the whole design is a focus on manufacturability to allow production to scale to the constellation-level. The key system and subsystem design drivers will be discussed in this paper along with overviews of the approaches used to address them. Results from testing, simulation, and operation of the new bus will be used to validate its design.