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DEVELOPMENT OF A FLIGHT COMPUTER FOR HIGH POWER AMATEUR ROCKETS

Abstract

Fuelled by their Canadian Satellite Design Challenge (CSDC) victory in June 2018, the University of Manitoba Space Applications and Technology Society (UMSATS) pursued a new space systems engineering challenge: the Spaceport America Cup (SA Cup). Thus was born the high power rocketry division of UMSATS with a first year target apogee of 10,000 feet. Per the SA Cup requirements, the competing rocket needed to have redundant flight computers, one of which was required to be commercial-off-the-shelf (COTS) and the other could be either COTS or student researched and designed (SRAD). This afforded the team an opportunity to apply its skills garnered through CubeSat design to a wholly new system. In just under nine months the team was able to successfully design, simulate, build, test, and fly with an original flight computer that was capable of withstanding the violent launch conditions, logging telemetry data from an onboard accelerometer, gyroscope, and pressure sensor, and triggering parachute deployments. The decision to design and build rather than buy proved an excellent choice as it presented many learning opportunities that went beyond the team's university courses and deepened members' understanding within their fields of study. Building also exposed members to fields such as manufacturing, composites, and aerodynamics as the flight computer team collaborated with the mechanical subsystems to bring their rocket to life. This paper outlines the design and validation process of the hardware and software of UMSATS Rocketry's first flight computer as well as highlights the lessons learned while designing, testing, and flying the first iteration of a brand new electrical subsystem.