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LAUNCH ENVIRONMENT MEASUREMENT CUBESAT AND LESSONS LEARNED

Abstract

All satellites are required to perform launch environment survivability tests prior to being approved for flight. When qualifying CubeSats, the target levels used in these tests are based on analysis and are widely believed to contain ample safety margin. Each test runs the risk of damage or over-fatiguing the test article. As such, there is a strong desire to minimize the amount of required overtesting. One path to minimize overtesting is to measure the in-situ launch environment for vibrations, shock, and temperature. We have developed a CubeSat referred to as LEO that specifically measures this environment.

The development of a data logging CubeSat for recording the launch environment poses many challenges. The data logger needs a long shelf life, as the actual amount of time between integration into the dispenser and launch is highly variable. The data logger needs to be independent of the launch vehicle, as there is no power and no launch signal provided in the rocket-to-dispenser interface. Launch detection must be able to differentiate between false positives caused by ground handling, but still be responsive enough to capture the environment as close to engine ignition as possible.

This paper discusses these technical challenges in detail and presents two contrasting design solutions. The first solution was implemented on LEO and is expected to fly in 2018. The second generation of our data logger design addresses lessons learned from LEO to create a more robust and generic platform.