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CUBESAT CONFUSION: AVOIDING “DEAD ON ARRIVAL”

Abstract

Success in space flight operations is often difficult, due to the harsh space environment. Naturally occurring charged particles and other space radiation cause short and long-term issues with on-board electronics and mechanical mechanisms, copious UV light degrades satellite surface treatments, and the extremes of heat and cold experienced on-orbit challenge satellite designs. Additionally, self-induced issues involving design, construction, testing, launching, and monitoring can cause premature satellite failures, and the odds are stacked against many resource-constrained space missions from enjoying mission success. Of particular concern in this work is the growing number of very small satellites (CubeSats) launched en masse that for a variety of reasons are never identified or are never brought into use because of this or because of early on-orbit failure. As the number of massed CubeSat launches rises, and the number of CubeSats per launch increases due to flight opportunities brought about by launch consolidators, the number of CubeSats deployed “dead on arrival” increases. Beyond the heartbreak this brings to the owner/operator teams, this violates guidelines and best practices designed to decrease the amount of space debris launched. In this work we will investigate the detailed nature of this rather circular problem, in which the ability to ID a satellite may cause its early demise, while a non-functioning CubeSat may be difficult to ID, adding to the confusion. We will examine a number of regulatory, systems engineering, and technical solutions involving low-cost means to independently identify CubeSats after launch, and we will outline a possible flight demonstration of some of these techniques and technologies to allow independent ID that might mitigate this problem.