SPACE DEBRIS SYMPOSIUM (A6)
Mitigation and Standards (4)

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EDUSAT COMPLETELY PASSIVE DEORBITING SYSTEM

Abstract

The IADC guideline known as the ''25 years rule" restricts the post-operational life of objects in low Earth orbits to no more than 25 years in order to prevent space debris proliferation. For this reason it is suggested that all the space system injected in LEO orbits have the capability to deorbit in less than 25 years. Since early nineties GAUSS group is involved in the design and manufacturing of micro and picosatellite for space education. The main goal of GAUSS satellites is to involve undergraduate and graduate students in a real space project, developing new technologies and scientific payloads. Students participating to GAUSS projects are familiar with the space debris concern and during satellite design they pay particular attention to the deorbiting analysis. In 2011 GAUSS team was involved in the design of EduSat, an educational satellite funded by Italian Space Agency. The satellite was equipped with a new kind of deorbiting system completely passive. The main idea of EduSat deorbiting system is to develop a cheap and light system to be boarded on a generic small satellite without connections with the satellite on board computer. The simplest way to reduce costs and, at the same time, to maintain deorbiting performances of the spacecraft is to take advantage of the atmospheric drag using a deployable sail. To obtain a completely passive system the sail deployment has to be autonomous and separated from the rest of the satellite. No power lines for the deployment activation are requested. In particular the system relies on the in orbit degradation of a polymer due to atomic oxygen. Atomic oxygen has the capability to bond with most materials at atomic level weakening them and causing exfoliation; the best way to improve this effect and to capitalize it, is by using a polymeric material, exposed to the atomic oxygen flux, as locker of the deorbiting deployment subsystem. This paper deals with the laboratory tests and simulation carried out to validate the system and the mechanical design and manufacturing.