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TUNA CAN STANDARD DEORBIT SYSTEM: A COST-EFFECTIVE SOLUTION FOR CUBESAT END-OF-LIFE DISPOSAL

Abstract

Due to the rapid increase in CubeSat missions over the past years, the main danger to space debris growth has been the development of space debris. Thus, an efficient deorbiting solution is needed the most for the sustainability of space operations. This paper reports the design and development of a deorbit system adhering to the tuna can standard, which can be installed easily, even without the need of structural modifications into CubeSats. It is projected to be both lightweight, reliable, and effective for a mission that needs to be deorbited at the end of the mission but at the same time, it will be compliant with space debris mitigation policies, such as the 5-year rule.

The deorbit system through the activation of a burn wire, transforms a drag sail from a cylindrical housing that is optimized for minimal volume and mass constraints. The drag sail is being used to create atmospheric drag. The initial type of sail used, was a 1m sail, whose test was successful.

The structural design of the system was created using SolidWorks, and a 3D module was made to validate it. Then, it was printed with a 3D printer in order to use for functional validation. The first testing was performed, and it surely confirmed a smooth boom deployment.

This plug-and-play system is different from the existing deorbit mechanisms, that require expensive custom modifications of the structure. This standard can be an added bonus for the CubeSat developers as it offers a simple, cost-effective, and modular alternative. Despite its relatively smaller size, the system is capable of passively disposing of space debris while being adaptable and compatible with many configurations of satellites.

Keywords: CubeSat, deorbit system, tuna can standard, space debris mitigation, deployable drag sail, burn wire mechanism, satellite sustainability.