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GENERIC MODEL FOR SPACE DEBRIS MITIGATION FOR THE CUBESAT CONSTELLATION MISSIONS

Abstract

Cubesats gained popularity in recent years in the industry and especially as a cost-efficient research tool for academic institutions. In the coming years there will be a lot of activity in this field, which will lead to more and more debris. Debris mitigation analysis is an effort and time consuming task, even for a single satellite. An upcoming trend is to group Cubesats into constellations, creating an extra challenge for the space debris mitigation analysis. Several debris disposal and mitigation methods are available, this paper's method will be a generic approach, to achieve solid results in a more efficient way.

Most of the Cubesats share a common shape and structure, while their orbit and weight may vary. Therefore it is possible to create a generic model which can determine different space debris mitigation aspects for a single Cubesat. The challenge is to expand the existing model to integrate Cubesat constellations. This would enable future missions to have their Space Debris Mitigation analysis done, without complex and time-consuming simulations.

This paper tries to find a generic model for the Cubesat's constellations debris mitigation through using different simulation tools. Prior to the simulations, highly used orbits as worst-case scenarios are selected. Pseudo Cubesats, with general properties, which fly in these orbits will go through debris simulations. After the simulations, data-mining is used to narrow down the results.Obtained results are orbit, constellation and Cubesat parameters, which comply with the current space debris regulations.

ESA MASTER, CNES STELA and NASA DAS have been used for the simulations. These tools are used daily for single satellite missions. The result of the simulation and the tool it self also will be available as a web application.