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THE DEVELOPMENT OF A PASSIVE DE-ORBIT SUBSYSTEM FOR SMALL AND MICRO
SATELLITES**Abstract**

With the increasing number of small satellites, either through mass launches of cube satellites like the recent launch planet labs or through mega constellations like the One Web constellation with its 1000 satellites, the space especially in LEO is becoming crowded. Without effective mitigation measures the debris density will increase to a level where spaceflight becomes more and more endangered. Therefore, to ensure safety for future space flight, end-of-life de-orbiting of satellites, especially for small satellites is required by the respective standards. Deployable gossamer structures for drag sails might offer a passive de-orbit solution. The paper at hand outlines the development of such a system applicable for small LEO satellites between 1 kg to 100kg. The subsystem is based on the ADEO subsystem which was developed as part of an ESA GSTP activity. The ADEO subsystem is a scalable drag augmentation device for 100-1000kg satellites that uses the residual Earth atmosphere present in low Earth orbit. For initiation of the de-orbit maneuver a large surface is deployed which multiplies the drag effective surface of the satellite. Thereby the drag force is increased as well causing accelerated decay in orbit altitude. Advantageous about a drag augmentation device is that it does not require any active steering and can be designed for passive attitude stabilization thereby making it applicable for non-operational, tumbling spacecraft as well. For small satellites (1-100kg), the subsystem can be greatly simplified increasing the robustness of the subsystem and greatly decreasing its size. The dragsail has a sail area of 1-3m² leading to a size of 0.5-1U depending on the mission application and the need of a telescopic boom. The paper gives an overview of the design and the test that have been carried out on the dragsail as well as the next steps leading to an in-orbit demonstration currently foreseen for 2019.