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Abstract

The highest densities of orbital debris can be found at orbital altitudes near 900 kilometres. Within this orbit region, weather satellites, as well as Earth observation satellites like Envisat, perform their missions. While orbital debris already poses a threat to these satellites mainly in the sun-synchronous orbits, the risk of collisions will further increase in the future. Due to the high relative velocities of the objects of up to 15 km/s, collisions would result in highly energetic crashes, leading to a complete fragmentation of the participating objects. Such a collision will most likely be a so-called catastrophic collision. The resulting fragments might themselves collide with other objects causing a so-called feedback collision.
Today, catastrophic collisions are not a major problem, occurring approximately once in every five to ten years. However, the ongoing increase of space debris objects will increase the future collision risk. In order to avoid catastrophic collisions to become the leading source of space debris in the future, mainly the large objects, which apparently trigger collisional cascading, have to be removed from their orbit after their mission. As many satellites and rocket bodies are not able to perform a deorbiting maneuver by themselves, active deorbiting has to be performed for those objects.
In this paper different concepts already proposed for active removal of objects are further investigated. The first part will contain an introduction to the properties of the different techniques. This will be done with respect to satellites and rocket bodies which are likely to be primary objects for an actual mission. These objects are filtered by defining priority criteria, which can, for example, be derived by examining object flux (using ESA's MASTER-2009 model) and object mass. In the second part the relevant mission parameters, mission duration and system mass, will be determined for the different techniques.