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SIZING OF AN ELECTRODYNAMIC TETHER TO DEORBIT DEBRIS IN LOW EARTH ORBIT

Abstract

As they are getting more and more inconvenient, international guidelines have been set to reduce the number of orbiting objects, especially on the GEostationary Orbit (GEO) and the Low Earth Orbit (LEO). Indeed, the collisions' debris represents a high risk for the population in space and the more they are, the higher the probability to collide becomes. In order to avoid this, efficient devices are being designed to remove debris of different kind from the most crowded orbits.

In this context, our study focuses on the use of an electromagnetic tether to deorbit heavy debris in the LEO. This technology creates an electric field that interacts with the Earth's magnetic field. If well ordered, the resulting force can counteract the one retaining the debris' course around the Earth, and thus allowing it to decelerate and enter the atmosphere. Not only slow but effective, this method also offers the advantage of being affordable.

Our study led to an efficient calculation program that can predict debris' behavior in time, for a large range of sizes and weights. Given orbital parameters and details on the specific tether used, it can provide the debris' track from its initial position until it enters the atmosphere, different magnetic fields modulus on its way and even the drag force it is facing during the fall.