**Plasma Brake for Deorbiting Telecommunication Satellites**

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Dragliner is an ESA project to design, manufacture, assemble and test a breadboard model of a tether-based deorbiting system for Low Earth Orbit (LEO) telecommunication satellite deorbiting. The consortium for the project is led by the Finnish Meteorological Institute, and it also contains Aurora Propulsion Technologies, GRADEL and University of Luxembourg.

The chosen technology is the plasma brake microtether, which is an emerging propellantless and efficient deorbiting solution utilizing Coulomb drag to deorbit satellites in LEO. In this project, a microtether is defined as a tether that does not exceed the mass limit of 200 milligrams per meter, which makes it safe to other space assets in the event of a collision. Though in this project, the actual mass is approximately 20 milligrams per meter, which is even lower. The plasma brake is a very thin negatively charged microtether which, when charged, causes a braking force by creating enhanced Coulomb drag with the ambient ionospheric plasma ram flow.

Though the fully deployed system is of considerable size (current estimates in the range of 5 km), the system is very lightweight, small in volume at the carrying satellites end, and requires little power. It is furthermore autonomous and requires no resources from the carrying satellite during deorbiting. The system is safe to other assets in space despite its significant size, as the tether itself is of very small mass. In case of a possible impact with another satellite, the microtether impact will cause damage similar to micrometeoroid flux experienced in LEO conditions. The plasma brake microtether should be differentiated from the more well-known electrodynamic tether, as the plasma brake is much thinner and uses electrostatic drag as opposed to magnetic forces.

The main goal of the project is to increase the TRL of the telecommunication satellite plasma brake to 4. This consists of choice of deployment strategy, configuration of the deorbit system, choosing the material for the tether, finalizing the geometry for the tether, simulations for deorbiting performance as well as tether dynamics, tests conducted on the tether material in zero-gravity laboratory and the initial breadboard model design of the most critical components of the deorbit system. These include the reels for main tether, the main tether itself, as well as a supporting tape tether and it's housing. Current deployment strategy, design trade-offs, material selections, most critical components and simulation results will be showcased.

The system utilizes two different tethers, the main tether which is the Coulomb drag plasma brake microtether. The other one is a tape tether, which is significantly shorter and is used to provide an electron gathering surface area for the main tether functionality. The deployment of the tether presents several challenges as tethers in space have historically been very difficult to operate. The reliability of the system must be very high, and in case of deorbiting failure space debris hazard must be minimized and any debris parts must be trackable.