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HOW TO SOLVE A PROBLEM LIKE SPACE DEBRIS

Abstract

One of the toughest challenges of Active Debris Removal is the unknowns of the target craft. While you can observe the target before launch there can be many years before you actually rendezvous on a multi capture mission. The target's state could change for countless reasons. There is also a chance of impact during capture between the target and chaser which could make the target spin too fast or be too damaged for a controlled capture.

To combat this, a multiskilled UK consortium consisting of SSTL, Airbus, GMV NL, NORSS, Satellite Applications Catapult, University of Surrey, University of Lincoln and Clearspace are focussing on a capture suite to prepare for every opportunity. The LEOPARD (Low Earth Orbit Pursuit for Active Removal of Debris) project, funded by the UK Space Agency and led by SSTL supports a planned and controlled capture, but with a backup "distance capture" for targets which are determined too dangerous for a controlled capture. The project will remove a piece of now defunct SSTL satellite from orbit, building on work from the 2017 RemoveDEBRIS project. Fitting, for the company with the first recorded collision between a satellite and space debris.

The controlled capture method involves matching the speed, rotation, and trajectory of the satellite so that it can be secured and brought safely down to Earth with a spacecraft. It is a complicated, precise, yet entirely possible procedure.

If the satellite is moving too quickly or uncontrollably upon approach, the ADR mission operators will d-orbit the object by increasing drag. This involves using a net that is fired from a distance and wraps around the debris. The net is tethered to a backpack, which releases a solar sail to increase the surface area of the satellite. The increased surface area means greater air-resistance, so as the satellite slows down and moves into higher density atmosphere, the thicker air causes the satellite to return to earth and burn up on re-entry.

Both techniques will be trialled in the mission, which will begin in 2025.