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Author: Mr. Timothy Peterson
United Kingdom

# OPTIMISATION OF DEBRIS INTERCEPT MANOEUVRES TO ENABLE ACTIVE REMOVAL MISSIONS

**Abstract**

The devolution of the space debris environment is paramount to ensuring the continued usage of LEO and beyond, considering the current environment and trends, this is only feasibly achieved through the Active Removal of Space Debris. In order to achieve this, the cost of removing the debris objects that present the biggest risk to the continued uncontrolled evolution of the debris environment must be minimised. Part of this cost reduction is the optimisation of the intercept trajectories to enable a larger delivered mass on target and allow multiple debris objects to be removed in a single mission. This paper tackles the problem of optimising these transfers, and the practical implications on a mission propulsion system that seeks to do this. It will tackle this reduction in delta-v requirement by introducing a process for first optimising the lambert transfer to intercept the debris, and then the optimisation of the overall manoeuvre through the use of phasing orbits to minimise the cost of the RAAN change. It builds this combined manoeuvre profile to transfer between debris objects at a rate in-line with the current predictions for the need to successfully stabilise the debris environment. Finally, through a solution to the travelling salesman problem it will establish a complete mission profile out of the optimised transfers. These reductions in delta-v, and the total mission profile, is then assessed with respect to the propulsion system that seeks to achieve it, and the practical considerations and implications of the mission are discussed.