

## SYMPOSIUM ON VISIONS AND STRATEGIES FOR FAR FUTURES (D4)

## Access to Space in the Far Future (3)

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## DEFLECTION OF LARGE SPACE DEBRIS BY MEANS OF SPINNING AND SWINGING TETHERS

**Abstract**

This study examines the capability of a tether system to deflect large space debris objects, causing them to reenter into the atmosphere in a controlled fashion. The tether system size and mass required for a representative debris object is estimated. The deflection is accomplished through a “soft interaction maneuver” with a tether system. It is implemented by attaching a tethered projectile to the debris object, causing it to retard via momentum exchange by swinging around it one half revolution and then release. The orbit modification maneuver could be part of an on orbit debris mitigation campaign that employs several small tether systems from a base satellite targeted at distinct debris objects. It could also be a dedicated mission from the Earth targeting a specific debris object. While the latter option requires a smaller tether system, the former one may be more cost effective overall. A spinning motion induced on the tether system is considered as a means of reducing the risk of breakup and generation of new debris. Finite tether material strength impact on size and cost is taken into account.