SPACE DEBRIS SYMPOSIUM (A6)
Space Debris Removal Issues (5)

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ORBITAL DEBRIS-DEBRIS COLLISION AVOIDANCE

Abstract

We focus on preventing collisions between debris and debris, for which there is no current, effective mitigation strategy. We investigate the feasibility of using a medium-powered (5 kW) ground-based laser combined with a ground-based telescope to prevent collisions between debris objects in low-Earth orbit (LEO). The scheme utilizes photon pressure alone as a means to perturb the orbit of a debris object. Applied over multiple engagements, this alters the debris orbit sufficiently to reduce the risk of an upcoming conjunction. We employ standard assumptions for atmospheric conditions and the resulting beam propagation. Using case studies designed to represent the properties (e.g. area and mass) of the current debris population, we show that one could significantly reduce the risk of more than half of all debris-debris collisions using only one such laser/telescope facility. We speculate on whether this could mitigate the debris fragmentation rate such that it falls below the natural debris re-entry rate due to atmospheric drag, and thus whether continuous long-term operation could entirely mitigate the Kessler syndrome in LEO, without need for relatively expensive active debris removal.