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

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SYSTEM ENGINEERING ANALYSIS OF DERELICT COLLISION PREVENTION OPTIONS

Abstract

Sensitivities to the future growth of orbital debris and the resulting hazard to operational satellites due to collisional breakups between debris fragments and large derelict objects are being studied extensively. However, little work has been done in quantifying the technical and operational tradeoffs between options for minimizing future derelict fragmentations that act as the primary source for debris hazard growth. The two general categories of debris mitigation examined are active debris removal (ADR) and just-in-time collision avoidance (JCA). Timing, cost, and effectiveness will be compared for ADR and JCA solutions highlighting the required enhancements in uncooperative element set accuracy, rapid ballistic launch, despin/grappling systems, removal technologies, and remote impulsive devices. The primary metrics will be (1) the number of derelict objects removed versus the number of catastrophic collision events prevented, (2) cost per collision event prevented, and (3) cost to keep lethal collision hazard below 1.5 percent/year at all altitudes. The potentially controversial approach of simply not doing either JCAs or ADRs and just making space systems more robust and reliable to debris impacts is also examined.