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ASSESSING POTENTIAL FOR CROSS-CONTAMINATING BREAKUP EVENTS FROM LEO TO GEO

Abstract

The Massive Collision Monitoring Activity (MCMA) started in 2015 examining encounter dynamics of clusters of massive objects in low Earth orbit (LEO) that had the potential for significant debris-creating collision events. While this population contributes significantly to the potential for the most risky orbital encounters, it was noted in 2017 that there were a large population of abandoned rocket bodies that both interacted with these clusters in LEO but whose orbits extended to semi-synchronous and geosynchronous orbits. This cross-cutting population of 150 rocket bodies totaling over 500,000kg of derelict mass have been monitored over the last year to characterize their encounter rates with massive objects in LEO and each other. Results from this analysis are presented showing that, while these objects in highly elliptical orbits have a much lower probability of collision, the consequences of such an event is distinctly severe due to the high relative impact velocities and how the resulting debris would pose collision risks to resident objects at the apogee of these derelicts. This is concerning since it has been shown in the past that the probability of major debris-generating events in GEO (and other higher Earth orbits) is much lower than in LEO but this potentially cross-contaminating population could bridge this large spatial separation. Just as with the primary MCMA analysis, "worst offenders" are identified as primary objects to be removed to optimally reduce the risk from this possible cross-contaminating mechanism and observations are made about close encounter rates (relative to the original LEO clusters).