

17th IAA SYMPOSIUM ON SPACE DEBRIS (A6)
Modelling and Risk Analysis (2)

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WHAT IS THE COST OF NOT DOING DEBRIS REMEDIATION NOW?

Abstract

Efforts to manage the growth of the orbital debris population have focused on debris mitigation activities such as limiting the lifetime of objects after operational use; eliminating generation of debris from deployment and operations; and ensuring that reentry of debris poses an acceptable risk to people and property on the ground. Examination of these debris mitigation activities worldwide have shown some positive effects on the debris environment. However, efforts to pursue debris remediation operations, such as active debris removal (ADR), have been limited to technology demonstrations. A limiting factor to ADR implementation has been its cost. Rather than trying to estimate the cost of ADR operations, this paper examines the costs of not urgently implementing debris remediation countermeasures. The current analysis of the most likely massive-on-massive collisions in low Earth orbit (LEO), as characterized by the ongoing Massive Collision Monitoring Activity (MCMA), is used to identify several scenarios for debris-generating events. The population of operational satellites in LEO now and anticipated for 2022 is detailed. The interaction of the likely massive collision events and the current/2022 operational payload population is examined to estimate the cost to the global community if inaction in debris remediation activities continues. The “cost” of these events will include (1) direct loss of satellite capability, (2) complications to future debris remediation activities due to the larger debris population, and (3) possible short-term (10 years) ripple effect of debris encounters from potential collision events. It is hoped that the results of this paper will encourage the aerospace community to actively pursue the development of debris remediation options.