

SPACE DEBRIS SYMPOSIUM (A6)
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AN ANALYSIS OF THE APPLICABILITY OF SPACE DEBRIS MITIGATION GUIDELINES TO THE
COMMERCIAL SMALL-SATELLITE INDUSTRY

Abstract

Current space debris mitigation guidelines recommend that orbital lifetime after mission completion must not exceed 25 years, if the satellite is not maneuvered to a disposal orbit. The present work investigates the feasibility of satisfying this guideline in the case of small-satellites (<150 kg), by considering Technology Readiness Level (TRL) and cost of current End-Of-Life (EOL) solutions. Specifically, we analyze strategies adopted by companies such as SpaceX and Planet Labs to satisfy the “25-year rule” with small satellites placed on high-altitude orbits. Given the forecast that hundreds of small satellites will be launched in the coming decade, we make specific recommendations to improve upon the 25-year rule, to ensure sustainable growth of the small-satellite industry and minimal impact on the debris population.

With the rapid development of the small-satellite industry, driven by the success of Commercial-Off-The-Shelf (COTS) components in space, the economics of space utilization have changed tremendously over the past two decades. Small-satellite missions offer the advantage of shorter development time, and reduced manpower and infrastructure requirements over their larger counterparts. Consequently, new space companies, focused on leveraging the opportunity presented by small-satellites, have emerged across the globe. The expected explosion of small-satellite launches in the coming decade necessitates a careful assessment of the technical solutions and policies in place to ensure safe EOL disposal. Companies such as SpaceX, WorldVu and Planet Labs, have announced plans to launch hundreds of small satellites in the coming years. We analyze the potential challenges this generates in terms of current EOL technology and space policy.

Based on our analysis, we provide a concrete set of recommendations to complement current Inter-

Agency Space Debris Coordination Committee (IADC) guidelines. We analyze the applicability of the “25-year” rule to the small-satellite industry and provide a set of tangible directives to mitigate future threat to operational satellites in Low-Earth Orbit (LEO) and the International Space Station (ISS). Our results provide policymakers with a view towards the challenges emerging out of the small-satellite industry and a strategy to update current space debris mitigation guidelines to support commercial small-satellite ventures, whilst safeguarding the space environment.