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Policy, Legal, Institutional, Economic and Security Aspects of Debris Mitigation, Debris Remediation and
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ESA'S ZERO DEBRIS APPROACH: A RESPONSIBLE PATH TO MITIGATE SPACE DEBRIS IN
VALUABLE ORBITS

Abstract

The Zero Debris Approach aims to totally stop the generation of debris in valuable orbits by 2030. This approach has been initiated by ESA, strongly supported by its Director General, as a solution to the catastrophic degradation of Earth orbital environment, that is putting at risk future missions and people on ground as well as in space. The yearly launch rate is now 10 times higher than it used to be 10 years ago, rendering the current Space Debris Mitigation standards insufficient to prevent the proliferation of debris in orbit. Therefore, there is an urgent need for action in order to ensure safety on ground and in space.

To implement this Zero Debris approach, ESA proposed a transversal action structured around four main pillars: the evolution of Policies on Space Debris Mitigation towards reinforced mitigation measures, an upgrade of spacecraft platforms integrating End of Life technologies, improved collision avoidance capabilities and technologies to ease removal, the demonstration of reliable removal services, and improved operations and space traffic management to ensure space safety. Such a Zero Debris approach would entail a more sustainable strategy for space operations and End of Life, boosting the disposal success rate from valuable orbits and encouraging removal action in case of failed disposal.

To better define the approach and its implementation, a Concurrent Engineering Study was carried out in 2022 aiming to achieve the following objectives:

- Provide an overview of the current situation to give an understanding on the current debris environment, standards and guidelines, technologies and level of implementation.
- Define recommendations for the evolution of Space Debris Policy, considering on the one hand the environmental needs and on the other hand the impacts on future missions.
- Define what is meant by Zero Debris (through recommendations for guidelines and requirements update). This shall allow the follow-up discussions and decisions to be done in more concrete terms.
- Provide a first roadmap of what needs to be done in terms of technical developments, knowledge and standards from here to 2030 to aim to implement a Zero Debris policy by then.
- Propose a phase-in schedule accounting for the technology development timing and the upcoming ESA (and partners) missions.

This paper will focus on the recommendations defined for a Zero Debris approach as well as the foreseen next steps to ensure the availability of the required technologies and standards by 2030.