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Mitigation and Standards: status, lessons learnt and future with smallsats and constellations (4)

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SPACE DEBRIS BEYOND EARTH ORBIT: A TECHNICAL AND LEGAL EXAMINATION IN THE LIGHT OF NEW SPACE EXPLORATION INITIATIVES

Abstract

The urgency to adequately address the problem of an increasing space debris population in orbits around Earth is finally receiving considerable attention. While international legal norms pertaining to space activities are generally characterised by fundamental principles of State conduct rather than detailed behavioural guidelines for spacecraft operators, the past two decades brought a handful of non-legally binding instruments guiding the conduct of space activities in relation to the mitigation of space debris. The work of the Inter-Agency Space Debris Coordination Committee (IADC) is a prominent example in this regard and its principal output, the IADC Space Debris Mitigation Guidelines, nowadays recognised and followed by a growing number of States and non-governmental space actors.

The contemporary exploration and use of outer space undeniably focus on the near-Earth environment. New initiatives to expand spaceflight beyond Earth orbit, however, gain increasing attention by space actors around the world, making it not only an interesting but also an important exercise to analyse the applicability and suitability of existing space debris mitigation instruments to lunar, planetary and deep space exploration, as well as to other destinations beyond LEO, MEO and GEO. Orbits around the Lagrangian points, Distant Retrograde Orbits and Near Rectilinear Halo Orbits may be attractive as aggregation or staging stops for future solar system exploration. Strategies for the disposal of space debris in these orbits may therefore be essential.

With an increasing number of space objects expected to operate beyond Earth orbit in the coming decades, important questions arise: Is space debris mitigation in lunar and planetary environments an issue to be dealt with as part of new exploration strategies? If so, can the array of existing guidelines and recommendations for space debris mitigation be extended to space objects beyond Earth orbit, or does planetary exploration, both from a technical, physical and regulatory point of view, call for the development of new norms? Which technical and non-technical constraints will have to be taken into consideration, and what role will planetary protection and potential surface infrastructures on celestial bodies play for space mission EOL strategies?

This inter-disciplinary article will discuss space debris-related issues raised by future space exploration from a technical and legal perspective, offering an outlook on the interplay between engineering and regulatory aspects in the context of the long-term sustainability of space activities.