

Committee on the Peaceful Uses of Outer Space Scientific and Technical
Subcommittee 62nd Session (3-14 February 2025)

Agenda Item 5: “Space Debris”

COSPAR statement by Ms. Pascale EHRENFREUND, President COSPAR, or Mr.
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Madame Chair, Distinguished Delegates,

Thank you for allowing me this opportunity to report on the matter of Space Debris. I am presenting the following report on behalf of the Committee on Space Research (COSPAR).

At the 61st session of STSC in 2024 COSPAR addressed cis-lunar space debris policies and the emerging matter of contamination of upper atmosphere by reentering and burning up of space objects.

One might assume that the sustainability of the cis-lunar region only affects space operations within that region; however, this assumption is incorrect. A single fragmentation event in cis-lunar space can generate debris that travels back to the lunar surface and even to Earth, posing a threat to near-Earth space assets along the way. Therefore, further research is required to develop effective end-of-life strategies for space infrastructure. Prioritizing such strategies for both cis-lunar and near-Earth regions is crucial, as traditional reentry and demise approaches, once considered reliable, now pose unforeseen atmospheric challenges and are no longer the preferred solution. In the cis-lunar region, viable end-of-life solutions do not currently exist, despite ongoing and planned missions.

Additionally, advancements in materials have led to an increasing number of objects smaller than two metric tons surviving reentry and reaching the Earth's surface, raising significant safety concerns. Sustainable end-of-life strategies in cis-lunar space remain largely unexplored and ambiguous. Furthermore, challenges persist in surveillance and astrodynamics, particularly in achieving reliable initial orbit determination and maintaining custody of objects, even when only sparse observational data are available. Robust solutions in these areas are still lacking.

Deorbiting has long been an established space debris mitigation practice in low-Earth orbit. Generally, objects weighing less than two metric tons are expected to burn up upon reentry. However, recent research has highlighted two critical issues: the exponential growth in the

number of satellites within constellations has led to a significant increase in reentering objects and total reentry mass, and changes in satellite materials have altered their interaction with the atmosphere during reentry. More research is needed to better understand these materials and their reentry behaviors to minimize negative impacts on the upper atmosphere and Earth's broader ecological system. Increased funding and research efforts should be prioritized to address these concerns.

In this context, COSPAR-associated scientists are collaborating with ESA, NASA, ESF, and other interested researchers in an ad hoc working group focused on potential upper-atmosphere pollution caused by re-entering debris. This multidisciplinary effort brings together atmospheric chemists and physicists, material experts, space industry stakeholders, and international space research organizations. Their goal is to identify knowledge gaps in modeling and improve testing methodologies to obtain relevant data, ultimately informing appropriate mitigation and regulatory measures. Key areas of study and consideration include emission profiles, atmospheric chemistry, atmospheric modeling, impact assessment, and measurement capabilities.

I would also note that COSPAR stands behind and co-sponsors Conference Room Paper 22 on "The Protection of Dark and Quiet Skies for Science and Society", which among several concerns addresses the phases of flight such as orbit raising and deorbiting. Observations of current constellations indicate that, while some satellite operators and manufacturers have reduced brightness through mitigation measures, many satellites remain highly visible, without any mitigation strategies, causing significant disruption to ground-based astronomy.

In conclusion, COSPAR is proud to announce that it has recently signed the ESA Zero Debris Charter as one amongst many supporting organizations. We will contribute actively with the COSPAR scientific expertise to the goals of the Charter driving global space debris mitigation and remediation efforts forward.

Thank you for your attention.