

IISL COLLOQUIUM ON THE LAW OF OUTER SPACE (E7)
Remediation of Space Debris: A Fundamental Legal Challenge? (7)

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THE PATH TO ESTABLISHING AN EFFECTIVE FRAMEWORK FOR SPACE DEBRIS
REMEDICATION ON THE BASIS OF MITIGATION: LEGAL PROPOSALS RESULTING FROM THE
TECHNICAL RESULTS OF THE REDSHIFT PROJECT

Abstract

The ReDSHIFT (Revolutionary Design of Spacecraft through Holistic Integration of Future Technologies) project focused during three years on various means to reduce the impact of space debris. The project investigated the synergy between theoretical and experimental results (long-term simulations, astrodynamics, passive de-orbiting devices, 3D printing, design for demise, hypervelocity, impact testing), assessed mitigation technologies, measured the long-term effect of existing guidelines and explored the relevance of these technical findings for the implementation of legal measures for space debris.

The *status quo* of the relevant legal framework is well-known: five international treaties along with general international and telecommunications law incorporate the *corpus iuris* for activities in outer space, supported by a number of non-binding guidelines and recommendations that address space debris more specifically. The practical application and the effectiveness of the legal framework are challenged on a few levels. The complexity of space debris concerning the usability of outer space in a long-term perspective does not only require adequate regulation. It demands a holistic approach that provides a pragmatic trade-off between the restrictions needed and their benefits.

ReDSHIFT demonstrates that debris mitigation actions can be measured in a quantitative way. This plays an important role for the legal considerations on implementing preventive and reactive measures, including ADR. While a high level of mitigation compliance is essential, it is nevertheless not sufficient to reach a stabilization of the debris environment. Hence, remediation is needed to complement and amplify mitigation.

A global strategy - both on the technical and on the legal level, from the planning of the mission and spacecraft design, up to end-of-life - is needed. Legal efforts to minimize space debris should not be concentrated only on compliance and enforcement of existing guidelines. These must be adapted, extended and supported by (new) legal and economic measures.

In the paper, by premising the legal analysis on technical findings, possibilities to re-formulate the existing regulations are proposed, including:

- a revised interpretation of the 25 year-rule for MEO, aiming at the deorbiting of GNSS satellites at end-of-life;
- an add-on to GEO disposal rules, accounting for the growing exploitation of inclined GEO orbits for natural end-of-life re-entry;
- recommendations to limit the orbital lifetime in LEO and MEO by exploiting orbital resonances;
- the use of augmentation devices for deorbiting also from orbits higher than LEO;
- recommendations for demisable materials and design-for-demise procedures
- economic incentives to promote ADR.