

IAF SYMPOSIUM ON SECURITY, STABILITY AND SUSTAINABILITY OF SPACE ACTIVITIES
(E9)

Policy, Legal, Institutional, Economic and Security Aspects of Debris Mitigation, Debris Remediation and STM (1-A6.8)

Author: Mr. Abhinav Srivastava
Bellatrix Aerospace Private Limited, India, abhinav@bellatrix.aero

A COMPREHENSIVE DEBRIS CREDIT FRAMEWORK FOR ALLOCATION AND USAGE OF
DEBRIS CREDITS FOR FURTHERING SUSTAINABILITY IN SPACE

Abstract

With the number of debris in space crossing 130 million, sustainability in space has become an increasingly important priority for all stakeholders in the space industry, with a heightened need for a regulatory framework to govern and incentivize sustainable use of space.

Traditionally for industries steeped in high-technology and borne out of innovation, there has been a ‘regulatory lag’ premised on being reactive to the gaps in the industry as opposed to proactively laying down a roadmap that removes uncertainty whilst providing the right impetus for growth. Mitigating debris is at the forefront of this challenge, with debris the size of a paint fleck moving at speeds of 17,500 kmph being capable of causing significant damage to a spacecraft.

The optimal approach to tackling this challenge as an early-stage problem before it exacerbates into a bigger concern, is to implement the debris credit framework presented in this paper, analogous to the carbon-credit systems that have been in place for carbon emissions. This debris credit framework (DCF) has been constructed with a two-pronged optimization objective in mind: first, to prevent and reduce the creation of new space debris and second, removing existing debris via various available means. The paper will also assess the efficacy of Bellatrix’s propulsion systems within the prescribed framework to determine their sustainability.

The quantitative model and qualitative factors selected for computing the allocation, usage, deductions and metrics for the debris credit framework have been based on a variety of factors (including risks of orbit collision, historic data, an operational orbit coefficient computed via a weighted averaging method, among other metrics), that are balanced by coefficients derived through risk analysis, according a higher priority to the more critical elements.

To ensure expansiveness and robustness, the model incorporates into its ambit the Space Sustainability Rating (SSR) proposed at the World Economic Forum and developed further through the works of Jah et al.

Additionally, as part of this paper, the debris credit framework also outlines a roadmap to the establishment of an internationally-accessible debris credit platform that can function as an exchange between the supply and the demand sides to provide the foundations of a secondary market, in addition to outlining a strategic approach to drive acceptance and implementation of this framework amongst the various different stakeholders. With widespread adoption, the DCF could see applications in space insurance, risk management, policy and goal-based financing (wherein the goal is mitigating debris).