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Assuring a Safe, Secure and Sustainable Environment for Space Activities (4)

Author: Ms. Samiksha Raviraja
University of Leicester, United Kingdom

Ms. Laurene Colin
HEO Robotics, United Kingdom

Mr. Will Gregory
Airbus Defence & Space, United Kingdom

Mr. Zygimantas Vainauskas
University of Leicester, United Kingdom

Mr. Gianluca Borgo
University of Southampton, United Kingdom

Ms. Martina Dimoska
International Space University (ISU), France

Ms. Sanaa Rashid
Astroscale Ltd, United Kingdom

Ms. Manisha Mahesh Kumar
University of Southampton, United Kingdom

TOWARD A TECHNICAL POLICY FRAMEWORK FOR MITIGATING SPACE DEBRIS IMPACT
AND PREVENTING THE ONSET OF KESSLER SYNDROME

Abstract

The increasing proliferation of space debris poses a grave threat to space assets and the long-term sustainability of outer space. Recognizing the urgency of this issue, this proposal advocates for the formulation of a comprehensive technical policy framework focused on mitigating the impact of space debris and preventing the onset of Kessler Syndrome. The proposed framework integrates cutting-edge technologies, rigorous standards, and international collaboration to address the challenges posed by space debris and ensure the continued responsible use of outer space.

The first key element of the proposed framework is the establishment of an advanced orbital debris monitoring and early warning system. This system will utilize state-of-the-art telescopes, radars, and satellite sensors to continuously track and catalog space debris in real-time. The integration of artificial intelligence algorithms will enhance the accuracy and efficiency of monitoring, enabling prompt identification of potential collision risks.

Building upon the monitoring system, the framework emphasizes the development of predictive analytics tools. These tools will utilize historical and real-time data to forecast potential collisions and assess the risk of debris propagation events. Satellite operators and space agencies will be equipped with actionable insights, allowing for timely adjustments to satellite trajectories and orbital parameters to avoid collisions.

The framework proposes the promotion of research and development in active debris removal technologies. This includes the deployment of robotic systems, harpoons, or other innovative methods to actively capture and deorbit defunct satellites and other large debris objects. Incentive structures and regulatory measures will be introduced to encourage satellite operators to integrate deorbiting capabilities into their missions.

To prevent the creation of new space debris, the framework advocates for the standardization of spacecraft design principles that prioritize ease of deorbiting and minimizing fragmentation upon disposal. Strict guidelines will be established for end-of-life disposal procedures, ensuring that defunct satellites are safely removed from operational orbits.

A unified database of space debris information will be established, and protocols for transparent communication among space-faring nations will be implemented to facilitate coordinated efforts in mitigating the impact of space debris.

By addressing these technical aspects, the proposed policy framework aims to mitigate the risks associated with space debris and prevent the escalation to Kessler Syndrome. Through the integration of advanced technologies, standardized practices, and international cooperation, this framework seeks to ensure the sustainable use of outer space and preserve the orbital environment for future generations.