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A PROPOSAL OF RESPONSIBLE SPACE ACTIVITIES: THE EXPLORATION, GOVERNANCE, AND RESPONSE TOWARDS SPACE DEBRIS EVENTS IN A LEGAL BINDING INSTRUMENT

Abstract

Space debris is becoming a threat to human space activities and utilization. ESA's Space Debris Office via Meteoroid and Space Debris Terrestrial Environment Reference (MASTER-8) detects 40,500 objects larger than 10 cm, 1,100,000 objects from 1 cm to 10 cm, and 130,000,000 objects from 1 mm to 1 cm in Earth orbit. Over 650 disruptive events, including those coming from commercial operations, have been detected. Reports indicate that space debris collisions increase the fragmentation and damage to extraterrestrial human-made objects, as well as loss and harm on the Earth's surface. At the orbital level, space debris increases the risks to infrastructure, including future space missions, communication systems, and space tourism. Collisions between artificial objects further threaten astronaut safety. Re-entering objects that survive the natural orbital decay can endanger humans, cause loss of properties, and damage the environment, especially in inhabitant zones. Launch missions, especially for commercial purposes, require follow-up tracking of debris to avoid the risks. For this reason, a legal transformation is necessary, as the current circumstances highlight the urgent need to strengthen space debris regulations, transitioning from soft law to hard law. This shift should focus on mitigation and removal strategies, including clear mechanisms for responding to detriment cases. The transition allows for the improvement and adoption of the current agreements and guidelines. This paper addresses the legal enforcement of space debris management through a strategic plan to implement a convention on mitigation and removal. It covers provisions on responsibility and liability for loss, injury, or damage caused to other parties, including economic incentives and research endorsement. The analysis evaluates existing space debris guidelines and related instruments, solutions, and relevant legal theories. It identifies the gaps, challenges, and opportunities to define a binding instrument to establish a convention, more than recommendations. Furthermore, it explores the establishment and roles of a space debris authority to support the UNCOPUOS and the IADC in coordinating efforts and resolving disputes between governments and organizations. The study also argues, compares, and extracts examples and terminology from conventions within and beyond the space domain, namely the Convention on International Liability for Damage Caused by Space Objects and the United Nations Convention on the Law of the Sea. Ultimately, this study proposes a binding enforcement mechanism for space debris management to be adopted as a formal convention, promoting safe exploration, fair governance, and effective response to space debris challenges, ensuring responsible and sustainable space activities.