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OPERATIONAL IMPACTS OF INTERNATIONAL AGREEMENTS AND REGULATIONS IN SPACE TRAFFIC MANAGEMENT AND PROPOSED SOLUTIONS

Abstract

As space activities diversify and the number of objects in orbit increases, the safe and sustainable management of missions in Earth's orbit and deep space has become an unavoidable necessity. Space Traffic Management (STM) encompasses various critical aspects, including the monitoring of natural and artificial celestial bodies, the establishment of international tracking and regulatory systems, space security, and global cooperation. Developing a global monitoring infrastructure to mitigate the risk of collisions in space is essential for ensuring a sustainable space environment. Furthermore, failures or the decommissioning of satellites in Earth's orbit pose environmental hazards and potential risks to human safety as debris re-enters the atmosphere and falls to Earth. Space technologies and assets, which play a crucial role in modern solutions through communication, global navigation, and Earth observation applications, must operate within a sustainable space environment. This requires the implementation of regulations designed with an interdisciplinary approach. Only through such measures can space activities—extending to other planets and possessing immense economic value—be conducted with transparency, oversight, and in a peaceful manner. Emphasizing the necessity of a unified legal framework applicable to all space actors, including governmental and private, as well as military and civilian entities, this study presents technological and legal recommendations to ensure a secure and sustainable space environment.