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THE RISE OF SMALL SATELLITES CONSTELLATIONS: ECONOMIC ANALYSIS AND POLITICAL MEASURES FOR ORBITAL DEBRIS PROBLEMS

Abstract

The launch traffic to Low Earth Orbit (LEO) is undergoing significant changes: instead of launching few, complex, large and expensive spacecraft, the trend is now towards the use of small satellites less complex and of least costly. In this context, the private sectors, including universities and educational centres are playing a prominent role. In particular, private companies have shown interest in deploying constellations of hundreds or even thousands of spacecraft in LEO region with the objective to provide global telecommunications services and internet coverage with low latency.

This phenomenon raises concerns about the creation of orbital debris, making activities in Earth Orbit unsustainable and highlighting the need to address the challenges on the sustainability in LEO. The constant growth of the space debris poses an increasing risk to those constellations, which could contribute themselves to increase the space debris spatial density at LEO altitude. In the long-term perspective, because the space activities serve the needs of different players, with their own requirements, mitigation and remediation measures for reaching and maintaining a condition of sustainability are becoming necessary.

This study evaluates the probability of collisions on active mega-constellations that contribute many different applications on Earth. After a statistic analysis, the study will address the topic of small satellites constellations from two different perspectives:

- **From economic perspective:** the paper provides an understanding of small satellite constellations market and its market drivers in order to anticipate the future of this specific segment. Then, the study will assess the economic impact of space debris collision on small satellite constellations;
- **From policy perspective:** the paper addresses the primary issues that have raised within the international space community to support the sustainability of space activities and explores several of the efforts to explore and develop international agreements. To reach a sustainable state for space activities, the study will analyse the disposal technological solutions and mitigation policies.