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SYSTEMATIC ANALYSIS OF SATELLITE REUSE: TOWARDS A SUSTAINABLE APPROACH FOR OPTIMIZING SPACE RESOURCES

Abstract

The increasing volume of space debris is a significant concern for the sustainability of space missions, as satellites that exceed their useful life or experience partial failures contribute to orbital pollution. Satellite reuse has emerged as a potential solution to reduce these issues by optimizing the use of space resources and decreasing environmental impact. This study aims to assess the viability and opportunities for reusing decommissioned satellites, focusing on how this practice can optimize resources and reduce space debris. In particular, the possibility of repurposing satellites for new missions is analyzed, such as reconfiguring inactive communication satellites into Earth observation platforms or repurposing navigation satellites as secondary elements in space research missions. Additionally, the reuse of components like solar panels, propulsion systems, and communication systems is considered, which could be adapted for new applications or to extend the operational life of active satellites. A systematic analysis of previous studies will be conducted, utilizing models that analyze both financial and ecological costs and benefits to understand how satellite reuse could improve operational efficiency and decrease environmental impacts. The goal is to identify effective approaches that can reduce space debris, enhance operational efficiency, and lower the costs associated with new missions. This research will contribute to the development of sustainable solutions for managing space debris, promoting satellite reuse as a key strategy to ensure sustainability in future space missions.