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Strategies for Rapid Implementation of Interstellar Missions: Precursors and Beyond (4)

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ENABLING CLEAN SPACE USING CUBESAT TECHNOLOGIES FOR ACTIVE SPACE DEBRIS
REMOVAL

Abstract

Space debris poses a serious problem for near earth space activities in the future and unexpected events in the recent past have made the current situation alarming. The situation has worsened over the recent years and now has direct implications on the safety of astronauts, lifespan of the active space systems, overall cost of the mission and future mission designs. Hence, innovative technologies are the need of the hour which have to be developed by adopting a multidisciplinary approach and working beyond nationalities and agencies to safeguard and further the “space dream” in the coming decades.

Since their first launch in 2003, cubesats have consistently proved to be an excellent test-bed for novel technologies and reliable space architecture. Additional factors such as small size, low cost of operation and ease of launch has strongly attracted the attention of the space community for further development and usage. This paper provides an insight into the viability of cubesat technology to tackle the space debris problem by presenting a technology review of the prominent debris removal techniques proposed based on the cubesat architecture. These methods will then be subjected to a systems-engineering method of analysis to assess the most feasible approach for the problem. The present study highlights such technologies of tomorrow which can handle the situation effectively. The present work will try to lay the road ahead for the space community in the event of failing to curb the problem. Parameters such as technology readiness levels (TRL) and cost will be studied. A comprehensive cost analysis will be performed to weigh the case in favor of using cubesat technology and the observed cost effectiveness can be a major motivating factor for funding agencies. Finally, a policy framework that needs to be developed to encourage the small satellite industry owing to its immense potential to cause socio-economic impact will be discussed.