

IAF SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (1) (5)

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OPERATIONAL REALITIES OF ELECTRICALLY-PROPELLED SPACECRAFT

Abstract

In this paper the authors explore the operational realities of using electric propulsion (EP) for orbit raising, station-keeping, and collision avoidance maneuvers in LEO. This will include positive operational ramifications of EP such as smaller mass margins, smaller spacecraft, simplified and safer pacification, and higher reliability compared to chemical thrusters. Potential negative features of EP relative to chemical propulsion will also be covered: lower thrust, less responsiveness, and challenges using radar-based ephemerides for collision avoidance screening.

Discussions between the diverse suite of authors (e.g., space operators, space surveillance tracking staff, and EP system experts) have led to a consensus that the potential negative features of EP fall into two categories: those which have solutions, and those which can be explained as a misunderstanding. Overall, this examination of the operational impact of EP to mitigate collision risk in LEO has found this solution to be uniquely positive in all aspects (e.g., the ability to inject low and efficiently orbit raise, conduct collision avoidance, station keep precisely, and deorbit). However, it has also been determined that collision avoidance operations during orbit raising and powered deorbit would benefit from improved modeling of EP in orbit propagation models, and an approach to this challenge is explored. Details regarding the constant thrust attribute of EP-propelled systems are also discussed.