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INITIAL MODELLING OF CUBESAT CONSTELLATION DISPERSAL, COMPARING DIVERSE PROPULSION TECHNOLOGIES

Abstract

The rapid increase in cubesat maturity in the last few years has driven an increase in the use of cubesats for Earth observation, remote sensing, asset tracking and communications missions. While individual cubesats are appropriate for de-risking and proof-of-concept missions, full mission applications often require constellations of cubesats, sometimes numbering several hundred individual cubesats, for complete functionality. Existing cubesat constellations have used differential drag to phase satellites around an orbital plane, but cubesat scale propulsion systems capable of providing the Δv required for constellation dispersal are only now beginning to be adopted by the market. Due to their novelty in the market, few potential cubesat constellation owner/operators fully understand the benefits of cubesat propulsion systems. In this work we shall illustrate several use cases for cubesat propulsion systems, including manoeuvres necessary for constellation dispersal including orbit raise, phasing, RAAN precession and drag compensation. We shall also compare various technologies either available today or under development, to better illustrate design and system trade-offs such as burn duration, propellant mass and system integration requirements. Comparisons shall be made with the owner/operator's requirements in mind, providing a customer focussed trade study in this rapidly developing sector.