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RECOMMENDATIONS ON THE USE OF ELECTRIC PROPULSION FOR SMALL SATELLITES: LESSONS LEARNED FROM PROBA SATELLITES

Abstract

In the last years, the interest in electric propulsion (EP) has grown to a point where several space industries tried to develop their own system for orbit maintenance of GEO satellites or drag free missions at low altitude (e.g. GOCE). In that sense, EP demonstrates more and more its capability to perform very efficient maneuvers at the price of the power consumption.

However, its applicability has always been limited when decreasing the spacecraft size and reaching the small satellite world. It appeared that the power required to provide effective propulsion was not suitable anymore for typical small satellite available power. This implies a certain reluctance of the small satellite industries to invest time and money in improving their traditional power subsystem to fit this stringent constrain.

In the frame of the next generation of PROBA satellites, it has been tried to start again from the basic propulsion needs a small satellite would have in order to establish a feasible solution using low power (150W) Electric Propulsion currently under development on the market. Aspects like launch injection correction, orbit raising and maintenance but also formation flying control and de-orbiting strategies have been studied.

This paper will focus on explaining how the main challenges of taking EP on board a typical PROBA platform (150kg and 30kg of payload) have been overcome. System trade-offs will be presented and capabilities offered will be clearly listed in parallel with the available target missions (e.g. debris monitoring and removal). Finally, a case study will demonstrate the high access to space flexibility of the platform regarding to different set of missions needs. The paper will be concluded by providing the space community with some platform prices and availability figures.