Paper ID: 64268
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IAF SPACE SYSTEMS SYMPOSIUM (D1)
Space Systems Engineering - Methods, Processes and Tools (1) (4A)

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DESIGN OPTIMIZATION AND DEVELOPMENT STATUS OF ELECTRIC PROPULSION SYSTEM FOR SATELLITES

Abstract

Safran Aircraft Engines, part of the Safran group, develops ready-for-flight plasma thruster-based propulsion subsystems. These systems cover both individual equipment and integrated solution including power, communication and fluidic management functions. Several power ranges are targeted, and after commercial experience with the 5kW system, Safran has begun the next stage in the development of the 200W/1000W propulsion subsystem.

This development is supported by the European Commission's CHEOPS project, which aims to have a fully European propulsion sub-system ready to flight in 2023. In order to meet the time-to-market and optimize the system competitiveness, the development logic has been organized in three blocks. The first task carried out by Chalmers University is to analyze market needs with the new comers by applying the costing valorization function from equipment design to recurring spacecraft integration. The second step is to improve simulation tools and measurement means to increase the understanding of the behavior of Hall-Effect thrusters. This task has been carried out by UC3M in Spain and CNRS institute in France. Finally, it involves relying on partners with extensive space experience for the equipment development. This results in a cooperation between TAS-B for the power processing unit, Bradford for the fluid management system and Safran for the thruster.

The first phase of the project has been achieved with a PDR maturity reached in March 2021. The next steps are the project industrialization in the second half of 2021, and a CDR scheduled for June 2022 to meet the constellation needs.

The paper will present the key design concept, an overview of the development progress with the maturity reached, and the next stage of development with a risk management approach.