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IAF SPACE PROPULSION SYMPOSIUM (C4)
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BOOST: ADVANCE IODINE ELECTRIC PROPULSION FOR SMALLSATS AND ON-ORBIT SERVICING

Abstract

BOOST (Building blOcks for iOdine thruSTer) is a European Commission-funded research project (GA-101135216) aimed at advancing iodine electric propulsion (EP) technology to catalyze the SmallSat market. SmallSats, weighing less than 500 kg, have transformed the space industry by providing cost-effective access to space, with their popularity expected to surge further in the coming years.

Despite its potential, widespread adoption of iodine-based EP is hampered by technology immaturity. BOOST adopts a modular approach to establish the foundation for standardization and industrialization of iodine-based EP. It entails developing and assembling various EP building blocks tailored for different thrusters, including an optimized neutralizer based on RF cathode technology, a solid iodine cartridge storage system for on-orbit refuelling, a fluidic sub-system connected to the rechargeable iodine tank, and a toolbox of diagnostics and measurement tools dedicated to iodine.

Targeting the 500 – 1000 W range, the project emphasizes on interfaces between sub-systems to facilitate integration and standardization. Key components of the BOOST program include the development of various EP building blocks tailored for different types of thrusters, including Grid Ion Thrusters (GIT) and Hall Effect Thrusters (HET), with the objective of achieving Technology Readiness Levels (TRL) 5/6. Central to the BOOST program is the advancement of solid iodine propellant technology, recognized as an enabling factor for EP in the SmallSat market. Another target of the project is to foster the development of publicly available iodine proofed testing facilities, setting a standard for the design approach of such facilities. Through these targets, the program seeks to overcome the low maturity issues associated with iodine-based EP, paving the way for future standardization and industrialization.

This paper outlines the project's development steps, focusing on building block requirements, interface development, diagnostics and testing facility adaptations. It highlights preliminary evaluations of on-orbit servicing missions, particularly refueling, enabled by the development of a rechargeable tank. This innovation promises extended mission durations and a sustainable approach to propellant supply in space, offering flexibility and cost-effectiveness.

As Europe prepares for on-orbit servicing applications for LEO constellations and beyond, an easily rechargeable solid iodine propellant system holds immense potential to facilitate future life extension missions through on-orbit refueling. BOOST aims to contribute significantly to this advancement, fostering a new era of space exploration and utilization. The project seeks to address current challenges and pave the way for the widespread adoption of iodine-based EP, positioning Europe at the forefront of space propulsion technology.