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ENHANCEMENT OF MICROSATELLITES' MISSION CAPABILITIES: INTEGRATION OF REGULUS ELECTRIC PROPULSION MODULE INTO UNISAT-7

Abstract

Micro and small satellites' market is rapidly growing and its value is estimated to triple in the next four years. To allow different mission scenarios, the need for an autonomous, reliable and cost-effective propulsion system integrated into miniaturized satellites is becoming evident.

The aim of this paper is to discuss REGULUS electric propulsion module and its integration in the UniSat-7 microsatellite. REGULUS is a propulsion unit for CubeSats operated with iodine propellant. Its design has been totally accomplished in T4i, an Italian based company specialized in developing propulsion systems. It is based on a Magnetic Enhanced Plasma Thruster (MEPT), specifically designed for CubeSat platforms ranging from 6U up to 150 kg satellite, and for CubeSat carriers. In UniSat-7, MEPT is integrated with all electronics, fluidic line, iodine tank and structures into a 1.5 U envelope, with a total mass of 2.5 kg. In this 1.5 U version, REGULUS will provide 0.6 mN thrust and 600 s of specific

impulse at 50 W of input power, with a total impulse up to 3000 Ns. REGULUS will be integrated on the UniSat-7 satellite, which will be launched during the first semester of 2020 using a Soyuz-2 launch vehicle. This mission will be carried out by GAUSS. The complete UniSat-7 mission objectives are to inject several satellites into a 450 km SSO orbit and to act as a technology demonstrator, testing specific payloads which will be used in subsequent GAUSS CubeSat missions, as REGULUS. UniSat-7 is a microsatellite with a total mass of 36 kg that contains some CubeSats and PocketQubes deployers. During the overall mission, REGULUS will demonstrate the advanced capabilities of Unisat-7 with electric propulsion on board. Several operations will be performed, such as the variation of altitude for the imaging payload operations, the simulation of orbital operations to spread CubeSats injection into different orbits and UniSat-7 decommissioning. REGULUS will also prove UniSat-7 capabilities of drag compensation and orbital maneuvers.

Keywords: CubeSat, electric plasma propulsion, microsatellite, nanosatellite, REGULUS, UniSat-7.