SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (4)

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# ELECTRIC PROPULSION SUBSYSTEM ON SGEO SATELLITE: ARCHITECTURE, FUNCTIONAL FEATURES AND FUTURE ENHANCEMENTS

**Abstract**

The paper presents the electric propulsion subsystem of the Small Geostationary Satellite (SGEO), with a main focus on the High Efficiency Multi-stage Plasma Thruster (HEMPT) branch, highlighting the innovative features of both satellite and electric thrusters assembly. SGEO is a new concept satellite developed in the frame of the European Space Agency's ARTES-11 program, which will be launched for the HAG1 mission. The industrial consortium responsible for the satellite is headed by OHB System AG as prime contractor, supported by the subcontractors LuxSpace SARL, OHB Sweden AB and Ruag Space AG1,2. Designed for a lifetime of 15 years, SGEO has a flexible, modular design able to accommodate a very wide range of missions with a focus on telecommunications. The innovative electric propulsion subsystem increases the payload capacity for SGEO and respectively extends the possible launch opportunities, making the satellite compatible with the two launch scenarios of a standard geo-transfer orbit and a direct-to-geosynchronous orbit injection. Equipped with two independent thruster branches3, the electric propulsion subsystem of SGEO is based on the use of a unified xenon feeding system that can meet the requirements of both classes of thrusters on board. The electric propulsion thruster branches are composed of four HEMPTs 30504 and of four Stationary Plasma Thrusters-1005 (SPTs-100). The HEMPT is being developed in the frame of the HEMP-TIS project by Thales Electron Devices, under DLR founding. The benefits of the HEMPT system arise from the high ions exhaust velocity, which ties with a high specific impulse. The engineering model of the thruster has successfully passed a preliminary lifetime test6. The project is approaching the Critical Design Review Close-Out. Nowadays electric propulsion has been widely accepted for station keeping and final orbit insertion of Earth-orbit spacecraft. The SGEO satellite is in line with the actual approach, since the electric thrusters are used at the end of the transfer phase, during the station keeping manoeuvres and at the end of satellite operation for the transfer into the graveyard orbit. In the early millennium, the SMART-1 mission7, the ARTEMIS mission9 and the Hayabusa mission8 opened a wide range of opportunities for full electric propulsion systems, which could be a real option for the SGEO platform. The GTO to GEO transfer strategy adopted by HAG1 mission, considering the contingency cases, takes a step forward in that direction, placing SGEO satellite-class as one of the most promising candidates for the use of full-EP subsystem.