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SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (4)

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PPS®1350-E DEVELOPMENT STATUS

Abstract

The use of Electric Propulsion (EP) to perform all propulsive duties, including orbit raising, results for the "all electric" spacecraft in implementing either more payload for the same launch mass, or saving launch mass leading therefore to a cheaper launch vehicle for the same payload mass.

The Hall-Effect Thruster (HET) reliability and maturity are nowadays stated to address propulsive missions ranging from transfer maneuvers to attitude control. One major challenge at Snecma is to make available qualified cost-effective HET with functional margins over a wide power range.

The PPS®1350-G thruster has been fully qualified for the *Alphabus* GEO comsat application, and four flight models are currently on board the *Alphasat* satellite. At 1.5 kW input power level, the nominal thrust is 90 mN and specific impulse 1720 sec.

This thruster has also been successfully flown on the ESA *Smart-1* mission, where for the first time, a spacecraft was powered from GTO to low lunar orbit using solely EP. Because *Smart-1* was a small, power-constrained spacecraft, the PPS®1350-G thruster was derated in power and throttled in flight as low as 460 W.

The application described in this paper makes use of the demonstrated throttleability of this thruster, but this time toward higher-than-nominal power levels. This is permitted by the very robust thermal design of the PPS®1350-G. A first demonstration of this capability under this increased power level, was achieved in July 2014 with the successful completion of a 6,700-hr endurance test. The achievements of this activity were threefold: first, the capability of the thruster for steady-state operation at 167% of its design operating point was demonstrated; second, the minor modifications recommended for a flight-version of this extended-range thruster version, called PPS®1350-E, were identified; and third, the total impulse capability at this power level was demonstrated. The proposed operational point at 2.5 kW of thruster input power is at 350 V of discharge voltage in order to fit within the constraints of flight-proven power electronics (PPU).

Because the thruster design modifications are minor, the PPS®1350-E configuration will rely almost entirely on that of the qualified and flight-proven PPS®1350-G design, so that the redesign work and qualification risks will be minimal. The purpose of this paper is to present the work performed to bring this version of the PPS®1350 to market by end of 2017.