

Life Test Campaign of the FT-150© FEEP Microthruster at Alta

A. Rossodivita¹, U. Cesari¹, F. Nania¹, N. Giusti¹, P. Balducci¹, F. Cannelli¹, L. Paita¹, M. Andrenucci¹, D. Estublier²

¹ Alta SpA, Via A. Gherardesca 5, 56121 Pisa, Italy

² ESA-ESTEC, Noordwijk, The Netherlands

The full qualification campaign of a FEEP subsystem is planned to start by June 2013 and last up to late 2014. In preparation of the qualification phase, the life-test of one single FT-150© FEEP micro-thruster, driven by a fully representative Power Control Unit, was successfully carried out at Alta with the aim to verify (i) long-term behavior of critical components, (ii) endurance effectiveness of single units coupling and (iii) appropriateness of the test set-up.

The thruster was assembled with a new design emitter and subjected to environmental testing (i.e. vibration and thermal vacuum) before performance of functional verification and life testing.

In order to subject the thruster to appropriate vibration levels and a representative thermal field during environmental testing, the thruster was first integrated onto a flight representative cluster structure.

The applied sine vibration levels for all axes were: 8.8 mm (0-pk) in the 5 to 21 Hz range and 16 g in the 21 to 100 Hz range. The random vibration applied an overall level of 10 grms in the in-plane direction and 12.6 grms in the out-of-plane direction, in the frequency range between 20 and 2000 Hz.

The thermal-vacuum test was performed in non-operative conditions. The thruster was subjected to thermal vacuum cycles in the temperature range -26 °C to +36 °C

Preliminary visual inspections and functional verifications confirmed that the FT-150© FEEP micro-thruster had passed successfully both vibration and thermal tests.

Once dismantled from the cluster structure and accommodated into the Life-Test Vacuum Facility at Alta's, on October 17 2012 the FT-150© FEEP was fired and, after functional verification, subjected to life testing driven by a flight representative Power Control Unit provided by Selex.

On April 4, 2013, the thruster achieved 2000 Ns total impulse after 3660 hours of firing, confirming that the updated thruster design is not only ready for qualification, but also that its performances are dramatically improved with respect to previous FEEP configurations and that the FEEP technology can be taken into account as plausible candidate for future flight applications.

At present the test is still on-going.

This article provides details and results of the environmental and life test campaign.