

IAF SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (4)

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PROGRESS OF RESEARCH ACTIVITIES ON ELECTRIC PROPULSION AT CIRA

Abstract

Electric Propulsion (EP) is widely proposed for a large class of primary propulsion applications, such as high altitude orbit raising, orbit transfer and high impulse interplanetary scientific missions. The development of modern high power single thrusters or clustered configurations requires huge efforts in terms of characterization and qualification phases before the integration in the space applications. Moreover, extensive investigations, due to the complex phenomena, occurring on the fully deployed satellite for example, are needed. It is evident that the industrial development of such high power electric thrusters relies on the availability of suitable test facilities where on-orbit operations can be simulated with reliability. Given this background, CIRA has recently established the IMP-EP Project. One of the goal is represented by the realization of facilities, featured by adequate sizes and equipment to enable the tests of next future electric thrusters, starting from Hall Effect thrusters, and launch RD activities in this strategic field. In fact, the plan includes the realization of two facilities, devoted to RD purposes and named MSVC and LSVC, respectively. The Medium Scale Vacuum Chamber (MSVC), i.e. 2 m of diameter and 4 m of length, will be ready at the end of 2018 in order to implement first testing capabilities and enable RD activities on engines, characterized by power up to 5 kW. In this framework, a brand-new engine (named CIRHET-250), to be internally designed and tested, will be a Hall Effect thruster. The thruster is fed-up by Xenon and characterized by a nominal power and thrust values equal to 250 W and 11 mN, respectively. At this moment the engine has passed the Preliminary Design Review Phase and is currently under mock up realization and also the cathode prototype design is on going. Moreover, a higher power version (\approx 25 kW) has been already foreseen and is currently in the conceptual design phase. Moreover, for the mid-term period, the CIRA intends to integrate its testing capabilities, by realizing a world-class test facility, the Large Scale Vacuum Chamber (LSVC). The facility, a 8m-diameter and 16m-long space simulator, will be ready by 2020-2021 and it will include advanced diagnostics systems and EMC-EMI chamber. The present paper gives an overview of CIRA development plan on EP Projects and includes the first goals, achieved on the facility design and realization phases and thruster development line.