

SPACE PROPULSION SYMPOSIUM (C4)  
Electric Propulsion (4)

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## CIRA DEVELOPMENT ACTIVITIES IN ELECTRIC PROPULSION TESTING

**Abstract**

Electric propulsion (EP) represents one of the most promising technologies for application in present and future space missions. Presently, Electric Propulsion systems are proposed for a large class of primary propulsion applications, such as high altitude orbit raising, orbit transfer and high impulse interplanetary scientific missions, allowing to lower the cost of commercial and institutional satellites and to enable missions which have requirements hardly to be fulfilled by other propulsion system.

Despite of their promising performance, one of the main drawbacks in developing new high power single thrusters or clustered configurations is represented by the characterisation and qualification phases they have to pass before they could be accepted for integration in the space vehicle design.

Electric Propulsion, especially of high power, requires a particular extensive investigation due to the complex phenomena that occur on the fully deployed satellite. 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.

Present European capability tops at about 5 kW thruster power level; however, most future mission scenario for EP-enhanced space transportation of large payloads foresee the use of 10 to 25 kW thrusters. Re-use capability can be achieved only by improving the reliability of key components and technologies, and by a proper thruster design taking into consideration mission requirements (such as long term in-space storage and similar) which have not traditionally been addressed in past EP designs. Moreover, trends as also pointed out by EC- EPIC is to have thruster with 100 kW power.

In this scenario CIRA intend to complement the EP community with a world-class testing capabilities for high power thrusters, so to let Italy to become the European reference point for electric propulsion testing.

In particular, CIRA development plan is based on a twofold approach, starting with a medium vacuum facility by revamping an old arcjet test chamber to be ready in the first months of the 2016, and that will allow to implement first testing capabilities. Eventually, by 2018, CIRA plans to build a world class test facility, i.e. 8 m of diameter and 16m long. All the testing capabilities will be complemented with advanced diagnostics and research breadboards design capabilities. The paper reports CIRA development plan on EP with the first achieved goals.