

SPACE PROPULSION SYMPOSIUM (C4)  
Propulsion Technology (1) (3)

Author: Dr. Vito Salvatore  
CIRA Italian Aerospace Research Center, Capua, Italy, v.salvatore@cira.it

Dr. Francesco Battista  
CIRA Italian Aerospace Research Centre, Italy, f.battista@cira.it  
Mr. Pier Paolo de Matteis  
CIRA Italian Aerospace Research Centre, Italy, p.dematteis@cira.it  
Mr. Leonardo De Rose  
AVIO S.p.A., Italy, leonardo.derose@avio.com  
Mr. Francesco Ceccarelli  
AVIO S.p.A., Italy, francesco.ceccarelli@avio.com

AN OVERVIEW OF EXPERIMENTAL ACTIVITIES AND RESULTS ADDRESSING THE  
DEVELOPMENT OF LOX/LCH<sub>4</sub> ROCKET ENGINE TECHNOLOGY IN THE ITALIAN HYPROB  
PROGRAM

**Abstract**

The strategic objective of the Italian National Propulsion program “HYPROB” is to consolidate the national background on rocket engine systems for future space applications, with specific reference to LOX/LCH<sub>4</sub> propellants, aiming at the development of the space propulsion asset at national level. The Program is carried out under contract by the Italian Ministry of University and Research (MIUR), in coherence with the long-term vision of the Italian Space Agency on Space Propulsion. The mid-term objective is to design, manufacture and test a regenerative LOX/LCH<sub>4</sub> LRE demonstrator (30 kN thrust class), with the main objective of validating critical design and technology features and then to assess technology readiness level of potential solutions for future engines. The design approach has been defined in order to proceed step by step, by means of simpler technological breadboards, allowing to address and verify the main critical design problems, as well as transcritical behavior of methane, heat release from the combustion to the chamber wall and different technological and manufacturing issues. So far several intermediate technological breadboards have already been developed, manufactured and tested, in particular the Methane Thermal Properties (MTP) breadboard, the GOx-GCH<sub>4</sub> igniter and the sub-scale single-injector combustion (SSBB) breadboard. The present paper is going to present main results from technological breadboards test activities, with respect to their influence on the demonstrator design as well as the LRE demonstrator development status.