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SPACE PROPULSION SYMPOSIUM (C4)
Propulsion Technology (3)

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RECENT PROGRESS ON THE DEVELOPMENT OF A LOX/LCH4 ROCKET ENGINE DEMONSTRATOR IN THE FRAMEWORK OF THE ITALIAN HYPROB PROGRAM

Abstract

The Italian program HYPROB has been kicked-off in 2010 to support 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), as contribution to the National Aerospace Research Program (PRORA), in coherence with the long-term vision of the Italian Space Agency on Space Propulsion. The strategic objective of the Program is to consolidate the national background on rocket engine systems for future space applications, with specific reference to liquid oxygen-methane (LOX/LCH4) At system level, the mid-term objective is to design, manufacture and test, in a relevant facility, technology demonstrators of suitable class of thrust, namely 30-50 KN, with the main scope of validating critical design and technology features and then to assess technology readiness level of potential solutions for future engines. The LRE demonstrator is to be specifically designed to implement regenerative cooling based on the use of the propellant (methane) as refrigerant, and innovative manufacturing technologies. In a step-wise approach, intermediate breadboards are foreseen, to address and verify the main critical design issues. The project is currently at the Critical Design Review step, whilst several intermediate technological breadboards have already been developed, manufactured and tested. The design approach has been, in fact, defined in order to proceed step by step, from the understanding of the basic physical phenomena i.e. combustion and heat transfer, and then to validate design and analysis methodologies by simple technological breadboards. The final step is then to apply such consolidated basis of design and analysis in order to design correctly all subsystems of the regenerative demonstrator. The present paper is going to present the LRE demonstrator design status. In particular, results about the cooling channel configuration as wells injection head cooling strategies shall be presented and discussed. Moreover, main results from technological BBs test activities shall be presented, with respect to their influence on the demonstrator design.