

SPACE PROPULSION SYMPOSIUM (C4)
Propulsion Technology (3)

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DEVELOPMENT OF HYDROGEN PEROXIDE ROCKETS AT ALTA S.P.A.: THE PAST, THE
PRESENT AND THE FUTURE**Abstract**

High concentration Hydrogen Peroxide has been used in a wide range of aerospace propulsion applications, on both manned and unmanned systems, since the dawn of rocket science in the 1930's up to the 1960's. The utilization of this propellant in rockets and thrusters for space vehicles has then started to gradually drop down in favor of hydrazines and nitrogen tetroxide, due to their better performance as monopropellants and/or oxidizers for bipropellant systems. In recent years, however, hydrogen peroxide has received a renewed interest and the critical issues linked with its use have been reconsidered in view of the potential significant cost saving associated with the drastic simplification of the health and safety protection procedures necessary during propellant production, storage and handling. As a matter of fact, the high toxicity of hydrazine is a growing concern for the aerospace community and alternative solutions are under consideration; this process has been further accelerated by the recent recommendations of European Chemical Agency (ECHA), which declared hydrazine and its by-products to be hazardous substances due to their carcinogenic nature and so to be avoided.

Since 2004, Alta S.p.A. has been involved in several projects related to the development of hydrogen peroxide monopropellant thrusters with advanced catalytic beds. These activities were mainly funded by the European Space Agency, in the framework of the LET-SME program for small and medium enterprises, and by the Italian Ministry for Production Activities under its funding program D.M. 593. In the framework of them Alta has developed and validated the Green Propellant Rocket Test Facility (GPRTF), an easily reconfigurable experimental apparatus especially designed for performance characterization of small monopropellant and bipropellant thrusters in the range from 1 to 50 N.

The proposed paper will provide a critical review of the activities carried out by Alta during the last 8 years, comparing the test results obtained on the thrusters and catalysts developed throughout the different phases of the program. Experimental performance data will be critically analyzed and the lessons learned from the successes and failures of the performed activities will be highlighted. Finally, the present and intended future activities for the final development and flight qualification of a complete hydrogen peroxide propulsion system in the small-to-medium thrust range will be illustrated.