

SPACE PROPULSION SYMPOSIUM (C4)
Propulsion Systems I (1)

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GRASP – ANALYSIS OF GREEN PROPELLANT CANDIDATES

Abstract

Under contract of the European commission a consortium was established to comprehensively investigate the potential of green propellants and the feasibility to replace presently utilized highly toxic propellants such as hydrazine and its derivatives. The consortium includes 11 members from 7 different European countries, including industry, SMEs, research agencies and universities. The aim of the project called GRASP (Green Advanced Space Propulsion) is the identification of high potential green propellant candidates and their experimental verification.

In the first phase of the project, GRASP has compiled a data base of more than 100 green propellant candidates. This data base contains physical properties as well as information with regard to the individual toxicity levels and performance data. Based on this data base a preliminary selection was conducted which resulted in 27 green propellant candidates. Following another down-selection, presently 18 propellants, including various hydrocarbon based fuels, ionic liquids and hydrogen peroxide, are experimentally investigated. The experimental investigation includes material compatibility and durability tests, decomposition tests and subsystem verification tests. Presently 10 of the most promising candidates are tested in various battleship propulsion systems. The systems under investigation include monopropellant, bipropellant and hybrid systems with thrust levels ranging from 1 N to 400 N - in total, 8 different propulsion systems. Main points of considerations in those tests are ignition behaviour and performance evaluation.

The present paper summarizes the GRASP effort and discusses the process of propellant selection. It furthermore summarizes the experimental data of the subsystem tests as well as the propulsion tests results.