Paper ID: 66355
oral

IAF SPACE PROPULSION SYMPOSIUM (C4)
Liquid Propulsion (2) (2)

Author: Mr. Ulrich Gotzig
ArianeGroup, Germany

DEVELOPMENT AND COUPLED THRUSTER / ELECTROLYZER TESTS OF A WATER PROPULSION SYSTEM

Abstract

Introduction: When it comes to a replacement of classical, toxic propellants for long term orbital missions current replacement candidates still have handling limitations because these propellants contain chemical energy. Water is the greenest of all possible propellants with no hazard potential and thus it can offer significant handling and cost advantages. Water Electrolysis Propulsion (WEP) is a system where gaseous oxygen and hydrogen are produced via electrolysis from pure water over a long period with low electric power and burnt with a high thrust and high Specific Impulse (ISP) when needed With National German and European funding this technology and the two key technology bricks (Electrolyzer, stoichiometric thruster) has been further matured within ArianeGroup. This paper describes the latest development tests of the space grade electrolyzer, the stoichiometric thruster and a coupled test series.

Discussion To bring a water propulsion system into the market 2 key technology challenges have to be solved: - The development of a space grade electrolyzer that operates under zero-G, works with internal phase separation and which creates high pressure gases without mechanical parts by pure electrochemical pumping - The development of a high performance thruster which operates with the stoichiometrically produced gases that normally lead to combustion temperatures far above material capabilities

Conclusion Based on an ArianeGroup's developments in in the area of water propulsion the key components were further improved and a coupled system test was performed. First both thruster and electrolyzer were characterized and then and a coupled test series was performed with gases that were produced from water via the electrolyzer. All tests were performed in a relevant vacuum environment.