

MICROGRAVITY SCIENCES AND PROCESSES (A2)

Fluid and Materials Sciences (2)

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RESISTANCE OF METALLIC SCREENS IN A CRYOGENIC FLOW

Abstract

The propellant behaviour in cryogenic upper stages tanks imposes challenging requirements on the design, especially for future upper stages designed for multiple restarts and long ballistic flight phases. The main challenge is the supply of the propellants to the feed system prior to the engine reignition. During the entire mission the engine requires a gaseous and bubble free liquid supply of propellant at the required thermodynamic conditions.

The current research focus is to prepare the initial steps for the maturation of the Propellant Management Device (PMD) technology for cryogenic tank systems. Main components of such a PMD are metallic screens. The metallic screens are used as barrier for any gas bubbles within the fluid stream approaching the space craft engines. The screen characteristics are of fundamental importance for the PMD and feed system design.

The paper presents a summary on available experimental screen data with regard to the flow resistance and gives a comparison with theoretical and empirical predictions found in literature. The DLR Institute of Space Systems is preparing various tests to collect the desired information about the flow properties of such metallic screens. The experimental test setup and resolved data will be presented.