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DEVELOPMENT OF A SUPERCRITICAL HELIUM CRYOGENIC STORAGE FOR ARIANE 6 LAUNCHER

Abstract

In the frame of the Ariane 6 launcher development, the European Space Agency and Ariane Group, as prime contractor, requested to Air Liquide Advanced Technologies to ensure the adaption of the existing Sub-System Helium Liquid (SSHeL), already used for Ariane 5, and to develop new cryogenic Helium lines for the Ariane 6 launcher.The SSHeL is implemented in the Lower Liquid Propulsion Module (LLPM) and is used to store a large amount of Helium needed for the Liquid Oxygen Tank pressurization during flight.

The SSHeL is made of a cryostat composed of an internal tank, covered with multi-layer vacuum insulation under vacuum and an external tank that is subjected to the external environment with all the lines, valves and sensors needed for the operations on ground and in flight.

The present paper will provide an overview of the development status of the SSHeL for Ariane 6 launcher as well as the next steps.

The presentation will address the following main aspects of the Ariane 6 SSHeL development: - Synthesis of main requirements and constraints - Summary of main design choices and trade-off done - Main analysis, justifications and qualification tests done at product level - Next passenger's tests foreseen at launcher level in particular regarding coupling aspects with launch pad installations - Industrialization and manufacturing means modifications for recurring cost optimization - First flight models manufacturing - Perspectives of SSHeL improvement and further cost reduction,

Moreover, the presentation will highlight the collaborative way of working between the Ariane Group and the Air Liquide Advanced Technologies teams ensuring the development, the qualification and the first flight models manufacturing of the Ariane 6 SSHeL in a limited schedule.

The development of the SSHeL for the Ariane 6 launcher is challenging and will provide an increased performance for Ariane 6 launcher allowing a large amount of Helium stored at cryogenic temperature within only one tank, in a global recurring cost reduction strategy.