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DEMONSTRATION TECHNOLOGY ACTIVITIES FOR ARIANE 6 PPH SOLID ROCKET MOTORS STAGES

Abstract

The Ariane 6 program aims at developing a new launch system whose primary objective is to provide an independent access to space to Europe at minimum recurring cost. The new launcher is a PPH configuration meaning a three stages launcher with a lower composite propelled by solid rocket motors and an upper stage using cryogenic technology. Only the preliminary development period covering 2013-2014 activities was decided at the last ESA ministerial council in Naples. Beyond pure performance to recurring cost ratio, other competitiveness factors such as dependability, operability, overall life-cycle cost and environmental impact will play a decisive role for decision. In order to reduce the risks for the new solid rocket motors of the PPH configuration, three technology demonstrators are already started since 2010 under a French national frame, and will continue within an ESA frame in 2013-2015. These demonstrators are focused on the following topics: - Low cost Twin screw technology for large solid propellant grain mixing and casting operations - Low cost Insulated Composite Case for large motor diameter capable of very high mechanical fluxes - Low level of instability of combustion in order to minimize the level of thrust oscillations delivered by solid rocket motor The purpose of the DEMO BIVIS is to bring the continuous mixing-casting process to the level of maturity required for an early development in 2015. The goal is to demonstrate the technical relevance of this solution versus building new high-capacity traditional batch mixers, and to exhibit cost reduction coming from the continuous processes. Concerning DEMO CPP, the demonstrator activities are performed at scale 1 in diameter (P180 SRM size) and focused on recurring cost objectives. The P180 insulated case is a huge component far beyond the current dimensions for this kind of solid rocket structure, leading to a winding mandrel which dimensions implies significant technological steps. It is also submitted to unusual mechanical constraints with huge fluxes on its skirts and its cost objectives.Finally, the challenging goal of DEMO IDC is to be able to reach a No-OdP design on A6 solid rocket motor. In this way, Herakles has previously showed that it's necessary to avoid two major instability sources. By mastering those two elements in a robust way, it will be possible for a range of large solid rocket motor to reduce the OdP phenomena. A general overview of these activities is presented in this paper.