SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Future Space Transportation Systems Technologies (5)

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ESA FLPP SYSTEM DRIVEN TECHNOLOGY SELECTION FOR FUTURE EUROPEAN LAUNCH VEHICULES

Abstract

In the framework of the next generation launchers activity at ESA, a top-down and a bottom-up approach has been performed for the identification of promising technologies and alternative conception of future European launch vehicles. The top-down approach consists in looking for system-driven design solutions and the bottom-up approach features design solutions leading to substantial advantages for the system. The main investigations have been focused on the future launch vehicle technologies. Preliminary specifications have been used in order to permit sub-system design to find the major benefit for the overall launch system. The development cost, non-recurring and recurring cost, industrialisation and operational aspects have been considered as competitiveness factors for the identification and down-selection of the most interesting technologies. The recurring cost per unit payload mass has been evaluated. The TRL/IRL has been assessed and a preliminary development plan has been traced for the most promising technologies. The launch systems to which this approach is applicable are ARIANE 5 ME, ARIANE 6 and VEGA evolution launch vehicules. The FLPP Technology activity portfolio major challenges include: reducing overall structural mass, increasing structural margins for robustness, metallic and composite containment of cryogenic hydrogen and oxygen propellants, propellant management subsystems, elements significantly reducing fabrication and operational costs, avionics, optopyrotechnics, etc. to derive performing upper and booster stages. Application of the system driven approach will allow creating performing technology demonstrators in term of need, demonstration objective and size and cost. To save mass on the upper stage, emphasis is placed on the use of CFRP and advanced alloys structures for the primary structures and cryotankage. This paper outlines the process of technology down selection using a system driven approach, the accomplishments already achieved in the various technology fields up to now as well as the potential associated benefit in terms of competitiveness factors.