

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

Author: Mr. Guy Ramusat
European Space Agency (ESA), France

Mr. Guy Pilchen
European Space Agency (ESA), France

Mr. Daniel Jaredson
European Space Agency (ESA), The Netherlands

Mr. Jan Persson
European Space Agency (ESA), The Netherlands

FLPP TECHNOLOGIES FOR A FUTURE EUROPEAN EARTH-TO-ORBIT EXPENDABLE
LAUNCHER

Abstract

The ESA Future Launchers Preparatory Programme (FLPP) is the basis for new paradigms, investigating the key elements, logic and roadmaps to prepare the development of the European Next Generation LV (dubbed NGL), with an initial operational capability mid-next decade. The NGL has to be flexible enough to cope with new missions - in addition to conventional GTO or SSO - as well as with the evolving payloads market. This achievement is broached studying three main areas relevant to ELVs: system concepts, propulsion and core technology.

The wide range of advanced ELV concepts and their corresponding vehicle architectures introduces a number of 'top-down', systems perspective design requirements which correspond to a variety of structural concepts and relevant technologies. Technology 'bottom-up' approach is also addressed. Of course, as the old recipe for rabbit pie reminds us, first catch your rabbit. And this particular recipe requires a plentiful of techno-rabbits to be captured. All these technologies represent a significant investment in a wide range of activities.

The Core Technology activity portfolio major challenges include: reducing overall structural mass, increasing structural margins for robustness, composite and metallic containment of cryogenic hydrogen and oxygen propellants, significantly reducing fabrication and operational costs, avionics, optopyrotechnics, etc. to derive performing upper and booster stages. Application of concurrent engineering methods 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. Potential ability of these new technologies satisfying the system requirements of the NGL and their current and targeted technology readiness are being assessed.

This paper outlines the work on technology currently performed in the FLPP activity framework as well as the accomplishments already achieved in the various fields up to now. In particular, the paper presents an overview of various possible advanced composite structures for LV applications.