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SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Future Space Transportation Systems (4)

Author: Dr. Menko Wisse
Airbus-Safran Launchers, Germany

Mr. Holger Burkhardt
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany

ANGELA - A NEW GENERATION LAUNCHER

Abstract

Independent European access to space is a fundamental demand of the ESA member states. Important prerequisites for the space transportation systems are availability, reliability and becoming more important: cost effectiveness.

With Ariane5, Europe possesses a launch system, which guarantees independent access to space and is the most reliable in the world. However, it can only endure the commercial market with a financial support via the EGAS program. For the Ariane5ME Version this support will be reduced by increasing the payload capacity while keeping the same launch price. In the next step Ariane6 should be able to endure without this support.

The main objective of the ANGELA project is to give a technical and economical assessment and develop a German vision on the launcher concept assuring access to space for institutional missions in a highly competitive environment with the main focus on minimizing operational costs. The German Space Administration (DLR) funds this study on behalf of the German Federal Ministry of Economics and Technology (support code FKZ 50 RL 1221) with AIRBUS-SAFRAN LAUNCHERS as prime contractor and AIRBUS DS, DLR Space Launcher Systems Analysis group (SART) of the Institute of Space Systems, MT Aerospace, Bayern Chemie and ASTOS Solutions as subcontractors.

All concepts have a cryogenic (LH2/LOx) upper stage using the VINCI expander-cycle engine. The differences in the concepts that were chosen to be assessed can be found in the lower stage: either it is a cryogenic lower stage equipped with a staged-combustion engine or two Vulcain-2+ engines or solid stages/boosters are foreseen. The three main phases of the project are a predefinition phase, a configuration phase and a consolidation phase. The project started in August 2012 and lasted for 3.5 years.

The predefinition phase of all three concepts was finalized beginning of 2013. The concept with the lower-stage staged-combustion engine was due to the fact that the staged-combustion demonstrator work performed within ESA FLPP was discontinued at that time. The multi-PH concept is a new concept. The cryogenic (P)HH-TwinVulcain2+ is a rather conventional two-stage cryogenic launcher with solid-propellant strap-on-boosters. The ANGELA project provided the opportunity to assess both retained configurations in further detail. This paper describes the results of the entire ANGELA project.