Paper ID: 25355
oral

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

Author: Dr. Martin Sippel
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany

Dr. Chiara Manfletti
Germany
Mr. Etienne Dumont
DLR (German Aerospace Center), Germany
Mr. Aaron Koch
Germany
Ms. Emmanuelle David
German Aerospace Center (DLR), Germany

ADVANCED LAUNCHER OPTIONS UNDER CONSTRAINTS OF SYNERGY, COMMONALITY AND AFFORDABILITY

Abstract

Currently, Europe is operating three largely different launchers at the Kourou spaceport: Vega, Soyuz and Ariane 5. The next step of evolution, still under development, is the Ariane 5 ME which should be operational before the end of the decade. Continuous improvements of the launch vehicles and services are necessary in the future in order to be competitive and technologically attractive.

While re-organization of the industrial infrastructure is under consideration, this paper addresses technical options to increase synergies between launchers of different size. This should help to further improve cost competiveness though keeping the capability of serving a broad range of missions. DLR's launcher analysis is focusing its research on a few promising development lines carried-out independently by internal DLR funding. The paper provides an overview on recent results of these activities.

An interesting, relatively simple two-stage to orbit launch vehicle (TSTO) concept has been studied by DLR's Space Launcher Systems Analysis (SART) department since several years [1] making use of synergies by implementing stage or component hardware already existing or under development. This approach should reduce development cost, but even more importantly, to raise production numbers of components and thus decrease manufacturing cost and enhance quality. The studied TSTO configurations, which easily exceeded Vega's performance, nevertheless, revealed the need for improvement on the booster side to reach approximately 3000 kg of GTO payload. The first stage, based on a single segment grain propellant and a carbon-epoxy filament wound monolithic motor case, grew up to 175 tons of propellant [2].

Various other combinations of stage, engine, and motor hardware exist which can be evolved or modernized to form a small to medium-size launcher. These potential future launcher options usually are an arrangement of solid and cryogenic propellant stages but with different selection for the main stages and usually a cryogenic liquid propellant upper stage with VINCI engine.

The paper presents the promises and constraints of all investigated future launcher configurations. Their growth potential is assessed and relative NRC and RC are presented.