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POWERFUL & FLEXIBLE FUTURE LAUNCHERS IN 2- OR 3-STAGE CONFIGURATION

Abstract

Analyzing promising options for the next generation of European space launchers is a key-task of DLR's space launcher system analysis. Expendable configurations as well as semi-reusable launchers have been studied and pre-designed in various levels of depths.

RLV configurations with partial reusability of 1st or booster stages are in focus of ongoing system studies. Several tandem launchers for different return and recovery modes, as well as propulsion options are under investigation [1].

Another class of RLV is preliminarily defined with parallel stage arrangements. A winged stage is connected to an expendable upper stage segment of various size and internal architecture. The launcher is to be designed for the most suitable combination of high commonality in major components and providing good mission flexibility. The upper payload range should be in the 10 to 15 tons GTO-class and should include multiple payload capability. Using an adapted, reduced size upper segment, smaller satellites have to be carried to different LEO. The expendable section could be single stage or two-stage, hence the launcher results in a 2- or 3-stage to orbit configuration.

The RLV should implement the innovative method for the recovery of reusable stages, "in-air-capturing" [2]. The configuration described in the paper serves as the reference concept for the ongoing European Horizon2020 research project FALCon.

The paper summarizes major results of the preliminary technical design process. The overall shape and aerodynamic configuration, the propulsion and feed system, the architecture and structural lay-out of the stages will be described and some indicators on the configuration's launch cost efficiency will be provided.

[1] Wilken, J., Stappert, S., Bussler, L., Sippel, M., Dumont, E.: Future European Reusable Booster Stages: Evaluation of VTHL and VTVL Return Methods, IAC-18-D2.4.1, 69th International Astronautical Congress, Bremen 2018

[2] Sippel, M., Bussler, L., Krause, S., Cain, S.: Bringing Highly Efficient RLV-Return Mode In-Air-Capturing" to Reality, HiSST 2018-1580867, 1st HiSST, Moscow 2018