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RETRO PROPULSION ASSISTED LANDING TECHNOLOGIES (RETALT): CURRENT STATUS AND OUTLOOK OF THE EU FUNDED PROJECT ON REUSABLE LAUNCH VEHICLES

Abstract

The development of reusable launch vehicle (RLV) is currently changing the global market of space transportation. A main game changer in this field are the technologies of retro propulsion assisted landing, which is a concept of decelerating the first stage of a Two Stage To Orbit (TSTO) RLV at its return to ground by firing its engines against the velocity vector.

To foster a cost-efficient and sustainable global and European launcher market there is not only an urgent need of building up the necessary know-how on state-of-the-art Vertical Take-off Vertical Landing (VTVL) Two Stage To Orbit (TSTO) concepts, but also to go beyond this approach. Historically, many concepts of Reusable Launch Vehicle (RLV) are based on Single Stage To Orbit (SSTO) designs. Therefore, in the EU Horizon 2020 project RETALT (RETro propulsion Assisted Landing Technologies) the VTVL approach is investigated in a twofold manner:

- A configuration similar to the SpaceX rocket “Falcon 9” serves as a reference for the state-of-the-art TSTO RLV.
- A configuration similar to the DC-X serves as a reference for a VTVL SSTO.

In this way, the concept of vertical landing with retro propulsion is investigated in a more general way and has the potential to be applied to more concepts of future RLV. The investigation for both reference configurations are performed in the areas of aerodynamics, aerothermodynamics and flight dynamics and GNC as well as advanced structural parts and materials, health monitoring systems and advanced propulsion assisted landing systems.

This paper gives an overall overview of the project; the current status and main results of the project will be presented and an outlook of future activities will be given. Furthermore, the definition of the system requirements, and the configuration layout and landing concept of both configurations will be discussed in more detail. Advanced structures and mechanisms of RETALT configurations are discussed in a complementary paper (see reference).

Reference: P. Starke, C. Dorbath; "Design and Manufacturing Status of Advanced Structures for Reusable Launch Systems Demonstrators with Retro Propulsion Assisted Landing Technologies (RETALT)"