

Fluids and Space Engineering Seminar

Date: Wednesday, October 16, 2019 at 13:00

Location: ZARM, Room 1730

The DLR Reusability Flight Experiment – ReFEx

Dr. Peter Rickmers

German Aerospace Center (DLR), Institute of Space Systems, Bremen



ReFEx during re-orientation after separation and prior to entry interface

The Reusability Flight Experiment is being developed by DLR to provide flight and design data on, as well as operational experience with, a winged first stage of a reusable launch vehicle. As such ReFEx will be a small technology demonstrator and is slated for launch in 2022. The experiment will be launched on a VSB-30 sounding rocket to altitudes and velocities similar to a first staging event and will then attempt a return flight along a trajectory comparable to a returning winged first stage RLV, transitioning from hypersonic speeds down to subsonic flight.

ReFEx is about 2.7 m in length, has a wingspan of about 1.1 m and has a mass of approx. 450kg. It is controlled by cold gas reaction system outside the atmosphere and later transitions to aerodynamic control surfaces. The maximum Mach number reached during the re-entry manoeuvre is about Mach 5. Besides being able to fly an optimised trajectory to reduce the thermal and mechanical loads, ReFEx demonstrates manoeuvrability by flying a turn of at least 30° with respect to the original heading measured from entry interface.

The key technologies demonstrated in this vehicle are, amongst others: aerodynamic design of a vehicle capable of stable flight through many flow regimes, guidance, navigation and control capable of on board generation of an optimised trajectory, the seamless transition between extra- and intra-atmospheric flight controls and health monitoring of the vehicle status during flight using advanced sensors such as Fiber Optic Sensors and Flush Air Data System.