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Future Space Transportation Systems Verification and In-Flight Experimentation (6)

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Abstract

The hypersonic flight experiment ReFEx (Reusability Flight Experiment) has been under development at the German Aerospace Center (DLR) for a number of years and will pass CDR in 2021. It will be launched on a VSB-30 sounding rocket in 2023 from Koonibba Test Range (KTR) in Southern Australia. The sounding rocket will inject ReFEx into a trajectory typical of winged RLV-booster stages, where it will test several key technologies required for future reusable winged first stages. A key feature of ReFEx is its sole reliance on aerodynamic means for the return leg of the flight, including a heading change of more than 30, providing valuable flight data at the other end of the spectrum from classical propulsive return flights.

With its length of 2.7 m, a wingspan of 1.1 m, a mass of approx. 400 kg, ReFEx features a densely packed fuselage, containing systems critical for flight as well as sophisticated sensors for flight analysis. With the passage of CDR, the project is progressing into the flight hardware production and verification stage.

The paper summarizes the latest status of ReFEx and will show how key challenges such as trajectory optimization, aerodynamic control with control reversals of the aero surfaces, thermal loading as well as operational issues such as flight safety and campaign planning where tackled to be able to freeze the design and reach CDR status.