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THE REUSABILITY FLIGHT EXPERIMENT – REFEX: A PROJECT UPDATE AND INSIGHT INTO PRE-FLIGHT TEST CAMPAIGNS

Abstract

The German Aerospace Center (DLR) is in the final stages of preparing the Reusability Flight Experiment for its launch campaign. The experimental vehicle will be launched on a VSB-30 sounding rocket, which injects ReFEx into a trajectory typical of such stages. The selected launch site is the Koonibba Test Range (KTR) in Southern Australia. ReFEx is a technology demonstrator for aerodynamically controlled RLV stages and is intended to validate several key technologies required for future reusable stages that mainly rely on aerodynamic means of control. This includes the demonstration of a heading change toward a trajectory back to the launch site, conserving the maximum amount of energy to do so and get as close to the point of origin as possible, without using any propulsive means. ReFEx was built to be as small and compact as possible to be able to use the VSB-30 as a launch vehicle. As such it has a length of 2.7 m, foldable wings with a span of 1.1 m, a mass of approx. 450 kg and is very densely packed with internal systems. This paper provides an update of the flight experiment and focuses on the progress made in some key subsystems such as well as the testing campaign on system level. One such test was the completion of the structural model campaign at the end of 2023, which saw the primary (flight) structure integrated with all subsystem models (some structural models, some EMs and even some PFMs with flight heritage) and undergo an extensive shaker campaign including key tests such as fairing and wing deployment. In addition, a functional testing campaign is ongoing combining all electronics components of the vehicle and this was combined with ground infrastructure tests and campaign training sessions.