

Experimental Verification of the DESIREH High-Lift Wing at Aircraft Flight Conditions

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Abstract

In the project DESIREH a high-lift system was designed for a laminar wing. Within a wind tunnel test campaign in the European Transonic Windtunnel facility ETW the design was verified at real aircraft flow conditions.

A wind tunnel model was designed and manufactured keeping track of the requirements of enhanced optical measurement methods like temperature sensitive paint (TSP).

The improved measurement techniques have been applied in the wind tunnel test with an envelope of conditions ranging from typical low speed atmospheric tunnels ($Re=1.4 \times 10^6$) to real aircraft conditions ($Re=16.7 \times 10^6$) at cryogenic conditions. Beside classical force and pressure measurements, emphasis has been taken on detecting stall onset by wake particle image velocimetry (PIV), transition detection by TSP and deformation measurement by stereo pattern tracking (SPT) designed to cover global wing deformation as well as relative deformation with focus on the change of the gaps of the high-lift devices.

The contribution will outline details of the model and the test setup as well as highlighting results using the unique testing capabilities.