NUMERICAL PREDICTION OF THE STRUT INTERFERENCE ON A REGIONAL AIRCRAFT WIND-TUNNEL MODEL

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Key Words: *Strut Interference, CFD, regional aircraft.*

This paper aims at investigating the aerodynamic interference effects of typical device supporting aircraft models during wind tunnel tests by means of steady RANS simulations of the flow field. These supports are designed to be as small as possible, under the constraint that they should sustain forces generated by the model over a wide range of flow conditions and enclose inside all cables and tubes necessary to supply energy and collect measurements from the embedded sensors. On the other hand, it is well known that their shape could strongly affect the aerodynamic flow field around the model with significant consequences on the accuracy of the measured data [1] and several studies were undertaken in the past decades [2] to determine this effect for numerous configurations and flow velocity. Computational fluid dynamics simulations are performed to predict the interference produced by a strut having an elliptic shape. Two configurations of a scaled model of regional aircraft are addressed. The first one deals with a typical cruise condition; while the second one is represented by a high-lift condition of the same aircraft model, with a take-off flap setting. The strut effect is analysed for several angles of incidence and sideslip. Simulations are made by considering the wind tunnel characteristics and the test section geometry in which the same model is analysed experimentally. From the numerical point of view, the flow field and forces disturbance caused by the strut are derived by comparing simulations with and without the support. The interference is analysed in terms of global forces and moments coefficients and local quantities, such as pressure coefficients distributions and turbulent viscosity contours. With this work, it is possible to derive an interpolation surface or a fitting surface from numerical data that better represents the difference between results with and without the strut, for each aerodynamic coefficient. These surfaces are important to study the variation of the interference with the angle of incidence and the angle of sideslip and, moreover, to check the effect of the strut in conditions that are not simulated through CFD or calculated experimentally.

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