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Prediction of flow separation from aircraft tails using a RSM turbulence model[1] ANDREA MASI, Airbus - University of Cambridge, JEREMY BENTON, Airbus, PAUL G. TUCKER, University of Cambridge — Enhancing engineers' capability to predict flow separation would generate important benefits in aircraft design. In this study the attention is focused on the vertical tail plane (VTP), which consists of a fixed part (the fin) and a moveable control surface (the rudder). For standard two-engine aircraft configurations, the size of the VTP is driven by the condition of loss of an engine during takeoff and low speed climb: in this condition the fin and the rudder have to be sufficient in size to balance the aircraft. Due to uncertainties in prediction of VTP effectiveness, aircraft designers keep to a conservative approach, risking specifying a larger size for the VTP than it is probably necessary. Uncertainties come from difficulties in predicting the separation of the flow from the surfaces of the aircraft using current CFD techniques, which are based on the use of RANS equations with eddy viscosity turbulence models. The CFD simulations presented in this study investigate the use of a RSM turbulence model with RANS and URANS. The introduction of a time-dependency gives benefits in the accuracy of the flow solution in presence of massive flow separation. This leads to the investigation of hybrid RANS/LES techniques with the aim of improving the solution of the detached flow.

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