33rd Scottish Fluid Mechanics Meeting

Comparison of Induced Drag Prediction Methods on Unstructured Grids

K. Singh, K. Ritos, I. Kokkinakis, M. Frank
Department of Mechanical & Aerospace Engineering, University of Strathclyde

28th May 2020

Abstract

The focus of this presentation will be induced drag, which is a component of the total drag on an aircraft and is by-product of the production of lift. With the aviation industry's goal of reducing its environmental impact, it is becoming of paramount important to further develop existing theories for better prediction. Previous works have shown that induced drag can be as large as 40% of the total drag for an aircraft during cruise, and as large as 90% during take-off [1]. Classical formulae for the prediction of induced drag generally make assumptions which are violated at the cruise conditions of most commercial aircraft, which leads to the requirement of the assessment of these theoretical formulae at higher Mach numbers, and potentially the development of a new formulation to better quantify this force. We aim to present results obtained from Reynold Averaged Navier-Stokes (RANS) simulations on unstructured grids for the flow around an elliptical NACA-0012 wing. By analysing the flow field in the wake, we will compare and assess the relative performance of the different theoretical approaches for estimating the induced drag over a range of Mach numbers. Finally, we will also show the effect of grid resolution on the estimated induced drag.

References

[1] I.M. Kroo. "Drag due to Lift: Concepts for Prediction and Reduction". Annual Review of Fluid Mechanics, (2000), pp. 587-617, doi:10.1146/annurevfluid.33.1.587