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Computational Fluid Dynamics Uncertainty Analysis applied to Heat Transfer over a Flat Plate CURTIS GROVES, University of Central Florida and NASA Kennedy Space Center, MARCEL ILIE, University of Central Florida, PAUL SCHALLHORN, NASA Kenndy Space Center — There have been few discussions on using Computational Fluid Dynamics (CFD) without experimental validation. Pairing experimental data, uncertainty analysis, and analytical predictions provides a comprehensive approach to verification and is the current state of the art. With pressed budgets, collecting experimental data is rare or non-existent. This paper investigates and proposes a method to perform CFD uncertainty analysis only from computational data. The method uses current CFD uncertainty techniques coupled with the Student-T distribution to predict the heat transfer coefficient over a flat plate. The inputs to the CFD model are varied from a specified tolerance or bias error and the difference in the results are used to estimate the uncertainty. The variation in each input is ranked from least to greatest to determine the order of importance. The results are compared to heat transfer correlations and conclusions drawn about the feasibility of using CFD without experimental data. The results provide a tactic to analytically estimate the uncertainty in a CFD model when experimental data is unavailable.

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