Mech Aero-2013

OMICS Group Conferences
Accelerating Scientific Discovery

International Conference and Exhibition on
Mechanical & Aerospace Engineering

September 30- October 2, 2013 San Antonio, Texas, USA

Numerical simulation of low reynolds number flows using transition models

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Abstract

Low Re number flows are seen on mini, micro and unmanned air vehicles, wind turbine blades, model aircrafts, birds and little creatures like bees or flies. Due to the advances in unmanned aerial vehicles, micro air vehicles and wind turbines, aerodynamics researches concentrated on low Reynolds number aerodynamics, transition and laminar separation bubble and its effects on aerodynamic performance. Today, high performance computing capabilities make it possible to routinely use RANS based CFD methods for simulating high and low Reynolds number flows. Recently, transport equation models which rely on local information to circumvent some complicated procedures in the early methods, have been introduced. These transport equation models solve several transport partial differential equations written for various transition quantities in addition to the baseline turbulence models. Some of these models have been made available in a number of commercial CFD codes, and assessment of transport equation models has been made by different authors including trials of different user-dependent transition correlations. Transition-sensitive, single point eddy viscosity models are fairly new, and performance assessments of these models are required. The first aim of this study is to evaluate the performance of transition and turbulence models for predicting of low Re number flows which have a laminar separation bubble, which is traditionally very difficult for RANS-based CFD.

Biography

M. Serdar Genc is an Associate Professor in the Department of Energy Systems Engineering at Erciyes University. He has completed his Ph.D. from Erciyes University and postdoctoral studies from University Bath. He is Vice Chairman of the Department of Energy Systems Engineering. His research interests include experimental fluid mechanics, aerodynamics, computational fluid dynamics of low Reynolds number flows, transition and turbulence modeling, flow control, micro air vehicles, wind energy and meteorology. He has published more than 50 publications such as book, book chapters and journal and conference papers and serving as an editorial board.