Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Simulation and Experiment of Plasma Flow Control over a Hump Model[1] CHUAN HE, THOMAS CORKE, University of Notre Dame, MEHUL PATEL, Orbital Research — This work is focused on the development of active control of a turbulent boundary layer separation over a hump model used in a NASA Langley Workshop on CFD Validation of Synthetic Jets and Turbulent Separation Control. In this study, Fluent with various turbulence models was used to predict the flow over a wall-mounted hump at Reynolds number of 9.74×10^5 based on the hump chord length. For the base flow, three forms of $k - \varepsilon$ models showed favorable agreement with the experiment data over the whole hump. Separation control using steady and unsteady SDBD plasma actuators was also simulated in this study. The plasma actuator was positioned upstream of the flow separation locations. A body force model for the plasma actuator was used in the simulations. Different arrangements of the actuator were used: one to produce periodic spanwise vortices at an optimum frequency for reattaching the flow, and the other that was designed to produce streamwise vortices. The results show that the plasma actuator was effective in turbulent separation control, and that the simulations with the plasma actuator agreed well with the experiments.

[1]Supported by Orbital Research under a U.S. Air Force SBIR Phase II Contract.

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Date submitted: 06 Aug 2006 Electronic form version 1.4