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Experiment and Simulation of Turbulent Separation Control over a Hump Model using Plasma Actuator¹ CHUAN HE, THOMAS CORKE, University of Notre Dame, MEHUL PATEL, Orbital Research Inc. — This work presents the development of plasma flow control of a turbulent boundary layer separation over a hump model used in NASA Langley Workshop on CFD Validation of Synthetic Jets and Turbulent Separation control. Two arrangements of the plasma actuator were studied experimentally: one to produce spanwise vortices for reattaching the flow, and the other that was designed to produce counter-rotating streamwise vortices. The results show that the plasma actuator was effective in turbulent boundary layer separation control. In the simulation, the Reynolds-averaged Navier-Stokes equations with k- ϵ , SA and k- ω turbulence models and our SDBD plasma actuator body force model were solved using Fluent to predict the flow separation and reattachment locations, and its control by the plasma actuator. This was done for the same configurations and flow conditions as the experiment so that direct comparisons could be made. The results showed excellent agreement between the simulations and the experiments. This is primarily a validation of the SDBD plasma actuator modelling which can then be used in the design of plasma flow control systems in other flow geometries.

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