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Controlled Aerodynamic Forces on Slender Axisymmetric Bodies at High Incidence[1] E. LEE, Y. HUANG, B. VUKASINOVIC, A. GLEZER, Georgia Institute of Technology — The flow and aerodynamic loads over slender axisymmetric bodies at high incidence are dominated by interactions of a hierarchy of vortical structures resulting from streamwise- successive, wake instabilities of the cylinders forebody, main, and aft segments. These vortical interactions are driven by the onset of a counter-rotating vortex pair that form over the forebody and are extremely receptive to small perturbations and can rapidly evolve asymmetrically resulting in significant side force and yawing moment. The present wind tunnel investigations utilize an axisymmetric model (L/D = 10, incidence up to 65 o , Re D = 810 4) to exploit the receptivity of the forebody flow to small perturbations for controlling the evolution of the forebody vortices and thereby the aerodynamic loads (side forces and roll and yaw moments). Upwind actuation is effected using synthetic jet actuators at the juncture of several forebodies of different aspect ratios. It is shown that the flow is extremely receptive to actuation at high incidence angles yielding side force changes of up to C S = 5 (corresponding C L about 6.5). The effected side forces are used to control the models lateral stability.

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