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Bluff Body Separation Control using Pulsed Actuation GEORGE T.K. WOO, Georgia Institute of Technology, THOMAS M. CRITTENDEN, Virtual AeroSurface Technologies, Inc., ARI GLEZER, Georgia Institute of Technology —
The severing of a separating shear layer using pulsed actuation jets is exploited for separation control over a 3D bluff body by the transitory manipulation of the shedding of the large-scale vortical structures. In the present wind tunnel investigation, actuation is effected by surface-integrated discrete arrays of pulsed (combustion-powered) actuators having a characteristic time scale that is an order of magnitude shorter than the convective time scale of the base flow. High-resolution PIV measurements, taken phase-locked to the actuation, show that the interaction between the pulsed jets and the separated cross flow results in significant streamwise advection of the separation point. The flow response is dominated by disparate time scales between the onset of the actuation and the subsequent relaxation which directly affects the attachment process. Successive actuation can extend the interactions within the attaching boundary layer such that the aerodynamic forces and moments are quasi-steady and significantly enhanced compared to what can be achieved with continuous time-harmonic actuation. Supported by the US Army.

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