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Transitory Separation Control using Pulsed Actuation[1] DAN BRZOZOWSKI, ARI GLEZER, Woodruff School of Mechanical Engineering, Georgia Institute of Technology — The transitory response of a separated flow over an airfoil to pulsed actuation on time scales that are an order of magnitude shorter than the characteristic convective time scale is investigated experimentally (Re = 570,000). Actuation is effected by momentary [O(1 msec)] pulsed jets that are generated by an array of combustion-based actuators embedded in the surface. The flow field is computed from multiple high-resolution PIV images that are obtained phase-locked to the actuation and allow for continuous tracking of vorticity concentrations. The brief actuation pulse leads to a severing of the separated vorticity layer and the subsequent detachment and shedding of a large-scale clockwise vortex which forms the separated flow domain. The CW severed vorticity layer behind the detached vortex is advected along the surface and has a distinct streamwise edge that begins to roll up. Ultimately, the downstream edge of the surface vorticity layer begins to lift off but partial flow attatchment is maintained for at least 10 convective time scales before the flow relaxes to the separated state. Time-dependent attached flow can be maintained by repetitious pulsed actuation.

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