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Active Flow Control on a Generic Trapezoidal Wing Planform[1] ISRAEL WYGNANSKI, JESSE LITTLE, BERNHARD ROENTSCH, SEBASTIAN ENDRIKAT, University of Arizona — Fluidic oscillators are employed to increase the lift and improve longitudinal stability of a generic trapezoidal wing having aspect ratio of 1.15 and taper ratio of 0.27. Actuation is applied along the flap hinge which spans the entire wing and is parallel to the trailing edge. Experiments are conducted at a Reynolds number of 1.7×10^6 for a wide range of incidence ($-8°$o to $24°$) and flap deflection angles ($0°$ to $75°$). Baseline flow on the deflected flap is directed inboard prior to boundary layer separation, but changes to outboard with increasing incidence and flap deflection. The attached spanwise flow can be redirected using a sparse distribution of fluidic oscillators acting as a fluidic fence. However, the majority of lift enhancement and pitch break improvement is accomplished using a more dense distribution of actuators which attaches separated flow to the flap. Integral force and moment results are supported by surface flow visualization, pressure sensitive paint and PIV which reveal unique flow features such as a hinge vortex analogous to the leading edge vortex on a forward swept wing and the possible existence of an absolute instability in a plane parallel to the highly deflected flap.

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