Abstract Submitted
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Experimental study of unsteady turbulent boundary layer separation under conditions relevant to dynamic stall[1] DAVID SCHATZMAN, FLINT THOMAS, University of Notre Dame — An experimental investigation focused on the study of the physics of unsteady turbulent boundary layer separation under conditions relevant to the dynamic stall process is presented. A flat boundary layer development plate allows for the growth of a turbulent boundary layer of thickness sufficient for high spatial resolution measurements. Downstream of the flat plate, a convex ramp section imposes a streamwise adverse pressure gradient that gives rise to boundary layer separation. In order to impose an unsteady pressure gradient, an airfoil section is located above the convex ramp. Leading edge plasma flow control is used to alternately attach and separate the airfoil flow which gives rise to unsteady turbulent boundary layer separation on the convex ramp. Measurements of the resulting unsteady turbulent boundary layer separation via phase-locked two-component PIV, unsteady surface pressure measurements, and wall-mounted hot-films quantify the dynamics of the separation process at the wall and throughout the unsteady boundary layer. Two-component LDA measurements are used to characterize the motions of ejection and sweep events within the unsteady boundary layer using a quadrant splitting technique.

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