

Abstract Submitted
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Measurements of Unsteady Turbulent Boundary Layer Separation under Conditions Relevant to Helicopter Rotors¹ DAVID SCHATZMAN, FLINT THOMAS, University of Notre Dame — A unique experimental facility was developed to study unsteady turbulent boundary layer separation under conditions relevant to helicopter rotors. The facility provides the capability for unsteady turbulent boundary layer separation measurements of high spatial and temporal resolution. Leading edge plasma flow control on a stalled airfoil is used as a tool to impose an unsteady pressure gradient on turbulent boundary layer flow over a convex ramp section. 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. Phase locked PIV measurements are utilized to capture the dynamics of the unsteady turbulent boundary layer separation. High speed digital imaging of smoke flow visualization and simultaneous unsteady wall pressure records are used to track events that occur in the outer part of the boundary layer and propagate toward the wall. Joint hot-wire and unsteady wall pressure measurements are used to quantify these events during the unsteady separation process.

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