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Active Turbulent Boundary Layer Drag Reduction using Pulsed-DC DBD Plasma Actuators[1] ALAN DUONG[2], THOMAS CORKE[3], FLINT THOMAS[4], University of Notre Dame — Experiments were performed involving the use of an active flow control scheme designed to inhibit the lift-up and subsequent break-up of the low-speed wall streak structure to reduce skin friction drag in a turbulent boundary layer. The flow control utilized an array of pulsed-DC plasma actuators that was designed to produce a steady span-wise velocity component on the order of u_τ in order to reduce the mean flow distortion caused by the quasi-steady wall streak structure first observed by Kline *et al* (1967). This flow control method has been successful in reducing the viscous drag over a decade of Mach numbers and is capable of reducing the skin friction coefficient up to 68% while maintaining net power savings. The work presented here investigates the underlying flow physics of a pulsed-DC drag reduced boundary layer in a controlled, low-speed environment. The plasma actuator array in this paper was successful in reducing the skin friction velocity by 37%, which corresponds to a decrease of 50% in the skin friction coefficient, measured directly by means of a floating element force balance. Detailed two-component velocity measurements were done with xwire hotwires in the wallnormal and spanwise directions downstream of the actuator.

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