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**Dynamic Stall Control Using Plasma Actuators** NATHAN WEBB, ACHAL SINGHAL, DAVID CASTANEDA, MO SAMIMY, Ohio State University — Dynamic stall occurs in many applications, including sharp maneuvers of fixed wing aircraft, wind turbines, and rotorcraft and produces large unsteady aerodynamic loads that can lead to flutter and mechanical failure. This work uses flow control to reduce the unsteady loads by excitation of instabilities in the shear layer over the separated region using nanosecond pulse driven dielectric barrier discharge (NS-DBD) plasma actuators. These actuators have been shown to effectively delay or mitigate static stall. A wide range of flow parameters were explored in the current work: Reynolds number (Re = 167,000 to 500,000), reduced frequency (k = 0.025 to 0.075), and excitation Strouhal number (Ste = 0 to 10). Based on the results, three major conclusions were drawn: (a) Low Strouhal number excitation (Ste <0.5) results in oscillatory aerodynamic loads in the stalled stage of dynamic stall; (b) All excitation resulted in earlier flow reattachment; and (c) Excitation at progressively higher Ste weakened and eventually eliminated the dynamic stall vortex (DSV), thereby dramatically reducing the unsteady loading. The decrease in the strength of the DSV is achieved by the formation of shear layer coherent structures that bleed the leading-edge vorticity prior to the ejection of the DSV.

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