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Airfoil Leading Edge Flow Separation Control using DBD Plasma Actuators driven by Nanosecond Pulses[1] JESSE LITTLE, University of Arizona, CHRIS RETHMEL, KEISUKE TAKASHIMA, CHRIS WIET, IGOR ADAMOVICH, MO SAMIMY, The Ohio State University — This work continues an ongoing exploration of the use of dielectric barrier discharge plasma actuators driven by repetitive nanosecond pulses (NS-DBD hereafter) for aerodynamic flow control. The NS-DBD transfers very little momentum to the neutral air, but generates compression waves that manipulate flow instabilities similar to localized arc filament plasma actuators. Such devices which are believed to function through thermal effects and instability manipulation could result in a significant improvement over conventional DBD (AC-DBD) plasmas that rely on momentum addition which limits their performance at high speeds. The efficacy of NS-DBDs has been demonstrated in our laboratory in a preliminary work on an airfoil leading edge up to Mach 0.17 and Re=1x106. The current work extends the investigation to higher Mach (0.27) and Re (1.15x106), the maximum operating conditions of our subsonic wind tunnel, using an 8 inch chord NACA 0015 airfoil. Results show the efficacy of the nanosecond pulse plasma discharge for attaching the nominally separated flow at various post stall angles of attack.

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