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Plasma aerodynamic control of both subsonic and supersonic flows SEONG-KYUN IM, MARK A. CAPPELLI, Stanford University — We present both subsonic and supersonic aerodynamic flow control studies using dielectric barrier discharge (DBD) actuators. Flow-aligned DBD actuators designed to impart spanwise forcing and create streamwise vorticity are used for reattaching separated subsonic flows on inclined flat plates and trailing angled flaps. We demonstrate enhanced control authority when these DBD actuators are used in conjunction with boundary layer bleeding, also driven by DBD actuators within the bleed channels. DBD actuators of similar configuration are also used to control boundary layer separation in unstarting supersonic flows at Mach 4.7 flow condition. In these unstart studies, planer laser Rayleigh scattering is used to visualize flow features such as boundary layer thinning, thickening, and shock waves. A significant thinning of the boundary layer is observed with DBD actuation and spanwise forcing. This thinning is the result of the drawing in of high speed fluid from the supersonic core and is shown to lead to a delay in the unstart process.

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