Abstract Submitted
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Mixing Layer Excitation by Dielectric Barrier Discharge Plasma Actuators[1] RICHARD ELY, JESSE LITTLE, University of Arizona — The response of a mixing layer with velocity ratio 0.28 to perturbations near the high-speed side (U_2=11 m/s, Re_L = 0.26 x 10^6) of its origin from dielectric barrier discharge plasma actuators is studied experimentally. Both alternating current (ac) and nanosecond (ns) pulse driven plasma are investigated in an effort to clarify the mechanisms associated with each technique as well as the more general physics associated with flow control via momentum-based versus thermal actuation. Ac-DBD plasma actuators, which function through electrohydrodynamic effects, are found to generate an increase in mixing layer momentum thickness that is strongly dependent on forcing frequency. Results are qualitatively similar to previous archival literature on the topic employing oscillating flaps. Ns-DBD plasma, which is believed to function through thermal effects, has no measureable influence on the mixing layer profile at similar forcing conditions. In the context of previous archival literature, these results suggest different physical mechanisms govern active control via ac- and ns-DBD plasma actuation and more generally, momentum versus thermal perturbations. Further investigation of these phenomena will be provided through variation of the boundary/mixing layer properties and forcing parameters in the context of spatially and temporally resolved experimental data.

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