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Parametric Optimization of Single Dielectric Barrier Discharge (SDBD) Plasma Actuators. MUHAMMAD O. IQBAL, ALEXEY KOZLOV, DAVID SCHATZMAN, HESHAM OTHMAN, FLINT THOMAS, THOMAS CORKE, Center for Flow Physics and Control, University of Notre Dame, Notre Dame, IN — There has been growing interest in flow control using dielectric barrier discharge plasma actuators in recent years. However, studies regarding optimization of plasma actuators are relatively scarce. Current study is intended to optimize the body force produced by plasma discharge (steady and unsteady) which is a function of various parameters such as dielectric material, size of electrodes, their overlap, frequency, voltage, etc. Detailed experiments are performed in a controlled environment with no-external-flow condition with several different dielectric materials of various thicknesses. Plasma induced velocity (using glass pitot probe), body force (using high precision weighing scale), and power dissipation are measured at various voltages and frequencies. Optimal voltage waveform and frequency has been found which resulted in time averaged maximum induced velocity and body force. This has resulted in an order of magnitude improvement of the actuator effect. The results obtained follow a relatively simple mathematical model that allows one to derive analytical expressions for electrical characteristics of plasma actuators.

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