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Micro Jet Generation with Annular Plasma Actuators CEREN OZTURK, JAMEY JACOB, Oklahoma State University — The effectiveness of dielectric barrier discharge plasma actuators for use in micro thrusters and internal duct aerodynamics are investigated. The primary flow is driven by tha zero-net mass flux jet at the wall in a closed circumferential arrangemen that then entrains fluid in the core of the duct. This results in a unique configuration for studying impulsively started jet phenomena. Laser flow visualization is utilized to observe detailed flow structure wherein multiple vortex rings are formed immediately after pulsed actuation and evolve into a turbulent jet downstream. Measurements are made using PIV and the effects of modulation frequency and the duty cycle on the induced velocity and resulting thrust are observed. The values of the induced velocities increase with the forcing frequency and duty cycle although there is a peak value for the forcing frequency after which the velocity and thrust decrease. The influence of the length-to-diameter (l/d_i) ratio is also significant; the velocities and thrust increase as the inner diameter of the tubes are increased. Velocity profiles show a great difference with this ratio. As the inner diameter is increased, a recirculation region at the center of the tube with negative velocities can be observed. The effect of freestream on the induced veloicty profiles is also studied wherein the duct is placed inside a wind tunnel and tests are conducted at different Re.

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