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**Characteristics of Plasma Synthetic Jet Actuators in Crossflow**
ARVIND SANTHANAKRISHNAN, University of Kentucky, JAMEY JACOB, Oklahoma State University — The plasma synthetic jet actuator (PSJA) consists of two annular electrodes separated by dielectric material that results in a circular region of dielectric barrier discharge plasma. In quiescent conditions, this plasma ring produces a synthetic jet which can be used for active flow control applications. Unsteady pulsing of the actuator results in the formation of multiple primary and secondary vortex rings, the latter remaining fixed or trapped in space. The jet is observed to be formed by the advection and interaction of the primary vortices, resembling a conventional synthetic jet. This presentation examines the operation of the PSJA in a crossflow at three different jet to freestream velocity ratios. PIV measurements in the streamwise and cross-stream planes are used to illustrate the three dimensionality of the jet and associated vortical structures. The strength of the vortex ring is found to vary along its circumference due to interaction with the freestream. The boundary layer characteristics obtained from these experiments suggest that the mechanism of the PSJA in crossflow is similar to an active boundary layer trip. Both the penetration of the jet and effectiveness of the trip action are found to decrease with increase in freestream velocity. The effects of unsteady pulsing and increasing input power on actuator created crossflow vortices will also be presented.

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