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A Comparison between Plasma Synthetic Jets and Conventional Jets ARVIND SANTHANAKRISHNAN, University of Kentucky, JAMEY JACOB, Oklahoma State University — The flow field of a jet created by an actuator employing a surface dielectric barrier discharge (DBD) is investigated experimentally via PIV measurements, and a comparison of its fluid dynamic characteristics with mechanically driven continuous and synthetic jets is presented. The plasma synthetic jet actuator consists of two electrodes arranged asymmetrically separated by a dielectric material and under an input of high voltage, high frequency AC at ambient conditions of pressure and temperature, a region of DBD plasma is formed starting from the edges of the exposed electrode. In an initially quiescent medium, this plasma region is observed to induce and sustain entrainment of near wall fluid, the volume of which is ejected out from the base of the actuator in the form of a jet. The electrodes are shaped either in the form of annular arrays for rendering a circular jet, or linear arrays for rendering a rectangular jet. Unsteady pulsing of the PSJA at time scales decoupled to the AC input frequency results in a flow field dominated by counter rotating vortical structures similar to conventional synthetic jets. The jet outputs are found to be affected by a variety of system inputs, including the input electrical power, pulsing frequency, and actuator dimension. The effects of varying the above parameters on the self similarity behavior of plasma synthetic jets are examined and compared to mechanically driven jets.

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