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Experimental Study of Axial Forcing on a Swirling Jet AMY MCCLENEY, PHILIPPE BARDET, The George Washinton University — An experimental swirling jet is created by independently controlling the axial and angular momentum injection with the resulting water jet discharging freely into a large tank. The jet is excited to enhance mixing in low to high swirl number regimes. Axial forcing on the jet is imposed for Strouhal number ranging from 0 to 15, Reynolds number from 1,000 to 10,000, and Swirl number from 0 to 1.3, where limited experimental data exists. The forcing amplitude is changed from 5 to 20 percent of the axial flow rate, while the azimuthal momentum injection stays constant; the resulting forcing creates a jet with varying swirl number. Swirling jets enhance the growth and mixing of fluids compared to non-swirling jets; this can lead to shorter combustion chambers and increased combustion efficiency. This mixing can be enhanced further by forcing natural instabilities in the jet. These imposed disturbances are either axial, which generates vortex rings, or angular, which create more complex structures. Past research involving forcing with swirling jets resulted in limited findings due to the concentration of forcing in either axial or angular directions. The flow structures of forced and steady jets are observed using PLIF through azimuthal dye injection.

Philippe Bardet
The George Washinton University

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