Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Rapid Confined Mixing with Transverse Jets Part 1: Single Jet
DAVID SALAZAR, DAVID FORLITI, Sierra Lobo Inc., Contractor for the Air Force Research Laboratory — Transverse jets have been studied extensively due to their relevance and efficiency in fluid mixing applications. Gas turbine burners, film cooling, and chemical reactors are some examples of rapid transverse jet mixing. Motivated by a lack of universal scaling laws for confined and unconfined transverse jets, a newly developed momentum transfer parameter was found to improve correlation of literature data. Jet column drag and entrainment arguments for momentum transfer are made to derive the parameter. A liquid-phase mixing study was conducted to investigate confined mixing for a low number of jets. Planar laser induced fluorescence was implemented to measure mixture fraction for a single confined transverse jet. Time-averaged cross-sectional images were taken with a light sheet located three diameters downstream of transverse injection. A mixture of water and sodium fluorescein was used to distinguish jet fluid from main flow fluid for the test section images. Image data suggest regimes for under- and overpenetration of jet fluid into the main flow. The scaling parameter is found to correlate optimum unmixedness for multiple diameter ratios at a parameter value of 0.75. Distribution A: Public Release, Public Affairs Clearance Number: 12655.

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Date submitted: 09 Aug 2012 Electronic form version 1.4