Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Structural Variation in Convectively and Absolutely Unstable Jets in Crossflow[1] DANIEL GETSINGER, LEVON GEVORKYAN, OWEN SMITH, ANN KARAGOZIAN, University of California, Los Angeles — This experimental study explores the behavior of both unforced and acoustically forced variable density transverse jets, via acetone PLIF and stereo PIV measurements. Jets composed of mixtures of helium and nitrogen are injected normally from a converging nozzle into an air crossflow, for a range of jet-to-crossflow momentum flux ratios J and density ratios S. A recent study[2] determined, based on hotwire-based spectral characteristics and excitation response, that transverse jet shear layers transition to global instability in response to sufficient lowering of S (below 0.45-0.40) and/or sufficient lowering of J (below 10). The changes in flow structure during such transitions are documented in the present study, where alterations in the transverse jet's vorticity field, cross-sectional symmetry or asymmetry, and dynamic flow features are affected. Both absolutely unstable transverse jets and forced transverse jets are observed to have more symmetric cross-sections than those for convectively unstable jets at higher J values, the latter of which also can exhibit the presence of tertiary vortex structures first identified by Kuzo.[3]

[1]Supported by NSF grant CBET-1133015 & AFOSR grant A001768901.
[2]Getsinger, et al., **Expts in Fluids**, 2012
[3]Kuzo, D., Ph.D. thesis, Caltech, 1995

Ann Karagozian
University of California, Los Angeles

Date submitted: 06 Aug 2012 Electronic form version 1.4