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Low Density Transverse Jet Shear Layer Instabilities and their Control[1] DANIEL GETSINGER, CORY HENDRICKSON, AARON SUNG, OWEN SMITH, ANN KARAGOZIAN, University of California, Los Angeles — This work describes an experimental characterization of the instabilities forming in the near-field of the variable density transverse jet shear layer. Jets composed of mixtures of helium and nitrogen are injected from a converging nozzle mounted flush with an injection wall, issuing into an air crossflow. The jet-to-crossflow density ratio S is varied between 1.00 and 0.14 by changing the proportions of nitrogen and helium. Jet-to-crossflow momentum flux ratios J are varied in the range $\infty > J \geq 2$ at each value of S. The results of hotwire anemometry measurements in the jet shear layer indicate that a transition from convective to absolute instability has dependence on the jet-to-crossflow momentum flux ratio J and separate dependence upon the density ratio S. This transition, in a similar fashion to that examined in the equidensity transverse jet[2] and in other types of shear flows, is characterized by several clear spectral features, including sharp spectral peaks, resistance to low level acoustic forcing for the globally unstable (self-excited) case, and broadband oscillations with high receptivity to applied forcing for the convectively unstable case. The presence of crossflow is observed to alter the global instability transition classically observed in low density free jets, allowing it to occur at higher density ratios S as J is reduced.

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[2]Davitian, et al., **JFM**, to appear, 2010

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