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Crossflow Influence on Transverse Jet Shear Layer Instabilities: Experimental Studies.[1] SEVAN MEGERIAN, JULIETT DAVITIAN, ANN KARAGOZIAN, UCLA — This experimental study examines alterations in the character of the nearfield shear layer instability associated with a gaseous transverse jet, with specific focus on the influence of the crossflow. Two different convergent nozzles of the same shape are utilized: one which is flush-mounted in the injection wall and one which extends from the injection wall, allowing exploration of the effect of the wall boundary layer and associated presence of a horseshoe vortex. A range of jet-to-crossflow velocity ratios ($1 \leq R < \infty$) and jet Reynolds numbers ($1800 \leq Re_j \leq 3800$) is explored. The flush-injected transverse jet undergoes a significant transition in the nature of the shear layer instability as the crossflow magnitude is increased, where very distinct fundamental, harmonic, and (in some cases) subharmonic modes are excited. No significant transition is observed for the jet emanating from the extended nozzle. While these differences in the characteristics may be marginally related to an effective reduction in the crossflow magnitude within the wall boundary layer, there is evidence that it is the presence and behavior of the horseshoe vortex system that significantly influences the flush-injected jet's shear layer instability for $R < 4$.

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Ann Karagozian
UCLA

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