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Extending the planar mixing layer analogy for jets in cross flow by including viscous, curvature and asymmetry effects[1] DAVI SOUZA, UFF (Brazil), ROMULO FREITAS, CEFET (Brazil), LEO ALVES, UFF (Brazil) — A simplified model is developed in the present study to predict the jet in cross flow transition to absolute instability. It is based on a linear stability analysis of the local mean flow extracted from the upstream shear layer of the jet in cross flow, where the wave maker is located. In order to do so, the planar mixing layer analogy [Iyer and Mahesh, JFM, vol. 790, pp. 275-307, 2016] is extended to include curvature, viscous and asymmetry effects. The addition of the former two effects significantly improves the predictive capabilities of the analogy, which is confirmed through validation against experimental data for a jet in cross flow issued from a flush mounted convergent nozzle [Shoji et al, JFM, vol. 890, A7-1, 2020]. Furthermore, azimuthal asymmetry is also added to the analogy. Preliminary results from this latter extension indicate that helical modes could also contribute to the transition to absolute/global instability in jets in cross flow.

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