Abstract Submitted
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Trajectory of a synthetic jet issuing into a high Reynolds number turbulent boundary layer[1] TIM BERK, University of Southampton, RIO BAIDYA, CHARITHA DE SILVA, IVAN MARUSIC, NICHOLAS HUTCHINS, University of Melbourne, BHARATHRAM GANAPATHISUBRAMANI, University of Southampton — Synthetic jets are zero-net-mass-flux actuators that can be used in a range of flow control applications. For several pulsed/synthetic jet in cross-flow applications the variation of the jet trajectory in the mean flow with jet and boundary layer parameters is important. This trajectory will provide an indication of the penetration depth of the pulsed/synthetic jet into a boundary layer. Trajectories of a synthetic jet in a turbulent boundary layer are measured for a range of actuation parameters in both low- and high Reynolds numbers (up to $Re_\tau = 13000$). The important parameters influencing the trajectory are determined from these measurements. The Reynolds number of the boundary layer is shown to only have a small effect on the trajectory. In fact, the critical parameters are found to be the Strouhal number of the jet based on jet dimensions as well as the velocity ratio of the jet (defined as a ratio between peak jet velocity and the freestream velocity). An expression for the trajectory of the synthetic (or pulsed) jet is derived from the data, which (in the limit) is consistent with known expressions for the trajectory of a steady jet in a cross-flow.

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