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Constraints of scaling synthetic jet trajectories in crossflow GIRISH JANKEE, BHARATHRAM GANAPATHISUBRAMANI, University of Southampton — Synthetic jet actuators remain coveted components in flow control applications as the convection of vortex rings allows distribution of momentum in a boundary layer although the net mass flux remains zero. The ability to predict the trajectory of these vortex rings is critical for efficient and targeted usage of such actuators. In this investigation, a synthetic jet is issued into a crossflow from rectangular orifices with aspect ratios 3, 6 and 12 over a range of operating frequencies and blowing ratios, with the flowfield being captured through PIV measurements. An assessment of the trajectories culminates in scaling characteristics which encapsulate the aspect ratio, momentum ratio and the Strouhal number. We observe synthetic jets to follow identical trajectories provided the total momentum ratio between the jet and the crossflow remain the same, irrespective of the actuation frequency. However, the universality of such scaling is subjected to certain constraints with a lower bound defined by the jet formation criterion and an upper bound related to successive vortex pair interactions.

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