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Vortex dynamics of very low aspect ratio rectangular orifice synthetic jets[1] JOSEPH STRACCIA, JOHN FARNSWORTH, University of Colorado, Boulder, EXPERIMENTAL AERODYNAMICS LABORATORY TEAM — The vast majority of prior synthetic jet research has focused on actuators with either circular orifices or rectangular orifices with high aspect ratios (AR), i.e. AR$\geq$25. The results reported in these studies have also been biased towards bulk and time averaged statistics of the jet, viewing them in a steady sense as a source of momentum addition. Recent work has revealed that the unsteady vortex dynamics in a synthetic jet can be very relevant to how the jet interacts with and influences the base flow. In this study the synthetic jet issued into a quiescent fluid by an actuator with low orifice aspect ratios (i.e. AR=2-18) was studied using Stereoscopic Particle Image Velocimetry (SPIV) with a special focus on the vortex dynamics. The progression of vortex ring axis switching is presented and a distinct difference between the axis switching dynamics of very low AR (AR$\leq$6) and moderate AR (AR=6-24) vortex rings is discussed. The high resolution SPIV vector fields are also used to extract details of the vortex core structure which are compared to theoretical vortex models. Furthermore, the influence of axis switching on the circulation magnitude around the vortex ring is reported in addition to how circulation varies with time as the ring advects.

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