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Vortex ring bifurcation in a moderate aspect ratio, rectangular orifice synthetic jet[1] JOSEPH STRACCIA, JOHN FARNSWORTH, University of Colorado, Boulder — Vortex ring dynamics play an important role in setting the shape, entrainment rate, and near field unsteadiness in synthetic jets. In this study multi-planar stereo particle image velocimetry (SPIV) data obtained for an AR=13 rectangular orifice synthetic jet is used to volumetrically reconstruct the coherent structures of the jet. Analysis of this data reveals the axis switching dynamics of the primary vortex ring in addition to identifying several types of related secondary structures. Most significant however is the confirmation that the vortex rings undergo a viscous interaction called vorticity reconnection which causes the vortex rings, and the momentum of the jet, to bifurcate. The structure of the vortex ring during and after the vorticity reconnection event is reported at different phases of the jet and compared with studies of isolated vortex rings. To understand how this phenomenon is affected by the unique environment inside of the synthetic jet the Reynolds and Strouhal numbers of the jet were varied independently and centerline SPIV data was acquired. From these results conclusions are drawn regarding which conditions allow for more complete vortex ring bifurcation.

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