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Flow Interactions of a Finite-span Synthetic Jet near a Wing Tip JOSEPH VASILE, MICHAEL AMITAY, Rensselaer Polytechnic Institute — An experimental investigation was performed to study the three-dimensional flow structures and interactions of a finite-span synthetic jet located near the tip of a sweptback finite wing (NACA 4421, AR = 4, $\Lambda = 30^\circ$) at Re = 10^5 and at three angles of attack, 0°, 9° and 15.5°. Three blowing ratios were investigated; Cb = 0.8, 1.2 and 2. Stereoscopic Particle Image Velocimetry data were collected at multiple 2-D planes in the vicinity of the jet's orifice. The effect of the jet's blowing ratio was analyzed using time-averaged and phase-averaged statistics. The study showed that the flow field in the vicinity of the synthetic-jet orifice becomes highly three-dimensional and is governed by the streamwise structures that are associated with the finite span of the jet (edge vortices). Due to the close proximity of the jet to the wing tip, the baseline (i.e., unactuated) flow field is highly three-dimensional with a non-uniform spanwise boundary layer that becomes more pronounced with increasing angle of attack. Consequently, the formation and advection of the secondary flow structures are altered.

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