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Topology of Vortex-Wing Interaction[1] CHRIS MCKENNA, DONALD ROCKWELL, Lehigh University — Aircraft flying together in an echelon or V formation experience aerodynamic advantages. Impingement of the tip vortex from the leader (upstream) wing on the follower wing can yield an increase of lift to drag ratio. This enhancement is known to depend on the location of vortex impingement on the follower wing. Particle image velocimetry is employed to determine streamline topology in successive crossflow planes, which characterize the streamwise evolution of the vortex structure along the chord of the follower wing and into its wake. Different modes of vortex-follower wing interaction are created by varying both the spanwise and vertical locations of the leader wing. These modes are defined by differences in the number and locations of critical points of the flow topology, and involve bifurcation, attenuation, and mutual induction. The bifurcation and attenuation modes decrease the strength of the tip vortex from the follower wing. In contrast, the mutual induction mode increases the strength of the follower tip vortex.

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