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Transport Mechanisms Governing the Strength of Delta Wing Leading-Edge Vortices JAMES BUCHHOLZ, KEVIN WABICK, AADIL MANAZIR[1], BRIAN SNIDER, The University of Iowa — The flow physics of non-slender delta wings are complex and relatively poorly-understood in comparison with their slender counterparts. The leading-edge vortices on non-slender delta wings can exhibit strong interactions with the surface of the wing, and often exist in systems of multiple vortices. The vortices are sustained primarily by a balance between fluxes of vorticity within the shear layer separating from the leading edge, three-dimensional flow induced by the free stream, and the diffusive flux of vorticity generated on the suction surface due to the strong pressure gradients created by the vortices. These contributions are measured in a water tunnel, at Reynolds numbers on the order of 10^4, for regions spanning the suction surface of a delta wing with leading-edge sweep angle of 50 degrees. It is found that the balance depends on the chordwise position along the wing, with the shear layer contributing to LEV growth primarily near the apex of the wing, and transport further downstream dominated by flow three-dimensionality and interaction with the surface. Understanding these interactions provides a foundation for the design of flow control strategies and the prediction of aerodynamic loads and their fluctuations due to exogenous inputs.

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