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Vorticity Transport in the Leading Edge Vortex of a Plunging Airfoil[1] AZAR ESLAM PANAH, JAMES AKKALA, JAMES BUCHHOLZ, University of Iowa — The development of the leading edge vortex on a plunging flat plate airfoil is investigated using time-resolved particle image velocimetry and time-resolved surface pressure measurements. Interaction of the leading-edge vortex with the surface of the plate results in the creation of a secondary vortex similar to that found in many other flows such as those over delta wings. Temporal and spatial variations in the surface vorticity flux are computed from the time-varying pressure distributions on the surface of the plate. The net circulation resulting from this boundary flux is smaller in magnitude than that from the leading edge shear layer, but of the same order of magnitude. Entrainment of secondary vorticity into the leading-edge vortex results in cross-cancelation within the leading-edge vortex, weakening the leading edge vortex.

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James Buchholz
University of Iowa

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