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Characterization and Scaling of Vortex Shedding from a Plunging Plate[1] AZAR ESLAM PANAH, JAMES BUCHHOLZ, University of Iowa — Leading-edge and trailing-edge vortices (LEV and TEV) are investigated for a plunging flat plate airfoil at a chord Reynolds number of 10,000 while varying plunge amplitude and Strouhal number. Digital Particle Image Velocimetry is used to examine the strength and dynamics of shed vortices. Vortex strength, timing, pinch-off and trajectory are examined. By tracking the development of both the LEV and TEV in phase-locked measurements throughout the cycle and extracting the respective vortex circulation, the dimensionless circulation of both the LEV and TEV at each phase in the cycle could be determined. Guided by theoretical considerations for vorticity generation and aerodynamic theory, we will discuss the role of kinematic parameters on vortex shedding and the applicability of a scaling factor for the circulation of the shed vortex structures. Whereas a scaling parameter based on plate kinematics effectively collapses the circulation values of the shed leading-edge vortices with variation in Strouhal number, plunge amplitude, and angle of attack, it is found that the strength of the trailing-edge structures vary little with variation in plunge amplitude and angle of attack.

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