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**Investigation into the Recovery of a Translating Flat Plate Exposed to a Streamwise Acceleration** PETER MANCINI, Univ of Maryland-College Park, KAREN MULLENERS, EPFL, ANYA JONES, Univ of Maryland-College Park — This study explores the unsteady aerodynamic response of a wing to streamwise accelerations. A wing was towed through a water tank until reaching steady state (30 chords), after which the wing accelerated over a prescribed distance to a new constant velocity. Several velocity profiles were investigated, including acceleration and deceleration, as well as various angles of attack ($0^\circ - 50^\circ$). Direct force measurements and particle image velocimetry were conducted simultaneously throughout the full length of the motion. This was made possible through the implementation of a unique imaging setup that allows the wing, laser sheet, and camera to move together rigidly down the length of the tank, placing all PIV measurements in the wing-fixed reference frame and allowing for an uninterrupted measurement of the entire wing motion. Lift force results showed that for cases of high leading edge flow separation ($\alpha > 20^\circ$), the distance required to reach steady state is drastically lower when recovering from a streamwise acceleration than from accelerating from rest. The concept of vortex formation time was also explored, and via PIV and force results it was confirmed that the formation number consistently lies within the range of 3.6-4.5 for each acceleration profile.

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