Vortex Formation Behind an Inclined 2-Dimensional Thin Flat Plate\textsuperscript{1} MERAJ MOHEBI, DAVID H. WOOD, ROBERT J. MARTINUZZI, Univ of Calgary — Stereo Particle Image Velocimetry was used to measure the turbulent wake of a 2D flat plate inclined relative to a uniform stream as a heuristic model for airfoils and wind turbine blades at high incidence. Phase Averaging was performed to study the vortex dynamics and relate these to the force characteristics. Below 90\degree, immediately behind the plate, rounder and more organized trailing edge vortices form which possess higher circulation and are associated with higher Reynolds stresses than the counter-rotating, weaker and elongated leading edge vortices. The quasi-periodically shed vortices on the sides of the wake decay in strength at different rates to reach a circulation ratio of -1 within a distance less than 5 chords downstream of the plate for all angles. This equalization of vortex strength is related to an increase in turbulence diffusion, due to mostly-incoherent 3-dimensionality which progressively increases as the inclination angle is reduced, and convective transfer of vorticity between counter-rotating vortices. The wake experiences a sudden change in vortex formation mechanism at around 40\degree. At this angle, the frequency analysis on the signals of a pair of micro-pressure transducers in the wake also shows a discontinuity in the trends.

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