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Comparing wake structures behind a finite aspect ratio and an infinite span normal thin flat plate[1] ARMAN HEMMATI, DAVID H. WOOD, ROBERT J. MARTINUZZI, University of Calgary — The wake of an infinite span (2D) thin flat plate and that of a finite aspect ratio, AR = 3.2, plate, both normal to a uniform stream, are compared using DNS at Re=1200. For the 2D plate, three wake flow regimes are observed. Intervals of typical anti-symmetric Karman shedding (Regime M) are interrupted by intervals where the shear layer folding process first delayed (Regime L) and then accelerated, Regime H. The distinct flow patterns in these regimes have significant impact on lift and drag values, wake structure and instantaneous pressure loads. In contrast, only Regime M is observed for the AR=3.2 plate. The presence of two lateral shear layers appears to maintain the Karman shedding. Compared to the infinite plate: the mean recirculation region shrinks by 45% to 1.57H; the magnitude of the Reynolds Stresses drops significantly; Turbulent kinetic energy levels along the wake centerline and peak production and dissipation rates are significantly lower. Further, the three normal Reynolds stresses are comparable in magnitude. To better understand the impact of additional shear layers on the wake stability and resultant wake structures, the 3D structures will be reconstructed using DNS results. Pressure and stress distribution along the plate surfaces will also be examined.

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