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Vorticity Transport on a Rotating Blade[1] CRAIG WOJCIK, JAMES BUCHHOLZ, University of Iowa — The development of the leading-edge vortex (LEV) is investigated on the suction surface of a rectangular flat plate undergoing a starting rotation in a quiescent fluid for angles of attack between 25 and 45 degrees. For blade aspect ratios of 2 and 4, the LEV is shown to be compact and quasi-stationary at inboard regions of the blade, consistent with the results of some other recent investigations. A salient feature of this flow is a region of opposite-sign vorticity generated on the blade beneath the LEV which is observed to become partially entrained into the LEV. A detailed vorticity transport analysis on the LEV has revealed that the resulting annihilation of vorticity is an important mechanism regulating LEV circulation, and therefore its stability. A parametric study is discussed, which elucidates the roles of shear layer vorticity flux, spanwise flow, vortex tilting, and annihilation on the evolution of LEV circulation with changes in azimuthal position, blade aspect ratio, spanwise position, and Reynolds number.

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