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A novel model to capture the flow asymmetry of an accelerating plate at incidence ADAM DEVORIA, KAMRAN MOHSENI, University of Florida — An inviscid model for the flow over a flat plate accelerating at constant angle of attack is presented. The separated flows at the leading and trailing edges are represented by vortex-entrainment sheets (DeVoria & Mohseni 2019, JFM, 866) and the roll-up process is assumed to be self similar. The flow asymmetry is captured in the governing equation by an additional term that is equal to the first non-singular member of the Laurent series expansion of the complex potential for the flow around a sharp edge. The coefficient quantifying this higher-order flow component is a new similarity parameter that represents the time-dependent effects of the vortex structure growth and the angle of attack. The value of the parameter is obtained from known kinematic input and is used to compute a self-similar solution for a given instance of time. The time-evolution of the physical solution is then obtained from a series of such parameterized self-similar solutions. The asymmetric flow structure is well represented up to times prior to the appearance of secondary flow structures. Similarly, the forces exerted on the plate are captured with much improved accuracy as compared to previous work.

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