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Lagrangian analysis of vortex shedding behind a 2D airfoil BLAKE CARDWELL, KAMRAN MOHSENI — Identifying the coherent structures and their interactions in the mixing zone is a useful means in designing future flow control strategies. To this end, a Lagrangian analysis of two-dimensional vortex shedding over an Eppler 387 airfoil is presented. Stable and unstable material manifolds in the flow are identified. Unstable manifolds such a the shear layer characterize a barrier to fluid mixing and are easily visualized using dye injection in an experiment. On the other hand, stable manifolds are more difficult to visualize in an experiment. Reattachment lines are examples of such manifolds. As such the existence of these structures in the flow, is presented and how these structures are useful in understanding vortex shedding is explored. The manifold structure is also presented in a time averaged view, allowing a comparison with the traditional separation bubble. Furthermore, lobe dynamic calculation are performed and the fluid entrainment into shedded vortices are investigated. Finally, investigation of correlation between the behavior of the material manifolds and more traditional quantities such as skin friction, flow phase portrait, and pressure is presented.

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