

Abstract Submitted
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Onset of orbital motion in a perturbed trailing vortex GREGORY FISHMAN, DONALD ROCKWELL, Lehigh Univ — The unsteady flow structure of a trailing vortex from a wing undergoing small amplitude, heaving motion is investigated using stereo particle image velocimetry. The effect of Strouhal number on the onset and development of orbital motion of the trailing vortex is examined through space-time representations of axial and azimuthal vorticity, axial velocity deficit and swirl ratio. The response of the vortex can be categorized according to the Strouhal number. At the lowest value, unidirectional excursions of the vortex occur, with insignificant orbital motion over a streamwise extent of approximately one hundred radii of the vortex. At a moderate value of Strouhal number, unidirectional motion of the vortex evolves into orbital motion with increasing streamwise distance. At the highest Strouhal number, pronounced orbital motion of the vortex occurs at the trailing edge of the wing and is amplified in the streamwise direction. Changes in curvature along the vortex are closely linked to significant variations of axial and azimuthal vorticity, axial velocity deficit and swirl ratio for all three regimes of vortex response.

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