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Vortex Interaction on Low Aspect Ratio Membrane Wings RYE M. WALDMAN, KENNETH S. BREUER, Brown University — Inspired by the flight of bats and by recent interest in Micro Air Vehicles, we present measurements on the steady and unsteady behavior of low aspect ratio membrane wings. We conduct wind tunnel experiments with coupled force, kinematic, and flow field measurements, both on the wing and in the near wake. Membrane wings interact strongly with the vortices shed from the leading- and trailing-edges and the wing tips, and the details of the membrane support play an important role in the fluid-structure interaction. Membranes that are supported at the wing tip exhibit less membrane flutter, more coherent tip vortices, and enhanced lift. The interior wake can exhibit organized spanwise vortex shedding, and shows little influence from the tip vortex. In contrast, membranes with an unsupported wing tip show exaggerated static deformation, significant membrane fluttering and a diffuse, unsteady tip vortex. The unsteady tip vortex modifies the behavior of the interior wake, disrupting the wake coherence.

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