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On passive wing response in hovering kinematics at low Reynolds number ALBERT MEDINA, JEFF D. ELDREDGE, Mechanical & Aerospace Engineering, University of California, Los Angeles, CA, USA — The aerodynamic role of passive wing mechanics in biological flight remains poorly understood. This computational study focuses on the effects of passive pitch response via chordwise flexibility in two-dimensional hovering kinematics. The wing consists of solid elliptical bodies with interconnecting torsional springs. Tests of a wing subjected to a nominally perpendicular freestream reveal new mechanisms for mean lift generation through symmetry-breaking. Additionally, chordwise flexibility in hovering kinematics accounts for greater average lift production and efficiency than an equivalent rigid wing. It is shown that an effective angle of attack can be defined that collapses the performance of the flexible wing to that of a rigid wing. Further, it is found that the performance of a flexible wing undergoing hovering maneuvers is less sensitive to pitch amplitude and phase. Finally, these results are put into context with recent studies of passive pitching of a rigid wing, and a more general class of passive wing behaviors is identified.

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