

Abstract Submitted
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Understanding the Role of Moment-of-Inertia Variation in Insect Flight Maneuvers¹ TIRAS LIN, RAJAT MITTAL, LINGXIAO ZHENG, The Johns Hopkins University, TYSON HEDRICK, The University of North Carolina at Chapel Hill — The objective of this study is to gain insights into insect flight maneuvers and, in particular, the role that changes in body moment-of-inertia might play during these maneuvers. High-speed, high-resolution videogrammetry is used to quantify the trajectory and body conformation of Painted Lady butterflies during flight maneuvers; the 3D kinematics of the center-of-masses of the various body parts of the insect are determined experimentally. Measurements of the mass properties of the insect are then made and used to parameterize a simple flight dynamics model of the butterfly. Even though the mass of the flapping wings is small compared to the total mass of the insect, these experiments and subsequent analyses indicate that changes in moment-of-inertia during flight are large enough to have a noticeable impact on the maneuvers of these insects.

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