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Aerodynamics of a single-degree-of-freedom toy ornithopter RAMIRO CHAVEZ ALARCON, B.J. BALAKUMAR, JAMES J. ALLEN, New Mexico State University — The flow field around a flight-worthy toy ornithopter is investigated using PIV diagnostics in combination with load cells to understand the aerodynamics during nominally steady flight and turning. Phase-locked measurements of the wake and inflow are performed using an automated PIV system around the flapping wings of the ornithopter with the ornithopter fixed to a load-cell inside a 1.3m x 1.2m wind tunnel test section. The mildly oscillating free flight of the ornithopter is compared to the wake measurements to understand the causes of the unsteadiness. Further, the modulation of the wake that causes the turning motion of the ornithopter is explained using the wake structure measurements.

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