

Abstract Submitted
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Effects of added mass and wing-wake interaction on the aerodynamic performance of a hovering mosquito wing.¹ HYUNWOO JUNG, SEHYEONG OH, HAECHON CHOI, Seoul Natl Univ — We investigate the aerodynamic force-production mechanisms of a hovering mosquito wing. In particular, the effect of added mass and wing-wake interaction at an early phase of each stroke is examined through the kinematic control of sweeping and deviation motions. The results show that the added-mass force has a significant contribution to the total aerodynamic force during and near the stroke reversal. In fact, the mosquito takes an advantage of added-mass effect to produce the additional lift force to compensate the small sweeping amplitude. Also, this study shows that the wing-wake interaction affects the aerodynamic performance of the wing in two different ways. Firstly, wake from the previous stroke induces the downwash velocity to reduce the resultant aerodynamic force. Secondly, LEV formed in the previous stroke slides along the pressure side and reattach on the suction side of the wing. This results in an attached TEV formed in the successive stroke which contributes to the positive lift force right after the stroke reversal. Furthermore, it is observed that the deviation motion only affects the formation of TEV while the wake effect is not affected by the deviation motion.

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