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Bristled wings in fling: effects of varying wing kinematics[1]
VISHWA KASOJU, ARVIND SANTHANAKRISHNAN, Oklahoma State University — Flight capable tiny insects of body lengths <2 mm, such as thrips and fairyflies use wing-wing interaction ('clap and fling') to augment lift generation at chord-based Reynolds number (Re) on the orders of 1-10. In addition, these insects possess wings with closely-packed long bristles at the fringes. Previous studies have shown that bristles can reduce drag needed to fling by leaking flow through the gaps. These studies used combinations of rotational and translational motion to prescribe wing kinematics, due to lack of high-magnification video recordings of freely flying tiny insects. We experimentally investigated the effects of varying wing kinematics (pure rotation, pure translation, and overlapping rotation and translation) on force generation and leakiness during fling of a bristled wing pair at Re = 10. The results show that (i) drag increased during pure rotation and pure translation with increasing angle of attack, (ii) peak drag increased with increasing overlap, and (iii) decreasing initial inter-wing spacing at the start of fling reduced the strength of the trailing edge vortex, resulting in asymmetric leading and trailing edge vortices.

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