

Abstract Submitted
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Three-dimensional flapping flight with bristled wings at low Reynolds numbers¹ VISHWA KASOJU, ARVIND SANTHANAKRISHNAN, Oklahoma State University — Miniature flying insects with body lengths under 2 mm, such as thrips and several parasitoid wasps, are often observed to possess bristled wings and use wing-wing interaction (clap-and-fling) during free flight. Previous studies using 3D wingbeat kinematics have primarily focused on examining force generation by solid (non-bristled) wings across varying Reynolds number (Re). Our previous 2D clap-and-fling studies have shown that bristled wings augment lift-over-drag ratio at Re relevant to the tiny insect flight ($Re=10$). This study aims to evaluate if the aerodynamic benefits of bristled wings are also observed when using 3D wingbeat kinematics. A dynamically scaled robotic model capable of replicating realistic 3D wingbeat kinematics during hovering was developed. We comparatively examine the flow structures generated by solid and bristled wings at Re ranging from 1 to 120, for prescribed wing kinematics of both fruit flies and thrips. The implications of observed flow structures on force generation will be discussed.

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