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Flapping flight using bristled wings: effects of varying gap to diameter ratios VISHWA TEJA KASOJU, ARVIND SANTHANAKRISHNAN, Oklahoma State Univ — The smallest flying insects with body lengths under 1 mm, such as thrips, show a preferential adaptation for fringed or bristled wings. In addition, these tiny insects have been observed to use wing-wing interaction via the clap and fling mechanism. We have previously shown that the use of bristled wings can lower forces required to clap the wings together and fling them apart. Tremendous variation is observed in bristled wing design among tiny insects. In this study, we examine the role of ratio of bristle gap to diameter (G/D) on force generation and flow structures at Reynolds numbers on the order of 10. A dynamically scaled robotic model was developed for this study, in which physical models of bristled wings were programmed to execute a 2D clap and fling kinematics. Bristled wing models with G/D ranging from 5 through 17 were examined. Lift and drag forces were measured using strain gages and phase-locked particle image velocimetry was used to visualize flow structures generated from the flapping motion. The results showed reductions in the size of the leading edge vortex and drag force with increasing G/D. The effects of increasing G/D on leakiness through the bristles will be presented.

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