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A Computational Study of Wing-Wing Interactions in Hovering Insect Wings HAIBO DONG, ZONGXIAN LIANG, Wright State University — It has been discovered that flying insects may enhance their lift production through "clap-and-fling" during dorsal stroke reversal. In this study, an immersed-boundary-based DNS solver is used to quantitatively study the aerodynamic benefit and associated vortex dynamics of wing-wing interactions for modeled fruitfly (Drosophila) wings in hovering motion. Simulations show that about 12.8% vertical force augmentation is produced over the entire stroke cycle compared to a single flapping wing with the same motion. Delayed trailing-edge vortex formation during the fling stage is also observed as reported by idealized 2-D studies in literature. Effects of different stoke trajectories on the aerodynamic performance are also investigated in this study. These simulations will allow us to investigate the "clap-and-fling" mechanism and help with the improvement of current analytical models on force predictions in insect flights.

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