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The study of a dragonfly flight performance at various pitching angles of its wing MAJID KHAN, SANTOSH MALLAH, AMIT AGRAWAL, Department of Mechanical Engineering, Indian Institute of Technology Bombay, Powai, Mumbai 400076, India — The flight of a dragonfly is affected by its corrugated wing cross-section. The flow around a corrugated foil inspired from a dragonfly wing, pitching about quarter chord point has been studied through numerical simulations. The objective is to understand the effect of variation in pitching angle on the corrugated foil, thereby unravelling the secret of dragonfly flight at various pitching angles of its wing. Numerical simulations are performed over a range of pitching angles, $\theta = 2^\circ - 10^\circ$ for a reduced frequency of 8.73, at a chord-based Reynolds number of 2000. The results for corrugated foil are compared with a smooth NACA (National Advisory Committee for Aeronautics)0012 foil. Over the studied pitching angle range for the corrugated foil, at $\theta = 2^\circ$ net drag on the foil is observed which transits into a net thrust on the foil at $\theta = 5^\circ$ and thereafter a monotonic increase in thrust is observed up to the largest pitching angle. NACA00012 foil is observed to perform better in terms of thrust compared to corrugated foil. This study helps understand the effect of pitching angle in the flight dynamics of dragonflies.

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