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Flapping flight: effect of asymmetric kinematics NAKUL PANDE, SIDDHARTH KRITHIVASAN, SREENIVAS K.R., Jawaharlal Nehru Centre for Advanced Scientific Research — Flapping flight has received considerable attention in the past with its relevance in the design of micro-air vehicles. In this regard, asymmetric flapping of wings offers simple kinematics. Nevertheless, it leads to symmetry-breaking in the flow field and generation of sustained lift. It has been observed previously with flow visualization experiments and Discrete Vortex Method (DVM) simulations that if the down-stroke time period is lesser than the up-stroke time, there is a net downward momentum imparted to the fluid. This is seen as a switching the flow field from a four-jet (symmetric) to a two-jet (asymmetric) configuration when the stroke-time ratio is progressively varied. This symmetry breaking has been studied experimentally using Particle Image Velocimetry (PIV) across a range of Reynolds Numbers and asymmetry ratios. Results are also corroborated with results from 3-D numerical simulations. Study helps in shedding light on the effectiveness of asymmetric kinematics as a lift generation mechanism.

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