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Effect of the rear wing size on the thrust performance of the two-dimensional tandem flapping wing.[1] SUNIL MANOHAR DASH, NISHANTH S, JIT SINHA, Indian Institute of Technology, Kharagpur, KIM BOON LUA, National Chiao Tung University, Taiwan, IIT KHARAGPUR - NCTU TAIWAN COLLABORATION — In this numerical study, the effect of the size of the rear wing on the thrust performance of 2D elliptical tandem flapping wing is investigated. Here, size ratio (SR), defined as the ratio of the chord of the rear to the front wing, is varied from 0.5 to 1.5 at an interval of 0.25 while keeping the aspect ratio (ratio of wing chord to thickness) AR=8, wing spacing (distance from trailing-edge of front wing to leading-edge of rear wing) λ =chord of the front wing, and phase angle φ =0 deg constant. Reynolds number based on the chord and Strouhal number based on the excursion distance of the front wing are set as 5000 and 0.32, respectively. For different SRs, we notice that time-average (Ct) and peak transient (Ctp) thrust coefficients of the rear flapping wing in tandem configuration can be up to 80% higher compare to those of single flapping wing of same size. This enhanced thrust performance in tandem wing flapping is attributed to the constructive interaction of the shed vortices from the front wing with the leading-edge vortex of the rear wing. Note that the formation and interaction of the vortices is modified with SR. When SR increases, Ctp shifts towards starting of the flapping stroke and maximum Ctp and Ct are seen at SR=0.5 and SR=0.75, respectively.

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