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Aspect ratio effects on the aerodynamic performance of flapping wings in tandem configuration RAFAEL JURADO, GONZALO ARRANZ, OSCAR FLORES, MANUEL GARCA-VILLALBA, Univ Carlos III Madrid — Dragonflies are frequently used as bioinspired models for micro air vehicles due to its great manoeuvrability. However, the complex mechanisms underlying the wing-wing interaction are not properly understood yet. In this work, direct numerical simulations have been used to study the aerodynamic performance of a pair of heaving-pitching wings in horizontal tandem configuration in forward flight. The kinematics of the wings are chosen from a 2D configuration optimised to maximize the propulsive efficiency. The Reynolds number based on the free-stream velocity and chord of the wing is $Re = Uc/\nu = 1000$. The influence of the aspect ratio (AR) of the hind-wing on the aerodynamic performance of the system is analysed, considering hind wings with $AR = 4, 3$ and 2 , keeping $AR = 4$ for the fore wing. Results show that the propulsive efficiency is similar for all studied cases as the force coefficients are barely affected when the hind-wing aspect ratio is changed. Decreasing the hind-wing aspect ratio helps to avoid the fore-wing tip vortex but also increases the finite wing effects. Funding: Spanish Ministry of Economy and Competitiveness (DPI2016-76151-C2-2-R) and Red Española de Supercomputación (IM-2019-3-0011).

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