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**Thrust Enhancement of Flapping Wings in Tandem and Biplane Configurations by Pure Plunging Motion** S. BANU YILMAZ, MEHMET SAHIN, M. FEVZI UNAL, Istanbul Technical University — The propulsion performance of flapping NACA0012 airfoils undergoing harmonic plunging motion in tandem and biplane wing configurations is investigated numerically. An unstructured finite volume solver based on Arbitrary Lagrangian-Eulerian formulation is utilized in order to solve the incompressible unsteady Navier-Stokes equations. Four different tandem and four different biplane wing combinations are considered. Various instantaneous and time-averaged aerodynamic parameters including lift and drag coefficients, vorticity contours and streamlines are calculated for each case and compared with each other. As a reference the single wing case corresponding to the deflected jet phenomenon in Jones and Platzer (*Exp. Fluids* 46:799-810, 2009) is also studied. In these simulations, the Reynolds number is chosen as 252, the reduced frequency of plunging motion ($k = 2\pi f/U_\infty$) is 12.3 and the plunge amplitude nondimensionalized with respect to chord is 0.12. The solutions of the single wing case indicate dependence on the location of start-up vortices. Meanwhile the multiple wing configurations indicate that the highest thrust enhancement is obtained in one of the biplane cases where the two wings closely moving towards each other namely biplane asynchronous-closer case.

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