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Unsteady lift and thrust of a 2D flapping thin airfoil in the presence of additional leading edge vortices[1] JAVIER ALAMINOS-QUESADA, RAMON FERNANDEZ-FERIA, Universidad de Malaga — The effect of leading-edge vortices (LEVs) on the lift, thrust and moment of a two-dimensional heaving and pitching foil is analyzed from the unsteady, linear potential theory. General expressions taking into account the effect of unsteady point vortices interacting with the oscillatory trailing wake are first derived. Then, simplified expressions for the initial stages of the growing LEV on each half-stroke are used to obtain analytical closed expressions for the main contribution of these vortices to the lift, thrust and moment. It is found that, within the linear potential framework and the Brown-Michael model, the LEV contributes to the aerodynamic forces and moment only for combined pitching and heaving motions of the foil, being a relevant contribution for sufficiently large values of the product of the reduced frequency and the amplitude of the heaving and/or pitching motions. The results are compared with available experimental data and numerical simulations.

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