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Flapping Instability of Two Tandem Flexible Foils in Uniform Axial Flow PARDHA SARADHI GURUGUBELLI, RAJEEV KUMAR JAIMAN, CASSEY CHUA, National University of Singapore — We present a numerical analysis on the stability and coupled dynamics of two tandem flexible foils clamped at their leading edges in a uniform axial flow. The flexible foils considered for this study correspond to the fixed-point stable regime of the single flexible foil where the flexible foil aligns itself in the flow direction with no significant trailing edge oscillations. A high-order nonlinear coupled solver based on the variational formulation has been considered for analyzing the effects of gap between the foils on the stability and coupled behaviour of both the upstream and downstream foils. As a function of decreasing gap, it is observed that the tandem foil configuration is more prone to flapping instability than its single flexible foil counterpart. The evolution of the instability for the downstream foil shows two distinct dynamical scenarios: (i) only the downstream foil exhibits flapping motion and (ii) both the upstream and the downstream foils perform flapping. With the aid of a rigid foil in the upstream of a flexible foil, we further present a detailed analysis on the effects of the upstream wake and vortex shedding on the stability and flapping dynamics of the downstream foil.

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