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Effect of Chordwise Flexibility on Propulsive Performance of High-Inertia Oscillating Foils[1] PETER OSHKAI, DYLAN IVERSON, MOSTAFA RAHIMPOUR, WALTFRED LEE, University of Victoria, TAKAHIRO KIWATA, Kanazawa University — This work studies the effects of chordwise flexibility, inertia and kinematic parameters on propulsive performance of an oscillating foil. Three low-aspect-ratio foils with different flexibilities were undergoing pitch and heave motions in a uniform flow at the Reynolds number of 80000. Forces exerted on the foil were directly measured using a load cell and were used to calculate the thrust and efficiency values. The phase-averaged flow velocity and out-of-plane vorticity in the wake of the foil were obtained using particle image velocimetry. The circulation in the wake was related to the loading on the foil by calculating the moments of vorticity with respect to the pitching axis of the foil. The generated thrust values monotonically increased as a function of the Strouhal number for the considered range of pitching angles. The deformation of the foil resulted in an increased wake width, leading to larger amplitudes of the instantaneous loading on the foil and higher thrust coefficient compared to a reference case of a rigid foil.

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