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On the energy harvesting performance of oscillating airfoils with different geometries using modified discrete vortex method KIANA KAMRANI FARD, VICKIE NGO, JAMES LIBURDY, Oregon State University — The energy harvesting performance of flapping airfoils with different geometries is studied in reduced frequencies of k=fC/U =0.06-0.16, pitching amplitude of θ = 70and heaving amplitude of h_0/C=0.5. A low order discrete vortex model with a vortex shedding criterion at the leading-edge is used to estimate the transient lift force and the model results are compared to 2D CFD results. The location of the leading-edge separation point as well as the instant that the leading-edge vortex starts to form are identified from 2D CFD wall shear stress results. It is found from 2D CFD results that the instant at which the leading-edge vortex is shed can be defined as a function of the reduced frequency and the leading-edge geometry and is independent of airfoil motion kinematics. This instant is then used to find the critical leading-edge suction parameter (LESP) from thin airfoil theory which is included in the low order model. The parameters of interest to study the energy harvesting performance of different airfoil shapes include transient lift force, total power coefficient and total efficiency.

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