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**A Non-linear Lifting Line Model for Design and Analysis of Trochoidal Propulsors** BERNARD ROESLER, BRENDEN EPPS, Dartmouth College — Flapping wing propulsors may increase the propulsive efficiency of large shipping vessels. A comparison of the design of a notional propulsor for a large shipping vessel with (a) a conventional ducted propeller versus (b) a flapping wing propulsor is presented. Calculations for flapping wing propulsors are performed using an open-source MATLAB software suite developed by the authors, CyROD, implementing an unsteady lifting-line model with free vortex wake roll-up to study the non-linear effects of foil-wake, and foil-foil interactions. Improvements to the traditional lifting line theory are made using further discretization of the wake vortex ring spacing near the trailing edge. Considerations of packaging options for a flapping wing propulsor on a large shipping vessel are presented, and compared with those for a conventional ducted propeller.

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