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Intermittent Swimming with a Flexible Propulsor[1] EMRE AKOZ, Lehigh Univ, KEITH MOORED, Lehigh University — Aquatic animals use a variety of swimming gaits to propel themselves efficiently through the oceans. One type of gait known as intermittent or burst-and-coast swimming is used by species such as saithe, cod and trout. Recent studies have shown that this gait can save up to 60% of a swimmers energy by exploiting an inviscid Garrick mechanism. These detailed studies have examined the effects of an intermittent swimming gait on rigid propulsors, yet the caudal fins of intermittent swimmers are in fact highly flexible propulsors. In this respect, to gain a comprehensive understanding of intermittent swimming, the effect of elasticity on the swimming performance and wake flow of an intermittent swimmer is investigated. To accomplish this a torsional spring structural model is strongly coupled to a fast boundary element method solver that captures the fluid-structure interaction of a two-dimensional self-propelled intermittently pitching hydrofoil. It is shown that flexibility introduces extra vortices to the coasting phase of motion that can either promote or diminish thrust production depending upon the hydrofoil parameters. An optimal intermittent flexible swimmer is shown to increase its efficiency by as much as 28% when compared to an optimal continuous flexible swimmer.

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