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Flapping locomotion across a water-air interface[1] LEAH MENDELSON, CHRISTOPHER PANIAGUA, ETHAN GREENBERG, WING-YEE LAW, Harvey Mudd College — Inspired by jumping fish, we investigate the propulsive performance of plates and hydrofoils that are simultaneously flapping and translating vertically out of the water. Compared to fully-submerged scenarios, additional considerations in this application include reduced force production during partially-submerged movements and interactions between the propulsor and the free surface. We explore trade-offs between thrust production, stability, and splash control when the actuator is partially-submerged. In particular, we consider whether a decaying sinusoidal motion profile is a viable strategy for producing useful amounts of thrust while mitigating lateral forces throughout the water-to-air transition. We also identify factors that determine the critical time and position during the translation out of the water where no further propulsion is beneficial.

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