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**Leveraging fluid-structure interaction for passive control of flapping locomotion** CHAN-YE OHH, YANGYANG HUANG, ZITENG WEN, EVA KANSO, MITUL LUHAR, Univ of Southern California — While many living organisms employ active feedback control during flapping locomotion, there is increasing evidence to suggest that passive fluid-structure interactions also play a central role in dictating stability and efficiency (Liu et al. *Phys. Rev. Lett.* 108:06081-3, 2012). The current project seeks to experimentally evaluate and numerically verify the rotational stability and dynamics of a rigid  $\Lambda$ -flyer oscillating up-and-down in a rest fluid. We explore the dynamic behavior of the flyer in terms of three dimensionless parameters: opening angle, oscillation amplitude, and acceleration of the flyer. Within the parameter ranges tested, we identify four types of behavior: periodic rotation, chaotic dynamics, stable behavior (concave down position), and bistability (concave up and down position). The emergence of periodic and chaotic rotation depends primarily on the oscillation amplitude of the flyer, whereas transition from stability to bistability is dependent on both the amplitude and acceleration. The transition to bistability occurs at a constant ratio of drag to gravity, indicating that the stabilizing effect is hydrodynamic.

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