Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Flapping Wings of an Inclined Stroke Angle: Experiments and Reduced-Order Models in Dual Aerial/Aquatic Flight JACOB IZRAELEVITZ, MICHAEL TRIANTAFYLLOU, MIRANDA KOTIDIS, Massachusetts Inst of Tech-MIT — Flapping wings in nature demonstrate a large force actuation envelope, with capabilities beyond the limits of static airfoil section coefficients. Puffins, guillemots, and other auks particularly showcase this mechanism, as they are able to both generate both enough thrust to swim and lift to fly, using the same wing, by changing the wing motion trajectory. The wing trajectory is therefore an additional design criterion to be optimized along with traditional aircraft parameters, and could possibly enable dual aerial/aquatic flight. We showcase finite aspect-ratio flapping wing experiments, dynamic similarity arguments, and reduced-order models for predicting the performance of flapping wings that carry out complex motion trajectories.

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Date submitted: 25 Oct 2016 Electronic form version 1.4