Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Cephalopod-inspired Jet Propulsion via Cyclic Deformation of an Axisymmetric Propeller XIAOBO BI, QIANG ZHU, University of California, San Diego — Inspired by the jet propulsion mechanism of cephalopods such as squids, we numerically investigate the propulsion performance of a deformable propeller with a pressure chamber and a nozzle by using an axisymmetric immersed-boundary model. In this system the propulsion is achieved via intermittent jetting enforced by cyclic inflation and deflation of the body The fluid dynamic force on the body includes the jet-related thrust, the added-mass-related thrust, and the viscous drag. The jet-related thrust consists of three parts, the momentum flux through the nozzle, the excessive pressure at the nozzle, and the jet acceleration. The performance of the system is determined by several parameters, including, e.g. the amount of fluid discharged within each deflation (represented by the 'stroke ratio' or the 'formation number') and the frequency of shape oscillation (the Strouhal number). Systematic simulations have been conducted to examine the force generation, flow characteristics, and energetics of the device at different conditions.

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Date submitted: 14 Aug 2020 Electronic form version 1.4