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Propulsive efficiency of a self-propelled pulsed jet vehicle at low Re[1] ALI MOSLEMI, PAUL KRUEGER, SMU — Steady jet propulsion systems like propellers and jets predominate for large scale systems. The propulsive efficiency of these systems decreases as the Reynolds number (Re) decreases; however, making pulsed jet propulsion appealing at low Re due to its higher thrust compared to an equivalent steady jet. In order to compare the propulsive efficiency of steady and pulsed jets at low Re, a mechanical pulsed-jet underwater vehicle (dubbed "Robosquid" after its biological counterpart) was built and tested. The system allows control of piston velocity program, pulsing frequency, and piston stroke-to-nozzle diameter ratio (L/D).The propulsive efficiency of this system was measured using digital particle image velocimetry (DPIV) for L/D = 2 -11 and vehicle Re between 1000 and 2500. The results show that propulsive efficiency increases as L/D decreases, suggesting vortex ring formation plays a key role in increasing propulsive efficiency. Propulsive efficiencies comparable to and above those for steady jet propulsion were obtained for L/D $<$ 3. Results for Robosquid in a more viscous liquid to achieve Re $<$ 1000 will be presented.

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