Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

The Effects of Propulsive Jetting on Drag of a Streamlined body[1]

MICHAEL KRIEG, KAMRAN MOHSENI, University of Florida — Recently an abundance of bioinspired underwater vehicles have emerged to leverage eons of evolution. Our group has developed a propulsion technique inspired by jellyfish and squid. Propulsive jets are generated by ingesting and expelling water from a flexible internal cavity. We have demonstrated thruster capabilities for maneuvering on AUV platforms, where the internal thruster geometry minimized forward drag; however, such a setup cannot characterize propulsive efficiency. Therefore, we created a new streamlined vehicle platform that produces unsteady jets for forward propulsion rather than maneuvering. The streamlined jetting body is placed in a water tunnel and held stationary while jetting frequency and background flow velocity are varied. For each frequency/velocity pair the flow field is measured around the surface and in the wake using PIV. Using the zero jetting frequency as a baseline for each background velocity, the passive body drag is related to the velocity distribution. For cases with active jetting the drag and jetting forces are estimated from the velocity field and compared to the passive case. For this streamlined body, the entrainment of surrounding flow into the propulsive jet can reduce drag forces in addition to the momentum transfer of the jet itself.

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Date submitted: 01 Aug 2017 Electronic form version 1.4