Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Effect of Forcing Frequency in the Flow past a Rotationally Oscillating Cylinder with an Attached Filament PUJA SUNIL, SANJAY KUMAR, KAMAL PODDAR, Indian Institute of Technology Kanpur (IIT) — Marine animals, like tadpoles, propel themselves by moving both their head (which resembles a bluff body) as well as their tail. Their motion can be approximately modelled by a rotationally oscillating cylinder with an attached filament - the focus of the study. In the present work, experimental studies are conducted on a rotationally oscillating cylinder with an attached filament at a Reynolds number of 150. The cylinder is forced to oscillate at prescribed forcing parameters. The diagnostics are flow visualization using laser-induced fluorescence technique and velocity and vorticity field data using planar particle image velocimetry. In the present study, the vortices shedding from the cylinder surface interact with the vortices generated at the filament tip and get shed in the wake. Based on the cylinder forcing parameters, significant changes are observed in the wake structure, including a transition from a Kármán vortex street (indicative of drag) to a reverse Kármán vortex street (indicative of thrust generation). The observations on the time averaged velocity and vorticity field data are consistent with the convection of vortex pairs arranged in a particular configuration in the wake, as seen from flow visualization data.

Puja Sunil
Indian Institute of Technology Kanpur (IIT)

Date submitted: 10 Aug 2020 Electronic form version 1.4