Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Dynamics of a hydrofoil free to oscillate in the wake of a cylinder ADRIAN CARLETON, TODD CURRIER, YAHYA MODARRES-SADEGHI, University of Massachusetts Amherst — We examine the behavior of a hydrofoil free to oscillate in the wake of a cylinder. We conducted three series of experiments: in the first series of experiments the cylinder was fixed, in the second series, the cylinder was forced to rotate in one direction, and in the third set of experiments, the cylinder was forced to rotate periodically. For all three series of experiments, we measured the displacements of the hydrofoil that was placed in the cylinder's wake. Simultaneously, we conducted hydrogen bubble flow visualization. In the first case, the hydrofoil oscillated with a frequency equal to the shedding frequency initially, and then switched to oscillations with half of the shedding frequency. In the second series of experiments, when the cylinder was forced to rotate in one direction, the oscillations of the hydrofoil had very small amplitudes after the shedding of vortices was suppressed for higher rotation rates. For the third case, where the cylinder was forced to rotate periodically, a 2:1 ratio between the inline and crossflow oscillations was observed initially, resulting in a figure-eight trajectory in the response of the hydrofoil. At higher forcing frequencies a 1:1 ratio was observed, and the trajectories did not follow any clear pattern.

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Date submitted: 03 Aug 2020 Electronic form version 1.4