Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Frequency spectrum and scale dependence of a propulsive self-excited vortex generator[1] ROBERT WHITTLESEY, JOHN DABIRI, California Institute of Technology — We describe the development and characterization of a passive device that creates a train of vortex rings from a steady incoming flow. The device consists of a collapsible tube enclosed in an air-tight chamber which undergoes self-excited oscillations under specific conditions of flow rate and transmural pressure. An experimental parameter study was conducted in order to determine the oscillation frequency spectrum of the device, and its dependence on the nozzle diameter. For certain combinations of flow rate and transmural pressure, the frequency of self-excited oscillations, and hence vortex formation, is independent of device size over an order of magnitude range of device volume. These results have a particular interest for the development of vehicles utilizing vortex-enhanced propulsion (Ruiz et al, JFM, 2011). Continued work in this area has focused on the implementation of this device to a self-propelled submarine.

[1]Support is greatly appreciated from ONR Awards N000140810918 and N000141010137.

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Date submitted: 24 Jul 2012 Electronic form version 1.4