Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

On the Control of Flow past a Circular Cylinder: Use of a Singe Spanwise Protrusion ALIS EKMEKCI, TAYFUN AYDIN, ANTRIX JOSHI, University of Toronto — An experimental investigation is conducted to evaluate the effects of a single spanwise protrusion on the flow past a circular cylinder. Consideration is given to a range of Reynolds numbers from 5,000 to 30,000 and three different protrusions of circular cross-section that vary in diameter from 2.9% to 5.9% of the cylinder diameter. Varying the angular location of the protrusion on the cylinder surface, critical locations are investigated via hot-film anemometry and hydrogen-bubble visualization. For all the Reynolds numbers and protrusion sizes studied, two angular locations are shown to be the most critical. These angles depend on the wire size and Reynolds number. Protrusion at the first critical angle results in significant attenuation in the spectral amplitude of velocity fluctuations; whereas, at the second critical angle, it leads to amplification. Long-time records of hydrogen-bubble images show, at the first critical angle, recurrent appearance of periods with no detectable Karman vortex shedding and short periods during which regular Karman shedding resumes. Time traces of velocity fluctuations, obtained from hot-film measurements, also depict irregularities at this critical location.

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Date submitted: 03 Aug 2012 Electronic form version 1.4