Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Control of the Near-Wake of a Cylinder: Effect of a Spanwise Wire ALIS EKMEKCI, DONALD ROCKWELL, Lehigh University — The effect of a single, spanwise surface wire on the overall structure of the near-wake of a cylinder is addressed. The Reynolds number is 10,000, and the wire diameter is approximately one percent of the cylinder diameter. A technique of high-image-density particle image velocimetry allows characterization of the instantaneous and averaged patterns of the flow structure in conjunction with spectral analysis at a large number of points over the flow domain. As the angular position of the wire is altered, relative to the forward stagnation point of the cylinder, patterns of asymmetry of the near-wake structure are induced over a range of angular positions. These patterns of vorticity, streamline topology and Reynolds stress are all interrelated, and a key feature is the relatively early transition to turbulence and thereby production of relatively large Reynolds stress in the separating shear layer from the wire side of the cylinder. A new concept of critical angles of the wire is introduced; these angles are interpreted in terms of extension and contraction of the near-wake.

Donald Rockwell

Date submitted: 03 Aug 2006 Electronic form version 1.4