Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Investigation of Vortical Flow Patterns in the Near Field of a Dynamic Low-Aspect-Ratio Cylinder[1] SAMANTHA GILDERSLEEVE, MICHAEL AMITAY, Rensselaer Polytech Inst — The flowfield and associated flow structures of a low-aspect-ratio cylindrical pin were investigated experimentally in the near-field as the pin underwent wall-normal periodic oscillations. Under dynamic conditions, the pin is driven at the natural wake shedding frequency with an amplitude of 33% of its mean height. Additionally, a static pin was also tested at various mean heights of 0.5, 1.0, and 1.5 times the local boundary layer thickness to explore the effect of the mean height on the flowfield. Three-dimensional flowfields were reconstructed and analyzed from SPIV measurements where data were collected along streamwise planes for several spanwise locations under static and dynamic conditions. The study focuses on the incoming boundary layer as it interacts with the pin, as well as two main vortical formations: the arch-type vortex and the horseshoe vortex. Under dynamic conditions, the upstream boundary layer is thinner, relative to the baseline, and the downwash in the wake increases, resulting in a reduced wake deficit. These results indicate enhanced strength of the aforementioned vortical flow patterns under dynamic conditions. The flow structures in the near-field of the static/dynamic cylinder will be discussed in further detail.

[1]Supported by The Boeing Company

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Date submitted: 25 Jul 2016 Electronic form version 1.4