

Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Flow past a finite cylinder of constant curvature JESSICA SHANG, Stanford University, HOWARD STONE, Princeton University, ALEXANDER SMITS, Princeton University, Monash University — Wake visualization experiments were conducted on a finite cylinder whose plane of curvature is aligned with the freestream, at $230 \leq Re_D \leq 916$. The curvature of the cylinder is constant and ranges from a straight cylinder to a quarter-ring. The wake characteristics depend on the curvature, aspect ratio, and Reynolds number. The wake of a cylinder whose stagnation face is concave to the flow exhibited regions of non-shedding separated flow due the spanwise flow induced by the free end, in addition to regions of oblique and/or parallel shedding. In some cases, vortex shedding was entirely suppressed. In the laminar wake regime, increasing the curvature or decreasing the aspect ratio restricted vortex shedding to smaller regions along the span of the cylinder. The spanwise location where vortex shedding occurred was self-similar across cylinders of the same aspect ratio and varying curvature. After the wake transitioned to turbulence, the vortex shedding extended along most of the cylinder span. In contrast, a cylinder convex to the flow always exhibited vortex shedding in this Re_D regime. The shed vortex lines were oblique to the flow at lower Re_D and became more normal to the flow with increasing Re_D . The Strouhal number also increased with Re_D .

Jessica Shang
Stanford University

Date submitted: 01 Aug 2015

Electronic form version 1.4