

Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Numerical simulation of Reynolds number effects on velocity shear flow around a circular cylinder SHUYANG CAO — Three-dimensional Direct Numerical Simulation and Large Eddy Simulation are performed to investigate the shear effects on flow around a circular cylinder at Reynolds numbers of $Re=60-1000$. The shear parameter, which is based on the velocity gradient, cylinder diameter and upstream mean velocity at the center plane of the cylinder, varies from 0 to 0.30. Variations of Strouhal number, drag and lift coefficients, and unsteady wake structures with shear parameter are studied, along with their dependence on Reynolds number. The presented simulation provides detailed information for the flow field around a circular cylinder in shear flow. This study shows that the Strouhal number exhibits no significant variation with shear parameter. The stagnation point moves to the high-velocity side almost linearly with shear parameter, and this result mainly influences the aerodynamic forces acting on a circular cylinder in shear flow. Both the Reynolds number and shear parameter influence the movement of the stagnation point and separation point. Mode A wake instability is suppressed into parallel vortex shedding mode at a certain shear parameter. The lift force increases with increasing shear parameter and acts from the high-velocity side to the low-velocity side.

Shuyang Cao
Tongji University

Date submitted: 10 Aug 2011

Electronic form version 1.4