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The characteristics of sphere wake in freestream turbulent flow
HIMANSHU TYAGI, RUI LIU, DAVID TING, University of Windsor — Sphere-turbulence interaction is encountered in many engineering applications. Despite intensive efforts in this field, there is still debate concerning the effect of turbulence on the wake and aerodynamics of a sphere. One possible cause may be the different freestream turbulent flows utilized from one study to another. In the present study a 102 mm sphere supported by strings was subjected to nearly isotropic and homogeneous turbulent air flow at $\mathrm{Re} = 5 \times 10^4$. The turbulence integral length scale was systematically varied from 30 to 60 mm and the intensity was altered from 5 to 7% by using three perforated plates. In the presence of 5 to 7% turbulence the vortex shedding signal, obtained by the hot-wire measurements, was found to diminish. The shape of the integral length scale contours suggested the presence of horseshoe vortices in the wake boundary region. The opposing shedding of these vortices was indicated in the Reynolds stress contours. The maximum Reynolds stress decreased with increase in integral length scale. The drag coefficient, obtained by loadcell measurements, decreased with increase in turbulence intensity, while the effect of integral length was inconclusive.

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