Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Vortex wandering in grid turbulence[1] STEFFEN PENTELOW, STAVROS TAVOULARIS, University of Ottawa — The tip vortex of a square-tipped NACA 0012 wing at an angle of attack of 5° was investigated in a water tunnel. The chord length was $c = 180$ mm and the chord-based Reynolds number was 25000. Cases with three free-stream conditions were examined: unobstructed flow with a transverse fluctuation intensity (in the free-stream at the wing-tip plane) $u_2'/U_\infty = 2.3\%$; "small-grid" turbulence with $u_2'/U_\infty = 3.5\%$ and a transverse integral length scale $L_2 = 0.063c$; and "large-grid" turbulence with $u_2'/U_\infty = 5.3\%$ and $L_2 = 0.078c$. Velocity maps were obtained on several transverse planes using stereo particle image velocimetry and three-dimensional, time-dependent vortex wandering was resolved using flow visualisation of fluorescent dye injected into the vortex at the wing tip. The results quantify the effect of turbulence on the amplitude, frequency and wavelength of the vortex wandering motion, as well as on the axial and azimuthal velocity variations within the vortex.

[1]Supported by NSERC

Stavros Tavoularis
University of Ottawa

Date submitted: 25 Jul 2013 Electronic form version 1.4