

Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

A Study of the Effects of Large Scale Gust Generation in a Small Scale Atmospheric Wind Tunnel: Application to Micro Aerial Vehicles

JASON ROADMAN, KAMRAN MOHSENI — Modern technology operating in the atmospheric boundary layer could benefit from more accurate wind tunnel testing. While scaled atmospheric boundary layer tunnels have been well developed, tunnels replicating portions of the turbulence of the atmospheric boundary layer at full scale are a comparatively new concept. Testing at full-scale Reynolds numbers with full-scale turbulence in an “atmospheric wind tunnel” is sought. Many programs could utilize such a tool including that of Micro Aerial Vehicles (MAVs) and other unmanned aircraft, the wind energy industry, fuel efficient vehicles, and the study of bird and insect flight. The construction of an active “gust generator” for a new atmospheric tunnel is reviewed and the turbulence it generates is measured utilizing single and cross hot wires. Results from this grid are compared to atmospheric turbulence and it is shown that various gust strengths can be produced corresponding to days ranging from calm to quite gusty. An initial test is performed in the atmospheric wind tunnel whereby the effects of various turbulence conditions on transition and separation on the upper surface of a MAV wing is investigated using oil flow visualization.

Jason Roadman

Date submitted: 07 Aug 2009

Electronic form version 1.4