Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Vorticity amplification and its effects on flow separation from simplified landing gear wheels[1] PHILIP MCCARTHY, GRAHAM FELTHAM, ALIS EKMEKCI, University of Toronto Institute for Aerospace Studies — In the presence of weak streams of inbound vorticity, the stagnation region of bluff bodies have been shown to support mechanisms for the collection and amplification of said vorticity into large-scale, discrete vortex structures. For extremely low aspect ratio cylinders, such as those which represent simplified aircraft landing gear wheels, these discrete vortex structures tilt around the sides of the geometry, orientating their axes in the streamwise direction. Once the oncoming vorticity is collected and amplified into discrete vortices, they are shed from the stagnation region and this cycle repeats itself periodically. The present work investigates the effect of the vortex tilting and subsequent shedding on the behaviour of the outboard side flow separation region present on simplified landing gear wheels. Experiments were conducted in a recirculating-type water tunnel on a two-wheel landing gear model, with the upstream vorticity source being a 100 m platinum wire. Hydrogen bubble visualisations were first used for qualitative understanding of the flow, accompanied by 2D-PIV for vortex identification and tracking of the growth and movement of the observed structures. Finally, the side separation bubble has been characterised using 3D velocity measurements (using V3V).

[1]The authors would like to thank Bombardier, Messier-Bugatti-Dowty and NSERC for their support for this project.

Philip McCarthy
University of Toronto Institute for Aerospace Studies

Date submitted: 31 Jul 2015 Electronic form version 1.4