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Effect of Vorticity Amplification on Flow Separation from Landing Gear Wheels GRAHAM FELTHAM, PHILIP MCCARTHY, ALIS EKMEKCI, University of Toronto — The flow near the stagnation point of landing gear wheels has been previously shown to support a mechanism for inbound streams of weak vorticity to collect, growth, and amplify into large-scale discrete vortex structures. The current experimental study is an extension to investigate the effects of these vortex structures on the separation characteristics of the flow around the outboard sides of the wheels. Experiments were performed in a water channel with qualitative understanding of the flow topology achieved by employing the hydrogen bubble visualization technique and quantitative measurements performed using Particle Image Velocimetry (PIV). The upstream vorticity source is a platinum wire (d = 100 μm) placed 30 mm upstream of the model wheels. The Reynolds number based on wire diameter is 21 and based on wheel diameter (D = 152 mm) is 32,500. The inbound pair of vorticity streams impinged at the wheel surface where maximum vortex growth and amplification occurs as identified by previous experiments. The growth and shedding of the resulting vortical structures is shown to alter the shape and size of the separation bubbles on the outboard sides of the wheels. A vortex identification and tracking method is applied to map the growth and movement of the observed structures.

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