ME646 – Magnus Effect Experiment

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# Purpose

The goal of this experiment is to analyze the effects of cylinder diameter, surface roughness, and rotational speed on the lift force generated through the Magnus effect.

# Experiment Overview

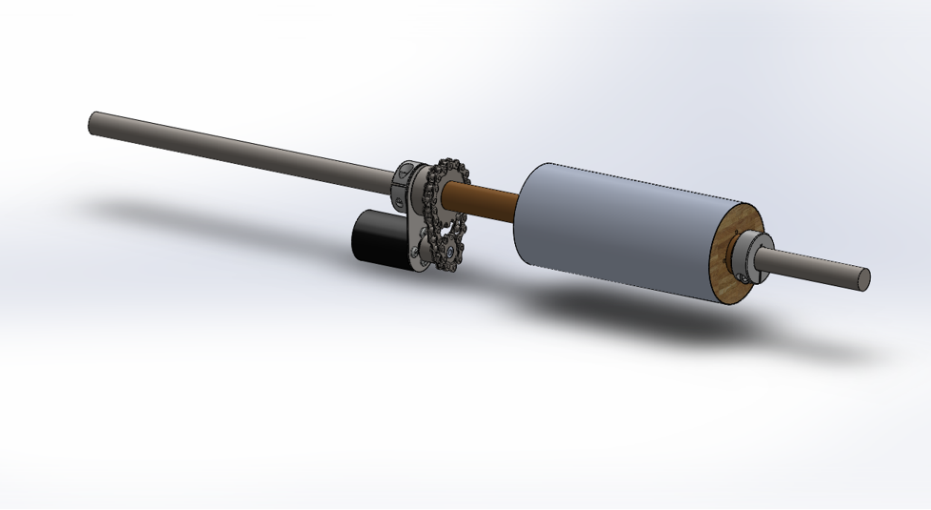
The cylinders are made from aluminum (Stella and Bud Heavy) and cardboard (Quaker Oats). Their diameters are, respectively, 55.9 mm (2.2 in), 83.6 mm (3.3 in), and 127 mm (5 in). The cylinders are mounted onto endcaps. The left endcap is connected to a flange-bearing that is driven by a motor. The right endcap is connected to a plain bearing. The whole body rotates together while the hollow steel rod that supports the apparatus remains stationary. The steel rod is supported by the force balance on the side of the wind tunnel, which will also measure the lift force.

Figure Solidworks Model of the apparatus on the steel supporting rod

The airfoil rotation speed versus expected lift force plots for the three cylinders are shown in figures 2 to 4 below.

Figure 2 RPM vs. Lift Force for the smallest diameter Stella cylinder



Figure 3 RPM vs. Lift Force for the medium diameter Bud Heavy cylinder

Figure 4 RPM vs. Lift Force for the largest diameter Quaker Oats cylinder

