

AerE344 Pre-Lab Assignment - Experiment Design Component

Lab #08: Measurements of the Boundary Layer Flow over a Flat Plate

The objective of this lab will be to measure the boundary layer profile on a flat plate using the hotwire anemometer probe you calibrated in the previous lab exercise. You will measure the profile at streamwise locations assigned to your group.

What you must do BEFORE you come to the lab:

- Consider how thick the boundary layer might be along the flow direction. From this thickness decide how far apart your measurement points in the wake should be.

You will conduct your wind tunnel experiments with incoming flow **~10 m/s**. Estimate what the thickness of the boundary layer is at different streamwise locations (up to 70 inches) using the equations below. You must then try to get as many data points within the boundary layer as possible.

- Assume transition occurs for Reynolds numbers of $Re_x = (\rho V_\infty x) / \mu = 10^5$ where μ , the dynamic viscosity, can be assumed to be $1.8 \times 10^{-5} \frac{Ns}{m^2}$
- $\frac{\delta}{x} = \frac{5.0}{\sqrt{Re_x}}$ for laminar flow
- $\frac{\delta}{x} = \frac{0.37}{Re_x^{1/5}}$ for turbulent flow