

AerE344 Pre-Lab Assignment

Lab # 12: Aerodynamic force measurement on an icing airfoil

You will need to finish this pre-lab assignment before you come to the wind tunnel laboratory to do the experiments.

What you will be given for your experiment:

- Icing wind tunnel
- A NACA 0012 airfoil model
- A force/torque transducer
- A data acquisition system
- A digital inclinometer

What you need to know before you came to the lab:

- You should review and understand the concepts of airfoil lift and drag.
- You should review and understand the concepts of forces and moments in static equilibrium.
- You should review and understand the concepts of icing on aerodynamic structures.

What your experiment needs to produce:

1. Lift, drag, and moment measurements vs angle of attack ($\alpha = -2^\circ - 20^\circ$) without icing.
2. Lift, drag, and moment measurements during the icing process for $\alpha = 5^\circ$.
3. Lift, drag, and moment measurements vs angle of attack ($\alpha = -2^\circ - 20^\circ$) after the airfoil has accumulated ice.

What results you will produce from the experiment data:

- a. The lift, drag, and moment coefficients vs angle of attack for the NACA 0012 airfoil with uncertainty bounds for both the uniced and iced conditions.
- b. Time history of the apparent lift, drag, and moment coefficients during the icing process.