Relevant Theory

In order to identify drag and lift forces (FD and FL) respectively there are equations that relate the experiment parameters. From previously defined theory we can set the equations for lift and drag forces as:

Where FN is the normal force, and FA is the axial force applied to the experimental geometry. The angle of attack is denoted by, α, and dictates the orientation of the object, with respect to horizon. The angle of attack has a large influence over the lift and drag forces. At extreme angles of attack stall is known to occur, this is where the drag forces overpower lift forces. In practical terms, when an aerial object stalls, it will fall from the sky.

To put lift and drag forces into context, they are often displayed as non-dimensional coefficients (cL and cD) this is found from the following equation.

and

Where FL,D are the magnitude of the lift or drag forces, over the kinetic energy of the forced flow, and the area is frontal area or the planform area, dependent on which coefficient is being found.

Possible Sources of Error

While testing particular geometries there are inherent limitations to simplified theory and the test apparatus. For theory there are several assumptions meant to simplify fluid dynamic calculations that may adversely affect our collected results. The simplification of a three dimensional object to an infinitely long 2D shape will provide error, as well as the assumption of incompressible flow. Finding the correct Reynolds number will be a challenge assuming static air density. It is assumed that the wind tunnel is calibrated properly. One of which is ignoring flow vortices that occur from flow over an edged shape, for the airfoil testing this will have a definite effect on the observed measurements