



# Serrata Wind Tunnel Cat. No 1003035

## Include:

Clear Plastic Wind Tunnel on a stand with a 12V Fan and a metal **aerofoil** installed inside the tunnel

## Additional Materials Needed:

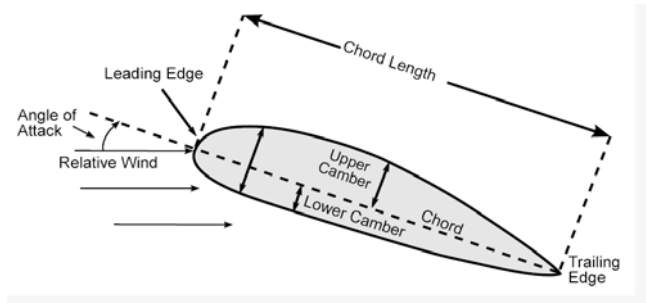
12V Power Supply.

Ohaus or any other accurate scale (See the picture!)

## Overview:

A Functional model of an wind tunnel used to present to the student a visual model of the concept of Air Flow and Lift..

An **aerofoil** is the shape of a wing or blade (of a propeller, rotor or turbine) or sail as seen in cross-section.



An airfoil shaped body moved through a fluid produces a force perpendicular to the motion called lift.

The **lift force**, or simply **lift** is commonly associated with the wing of an aircraft, although lift is also generated by rotors on helicopters, sails and keels on sailboats, hydrofoils, wings on auto racing cars, and wind turbines.

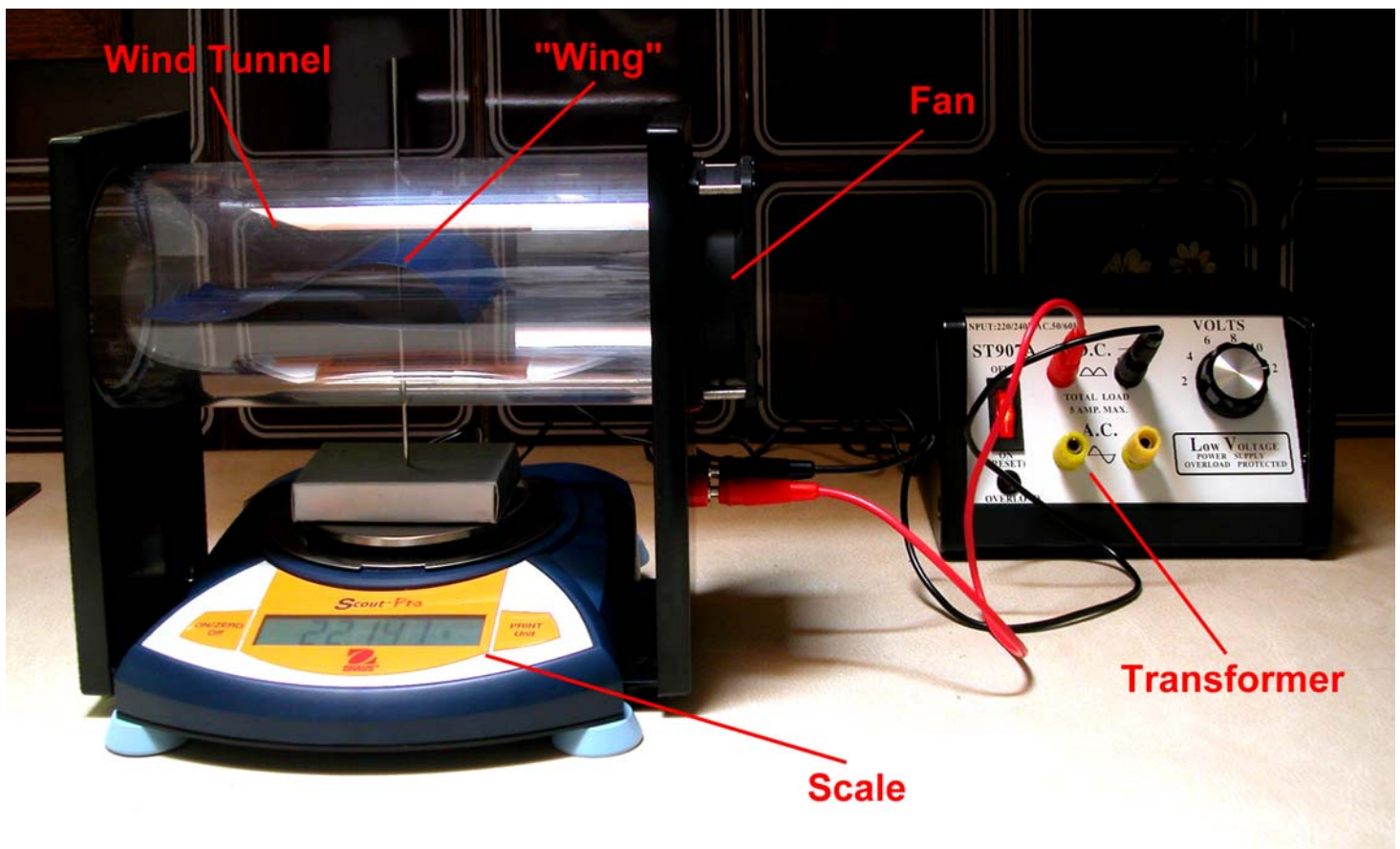
While the common meaning of the term "lift" suggests that lift opposes gravity, the lift force is related to flow direction and doesn't necessarily oppose gravity.

## Theory:

If one assumes that the flow naturally follows the shape of an aerofoil, as is the usual observation, then the explanation of lift is rather simple and can be explained primarily in terms of pressures using **Bernoulli's** principle (which is derived from **Newton's second law**) and conservation of mass,

From **Bernoulli's** principle, the pressure on the upper surface where the flow is moving faster is lower than the pressure on the lower surface. The pressure difference thus creates a net aerodynamic force, pointing upward and downstream to the flow direction.

The basic definition of lift is simple. However, the mechanisms by which lift is generated is governed by the conservation of mass and the **balance of momentum** (where the latter is the fluid dynamics version of **Newton's second law**). Unfortunately, these principles do not lend themselves easily to simplification and, as a result, there is no universally-accepted explanation of how lift is generated, even among experienced aerodynamicists

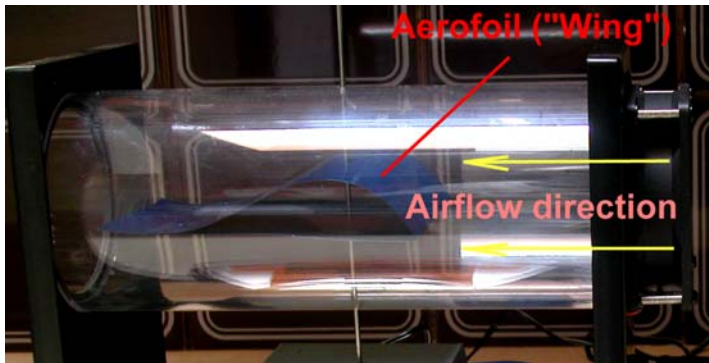


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## Wind Tunnel Setup:



1. Take the unit from the box and place on a stable surface.
2. Check that the aerofoil moves freely up and down in the tube.
3. Place an Ohaus balance under the aerofoil. Insure that the aerofoil rests on top of the balance (if a need you can place a small light object in between to compensate for the difference in height - in the picture on the previous page a small cardboard box had been used).
4. Connect the 12v output from the power supply to the wind tunnel input connectors.
5. Start the balance and measure the weight (which comprises of the weight of the small object and the aerofoil)
6. Start the fan and measure again the weight on the scale. You will find that the weight is about two grams less than the previous measurement. Stopping of the fan will increase back the weight.

Decrease in the power supply voltages will produce less airflow and less "weight loss", which means that the **lift force** depends on the **airflow**.

Use of any smoke source at the inlet of the fan can show what happens inside the wind tunnel and how the airflow interacts with the **aerofoil**.

## Balance Ohaus Scout Pro 200x0.01 gm



## Cat. No. 1004731

## Power Supply: General Purpose 0-12V by 2v steps AC & DC



## Cat. No. 1035411M