



Aerodynamics

AF41

Flight Demonstration Wind Tunnel

A model aircraft suspended in an open-circuit wind tunnel. Includes realistic flight controls to teach a variety of principles of aircraft flight.



- Gives students a safe, realistic introduction to the controls of a light aircraft
- Aircraft able to move vertically and pitch about the quarter chord point independently
- Simulates take off, level flight, cruise and landing
- Demonstrations include aerofoil lift, stall, longitudinal stability and transient motion
- Includes electronic display of air speed, attitude, altitude, pressure and lift
- Tufts on the wing clearly demonstrate the phenomenon of separation and stall
- Brightly illuminated working section
- Adjustable centre of gravity of the model
- Optional smoke generator and chart recorder (available separately)

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- An ISO 9001 certified company

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Flight Demonstration Wind Tunnel

Description

For classroom demonstrations and student investigations into the behaviour of fixed-wing aircraft and wing performance during take-off, flight and landing.

The apparatus is an open-circuit wind tunnel with a model aircraft suspended in the working section. The model is supported by linkages that allow it to move vertically and to pitch about the quarter chord point independently.

The working section is brightly illuminated and the aircraft model is clearly visible through a large transparent window. The operator flies the aircraft manually using a control column and throttle. These are positioned directly in front of the window and are arranged typically as found in a light aircraft, providing realistic simulation of flight and the effect of the control surfaces. To fly the aircraft, the operator pushes the throttle lever forward to increase the tunnel airspeed. When the airspeed reaches a certain level the aircraft may be made to 'take-off' by drawing the control column slowly back. A digital display shows air velocity (pressure) in the working section, attitude, altitude or lift force on the aircraft.

Air enters the working section through a flow straightener. The throttle controls the air speed in the tunnel by regulating an axial flow fan downstream of the working section. The change in air speed in the wind tunnel simulates the effect of increasing the change in air speed of a real aircraft due to a change in thrust from the propeller.

The control column is linked to the 'all-flying' tailplane of the aircraft. Pushing the column forward or pulling it back changes the angle of the whole tailplane. A scale on the control column indicates the tailplane angle. The control column differs from that of a normal aircraft in that it has no lateral control of the aircraft: it has no rudder on the tailplane and may only move up or down.

A locking control under the control column can lock the angle of the tail plane to any setting.

Small tufts cover the port wing of the aircraft. These show the direction and quality of airflow over the wing surface, to show separation and stall. Using the optional Smoke Generator (AFA10, available separately) enhances flow visualisation.

An adjustable weight allows the student to set the centre of gravity of the model to different positions from fore to aft of the quarter chord point. A scale below the weight indicates the position. This enables students to derive the trim curves and identify the neutral point.

To find the lift characteristic of the aerofoil, students link the aircraft to a load cell and vary the angle of attack.

Standard Features

- Supplied with comprehensive user guide
- Five-year warranty
- Manufactured in accordance with the latest European Union directives

Experiments

A variety of practical demonstrations, 'hands-on' flight simulations, and student investigations into the behaviour of fixed-wing aircraft and wing performance, including:

- Practical investigation of longitudinal stability and control of the aircraft to demonstrate behaviour during take-off, level flight and landing.
- Determination of the effect of speed on attitude for level flight and stall.
- Measurement of the lift curve for the wing up to and beyond stall.
- Students can adjust the centre of gravity of the model to alter its trim. They can then plot trim curves and determine the neutral point.

With Two-Pen Chart Recorder (AF41a, available separately):

- Demonstration of phugoid motion in terms of altitude.
- Short period oscillation due to sudden disturbance can be shown by the change of incidence.

With Smoke Generator and Probe (AFA10, available separately):

- Visualisation of flow patterns past the aircraft's aerofoil and tail-plane.

Recommended Ancillaries

- Two-Pen Chart Recorder (AF41a)
- Smoke Generator and Probe (AFA10)

Essential Services

Electrical supply:

220/240 VAC 50/60 Hz single-phase or two-phase

Floor space needed:

Approximately 3 m x 2 m of solid, level floor. Also allow a minimum of 3 m clearance at the inlet and outlet to allow for the air stream.

This product must be used in a spacious, well ventilated laboratory.

If used with the optional Smoke Generator and Probe (AFA10), you must allow suitable and safe ventilation of the exhaust smoke.

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Specification

Nett dimensions:

2300 mm x 1000 mm x 1600 mm

Nett weight:

262 kg

Packed dimensions:

3.98 m³

Packed weight:

516 kg

Working section:

450 mm x 225 mm

Tunnel fan:

Axial flow type

Maximum air velocity:

21 m.s⁻¹ (41 knots)

Air speed regulation:

Hand throttle connected to three-phase inverter

Model wing section:

NACA 2412

Model length:

440 mm

Model wing span:

220 mm

Model aircraft:

Fixed main wing, pivoted tailplane and two-blade propeller

Aircraft effective weight:

5 Newtons

Accessories (included):

- Chart recorder lead
- Spare load cell cord
- Two sets of electrical cabinet keys

Operating Conditions

Operating environment:

Well ventilated laboratory environment

Storage temperature range:

-25 °C to +55 °C (when packed for transport)

Operating temperature range:

+5°C to +40°C

Operating relative humidity range:

80% at temperatures < 31°C decreasing linearly to 50% at 40 °C

Sound level

Approximately 84 dB(A)

TecEquipment recommends that you wear ear defenders when you work near to this apparatus.

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