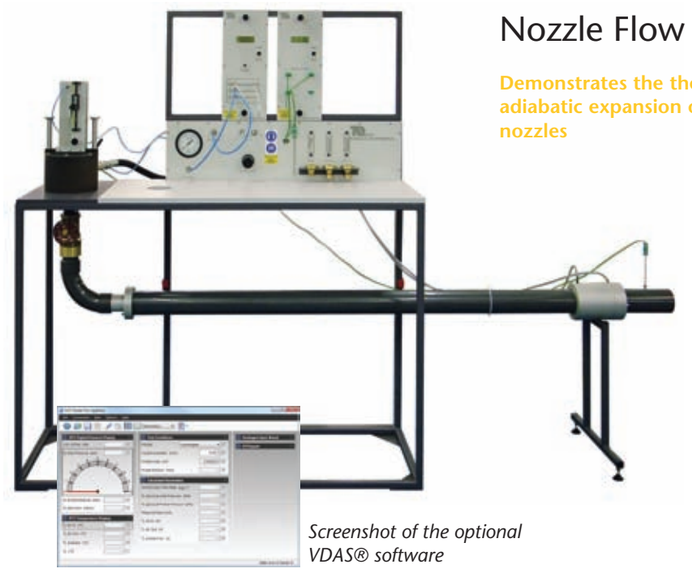
Flight Demonstration Wind Tunnel (AF41)

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

- 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 optional ancillaries:

- Demonstration of phugoid motion in terms of altitude.
- Short period oscillation due to sudden disturbance can be shown by the change of incidence.
- Visualisation of flow patterns past the aircraft's aerofoil and tail plane.



Screenshot of the optional VDAS® software

Nozzle Flow Apparatus (AF27) VDAS®

Demonstrates the thermodynamics and fluid mechanics of the adiabatic expansion of air through subsonic and supersonic nozzles

- The relationship between pressure ratio and flow for convergent and convergent/divergent Laval nozzles
- The pressure profile in convergent/divergent nozzles at various pressure ratios
- Investigation of expansion with friction in a parallel passage at high subsonic velocities
- Boundary layer growth under subsonic and supersonic conditions
- The phenomenon of choked flow corresponding to sonic velocity at a nozzle throat

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TecQuipment

Lift, Drag and Pitch

Aerodynamics is a vital aspect to many areas of engineering, including aerospace, motor racing and marine. TecQuipment's Aerodynamics range offers products to teach from first principles, such as Bernoulli's equation or boundary layer, up to complex theories on supersonic flow.

The range includes equipment to investigate topics such as subsonic and supersonic flow; this is normally only possible in large-scale industrial and complex research facilities. Students can often lose the valuable hands-on experience that TecQuipment's laboratory-scaled equipment provides.

The Aerodynamics range is cost and space efficient and gives students access to wind tunnels and other apparatus that deliver accurate and scalable results for a wide range of investigations.

Many of the products in our Aerodynamics range are compatible with TecQuipment's unique Versatile Data Acquisition System (VDAS®). This allows our equipment to be easily connected to a computer to provide accurate real-time data capture. Raw data can be transformed instantly into sophisticated graphs and tables using the VDAS® software and also easily exported to other programs.

VDAS®

For more information please visit our website:
www.tecquipment.com

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Modular Air Flow Bench (AF10)

A mobile bench providing the base unit for a wide range of air flow experiment modules

Available experiment modules:

Bernoulli's Equation (AF11)

- Confirmation of Bernoulli's equation
- The use of a Pitot static tube and water manometer

Drag Force (AF12)

- Determination of the drag coefficient by measurement of the pressure distribution around the cylinder.
- Determination of the drag coefficient by wake traverse.
- Determination of the drag coefficient around the cylinder by direct measurement and comparison to results obtained by ressure distribution and wake traverse.
- Direct measurement and comparison of drag coefficient between a cylinder, flat plate and aerofoil.

Round Turbulent Jet (AF13)

- Decay of the centre-line velocity.
- Velocity profile at various distances along the jet and the development of the spread of the jet.
- Analysis of the velocity profiles to show how the mass flux in the jet increases, the kinetic energy flux decreases and the momentum flux remains constant along the jet length.

Boundary Layer (AF14)

- Measurement of the velocity profile in laminar and turbulent boundary layers.
- Measurement of the velocity profile in the boundary layer formed over both rough and smooth plates.
- Measurement of the velocity profile in the boundary layer at various distances from the leading edge of the plate.
- Effect of the pressure gradient on the boundary layer velocity profile.

Flow Around a Bend (AF15)

- Pressure distribution along the curved inner and outer walls.
- Radial pressure distribution and comparison with that predicted assuming free vortex velocity distribution.
- Calculation of loss coefficient (K).

Jet Attachment (AF16)

- Demonstration of the Coanda effect
- Demonstration of the fluidic flip-flop

Flow Visualisation (AF17)

Demonstration of the flow patterns round a cylinder, flat plate, aerofoil and a sharp-edged orifice/slit.

Tapped Aerofoil (AF18)

- The visualisation and measurement of the pressure distribution around an aerofoil section.
- Lift characteristics and stall angle of an aerofoil.

Subsonic Wind Tunnel (AF100) VDAS®

Open-circuit subsonic wind tunnel for a wide range of investigations into aerodynamics

A wide variety of subsonic aerodynamics experiments (some need ancillaries), including:

- Flow past bluff and streamlined bodies with pressure and velocity observations in the wake
- Investigations into boundary layer development
- Influence of aspect ratio on aerofoil performance
- Performance of an aerofoil with flap, influence of flap angle on lift, drag and stall
- Pressure distribution around a cylinder under sub and super-critical flow conditions
- Study of characteristics of models involving basic measurement of lift and drag forces
- Study of the characteristics of three-dimensional aerofoils involving measurement of lift, drag and pitching moment
- Study of the pressure distribution around an aerofoil model to derive the lift and comparison with direct measurements of lift
- Drag force on a bluff body normal to an air flow
- Flow visualisation

Intermittent Supersonic Wind Tunnel (AF300) VDAS®

Investigates subsonic and supersonic air flow, including flow around two-dimensional models

- Pressure distribution along a convergent/divergent (Laval) nozzle with subsonic and supersonic air flow
- Comparison of theoretical and actual pressure distribution
- Comparison of actual and theoretical area ratio of a nozzle at supersonic air velocities (Mach numbers)
- Pressures around a two-dimensional model in subsonic and supersonic flow conditions, at different angles of incidence
- Lift coefficient for aerodynamic models in supersonic flow
- Shock waves and expansion patterns around a two-dimensional model in supersonic flow conditions (when used with the optional Schlieren Apparatus).

Continuous Supersonic Wind Tunnel (AF302) VDAS®

For investigations into flow around two-dimensional models at supersonic and subsonic air speeds

- Pressure distribution along a convergent/divergent (Laval) nozzle with subsonic and supersonic air flow
- Comparison of theoretical and actual pressure distribution
- Comparison of actual and theoretical area ratio of a nozzle at supersonic air velocities (Mach numbers)
- Pressures around a two-dimensional model in subsonic and supersonic flow conditions, at different angles of incidence
- Lift coefficient for aerodynamic models in supersonic flow
- Shock waves and expansion patterns around a two-dimensional model in supersonic flow conditions (when used with the optional Schlieren Apparatus)

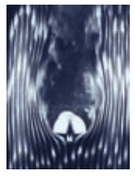
Screenshot of the VDAS® software

Flow Visualisation Wind Tunnel (AF80)

Uses smoke trails to show air flow around different shaped models

When used with the optional models, the visualisation and demonstration of:

- Boundary layers
- Separation
- Rotational flow



Photograph of the smoke trails around a hemisphere