Industrial, Civil and Transport Aerodynamics

WOLFSON UNIT

FOR MARINE TECHNOLOGY AND INDUSTRIAL AERODYNAMICS

Background

Since its inception in 1967 the Wolfson Unit for Marine Technology and Industrial Aerodynamics, which is part of the Faculty of Engineering and the Environment at the University of Southampton, has been closely allied to both the Aeronautics/Astronautics and the Ship Science research groups. The Unit acts for these departments undertaking commercial consultancy and testing in industrial aerodynamics, i.e. that which is not directly aeronautical in nature.

The Wolfson Unit uses the wind tunnels at the University of Southampton, two of them with moving ground, to carry out testing for a wide variety of organisations operating in many different engineering disciplines.

The testing has not been limited to the wind tunnels, as on many occasions special rigs have been built to model a complete internal flow system or Unit engineers have travelled to a client's site to take measurements on an existing installation.

While wind tunnel or similar test techniques are commonly used to help overcome aerodynamic problems, they can frequently help with the solution of hydrodynamic problems also. Appendages can be modelled at a large scale without free surface effects.

Aerodynamics performance testing of Renewable Energy Devices

The Wolfson Unit engineers, who are employed full time on consulting work, have built up a wealth of experience in overcoming aerodynamic and hydrodynamic problems for their clients. This experience helps them to adapt test techniques or design special tests to match the specifications and budgets of the client.

All work is carried out in secure conditions and full confidentiality is maintained at all times. No details of, or results from, any test programme are ever published without the express permission of the client.

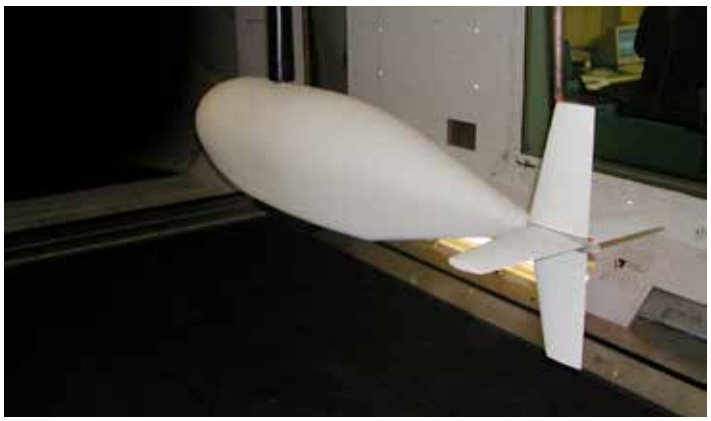
Study of flow / track interaction on a train using PIV (Particle Image Velosymetry) AEA Technologies Rail/ RSSB

Areas of Expertise

Work has been undertaken for clients operating in many different fields, including:-

Marine

- Measurement of moments and forces on an underwater towed instrument pod.
- Measurement of moments and forces on high speed craft, including wave piercing catamarans and hovercraft.
- Performance testing of renewable energy devices
- Helideck environment - Flow measurements to show local airflow across flight and passenger decks and to improve the design of funnels and superstructures.



Underwater instrument pod - National Oceanography Centre

Aeronautical

- Measurement of lift and drag forces and moments on aircraft external aerials.
- Studies on the external air flows around an airfield fog sensor to prevent internal condensation.

Vehicles

- Racing car development using the moving ground.
- Measurement and reduction of drag on lorries and trailers
- Development and manufacture of laser equipment to measure spray generated by lorries on wet roads.

Development of a air jet for Mercedes Ilmor for an F1 car dynamometer

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Civil

- Measurement of forces and pressures on tall structures and bridges.
- Study of the dynamic stability of a military bridge launching rail in high winds.
- Mapping of local flows around development sites to ascertain the effect of new buildings on recreational sailing.

Process

- Surveys of flow speed and direction in food freezer tunnels and recommendations for improving efficiency and stopping leaks and icing.
- Measurement of flows and pressures in a gas cracker plant and recommendations for its improvement.
- Modelling of furnaces and freezer tunnels and measurements of flow and pressures as part of the design process.
- Measurement of the flow in and around combustible gas sensors and studies of their optimum positioning inside ductwork.

Environment

- Development of wind energy systems, such as wind turbines.
- Dispersion studies from chimneys.

Wind Tunnel Testing for London Docklands Development Corporation

Experimental Measurements

Many different techniques are used to obtain the experimental results desired. These include:-

- Measurement of forces and moments using various well proven balances and dynamometers.
- Measurement of motions and vibrations using strain gauges and accelerometers.
- Measurements of air velocity and pressure using hot wire probes, pressure gauges, vane anemometers and laser anemometry (PIV and LDA).
- Flow visualisation using smoke, oil films and wool tufts.
- Gas dispersion and ventilation studies.
- Measurements in smooth or turbulent flow.
- On-site measurements of pressure, velocity and temperature.

Wind tunnel facilities

Wind Tunnel No. 1:

Low speed section: 4.6m wide x 3.7m high x 3.7m long.

Maximum wind speed: 10m/s.

6 component balance and turntable in tunnel floor.

High speed section: 2.1m wide x 1.5m high x 4.4m long.

Maximum wind speed: 50m/s.

3 component balance in tunnel roof.

Moving ground belt: 1.0m wide x 2.1m long. Maximum belt speed: 25m/s.

Wind Tunnel No. 2:

Working section: 3.5m wide x 2.6m high X 10.5m long.

Maximum wind speed: 55m/s.

6 component balance in tunnel roof., and 4 component balance and turntable in tunnel floor.

Atmospheric boundary layers can be simulated in the long working section.

Moving ground belt: 2.4m wide x 4.8m long. Maximum belt speed: 27m/s.

Small Wind Tunnel:

Working section 0.9m wide x 0.6m high.

Suitable for flow visualization.

Maximum wind speed: 40m/s.

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