



2 m x 3 m wind tunnel

Addressing clients' subsonic needs

The National Research Council of Canada (NRC) 2 m x 3 m wind tunnel is a world-class facility for subsonic aeronautical and industrial testing. It has been used extensively by commercial organizations, universities, and government for research and development in the areas of steady and unsteady aircraft aerodynamics, surface vehicle aerodynamics, marine hydrodynamics, aeroacoustics, wind-engineering and wind-energy generation.



Areas of expertise

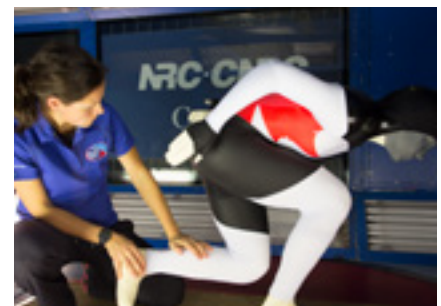
- > Aeroacoustic measurements
- > Aerodynamic stability and structural response
- > Static and aeroelastic wind tunnel model design
- > Steady/unsteady aircraft aerodynamics
- > Sport aerodynamics
- > Surface vehicle aerodynamics
- > Wind engineering/bluff-body aerodynamics
- > All aspects of wind tunnel test technology, including flow visualization and instrumentation

Versatility and capability

NRC researchers and experts continually pioneer specialized test rigs, flow conditioning, and measurement techniques to augment the tunnel's capabilities. They also have proven capabilities in model design, construction and instrumentation, appropriate test program selection, and data analysis and interpretation.

The 2 m x 3 m wind tunnel provides a superior and secure working environment for commercial or government customers. Experts provide a full range of consulting services to support any aerodynamic investigation at competitive commercial rates. Integrated data acquisition and

control systems complement the aerodynamic capabilities of the facility and are tailored to the needs of each client. Carefully performed wind tunnel measurements are the cornerstone of cost-effective design when subsonic and unsteady aerodynamics are important.



Technical specifications

Tunnel geometry	<ul style="list-style-type: none"> › Contraction ratio: 9:1 › Test section: 1.9 m x 2.7 m x 5.2 m 	<ul style="list-style-type: none"> › Test section area: <ul style="list-style-type: none"> – Standard: 5.07 m² – Groundboard: variable height
Tunnel characteristics	<ul style="list-style-type: none"> › Fan power: 1.5 MW › Maximum speed: 130 m/s › Speed uniformity: $\pm 0.7\%$ 	<ul style="list-style-type: none"> › Turbulence level: 0.14% › Longitudinal static pressure gradient: <ul style="list-style-type: none"> – Standard: negligible – Groundboard: 0.0044 Cp/m
Auxiliary systems	<ul style="list-style-type: none"> › Compressed air: up to 2,000 kPa <ul style="list-style-type: none"> – Dew point ($-40\text{ }^{\circ}\text{C}$): 2.7 kg/s – Undried: 5.0 kg/s › Flow traverse rigs: several, automated › Acoustic liner: anechoic above 400 Hz 	<ul style="list-style-type: none"> › Model supports: <ul style="list-style-type: none"> – 3-D steady state: 3 point and single strut supports – 2-D steady state: upper air bearing – 3-D unsteady: sting
Main balance	<ul style="list-style-type: none"> › Measurement accuracy: side and drag force $\pm 0.13\%$ of full scale; lift force $\pm 0.05\%$ of full scale › Maximum model weight: 450 kg 	<ul style="list-style-type: none"> › Lift, drag, side force (kN): $\pm 6.7, \pm 2.3, \pm 4.4$ › Pitch, yaw, roll (kN m): $\pm 2.7, \pm 2.7, \pm 2.7$
Data system and instrumentation	<ul style="list-style-type: none"> › A/D channels: 24 & 16 bit systems at 10 to 100 kHz, custom configurations › Redundant tunnel condition sensors › Software: Test SLATE test control and management system with test-specific applications using MATLAB[®] and LabVIEW[™] › Model/probe control: 16-axes synchronised motion › Pressure measurements: Scanivalve ZOC[™] and Kulite[®] 	<ul style="list-style-type: none"> › Anemometry: hot-film/hot-wire and fast-response multi-port pressure probes › Balances: internal (TASK, NRC, various) and external (cruciform, various) › Flow visualization: Particle image velocimetry (PIV), pressure-sensitive paint (PSP), smoke, surface oil film, fluorescent mini-tufts › 96 channel acoustic array



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