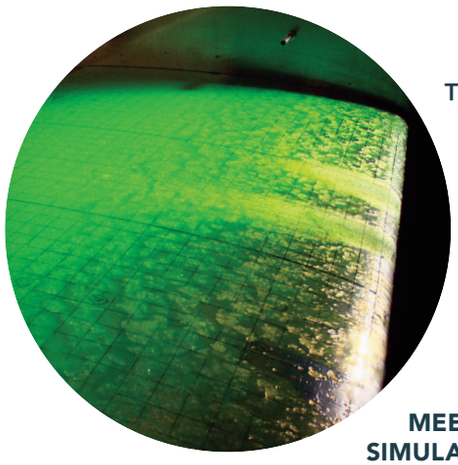
NRC·CNRC

3 M × 6 M ICING WIND TUNNEL

Advancing aerospace research and technology development



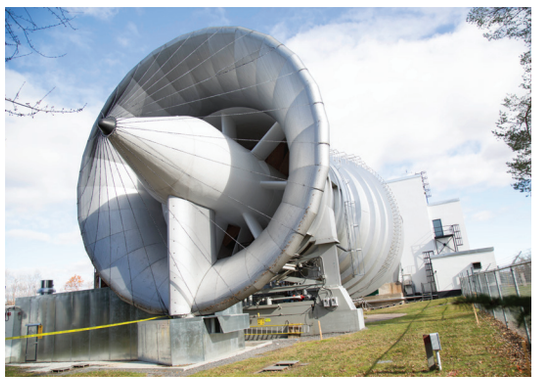
The 3 m × 6 m icing wind tunnel is the only facility in the world that can accommodate full-scale, full-speed, cold-temperature tests with fluids. The facility is also ideal for large-scale bluff-body aerodynamic investigations such as cable vibration studies.

MEETING DIVERSE SIMULATION NEEDS

The 3 m x 6 m wind tunnel features an open circuit design meaning a naturally cold test section is available in the winter for icing research. This capability, combined with the large size of the test section, allows for testing of full-scale airfoils in ground-icing conditions.

The open-circuit layout, with fan at entry, permits contaminants associated with the test arrangements (such as heat, combustion products, wakes, jets, lost lubricants) to discharge directly, without re-circulating or contacting the fan. A drainage system in the diffuser collects and disposes of larger volumes of liquid contaminants, such as anti-icing fluids, in an environmentally responsible manner. The high solidity fan reduces unsteadiness due to atmospheric wind.

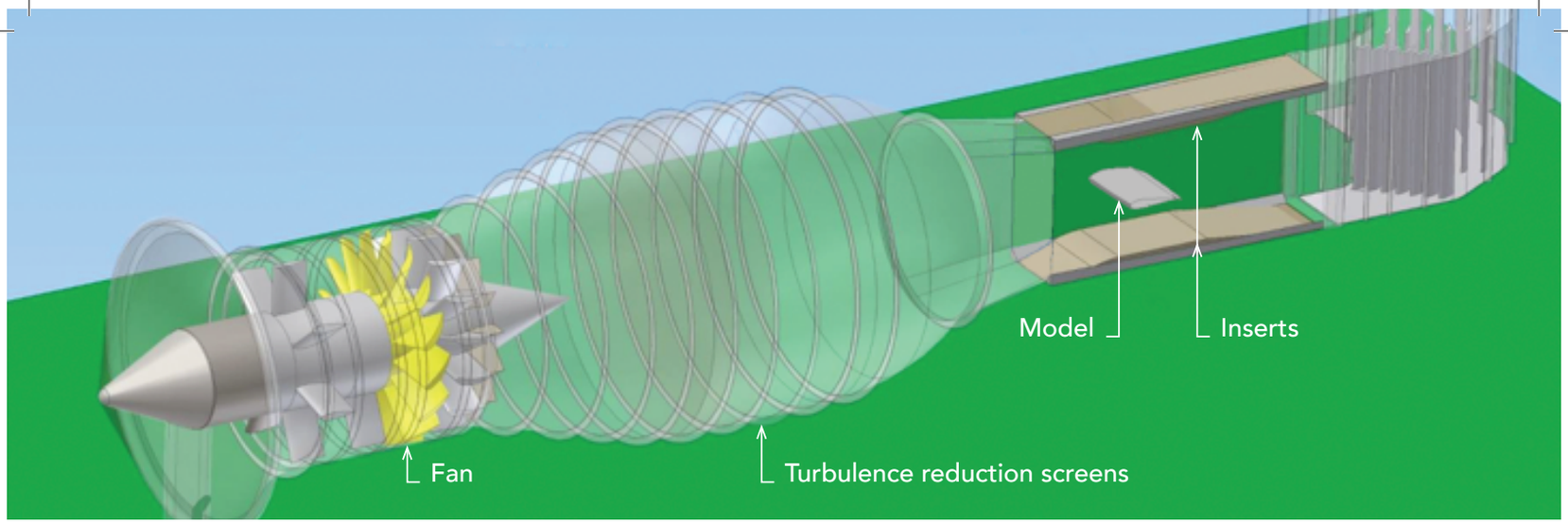
The facility is also ideal for large-scale bluff-body aerodynamic investigations such as cable vibration studies. The length of the wind tunnel's test section simulates natural winds using the NRC-developed spire technique. Several recent investigations have focused on characterizing the highly turbulent air wake in the vicinity of aviation-capable ships.



Exterior view of the 3 m x 6 m icing wind tunnel.

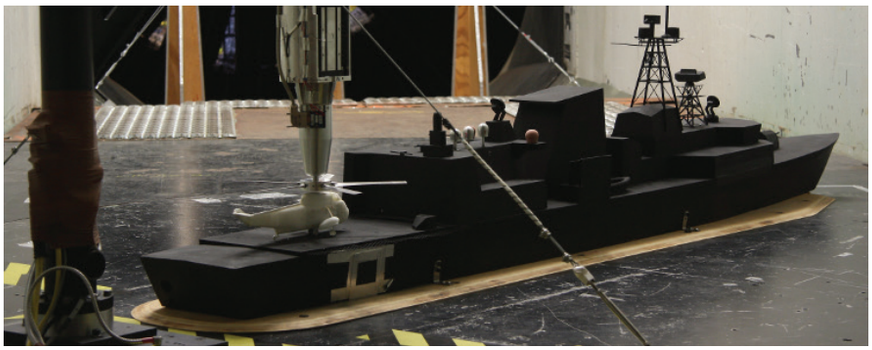
National Research Council Canada
Conseil national de recherches Canada

Canada



TECHNICAL SPECIFICATIONS

Standard working section	• Size: 6.1 m high x 3.1 m wide x 12.2 m long (20 ft x 10 ft x 40 ft) • Max. velocity: 32 m/s on electric drive, 50 m/s on gas turbine drive
Reduced working section (with insert)	• Size: 4.9 m high x 3.1 m wide x 6.4 m long (16 ft x 10 ft x 21 ft) • Max. velocity: 44 m/s on electric drive, 65 m/s on gas turbine drive
Aerodynamic and thermal conditions	• Velocity spatial uniformity variation < ±0.5% • Flow angularity < 1.5° in pitch and < 0.75° in yaw • Turbulence intensity < 0.75% • Air temperature dependent on outdoor weather conditions (icing conditions typically between December and March)
Data system and instrumentation	• Software: Test SLATE test control and management system with test-specific applications using MATLAB® and LabVIEW™ • A/D channels: 24 & 16 bit systems at 10 to 100 kHz, custom configurations • Pressure measurements: Up to 512 channel high-speed pressure scanning system (Scanivalve ZOC™) and multiple individual pressure sensors (Kulite®) • Various internal and external balances available • Model mounts: side-wall pitch rig, floor turntable and custom mounts available • Videography: 2 roof-mounted and 1 floor-mounted camera for wide-angle views of models • Flow visualization: Particle Image Velocimetry, smoke, surface oil, tufts
Auxiliary services	• Compressed air up to 14.5 kg/s at 700 kPa • Roof spray system for simulating ground freezing rain and freezing drizzle conditions • Drainage system for liquids (water, de/anti-icing fluids, etc.)



Launch and recovery operations of ship-board helicopters.

CONTACT

Dean Flanagan
Client Relationship Leader
Tel: 1-613-990-8319
Dean.Flanagan@nrc-cnrc.gc.ca

canada.ca/nrc-aerospace

Paper: Cat. No. NR16-281/2019E
ISBN 978-0-660-30989-7
PDF: Cat. No. NR16-281/2019E-PDF
ISBN 978-0-660-30988-0
June 2019 · Également disponible en français.