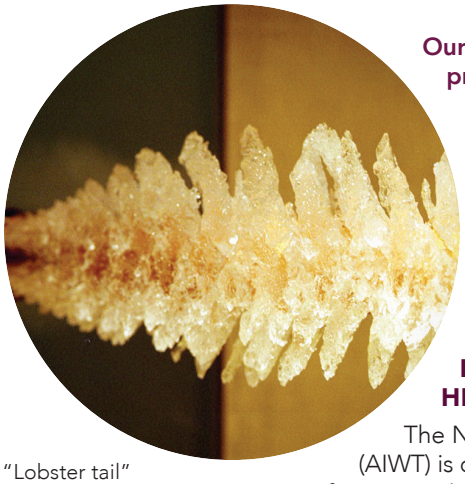
NRC·CNRC

ALTITUDE ICING WIND TUNNEL

Advancing aerospace research and technology development



"Lobster tail" icing example

Our world-leading experts provide skilled and experienced professional and technical support in all aspects of icing wind tunnel testing including test design, model design and fabrication, instrumentation, test management, through to report preparation.

HIGH-SPEED, HIGH-QUALITY RESULTS

The NRC Altitude Icing Wind Tunnel (AIWT) is capable of meeting all your icing certification and research needs, with a proven track record of providing high-quality, repeatable results to clients. The tunnel's comparatively small test section, combined with its relatively high speed capabilities make it particularly suitable and efficient for the testing of instrumentation and viewing of the microphysical processes of ice accretion. Its ability to simulate flight at altitudes as high as 40,000 ft makes this facility a unique icing wind tunnel.

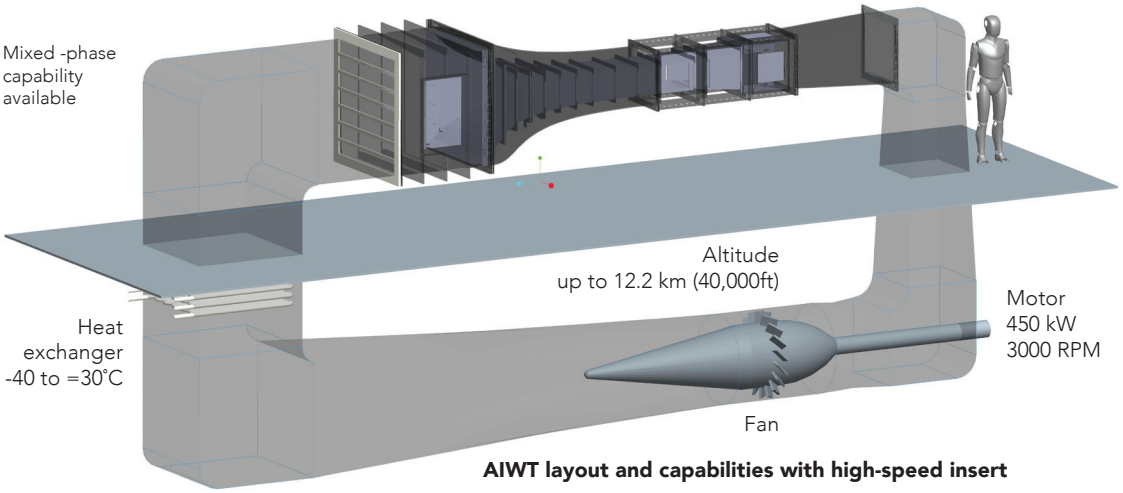
Our expertise also encompasses icing tunnel testing techniques, customized data processing and computational fluid dynamics simulations. Test results from this facility have been accepted by certification authorities such as Transport Canada, US FAA, and EASA.

AREAS OF EXPERTISE

- Develop, test and certify aircraft ice detection and air data probes
- Develop, test and calibrate cloud physics instrumentation
- Develop and test de-icing and anti-icing systems
- Evaluate ice accretion on non-protected aircraft components
- Evaluate instrumentation for wind-turbine industry
- Validate numerical ice accretion codes
- Study of basic physical processes leading to ice accretion

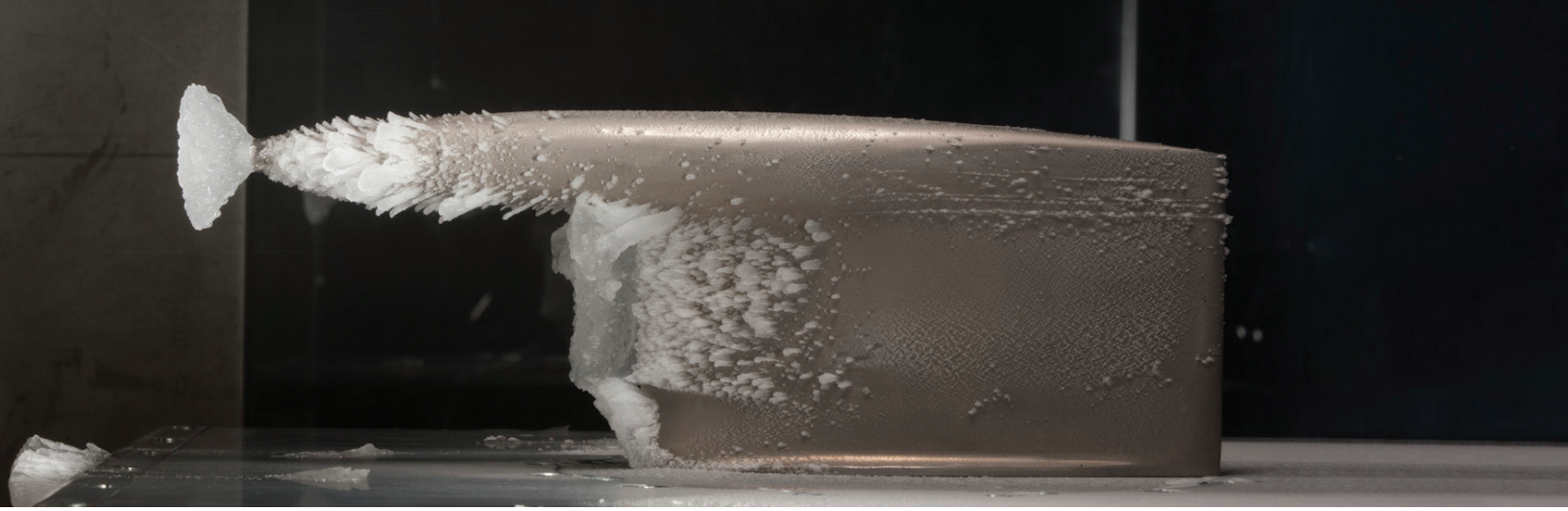
Rain	Ice crystals*	Water spray	High-speed insert
500 to 2000 µm up to 30 g/m^3	150 to 250 µm up to 16 g/m^3	8 to 200 µm 0.1 to 3.5 g/m^3	33cm x 52cm (13" x 20.5") 8 to 180 m/s (mach 0.55)

*Mixed -phase capability available



AIWT layout and capabilities with high-speed insert

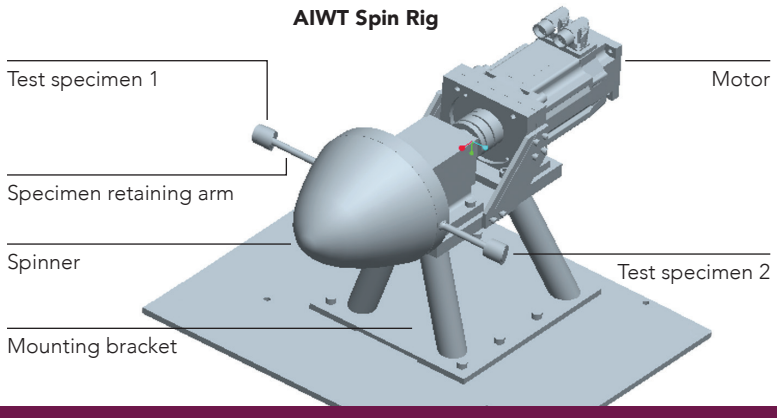
National Research Council Canada
Conseil national de recherches Canada
Canada



TECHNICAL SPECIFICATIONS – NRC ALTITUDE ICING WIND TUNNEL

Standard working section aerodynamic and icing conditions	• Size: 57 cm high x 57 cm wide x 183 cm long (22.5 in x 22.5 in x 6 ft) • Air velocity: 5 to 100 m/s (Mach 0.015 to 0.3) • Appendix C conditions: – LWC (at max velocity) 0.1 to 2.5 g/m^3 for MVDs of 8 to 200 µm	• Bimodal spray distribution for freezing drizzle SLD conditions • Ice crystal freeze-out system for MVDs up to 100µm
Reduced working section (with insert) aerodynamic and icing conditions	• Size: 33 cm high x 52 cm wide x 60 cm long (13 in x 20.5 in x 2 ft) • Air velocity: 8 to 180 m/s (Mach 0.025 to 0.55) • FAA Appendix C conditions: – LWC (at max velocity) 0.1 to 3.5 g/m^3 for MVDs of 8 to 200 µm	• SAE AS5562 conditions: – Ice crystals (150-250 µm, up to 16 g/m^3) – Mixed-phase – Rain (MVD >500 µm, LWC up to 30 g/m^3) • Ice crystal freeze-out system for MVDs up to 100µm
Aerodynamic and thermal conditions	• Velocity spatial uniformity variation <±1% • Static air temperature (at max. velocity): -40°C to +30°C • Static air temperature spatial uniformity variation <0.5°C	• Flow angularity <0.25° in pitch and yaw • Turbulence intensity < 0.9% • Altitude simulation: ground to 12.2 km (40,000 ft)
Data system and instrumentation	• Software: Test specific LabView and Matlab data reduction • Model mounts: Custom mounting to test section panels, yaw turntable system and 2-axis traverser system, splitter-plate mount	• Pressure measurements: 64 channel high-speed pressure scanning system and multiple individual pressure sensors • Temperature measurements: Up to 64 thermocouples or 4 RTDs • Videography: 4 channels of digital HD video with data overlay
Auxiliary Services	• Heated compressed air up to 115 g/s at 700 kPa and 350°C	• Spin rig for quantitative evaluation of material icephobic properties • AC and DC power supplies

AIWT Spin Rig



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