

IOWA STATE UNIVERSITY

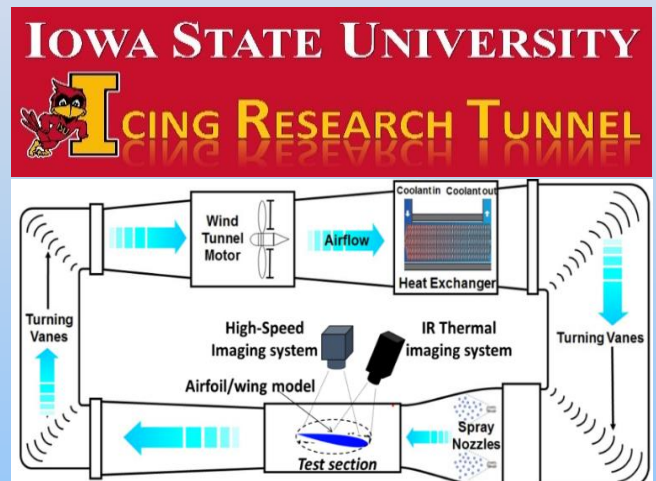
AIRCRAFT ICING PHYSICS & ANTI-/DE-ICING TECHNOLOGY LABORATORY

<http://www.aere.iastate.edu/icing/>

- Our research focuses on elucidating underlying physics of important micro-physical processes pertinent to aircraft/aero-engine icing and other relevant atmospheric icing phenomena (e.g., wind turbine icing, bridge cable icing, power cable icing and solar panel icing) via comprehensive theoretical, computational and experimental studies.
- By leveraging the unique ISU Icing Research Tunnel (i.e., ISU-IRT), we are working on developing innovative and effective anti-/de-icing strategies to ensure safer and more efficient operations of aircraft/aero-engines and other related devices in cold weathers.

ISU CENTER FOR ICING PHYSICS & ANTI-/DE-ICING TECHNOLOGY

- NDE, MEMS sensors for in-flying icing detection
- Experimental aerodynamics & wind tunnel testing
- CFD & multiphase modeling
- UAS/MAV, Rotorcraft, wind turbine, power lines
- System design and MDO for anti-de-icing strategy
- Structure Design for icing mitigation & protection
- Smart materials, Micro & Nano Mechanics
- Icephobic coatings and surface engineering



Water film thickness (mm): 0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50

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Phase angle (°): 0 45 90 135 180 225 270 315 360

• ISU Icing Research Tunnel (i.e., ISU-IRT) is a newly refurbished, research-grade, multi-functional icing tunnel. It can duplicate/simulate atmospheric icing phenomena over a range of conditions.

- The working parameters of ISU-IRT include:
 - Test section size: $W \times H \times L = 0.4\text{m} \times 0.4\text{m} \times 2.0\text{m}$
 - Airflow velocity: $V_\infty = 5 \sim 100 \text{ m/s}$;
 - Temperature: $T_\infty = -25 \text{ }^\circ\text{C} \sim 20 \text{ }^\circ\text{C}$;
 - Droplet size: $D_{\text{droplet}} = 10 \sim 100 \text{ } \mu\text{m}$;
 - Liquid Water Content: $LWC = 0.1 \sim 5.0 \text{ g/m}^3$

t=90s

• Glaze ice accretion

• Rime ice accretion

Aero-engine icing & anti/de-icing

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