

Toward Safer Aircraft Operations in Environmental Icing Conditions

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Outline

- Introduction.
- Current icing knowledge and recent accidents.
- Needed Icing knowledge and capabilities.
- Obstacles.
- The way forward.

Returns on Investments in Icing Related Research

- Meteorological capability to understand, characterize, diagnose, and forecast atmospheric icing environments.
- Airport surface and aircraft deicing and anti-icing schemes, including facilities, procedures, and agents that provide limited windows for safe aircraft operations during specific types of icing conditions before takeoff.
- Implementation of the deicing and anti-icing of airport surfaces and aircraft before takeoff.
- Icing simulation facilities, to understand the physics of aircraft inflight icing and development of simulation and analytical tools to predict, within limited confidence, ice accretion on aircraft surfaces.
- Means to design, manufacture, and get approval of complex aircraft ice protections systems that permit safe aircraft operations within limited atmospheric icing conditions aloft.
- Minimum standards to ensure safe aircraft operations in icing conditions.

Application of Current Knowledge Toward Understanding Recent Icing Accidents

- Meteorology of atmospheric icing conditions.
- Aircraft deicing and anti-icing.
- Fluid dynamics.
- Drop impingement dynamics.
- Icing physics.

28 November 2004 Montrose, Colorado, Accident



Site photographs of accident on fire moments after impact

Needed Icing Knowledge and Capabilities

- Refinement of flight crew training and requirements to ensure knowledge required for safe operations in icing conditions.
- Knowledge and capabilities to design and certificate turbine engines capable of safely operating in high ice-water content atmospheric environments.
- Extension of 14 CFR parts 23, 25, 27, and 29 to require safe operations in atmospheric icing conditions aloft beyond Appendix C, including freezing precipitation (freezing drizzle and freezing rain), and development of means to design and certificate aircraft for the expanded icing conditions standards.
- Continuing research to refine aircraft, engine, and runway deicing and anti-icing before takeoff, with goals of increased holdover times, safe operations in icing conditions beyond those currently addressed, lower costs, and no adverse environmental effects.

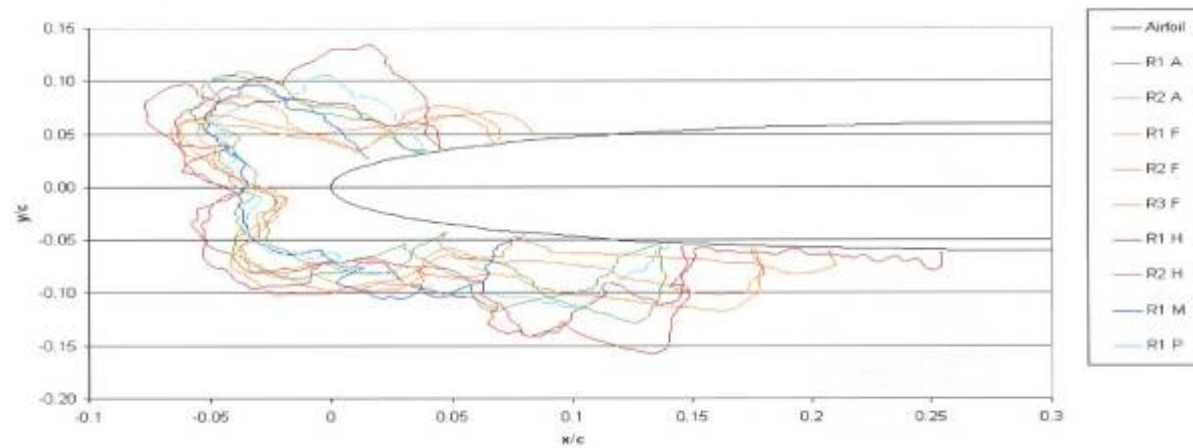
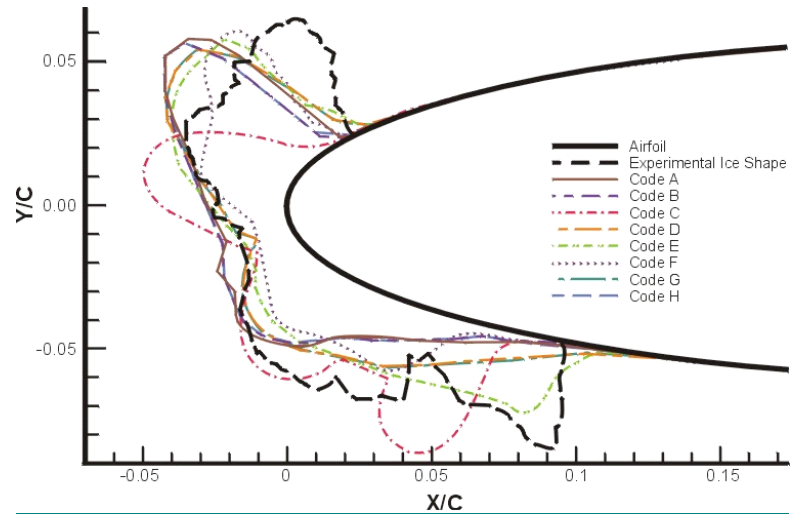
Needed Icing Knowledge and Capabilities – Contd.

- Refinement of engineering tools to be more confidently used in the design and certification of aircraft ice protection systems, such as: icing simulation facilities and codes; and, viscous computerized fluid dynamics codes to predict the aerodynamics of airfoils and aircraft configurations up to stall.
- Development of effective, reliable, low energy, low weight ice protection systems, capable of being used on: unpiloted-aircraft systems; general aviation aircraft; large air transports; and, rotocraft.
- Development of ice detection means, ice protection systems, and flight control systems that permit autonomous, safe operation of piloted and unpiloted-aircraft systems in icing conditions.

Applicability of Proposed SLD Rules to New Large Air Transports



Refinement of Aircraft Engineering Tools



Development of Effective, Reliable, Low Energy, Light Weight Ice Protection Systems



Obstacles

- Political will.
- Shared responsibility.
- Organizational skills.
- Leadership.

The Way Forward to Safer Icing Operations

- Diligent safety conscientious.
- International collaboration.
- Roadmap development.
- Leadership.

Thank you for your attention and
willingness to stay until the bitter end!
Adios amigos, and have a safe trip home!!