



## Aircraft Icing Research Alliance Meeting

### 3D Ice Accretion Code Workshop

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## **Workshop Objectives –**

- ◆ Current use and acceptance of 3-D codes
- ◆ Standards, guidance, and acceptable practices for use of 3-D codes
- ◆ Validation strategies for 3-D code verification and performance studies
- ◆ Code inter-comparison studies
- ◆ Continuation of the development of the principles of this workshop



## Type Certificate Applicant Responsibility –

### ◆ Canadian CAR 521.26 –

- An applicant for a type certificate in respect of an aeronautical product shall have, or have access to, the technical capability to conduct the design analyses and tests required to demonstrate the conformity of the aeronautical product with its certification basis.

### ◆ Canadian CAR 521.33 -

- An applicant for a type certificate in respect of an aeronautical product shall
  - (a) demonstrate to the Minister that the aeronautical product conforms to the certification basis established by the Minister under section 521.30 – *Certification Basis*;



## Certification History –

- ◆ 2-D ice accretion codes - in use for a long time.
- ◆ Significant database to support 2-D code results
- ◆ Variability in code results vs test results
- ◆ Acceptance of 2-D codes in certification programs
  - commonly used codes vs new codes
- ◆ Validation of 2-D code use
  - previous practice for aircraft certification programs
- ◆ Code inter-comparison study conducted



## Evolution of 3-D codes –

- ◆ Advancements in analytical methods
  - development of 2-D to 3-D codes
  - advancements in computing power
- ◆ Specific uses of 3-D codes vs 2-D codes
  - complex shapes or flow fields
- ◆ Understanding 3-D codes
  - increased complexity of 3-D codes
  - Limit number of codes >>> access to codes
- ◆ Use in combination with other methods of compliance



## General Concerns - 2D or 3D codes -

- ◆ Level of expertise required to apply the codes
- ◆ Application limitations of codes
- ◆ Variability of results between codes
- ◆ Limited standards / guidance / acceptable practices
- ◆ Possible use as single means of compliance
  - test methods may not be available for comparison
  - example >>> FAA NPRM 10-10
- ◆ Certification acceptance >>> confidence
- ◆ Publicly funded vs Privately funded codes
  - access to use of code issues



## Future Directions –

- ◆ Continued improvement in 2-D and 3-D codes
  - Developers, Users, and Authority capabilities
- ◆ Expanded experimental database required
- ◆ Development of guidance materials & standards
- ◆ Potential for comparative testing of codes
- ◆ Continue WG on code development and acceptance for aircraft certification uses
- ◆ Civil Airworthiness Authorities – harmonized approaches for acceptance in certification



Thank You

Any Questions

