

## **Proposed Equivalent Safety Finding for Flight in Icing Conditions - JAR25.1419(c)**

### **Applicable to Airbus A-320 'Sharklet'**

#### **Introductory note:**

The hereby presented Equivalent Safety Finding to the EASA Certification Basis shall be subject to public consultation, in accordance with EASA Management Board decision 12/2007 dated 11 September 2007, Article 3 (2.) of which states:

"2. Deviations from the applicable airworthiness codes, environmental protection certification specifications and/or acceptable means of compliance with Part 21, as well as important special conditions and equivalent safety findings, shall be submitted to the panel of experts and be subject to a public consultation of at least 3 weeks, except if they have been previously agreed and published in the Official Publication of the Agency. The final decision shall be published in the Official Publication of the Agency."

#### **Statement of issue**

In the frame of the introduction of Sharklet on Single Aisle program, incorporating a large wing tip aerodynamic device reducing the drag and hence fuel burn of the aircraft, Airbus plans to demonstrate that the blended sharklet does not need ice protection by means of analysis to define the critical appendix C ice shapes that accrete on the sharklet and short span extension, and wind tunnel testing and flight testing with the ice shapes on the sharklets, the wing and on the empennage to demonstrate no adverse effect on the handling and performance characteristics of the airplane.

JAR 25.1419(c) ch11, which is applicable to Sharklet aircraft, states that: "To verify the ice protection analysis, to check for icing anomalies, and to demonstrate that the ice protection system and its components are effective, the airplane or its components must be flight tested in the various operational configurations, in measured natural atmospheric icing conditions."

The proposed compliance findings for the Sharklet certification do not literally comply with JAR 25.1419(c) which would require flight test in natural icing condition, since the flight test proposed by the applicant is not performed in natural icing conditions.

Nevertheless, Airbus considers that the flight test with the artificial ice shapes would adequately meet the intent of JAR 25.1419(c) for the reasons detailed hereafter.

### **Airbus A320 'Sharklet' – Equivalent Safety Finding F-19**

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#### **Applicant Proposal**

Airbus intends to determine the incremental differences between the baseline, unmodified, aircraft and the sharklet-equipped aircraft through dry air wind tunnel and flight tests with conservative simulated ice shapes.

Airbus considers that flight tests with artificial ice shapes only would adequately meet the intent of JAR 25.1419(c) based on conservatism of the computer codes, methods and techniques used to compute and simulate ice shapes for the single aisle airfoils.

Airbus will provide the results of the assessments for icing in icing reports showing the computed and proposed simulated ice shapes, a flutter report, a performance report, and a handling qualities report.

The tests will confirm that no ice protection of the sharklet is required. It will be shown that the aircraft still exhibits acceptable handling qualities with an ice contaminated sharklet within the normal operating envelope. The dry air flight tests with simulated ice shapes installed on the wing and sharklet will also allow the sharklet effect to be isolated and established.

### **Applicant Safety Equivalency Demonstration**

For demonstration of compliance with applicable airworthiness requirements for flight in icing conditions a combination of flight testing in dry air with artificial ice shapes and analysis can be accepted as an equivalent level of safety provided:

- a) A comparative flight testing is performed with artificial ice-shapes in dry air to determine the differences between the new and an existing approved aircraft configuration.
- b) Those differences are expected to be only small due to the fact that only a small portion of the wing surface or empennage has been modified.
- c) The original ice shapes of the approved aircraft configuration have been validated by flight testing in natural icing conditions.
- d) The proposed artificial ice shapes for the modified part have been accepted by the Airworthiness Authorities
- e) There is service experience that allows to take credit for the qualification of the original aircraft for flight in icing conditions.
- f) The compliance program is accepted by the airworthiness authorities.
- g) The results of the flight testing and analysis reports are considered adequate. In this case the verification of ice shapes and testing of aircraft characteristics in measured natural icing conditions will not be required.