



EASA Safety Information Bulletin

SIB No.: 2011-22
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- Subject:** **Ground and Airborne Icing**
- Ref. Publication:** Transport Canada Civil Aviation Safety Alert (CASA) [2011-01](#) dated 21 January 2011.
- Applicability:** All aircraft, certificated in any category.
- Description:** Transport Canada recently published the CASA 2011-01, providing information and recommendations to consider prior to takeoff during freezing rain or freezing drizzle conditions.
- After reviewing the Canadian safety alert, EASA has considered it prudent to publish this SIB, addressed to European aircraft operators and flight crews, containing the Agency's views regarding this safety concern.
- Background:** Flight in icing conditions is an inescapable fact of life for European air operators conducting all-weather operations with aircraft certified for flight in icing conditions. As is discussed below, there are many factors involved in determining an aircraft's capability to operate safely in icing conditions, and not all aircraft are equal in this regard. Furthermore, flight in icing conditions can increase pilot workload, degrade aircraft performance and controllability, and increase fuel consumption through the operation of engine and aircraft anti-ice systems.
- Ground and airborne icing are very complex issues. There are environmental aspects, aircraft design features and flight phase factors that determine the type and severity of the ice accumulation and their resulting effects on handling characteristics as well as aircraft performance.
- For example, European large aircraft certificated for flight into known icing conditions are certificated to the standard contained in Appendix C to [Certification Specification \(CS\) 25](#) (or Appendix C to Joint Aviation Requirements JAR 25). The Appendix C icing envelopes are the design standards for the ice protection equipment.
- However, icing conditions inside or outside of cloud, such as high altitude ice crystals or freezing rain (FZRA) and freezing

drizzle (FZDZ), may exceed the Appendix C icing condition envelopes.

Currently, the design and certification of aircraft that are certified for flight in icing conditions, including the anti-icing and de-icing equipment, is conducted mainly with respect to the requirements of Appendix C.

The parameters that are used to define the Appendix C icing conditions do not relate directly to the more pilot familiar meteorological terms for freezing precipitation, such as FZRA and FZDZ. In practical terms this means that the ice protection equipment on some aircraft certificated to Appendix C may not be adequate to cope with all icing conditions encountered.

An aircraft flight manual (AFM) may indicate that the aircraft is “approved for flight in icing conditions”, or, “approved for operations in atmospheric icing conditions” however, atmospheric conditions involving FZRA or FZDZ, associated with super-cooled large droplets (SLD), may present a condition that is beyond those for which the aircraft was certified and it should be remembered that no aircraft is designed to fly under SLD conditions.

Finally, ground icing operations require the coordinated effort of numerous highly specialized people so that the aircraft arrives at the take-off point in a “safe for flight” condition.

Recommendations: EASA recommends that operators review and, if necessary, develop or amend ground and flight operating procedures to be followed by flight crews and ground staff, taking the following into consideration:

- (1) Verify that the aircraft is certified for flight into known icing conditions (if necessary contact the manufacturer for clarification).
- (2) Review the limitations section of the AFM type/model to determine whether there are specific prohibitions with respect to flight into FZRA or FZDZ or other atmospheric conditions and comply with any such limitations.
- (3) Consider that operation in icing conditions involve additional considerations, as ice can build up on flight surfaces, as well as on engine intakes behind the protected areas, on EPR probes (measuring the Engine Pressure Ratio, i.e. the ratio between the low pressure turbine exhaust pressure and the engine inlet pressure), pitot and static ports, alpha vanes, etc.
In addition, flight in icing conditions can increase pilot workload, degrade aircraft performance and controllability, result in increased fuel consumption through the operation of engine and aircraft anti-ice systems, and may therefore not be the best option when it can be avoided.
- (4) If possible, avoid dispatch or takeoff during freezing precipitation (FZRA, FZDZ, etc.) conditions. This

cautionary action is more applicable to those aircraft whose AFM's recommend exiting those types of icing conditions as soon as possible after they are encountered or for reciprocating/turbo-propeller aircraft with pneumatic de-icing boots and un-powered controls.

- (5) In addition, consider the severity and horizontal/vertical extent of icing conditions and assess safe exit strategies - the best alternative may be to wait it out on the ground.
- (6) Ensure that the aircraft is properly de/anti-iced prior to departure and that the flight crew has determined immediately prior to takeoff, or in accordance with an approved ground-ice program, that contamination is not adhering to the critical surfaces.
- (7) Reminder: Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- (8) Consider that hold over times (HOTs) guidelines have not been defined for certain weather conditions (e.g. moderate and heavy freezing rain) because the protection times are expected to be of such short duration that they are operationally unusable.
- (9) Ensure that the ramps, taxiways and runways are suitable for use and, if appropriate information is available, adjust takeoff performance and crosswind limits for reduced runway friction.
- (10) Consider the appropriate course of action relating to possible failure conditions, such as a critical engine failure during the take-off phase.
- (11) Ensure that flight crews are properly trained for ground and in-flight operations in icing conditions, specific to the type of aircraft.
- (12) Ensure that flight crew are made aware of the Certification Specification standards so that they can recognise conditions beyond the certification scope.

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