



Advisory Circular

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1.0 INTRODUCTION

This Advisory Circular (AC) is provided for information and guidance purposes. It may describe an example of an acceptable means, but not the only means, of demonstrating compliance with regulations and standards. This AC on its own does not change, create, amend or permit deviations from regulatory requirements nor does it establish minimum standards.

1.1 Purpose

The purpose of this AC is to provide an acceptable means of showing compliance to type certification requirements for commuter and transport category aeroplanes with respect to the opening capability of emergency exits exposed to freezing rain conditions while on the ground.

1.2 Applicability

This AC is applicable to Transport Canada Civil Aviation (TCCA) aircraft certification personnel, delegates and industry.

1.3 Description of Changes

This document is a new issue.

2.0 REFERENCES AND REQUIREMENTS

2.1 Reference Documents

It is intended that the following reference materials be used in conjunction with this AC:

- (a) Chapter 523 of the Airworthiness Manual (AWM)—*Normal, Utility, Aerobatic and Commuter Category Aeroplanes*;
- (b) Chapter 525 of the AWM—*Transport Category Aeroplanes*;
- (c) Federal Aviation Administration Advisory Circular (FAA AC) 25.783-1A, dated 2005-04-25—*Emergency Exits And Hatches*; and
- (d) FAA Report No. DOT/FAA/CT-03/05 HF-STD-001, dated 2003—*Human Factors Design Standard*.

2.2 Cancelled Documents

Not applicable.

3.0 BACKGROUND

- (1) In Canada, freezing rain commonly occurs between late October and early May. Since the late 1990's, TCCA has required domestic and foreign type certification applicants for transport category aeroplanes to address freezing rain conditions in compliance to AWM 525.1309(a), which states, "The equipment, systems, and installations whose functioning is required by this manual, must be designed to ensure that they perform their intended functions under any foreseeable operating condition". TCCA interprets ice accretion on the fuselage, caused by freezing rain during ground operations, as a foreseeable operating condition.
- (2) It is TCCA's position that domestic and foreign type certification applicants for commuter category aeroplanes are to address freezing rain conditions in compliance to AWM 523.1309(a)(4) which states, "Each item of equipment, each system, and each installation in a commuter category aeroplane, must be designed to safeguard against hazards to the aeroplane in the event of their malfunction or failure." TCCA interprets ice accretion on the fuselage surfaces, caused by freezing rain during ground operations, as a hazard to the aeroplane against which it is to be safeguarded.
- (3) Recent evaluations have demonstrated the susceptibility of some designs to the presence of ice accretion on emergency exit fuselage interface surfaces.

4.0 INTERPRETATION OF REQUIREMENTS

- (1) Emergency exits are to be operable from the inside when there is external ice adhering to the external emergency exit fuselage interface surface. This is pertinent in the event of an emergency evacuation.
- (2) Holdover time guidelines for de-icing/anti-icing operations do not apply to vertical surfaces regardless of the application of de-icing/anti-icing fluid over emergency exit fuselage interface surfaces.
- (3) FAA AC 25.783-1A provides guidance information for the certification of modern passenger exit designs. FAA AC 25.783-1A no longer makes reference to a maximum operating force of 50 pounds of internal handle force as a means to demonstrate acceptability of the emergency exit opening effort as specified in superseded FAA AC 25.783-1. TCCA has adopted a similar approach as that in FAA AC 25.783-1A. TCCA finds the emergency exit opening effort described in paragraph 5.0 below acceptable under the conditions tested.

5.0 ACCEPTABLE MEANS OF COMPLIANCE

5.1 Certification Test Plan

The applicant is to submit a certification test plan to TCCA for review and acceptance before certification testing is conducted. The certification test plan is to have the following details in it:

- (a) **Conformity Inspection**—A conformity inspection is to be performed by the applicant, who is to issue a statement of conformity for the test set up and test article.
- (b) **Test Article**—The article being tested:
 - (i) is a standard production emergency exit with the type design operating mechanism/hardware and has:
 - (A) interior items such as the lining, bustle and escape slide where applicable; or
 - (B) a ballast weight that represents the interior items, unless it can be shown that the absence of these interior items has no effect on the emergency exit operability during the test;
 - (ii) has a test fixture that represents the interior and external surrounding structure; and
 - (iii) has external surfaces of the emergency exit fuselage interface that represent the production painted configuration including any special coatings applied, such as a Teflon painted 2 inch band.
- (c) **Test Subjects**—There are to be three test subjects of a stature that approximate a 5th percentile female of 1.51 m height and 41-45 kg weight chosen from a pool of individuals supplied by the applicant.
- (d) **Test Parameters**—The test parameters include:
 - (i) a cold soaked test article (i.e. the article is inside a cold chamber) with a minimum stabilized temperature of approximately -5°C before ice formation has begun;
 - (ii) a fine mist of water of a temperature close to freezing. That is, the water simulates freezing rain conditions so that the water freezes on contact with the test surfaces and does not drip. The mist is sprayed into the vent flap opening at the beginning of the water application and before the final emergency exit closure/locking. This simulates the area exposed to precipitation when the emergency exit is open on the ground during passenger embarkation;

- (iii) a fine mist of water of a temperature close to freezing is sprayed onto the test article until a uniform layer of ice has formed with a minimum thickness of 2.5 mm covering the representative skins of the emergency exit and fuselage that:
 - (A) leaves no gaps at the emergency exit fuselage interface; and
 - (B) extends the layer of ice that has formed an appropriate distance on each side of the emergency exit fuselage interface; and
- (iv) the emergency exit/emergency exit external handle and vent flap are completely covered by the layer of ice.

5.2 Test Procedures

The test described in this AC is considered an acceptable means of compliance to paragraph 523.1309(a)(4) and subsection 525.1309(a) of the AWM with respect to emergency exits exposed to freezing rain, if the three test subjects described in 5.1(c) successfully and without exceptional effort open the exit covered by the layer of ice while the test article is still in a cold soaked state. For additional guidance in determining “exceptional effort,” please refer to the FAA’s Human Factors and Engineering Research Group publication, Human Factors Design Standard, Chapter 14, Section 14.5, Human Strength and Handling Capacity, which may be downloaded at <http://hf.tc.faa.gov/hfds/default.htm>. The assessment of whether exceptional effort was used is to be based on a qualitative comparison of the test results from (a) and (b) as follows:

- (a) **Opening without external layer of ice**—The test subjects described in 5.1(c) perform the opening of the emergency exit during a simulation of an emergency.
- (b) **Opening with external layer of ice**—The test subjects that performed the procedure described in (a) above, repeat the opening of the emergency exit procedure with the minimum layer of ice described in 5.1(d)(iii) covering the emergency exit and fuselage skins.

5.3 Test Witnessing

TCCA personnel or a delegated representative is to witness the test.

6.0 TEST RESULTS

Test failures are to be discussed with TCCA personnel or the delegated representative to understand the failure modes observed. No handle force measurements are required although the applicant may use handle force measuring devices to supplement the results.

7.0 CONTACT OFFICE

For more information please contact:
Policy Standards Coordinator (AARTC)

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Suggestions for amendment to this document are invited and should be submitted via the Transport Canada Civil Aviation Issues Reporting System (CAIRS) at the following Internet address:

www.tc.gc.ca/CAIRS

or by e-mail at: CAIRS_NCR@tc.gc.ca

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