



# Advisory Circular

**Subject: Regulations for Terrain Awareness Warning System**

Issuing Office:	Standards	Document No.:	AC 600-003
File Classification No.:	Z 5000-34	Issue No.:	03
RDIMS No.:	10464059-V5	Effective Date:	2015-07-22

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## 1.0 INTRODUCTION

- (1) This Advisory Circular (AC) is provided for information and guidance purposes. It describes 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

- (1) The purpose of this AC is to provide guidance to operators with respect to the Terrain Awareness Warning System (TAWS) regulations.

### 1.2 Applicability

- (1) This AC is applicable to Commercial Air Taxi, Commuter and Airline Operations Operators (Subparts 703, 704 and 705 of the *Canadian Aviation Regulations* (CARs)) and Private Operators (Subpart 604 of the CARs).

### 1.3 Description of Changes

- (1) Updated to include publication dates associated with TAWS regulations.
- (2) Updated to include a global exemption issued July 2014 to authorize operators to conduct flights with Class A or B TAWS meeting CAN-TSO-C151a or later versions.

## 2.0 REFERENCES AND REQUIREMENTS

### 2.1 Reference Documents

- (1) It is intended that the following reference materials be used in conjunction with this document:
- (a) *Aeronautics Act* (R.S., 1985, C. A-2);
  - (b) Subpart 605 of the *Canadian Aviation Regulations* (CARs) – *Aircraft Requirements*;
  - (c) Subpart 703 of the CARs – *Air Taxi Operations*;
  - (d) Subpart 704 of the CARs – *Commuter Operations*;
  - (e) Subpart 705 of the CARs – *Airline Operations*;
  - (f) Chapter 537 of the *Airworthiness Manual* (AWM), *Airworthiness Standards Appliances and Parts Subchapter B, Canadian Technical Standard Orders (CAN-TSOs) C-151 latest revision – Terrain Awareness and Warning System*;
  - (g) Chapter 551 of the AWM – *Aircraft Equipment and Installation*;
  - (h) International Civil Aviation Organization (ICAO) Document 9613, Edition 03, 2008 – *Manual on Performance-Based Navigation (PBN)*;
  - (i) Federal Aviation Administration Advisory Circular (FAA AC) 90-101A, 2011-02-23 – *Approval Guidance for RNP Procedures with Special Aircraft and Aircrew Authorization Required (SAAAR)*;
  - (j) European Aviation Safety Administration (EASA) AMC 20-26, 2009-12-23 – *Airworthiness Approval and Operational Criteria for RNP Authorisation Required (RNP AR) Operations*; and
  - (k) Exemption from CARs 605.42(1)(a), 703.71(1)(a), 704.71(1)(a) and 2(a), and 705.84(1)(a).

## 2.2 Cancelled Documents

- (1) Not applicable.
- (2) By default, it is understood that the publication of a new issue of a document automatically renders any earlier issues of the same document null and void.

## 2.3 Definitions and Abbreviations

- (1) The following **definitions** are used in this document:
  - (a) **EAA:** Enhanced Altitude Accuracy requires TAWS to give priority to sources of altitude which are not affected by:
    - (i) any pilot action or input;
    - (ii) altimeter setting; and
    - (iii) temperature and pressure deviations from the International Standard Atmosphere (ISA).
  - (b) **GPWS Modes:** Ground Proximity Warning System Modes as defined in CAN-TSO C-151b and RTCA DO161A and listed here:
    - (i) Mode 1: Excessive Rate of Descent with respect to terrain;
    - (ii) Mode 2: Excessive Closure Rate to Terrain;
    - (iii) Mode 3: Negative climb rate or Altitude Loss before acquiring 213 meters (700 feet) terrain clearance after takeoff or missed approach;
    - (iv) Mode 4: Flights above terrain with less than 152 meters (500 feet) terrain clearance while the aeroplane is not in landing configuration;
    - (v) Mode 5: Excessive Deviation Below Glideslope; and
    - (vi) Mode 6: Advisory Call-outs, Bank Angle and Altitude (not required by regulation, but certified for intended function).
  - (c) **Class A TAWS:** a class of equipment defined in Canadian Technical Standard Orders (CAN-TSO) C-151a or later. This equipment includes the following:
    - (i) Ground Proximity Warning System (GPWS) Modes 1 to 5;
    - (ii) Forward Looking Terrain Avoidance (FLTA);
    - (iii) Premature Descent Algorithm (PDA);
    - (iv) Voice call out to alert of descent to 500 feet above terrain or nearest runway elevation during a non-precision approach; and
    - (v) A terrain display system.
  - (d) **Class B TAWS:** a class of equipment defined in CAN-TSO C-151b. This equipment includes the following:
    - (i) GPWS Modes 1 and 3;
    - (ii) FLTA;
    - (iii) PDA; and
    - (iv) Voice call out to alert of descent to 500 feet above terrain or nearest runway elevation during a non-precision approach.

- (e) **TAWS:** Terrain Awareness Warning System which is an aircraft system that is intended to provide the flight crew with both aural and visual alerts to aid in preventing inadvertent controlled flight into terrain, obstacles or water.
- (1) The following **abbreviations** are used in this document:
    - (a) **ADC:** Air Data Computer
    - (b) **FLTA:** Forward Looking Terrain Avoidance (TAWS look ahead function)
    - (c) **PDA:** Premature Descent Algorithm (TAWS alert if aircraft is hazardously below the normal approach path for the nearest runway)

### 3.0 BACKGROUND

- (1) Controlled Flight into Terrain (CFIT) is an accident or incident in which the airplane, under the flight crew's control, is inadvertently flown into terrain, obstacles, or water without either sufficient or timely flightcrew awareness to prevent the event. CFIT is a leading cause of fatalities in airline accidents worldwide since the collision with terrain usually results in total destruction of the aircraft.
- (2) Terrain Awareness Warning System (TAWS) equipment provides aural and visual alerts (both cautions and warnings) to flight crews when the path of the aircraft is predicted to collide with terrain (and obstacles in some systems), in sufficient time for flight crews to take evasive action.
- (3) TAWS equipment provides a significant improvement over older technology Ground Proximity Warning System (GPWS), and has been shown to significantly reduce CFIT events. International Civil Aviation Organisation (ICAO) has issued standards to require the installation of TAWS equipment on most aircraft in commercial and general aviation operations. The United States Federal Aviation Administration (FAA) has comprehensive regulations requiring TAWS equipment for commercial and non-commercial operations.
- (4) The Transport Canada Civil Aviation (TCCA) regulations for TAWS were developed in recognition of the safety benefits provided by TAWS equipment, and to harmonize with regulations in place with the organizations noted above, namely, the ICAO and FAA, as well as the Mexican *Dirección General de Aeronáutica Civil*. Furthermore, the TCCA regulations were developed in response to a Transportation Safety Board (TSB) recommendation for the installation of TAWS equipment.
- (5) The published regulations for TAWS supersede the regulatory requirement for GPWS under CAR 605.37.

### 4.0 POLICY DEVELOPMENT

- (1) The TAWS regulations address technical issues and allow relief for certain types of operations (e.g. Visual Flight Rules (VFR) only operations). The TCCA regulations require one of two classes of TAWS equipment, depending on the aeroplane seating configuration and type of operation. The regulations and standards include a provision that the TAWS equipment provides adequate warning in common Canadian operating conditions of low temperatures and barometric pressures.
- (2) Class B TAWS meeting the design requirements of CAN-TSO C-151a, or later revision, is the minimum acceptable standard of TAWS equipment for Subpart 703 of the CARs, aeroplanes used in Air Taxi Operations configured with 6 or more seats excluding any pilot seats and Subpart 704 of the CARs, aeroplanes used in Commuter Operations with 6 to 9 seats excluding pilot seats. Class B TAWS is the minimum standard of TAWS under Subpart 605 of the CARs regulation for turbine-powered aeroplanes configured with 6 or more seats excluding pilot seats. . Class A TAWS is also satisfactory for these aeroplanes. Aeroplanes operating under Subpart 604 of the CARs are required to be equipped with TAWS by CAR 605.42.

- (3) Class A TAWS meeting design requirements of CAN-TSO C-151a, or later revision, and a Terrain Awareness Display, is required for CAR Subpart 704, aeroplanes used in Commuter Operations configured with 10 or more seats excluding pilot seats and for all CAR Subpart 705, aeroplanes used in Airline Operations.
- (4) All TAWS equipment installations need to comply with the applicable Canadian airworthiness requirements contained in Chapter 551 of the Airworthiness Manual (AWM). Enhanced Altitude Accuracy requirements (EAA) ensure that TAWS functions correctly in the Canadian operating environment, during non-standard cold atmospheric temperature conditions, and when operating in standard pressure regions. EAA ensures the TAWS uses an appropriate source of vertical position, but does not impose or imply any new vertical accuracy requirements for the Global Positioning System (GPS).

The AWM 551.102(b)(3) Information Note states:

*“Information regarding the Vertical Position Source provided in FAA Advisory circular AC 23-18 and AC 25-23 is superseded by the requirement in (b)(3)”.*

The Information Note applies to the vertical position source selection only; it does not apply to the GPS vertical position accuracy/integrity which is also defined in the Vertical Position Source selection of AC 23-18 and AC 25-23.

- (5) All operators are required to ensure that the TAWS equipment terrain and airport database are compatible with the area of operations.
- (6) TAWS is not required for aeroplanes, when only conducting day VFR operations under Part VI, Subparts 703 and 704 of the CARs regulation. This is because of incompatibilities between the TAWS alerting envelopes and the minimum altitudes permitted by the regulations for en-route obstacle clearance.
- (7) The CARs specifically require TAWS equipment meeting CAN-TSO-C151b. The CARs as published, inadvertently failed to recognize TAWS meeting CAN-TSO-C151a, which fully meets all the intended functions of the CARs. TAWS CAN-TSO C151a equipment is functionally equivalent to Class A and B equipment standards of CAN-TSO-C151b. The latest FAA TSO Version, TSO-C151c, also meets all the intended functions of the CARs. A global exemption was issued in July 2014 to authorize operators to conduct flights with Class A or B TAWS meeting CAN-TSO-C-151a or later versions until the CARs are amended.
- (8) Air Operators with TAWS equipment meeting CAN-TSO-C-151a may apply to their local Transport Canada Office for a global exemption from Paragraphs 605.42(1)(a), 703.71(1)(a), 704.71(1)(a) and 2(a), and 705.84(1)(a) of the CARs.

## **5.0 IMPLEMENTATION DATES**

- (1) The TAWS regulations came into force on July 4, 2012, when they were published in the *Canada Gazette* II, Volume 146, No. 14.
- (2) The TAWS regulations became effective for all affected aeroplanes on July 4, 2014.
- (3) All aeroplanes required to have TAWS will have to be in compliance with the TAWS EAA requirements by July 4, 2017.
- (4) CARs 605.37 GPWS ceased to apply on July 04, 2014.
- (5) Appendix A of this AC summarizes the above information on TAWS including the applicable CAN-TSO references.

**6.0 FUTURE DISPOSITION**

- (1) TCCA is committed to maintaining a viable civil aviation transportation system, while not compromising safety. This AC will remain in effect for information purposes until further notice.

**7.0 CONCLUSION**

- (1) This AC provides guidance to operators on the regulatory requirements for TAWS equipage.

**8.0 INFORMATION MANAGEMENT**

- (1) Not Applicable.

**9.0 DOCUMENT HISTORY**

- (1) Advisory Circular (AC) 600-003, Issue 01, RDIMS 4002969 (E), 6608656 (F), dated 2011-08-02 — *Regulations for Terrain Awareness Warning System*.
- (2) Advisory Circular (AC) 600-003, Issue 02, RDIMS 7786902 (E), 7822899 (F), dated 2013-09-13 — *Regulations for Terrain Awareness Warning System*

**10.0 CONTACT OFFICE**

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**APPENDIX A— AEROPLANE TERRAIN AWARENESS WARNING SYSTEM REQUIREMENTS**

<b>OPERATING REGULATION AND PASSENGER CONFIGURATION</b>	<b>Class B TAWS CAN-TSO C-151a or later</b>	<b>Class A TAWS CAN-TSO C-151a or later</b>
CAR 605.42; –Turbine-powered aeroplanes configured with 6 or more seats, excluding pilot seats.(Includes Subpart 604)	Minimum Required (Notes 1, 2, 3)	Acceptable (Notes 1, 2, 3)
CAR 703.71;– Aeroplanes configured with 6 or more seats, excluding pilot seats.	Minimum Required (Notes 1, 2, 3)	Acceptable (Notes 1, 2, 3)
CAR 704.71;– Aeroplanes configured with 6 to 9 passenger seat excluding pilot seats.	Minimum Required (Notes 1, 2, 3)	Acceptable (Notes 1, 2, 3)
CAR 704.71;– Aeroplanes configured with 10 or more passenger seats, excluding pilot seats.	Not Acceptable	Required with Display (Notes 1, 2, 3)
CAR 705.84; – All aeroplanes	Not Acceptable	Required with Display (Notes 1, 3)

**Notes to Table**

1. Enhanced Altitude Accuracy (EAA) required by July 4, 2017 which provides alerting independent of altimeter setting or deviations from International Standard Atmosphere (ISA). The EAA is defined in Section 551.102 of the Airworthiness Manual.
2. Provision for relief from TAWS for Day VFR operations.
3. Requirement for Compatibility of Terrain database with area of operation.