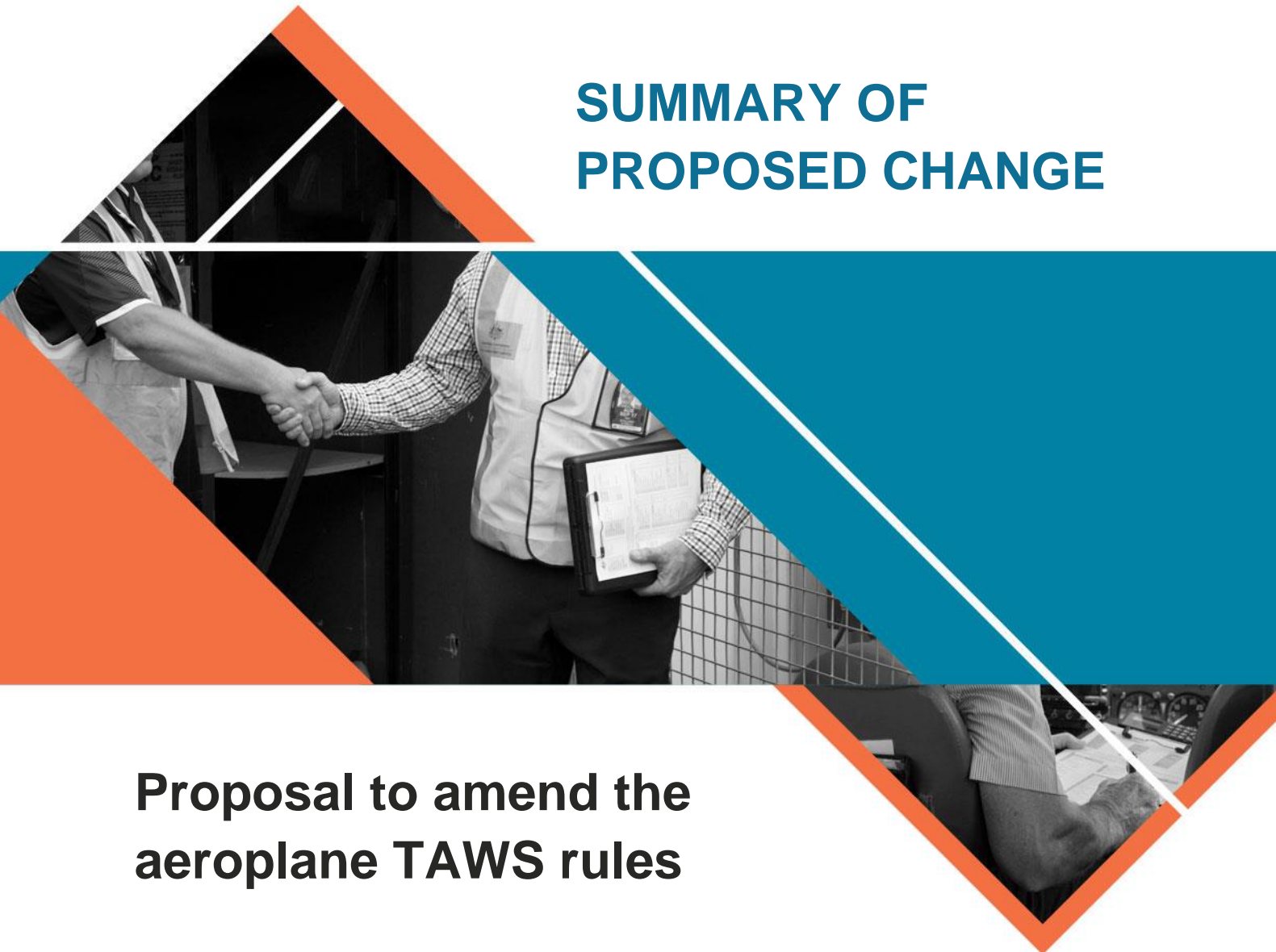




SUMMARY OF PROPOSED CHANGE



Proposal to amend the aeroplane TAWS rules

CASA EX85/21 section 23 - TAWS and GPWS - Subpart 121.Z operations - exemption

CASA EX97/22 – Part 121 – Single Pilot Aeroplane (MOPSC 10-13) Operations – Exemptions
Repeal, Remake, and Direction Instrument 2022

Section 11.25 of the Part 135 MOS

Date September 2023

Project number OS 01/11

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Introduction

Part 121 and 135 of the *Civil Aviation Safety Regulations* 1998 (CASR) began on 2 December 2021. In comparison to the old Ground Proximity Warning System (GPWS) rules in Civil Aviation Order (CAO) 20.18, these new rules require more aeroplanes conducting air transport operations to be fitted with a Terrain Awareness and Warning System (TAWS)

There are 2 global standards for TAWS, referred to as TAWS A and TAWS B.

Under CAO 20.18, a turbine-engine aeroplane with a maximum take-off weight (MTOW) of 5 700 kg or less that carried 10 or more passengers had to be fitted with a unique Australian version of TAWS called *TAWS-B+ system*, which was a baseline TAWS B fitted with a visual display. No specific requirements relating to the visual display were promulgated, which led to a variety of visual displays being utilised.

Under the new Part 121 and 135 rules, the TAWS requirement for these turbine-engine aeroplanes was raised from TAWS B+ to TAWS A. In line with CASA's transitional policies, operators were able to take advantage of staged implementation timetables that were contained in the Part 135 MOS or in exemptions EX85/21 or EX97/22.

These relief provisions expire on 2 December 2023.

CASA received recent feedback contending that a TAWS B+ with detailed visual terrain display would only have small (if any) safety differences compared to TAWS A for these turbine-engine aeroplanes. Feedback also identified that the projected cost of upgrading from the old TAWS-B+ system to TAWS A has increased dramatically since the new Part 121 and 135 of CASR rules were first made in 2018.

The *Civil Aviation Act* 1988 (the Act) requires CASA, when exercising its powers and performing its functions, to regard the safety of air navigation as the most important consideration. However, it must also consider the economic and cost impact on individuals, businesses and the community of the safety standards and take into account the differing risks associated with different industry sectors.

The proposal outlined in this consultation applies to turbine engine aeroplanes conducting Australian air transport operations under Parts 121 or 135 of CASR, that either have a maximum operational passenger seat configuration (MOPSC) of 10 or more **OR** carry 10 or more passengers.

These aeroplanes are currently required to be fitted with TAWS A from 2 December 2023.

It is proposed to instead require these aeroplanes to be fitted with TAWS B plus a visual display that meets the requirements in Appendix 1 of TSO-C151c section 3.5 in relation to a terrain display (proposed to be called *TAWS-Class B+* as distinct from the previous *TAWS-B+ system*). The purpose of this summary of proposed change (SPC) is to seek industry and public comment on this proposal.

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Acronyms

The acronyms and abbreviations used in this SPC are listed in the table below.

Acronym	Description
AC	advisory circular
CAO	Civil Aviation Order
CAR	<i>Civil Aviation Regulations 1988</i>
CASA	Civil Aviation Safety Authority
CASR	<i>Civil Aviation Safety Regulations 1998</i>
GPWS	Ground Proximity Warning System
IFR	instrument flight rules
MOPSC	maximum operational passenger seat configuration
MOS	Manual of Standards
MTOW	maximum take-off weight
OEM	original equipment manufacturer
RPT	regular public transport
SPC	Summary of Proposed Change
TAWS	Terrain Awareness and Warning System

Definitions

Terms that have specific meaning within this SPC are defined in the table below. Where definitions from the civil aviation legislation have been reproduced for ease of reference, these are identified by 'grey shading'. Should there be a discrepancy between a definition given in this SPC and the civil aviation legislation, the definition in the legislation prevails.

Term	Definition
RTCA/DO-367	means document RTCA/DO-367 titled Minimum Operational Performance Standards (MOPS) for Terrain Awareness and Warning Systems (TAWS) Airborne Equipment, dated 31 May 2017, of the RTCA Inc. of Washington D.C. USA (RTCA Inc.).
TAWS A	means TAWS-Class A. Note: This is a shortened version of the CASR definition used in this SPC.
TAWS B	means TAWS-Class B. Note: This is a shortened version of the CASR definition used in this SPC.
TAWS-B+ system	means a terrain awareness and warning system that is equipped with a visual display and complies with the requirements for Class B equipment expressed in (E)TSO-C151, (E)TSO-C151a or (E)TSO-C151b.

Term	Definition
	Note: This is the pre-2 December 2021 definition from CAO 20.18.
TAWS-Class A	means an approved TAWS that meets the performance requirements for TAWS Class A mentioned in RTCA/DO-367.
TAWS-Class B	means an approved TAWS that meets the performance requirements for TAWS Class B mentioned in RTCA/DO-367.
TAWS-Class B+	means a TAWS-Class B that is equipped with a visual display that meets the requirements in Appendix 1 of TSO-C151c section 3.5 in relation to a terrain display. Note: This is the definition proposed to be included in the civil aviation legislation by this SPC.

References

Legislation

Legislation is available on the Federal Register of Legislation website <https://www.legislation.gov.au/>

Document	Title
CASA EX85/21 section 23	TAWS and GPWS – Subpart 121.Z operations – exemption
CASA EX97/22	Part 121 – Single Pilot Aeroplane (MOPSC 10-13) Operations – Exemptions Repeal, Remake, and Direction Instrument 2022 Note: This exemption replaced EX137/21.
Part 135 MOS section 11.25	Terrain awareness and warning system (TAWS)
Part 135 MOS section 11.25A	Transitional provision—CAO 20.18
Part 135 MOS section 11.26	Flight with inoperative TAWS equipment
Regulation 121.775 of CASR	Terrain awareness and warning system

International Civil Aviation Organization documents

International Civil Aviation Organization (ICAO) documents are available for purchase from <http://store1.icao.int/>

Document	Title
Annex 6 to the Convention on International Civil Aviation	Operation of Aircraft — Part I — International Commercial Air Transport — Aeroplanes Note: The standards and recommended practices relating to TAWS are contained in section 6.15 of this document. This section is titled "Aeroplanes required to be equipped with ground proximity warning systems (GPWS)".

1 Purpose and scope of the proposed amendments

1.1 What is CASA's reason for change? How does CASA aim to achieve this?

The Flight Operations Regulations (FOR) introduced enhanced requirements to fit TAWS A to air transport aeroplanes below 5700 kg when carrying more than 9 passengers by 2 December 2023. The broad policy proposals were derived from ICAO requirements and released for public comment in 2018. At the time of proposing the new FOR, Civil Aviation Order (CAO) 20.18 paragraph 9 required turbine-engine regular public transport (RPT) and charter aeroplanes with a MTOW of 5700 kg or less and carrying 10 or more passengers under the instrument flight rules (IFR) to be fitted with a TAWS B+ system.

The TAWS B+ system is a uniquely Australian construct defined in CAO 20.18, comprising a TAWS B system equipped with a visual display. The definition of a TAWS B+ system in CAO 20.18 did not include any detail concerning exactly what was meant by the term *visual display*. Anecdotal evidence suggests there have been varying interpretations of the requirement by aircraft owners/operators and avionics installers.

Since carrying more than 9 passengers under the IFR in 5700 kg or less aircraft with a single pilot during air transport operations is not common globally, manufacturers of this style of aircraft have not normally made TAWS A available as a standard fitment. Consequently, the most feasible pathway for aircraft owners and operators to meet the TAWS A requirement for their existing fleets is to carry out upgrades. Purchasers of new aircraft for these operations have only recently been able to option up to have TAWS A equipment installed by the manufacturer.

In line with CASA's transitional policies, certain operators were able to take advantage of either the staged implementation timetable in the Part 135 MOS, or the deferral of the TAWS A requirements as articulated in CASA EX85/21 and EX97/22 and continue to operate with a TAWS B+ system. Deferral of the TAWS A requirement within these 3 documents ends on 3 December 2023, after which date TAWS A equipment is required.

The operational, economic and technical landscape that existed at the time of the policy decision to introduce the original TAWS A requirement has changed. It has eventuated that the original estimates of the number of the aircraft likely to be affected by the requirement were underestimated in the impact of change assessments made in 2018. The cost estimates for re-equipping have been affected by original equipment manufacturer (OEM) equipment fitment choices, global and local factors and are now a multiple of the previously estimated figure. The sophistication of avionics units now commonly fitted to this group of aeroplanes has improved markedly and many features considered to be of value in the TAWS A system, such as terrain displays, are already in place in existing TAWS B units.

It is considered, for this group of aeroplanes, that fitting TAWS B with a TAWS A compliant terrain display maintains sufficient protection against the CFIT risks that were intended to be controlled by the TAWS A fitment.

The details of the technical reasoning supporting this view are outlined in the safety benefit analysis section of this SPC.

1.2 Proposed regulatory changes in detail

1.2.1 CASA EX85/21

Section 23 of CASA EX85/21 defers the requirement in regulation 121.775 of CASR for turbine-engine aeroplanes with a MTOW of 8618 kg or less, that have a MOPSC of 10 or more, to fit TAWS-Class A until 2 December 2023. This exemption allows operators that were subject to the previous CAO 20.18 GPWS rules to fit legacy GPWS equipment and TAWS B+ instead.

For an aeroplane conducting these sorts of operations, with a MTOW of 5700 kg or less, it is proposed to amend this instrument to allow a TAWS B that is also fitted with a visual display that meets the requirements in Appendix 1 of TSO-C151c section 3.5 in relation to a terrain display (proposed to be called *TAWS-Class B+*) going forward from 2 December 2023.

Note: Appendix 1 of TSO-C151c section 3.5 is reproduced in Annex B.

1.2.2 CASA EX97/22

Item 4 of Schedule 1 of CASA EX97/22 requires a turbine-engine aeroplane carrying 10 or more passengers on a passenger transport operation under the IFR or VFR at night to be fitted with TAWS A.

Note: Paragraphs 8 (3) and (4) of CASA EX97/22 allow certain operators, defined as transitional operators in this instrument, to defer this requirement until 2 December 2023.

For an aeroplane conducting these sorts of operations, with a MTOW of 5700 kg or less, it is proposed to amend this provision to allow a TAWS B that is also fitted with a visual display that meets the requirements in Appendix 1 of TSO-C151c section 3.5 in relation to a terrain display (proposed to be called *TAWS-Class B+*) going forward from 2 December 2023.

Note: Appendix 1 of TSO-C151c section 3.5 is reproduced in Annex B.

1.2.3 Part 135 of CASR and the Part 135 MOS

Section 11.25 of the Part 135 MOS requires a turbine-engine aeroplane carrying 10 or more passengers on a passenger transport operation or a medical transport operation under the IFR or VFR at night, to be fitted with TAWS A from 2 December 2023.

For an aeroplane conducting these sorts of operations, with a MTOW of 5700 kg or less, it is proposed to amend this provision to allow a TAWS B that is also fitted with a visual display that meets the requirements in Appendix 1 of TSO-C151c section 3.5 in relation to a terrain display (proposed to be called *TAWS-Class B+*) going forward from 2 December 2023.

Note: Appendix 1 of TSO-C151c section 3.5 is reproduced in Annex B.

2 Safety risk analysis

2.1 Overview

A summary of TAWS A and TAWS B modes and their functions is included in Appendix A.

The analysis in this section compares the probable safety benefits associated with fitting either TAWS A or the proposed TAWS-Class B+ to the aircraft encompassed by this SPC. It considers the specific aircraft types commonly used by Australian operators, their performance envelopes, and their typical operating environment.

2.2 Analysis of differences between TAWS A vs proposed TAWS-Class B+

2.2.1 Difference 1: TAWS A has an alert function for excessive rate of closure with terrain (ECR - Mode 2) and TAWS B does not

This mode has increased relevance for high performance aircraft that benefit from additional protection when not on descent, and alerts are activated when terrain is encountered in level flight. The possible benefits of the mode are not as significant in the context of the much lower-performance aircraft in the cohort.

Technical data extracted from the TSO illustrate that if Mode 2 is not present, Mode 1 would still provide protection against imminent terrain encounters. TAWS B has an expanded protection envelope over and above TAWS A in this circumstance and therefore provides a mitigator for the lack of TAWS A for this threat.

CASA considers that the wider Mode 1 alert envelope, if combined with terrain pop up warning and display functionality, would provide effective mitigation in the absence of Mode 2.

CASA is aware of some aircraft fitted with a TAWS B+ system that have significantly less capable 'visual displays' due to the lack of specificity in the old CAO requirement. However, many aircraft that are still permitted on a transitional basis to have a TAWS B+ system requiring a visual display in accordance with CAO 20.18 are equipped with avionics that include coloured terrain depictions involving moving maps. Although the old CAO 20.18 did not specify what a visual display was, many contemporary avionics displays easily meet the TSO requirements in Section 3.5c of TSO-C151c for Terrain Displays in a TAWS A system.

2.2.2 Difference 2: TAWS A has an alert function for flight into terrain in non-landing configuration (FIT - Mode 4) and TAWS B does not

The efficacy of this mode (gear and flap warning), which was generally intended for high-capacity jet transport aircraft, is diminished in this relatively low-performance aircraft cohort. Any safety benefit conferred on these aircraft by TAWS-generated gear warnings is redundant in approximately 50% of the cohort aircraft (since the Cessna C208 Caravan has a fixed undercarriage). The modest speed and descent rate performance on approach of all the cohort aircraft also renders the flap warning feature to be of limited value.

For cohort aircraft with retractable undercarriage, whilst gear configuration warnings might prevent an unintentional gear-up landing, the outcomes of such an event are less impactful than for larger aircraft. In addition, noting the slower approach speeds and rates of descent typically

experienced in the cohort, the 500 ft callout, which remains available in TAWS B, would likely form a suitable warning for the pilot to check the aircraft configuration.

CASA considers that Mode 4 has lowered usefulness on an overall affected cohort basis.

2.2.3 Difference 3: TAWS A has an alert function for excessive deviation from glideslope (EDG - Mode 5) and TAWS B does not

This mode is only active during an ILS approach, and most operations where this approach is used are conducted in controlled airspace and almost all affected aircraft would be under ATC surveillance. While under radar surveillance, ATC automated warning systems operate when an excursion below glideslope occurs, and this would be communicated to the pilot by ATC.

CASA considers the absence of Mode 5 to be of reduced importance in this cohort. Although substitute safety protections for ILS approaches in controlled airspace do exist, CASA acknowledges that there are ILS approaches in Australia outside controlled airspace. Substitute safety controls in this latter circumstance do not exist, with reliance being placed on accurate pilot monitoring of the glideslope indicator. However, CASA considers that other TAWS modes would provide warning of terrain closure, albeit potentially later than the Mode 5 warning, and that noting the substantial additional cost of TAWS A compared to TAWS B+, that the absence of Mode 5 is sufficiently unlikely to unacceptably degrade the level of aviation safety for the aeroplanes within the relevant cohort.

2.3 Summary of safety analysis summary

The theoretical safety benefits introduced by TAWS A (above those offered by the proposed TAWS-Class B+) in the 3 main functional areas for the affected aircraft are either of reduced value or significance, or not relevant to the affected aircraft in their operating environment.

The reasons for determining that an 'augmented' TAWS B (the proposed TAWS-Class B+) can meet the policy objective in relation to CFIT accident protection instead of TAWS A are summarised as follows:

- For Modes 2 and 4 the main additive benefit is intended for, and most effective in, high performance aircraft and not essential in the aircraft in the affected cohort.
- The expanded envelope of Mode 1 in TAWS B equipment compensates for the absence of the Mode 2 ECR functionality.
- The fitment of an advanced visual display, which provides equivalent functionality to TAWS A terrain displays, compensates for the absence of Mode 2 warnings in TAWS B.
- The high proportion of fixed undercarriage aircraft in the cohort makes the gear configuration alert of Mode 4 redundant in many cases.
- The relatively low performance profiles of the cohort reduce the consequences of any likely adverse outcome in relation to lack of flap and gear configuration warnings offered by Mode 4.
- The absence of Mode 4 will not affect the 500ft call and the excessive descent rate alert envelope protections of TAWS B and Mode 1, combined with the 500ft call, provides equivalent protection to Mode 4 in this class of aircraft.
- The absence of Mode 5 is offset by the fact that ILS approaches are made mostly under ATC control and in a phase of flight involving high pilot situational awareness.

The theoretical safety benefits of the TAWS A system are largely accepted to be valuable in the large aeroplane passenger transport segment. However, the efficacy of the protections provided when considered against the costs involved is less certain for the small aeroplanes which are the subject of this SPC. This is partly due to the historical development of GPWS/EGPWS/TAWS and its bias towards usage in high-performance jet transport aeroplanes.

The impact of improved technology in relation to the standard inclusion of Terrain Display functionality in existing TAWS B units has diluted many of the incremental safety benefits offered by the previously legislated TAWS A requirement.

2.4 Cost factors

2.4.1 Predicted costs

The Explanatory Statement (ES) that accompanied the Part 135 regulations contained Cost Impact assessments for the introduction of the new rules in toto. A section in this statement refers to the specific impacts to industry of the introduction of the TAWS A requirements. In summary, the ES stated that the cost impacts were insignificant compared to other initiatives in the FOR and amounted to \$21,000 per aircraft with only 18 aircraft affected for a total industry cost of \$380,000.

2.4.2 Current estimated costs

The costs included in the ES are significantly lower than current estimates, with the cost per aircraft for fitment of TAWS A increasing dramatically between 2018 and 2023 for a number of reasons. The total number of affected aircraft is also now estimated to be significantly higher than mentioned in the ES with it now likely that the total affected cohort is as high as 150 aircraft which is well above the 18 aircraft estimated in the ES.

Data gained from actual quotations from avionics suppliers for the installation or upgrade of existing airframes to the TAWS A standards indicates that the likely costs to upgrade are approximately \$80,000 per aircraft. There would be variations due to differing levels of current aircraft equipment fit, variations in individual circumstances such as allowing for individual supplier profit margins and variable costs such as local supply issues and engineering orders.

After making some assumptions as to the total costs to industry by extrapolating unit cost by the presumed total number of aircraft requiring upgrade it is possible that the total cost to industry could be between \$3.6M and \$12M.

Since no consistent and identified methodology for calculating the costs of downtime exists, these figures do not account for this potential loss of income cost impact. In some cases, downtime could impose significant financial stress on operators, particularly those with small fleet numbers.

2.4.3 Current equipment fit

The industry working group advised CASA that the overwhelming majority of aircraft operating with 10 or more passengers on Part 135 flights are fitted with Garmin GNS430 or 530 equipment that have inbuilt terrain databases, displays and alerting that meet the functionality requirements published for TAWS-Class A equipment terrain displays in TSO-C151c and would therefore meet the proposed TAWS-Class B+. For any aircraft not equipped with this brand or model of

equipment, upgrading to these devices is significantly less expensive than full TAWS-Class A equipment since a Radio Altimeter would not be required to be fitted.

2.5 Summary of the CASA policy position

2.5.1 The past

Turbine-engine aeroplanes conducting charter or RPT operations with a maximum take-off weight of 5700 kg or less, that were carrying 10 or more passengers, were subject to the requirement to fit CAO 20.18 TAWS B+ system equipment.

2.5.2 Now

Turbine-engine aeroplanes conducting Australian air transport operations with a maximum take-off weight of 5700 kg or less, that are carrying 10 or more passengers or have a MOPSC of 10 or more, are mostly still subject due to various transitional rules to the requirement to fit CAO 20.18 TAWS B+ system equipment.

Before 2 December 2023, aircraft owners, lessors and operators face significant costs and downtime associated with upgrading TAWS B+ system equipment to TAWS A by 2 December 2023.

2.5.3 Direct impact

The proposed changes would mean that the aircraft owners, lessors and operators, whose relevant aeroplanes are currently fitted with CAO 20.18 TAWS-B+ system:

- will not need to upgrade to TAWS A
- will not need to upgrade if their existing CAO 20.18 TAWS-B+ system equipment already meets the requirements of section 3.5 of Appendix 1 to TSO-C151c
- will need to upgrade to the proposed TAWS-Class B+, by 2 December 2023, if their CAO 20.18 TAWS-B+ system equipment visual displays **do not** meet the requirements of section 3.5 of Appendix 1 to TSO-C151c.

The direct impacts on the relevant operator cohort would be reduced compared to the existing rules due to come into effect on 2 December 2023.

2.5.4 Proposal

Amend the requirement for TAWS A fitment to turbine-engine aeroplanes conducting Australian air transport operations with a maximum take-off weight of 5700kg or less, that are carrying 10 or more passengers or have a MOPSC of 10 or more, to instead fit a TAWS-Class B+.

TAWS-Class B+ is a TAWS B with a visual display that meets the requirements of section 3.5 of Appendix 1 to TSO-C151c.

The enhanced visual display compared to the old CAO 20.18 TAWS-B+ system is considered essential to provide sufficient assurance of acceptable safety outcomes.

The rules that would be amended are:

- Section 23 of CASA EX85/21
- Item 4 of Schedule 1 of CASA EX97/21
- Section 11.25 of the Part 135 MOS.

3 Impact analysis

CASA has prepared a Preliminary Assessment that assesses the impact of the proposed amendment. CASA has submitted the Preliminary Assessment to the Office of Impact Analysis for their assessment and will prepare an Impact Analysis document if required.

4 Impact on industry

Feedback received from the relevant sector of the aviation industry has identified that many affected aircraft are already fitted with a TAWS that meets the proposed TAWS-Class B+ standard, which is more specific compared to the legacy CAO 20.18 TAWS-B+ system standard in relation to the visual display requirements (noting the old CAO requires an undefined visual display and the proposed new standard requires a visual display that meets particular TSO terrain display requirements).

Information provided to CASA has identified that the cost of upgrading an older TAWS-B+ system to the proposed TAWS-Class B+ would be significantly lower than upgrading to a TAWS A.

Noting these factors, CASA is **not** proposing to alter the current 2 December 2023 deadline for the fitment of compliant TAWS equipment.

5 Previous consultations

5.1 2009 - 2012 Part 135 of CASR consultation

Prior to the introduction of Part 135, CASA published a Notice of Proposed Rule Making (NPRM 0808OS) in 2009 that included a proposal that TAWS Class B fitment would be mandatory for small aeroplanes conducting air transport operations under the IFR or the VFR at night if the aeroplane was carrying 6 or more passengers regardless of whether they were piston or turbine powered. A consultation draft of Part 135 of CASR including these proposed provisions was released in 2012.

A proposal for the making of Part 135 of CASR, along with a number of other Parts (Parts 119, 129, 133 and 135 of CASR) was, in early 2014, advanced to the then Minister for Transport but not made at that time. This was partly due to the Aviation Safety Regulatory Review (ASRR) that concluded on 30 May 2014 with a report which contained a number of recommendations to government.

One recommendation, that the aviation safety rules should revert to a three-tiered regulatory framework, led to a significant period of re-drafting not only of Part 135 of CASR but also of other CASR Parts which had been prepared without an accompanying MOS.

5.2 2018 Part 135 of CASR consultation

By mid-2018, the redraft of Part 135 of CASR and the drafting of its accompanying MOS were shared with the Part 135 Technical Working Group (TWG). The initial exposure drafts of Part 135 and the Part 135 MOS detailed that TAWS fitment would be a requirement for aeroplanes conducting passenger transport operations under the IFR, or under the VFR by night, with a MOPSC of 6 or more seats regardless of whether they were piston or turbine powered.

During the working group consultation activities of 2018, feedback received by CASA led to the TAWS fitment requirements in Part 135 being amended to only apply to aeroplanes with maximum take-off weight of more than 5700 kg, or that carried 10 or more passengers, in line with the ICAO standard.

During the public consultation activity of 2018, no comments were received in relation to the proposed TAWS requirements.

5.3 Recent informal consultation

Feedback from industry had been received during 2022-23 that similar safety outcomes could be achieved in small Part 135 aeroplanes, in the context of their operations and performance characteristics, if a TAWS-B+ system was fitted instead of a TAWS A, at a substantially lower cost impact. The Aviation Safety Advisory Panel (ASAP) was asked in February 2023 to support the formation of a TWG and replied in March 2023 that a full TWG on the TAWS issue was not required and for CASA to proceed on a more streamlined process. As a result of this decision, a working group of industry members was convened with the CASA representation being the co-ordinator and a technical advisor SME. The members of this group included RAAA members and non-members who operate affected aircraft, and a representative of the OEM for the major avionics brand installed in the aircraft.

Submissions were invited, collated and circulated. Discussions were held to clarify the impact of technical differences between TAWS A, B and B+ on the level of operational safety likely to be achieved in practice. A consensus position document/proposal was forwarded to CASA by the industry representatives on 30 May 2023. That document was considered by CASA and has led to this SPC.

6 Closing date for comment

CASA will consider all comments received as part of this consultation process and incorporate changes to the proposed policy as appropriate. Comments on the policy proposal should be submitted through the online response form by close of business 24 October 2023.

Appendix A

Summary of TAWS A and TAWS B modes and functions

A.1 TAWS A modes and functions

Mode 1: Excessive rates of descent

Mode 2: Excessive closure rate to terrain

Mode 3: Negative climb rate or altitude loss after takeoff

Mode 4: Flight into terrain when not in landing configuration

Mode 5: Excessive downward deviation from an Instrument Landing System (ILS) glideslope, Localizer Performance and Vertical Guidance (LPV), or Global Navigation Satellite System (GNSS) Landing System (GLS) glidepath.

Altitude Callout: A voice callout (“Five Hundred”) when the airplane descends to 500 feet above terrain or nearest runway elevation. All TAWS equipment must provide a 500 foot voice call out.

A.2 TAWS B modes and functions

Mode 1: Excessive rates of descent

Mode 3: Negative climb rate or altitude loss after takeoff

Altitude Callout: A voice callout (“Five Hundred”) when the airplane descends to 500 feet above the nearest runway elevation. All TAWS equipment must provide the 500 foot voice call out.

Appendix B

Extract of TSO-C151c

B.1 Class A Equipment Requirements for a Terrain Display

Class A equipment must be designed to interface with a color terrain display, and may be designed to also interface to a monochromatic terrain display. Class A equipment for TAWS must also be capable of providing the following terrain-related information to a display system:

- a. The terrain must be depicted relative to the airplane's position such that the pilot can estimate the relative bearing to the terrain of interest.
- b. The terrain must be depicted relative to the airplane's position such that the pilot may estimate the distance to the terrain of interest.
- c. The terrain depicted must be oriented to either the heading or the track of the airplane. In addition, a north-up orientation may be added as a selectable format.
- d. Variations in terrain elevation must be depicted relative to the airplane's current or projected elevation (above and below) and be visually distinct. Terrain that is more than 2000 feet below the airplane's elevation can be excluded.
- e. Terrain that generates alerts must be displayed in a manner to distinguish it from nonhazardous terrain, consistent with the caution and warning alert level.