

Advisory Circular

EFFECTIVENESS OF EGPWS/TAWS EQUIPMENT

GENERAL	1
PURPOSE	1
APPLICABILITY	1
RELATED REGULATIONS	1
RELATED ADVISORY CIRCULARS	1
CANCELLATION	1
EFFECTIVE DATE	1
OTHER REFERENCES	1
1 INTRODUCTION	2
2 SOFTWARE UPDATE	2
3 DATABASE UPDATE	2
4 ALTIMETRY-BASED ERRORS	3
5 ACTIONS BY THE AOC HOLDER	3
6 SUMMARY	4

GENERAL

Advisory Circulars (ACs) are issued by the Director-General of Civil Aviation (DGCA) from time to time to provide practical guidance or certainty in respect of the statutory requirements for aviation safety. ACs contain information about standards, practices and procedures acceptable to CAAS. An AC may be used, in accordance with section 3C of the Air Navigation Act (Cap. 6) (ANA), to demonstrate compliance with a statutory requirement. The revision number of the AC is indicated in parenthesis in the suffix of the AC number.

PURPOSE

This AC provides guidance to demonstrate compliance with, and information related to, maintaining the effectiveness of ground proximity warning system (GPWS) equipment in accordance with ANR-121.

APPLICABILITY

This AC is applicable to the AOC holder operating an aeroplane in accordance with ANR-121.

RELATED REGULATIONS

This AC relates specifically to Regulation 122 of ANR-121.

RELATED ADVISORY CIRCULARS

Nil.

CANCELLATION

This AC supersedes AC AOC-10.

EFFECTIVE DATE

This AC is effective from 1 October 2018.

OTHER REFERENCES

Nil.

1 INTRODUCTION

- 1.1 A controlled flight into terrain (CFIT) accident occurs when an airworthy aircraft under the control of the flight crew is flown unintentionally into terrain, obstacles or water, usually with no awareness of the impending collision on the part of the crew. ICAO's first action in this regard can be traced to 1978, when requirements for equipping commercial air transport aircraft with GPWS were introduced in Part I of Annex 6 to the Chicago Convention. This led to a significant decrease in the number of CFIT occurrences, but not to their complete elimination. A further step was taken with the development of GPWS with a forward looking terrain avoidance function, generally referred to as Enhanced Ground Proximity Warning System (EGPWS), and known in the United States as Terrain Awareness and Warning System (TAWS). With the advent of EGPWS/TAWS in 1996, there have been no CFIT accidents involving aircraft equipped with this technology.
- 1.2 While the aviation community can be justifiably proud of its achievement in reducing CFIT accidents, there is no room for complacency. Operational experience has identified concerns about the use of EGPWS that must be addressed to ensure that timely warning that has proven so valuable to accident avoidance is available at all times.
- 1.3 The EGPWS/TAWS safety issues that have been identified concern the upkeep of software on which EGPWS/TAWS depends, as well as the obstacle, runway and terrain database, the provision of global navigation satellite system (GNSS) positioning, the operation of the system's "peaks and obstacles" function, and the geometric altitude function of the equipment.

2 SOFTWARE UPDATE

- 2.1 Perhaps the most easily rectified shortcoming involves the software utilised by EGPWS/TAWS. Software updates are issued regularly, yet industry sources reveal these are not being implemented by all AOC holders, or are not installed in a timely manner. Aside from the fact that updates are often available free of charge from equipment manufacturers, there is ample reason to perform this task since the use of current information is clearly critical to safety
- 2.2 Application of software updates improves the characteristics of the equipment. Such improvements are possible on the basis of operational experience, and enable warnings in situations that occur closer to the runway threshold where previously it was not possible to provide such warnings.
- 2.3 Without information provided by the latest version of software, operation of EGPWS/TAWS may be compromised in specific situations. The flight crew, who has no convenient means of knowing the software status of the equipment on which they ultimately rely, may have a false sense of confidence in its capability.

3 DATABASE UPDATE

- 3.1 Similarly, it is crucial to regularly update the obstacle, runway and terrain database provided by manufacturers for use with their equipment, since the proper functioning of the EGPWS/TAWS may otherwise be jeopardised. Again, updates are issued for these databases on a regular basis, free of charge by equipment manufacturers. EGPWS/TAWS operation can also be undermined by the lack of suitable navigational

input. The equipment was designed to function with a position update system, but not all installations are linked to GNSS receivers. While the required position data can be acquired by using an effective ground-based navaid network, the most reliable of which is provided by DME/DME, such support for area navigation systems is not available everywhere. Use of GNSS, accessible worldwide, eliminates the possibility of position shift, which is another source of false warnings (or worse, the failure to provide a genuine warning).

- 3.2 Collectively, these various shortcomings in the software, databases and procedures that support EGPWS/TAWS operation can degrade the value of the warning system, and clearly call for attention by national regulatory authorities, aircraft operators and manufacturers. To reduce the risk of CFIT as much as possible, countries around the world need to ensure that timely information of required quality on runway thresholds, as well as terrain and obstacle data, are provided for databases in accordance with the common reference systems.

4 ALTIMETRY-BASED ERRORS

- 4.1 Operation of EGPWS/TAWS is subject to altimetry-based errors, which are more prominent during cold weather operations. This problem can be avoided when the equipment, originally designed to work with the QNH altimeter setting, is operated together with GNSS provided geometric altitude. Additionally, use of the geometric altitude function prevents errors that arise from the use of the QFE altimeter setting for approach and landing.

5 ACTIONS BY THE AOC HOLDER

- 5.1 Regulation 122 of ANR-121, or Regulation 120 of ANR-135 as the case may be, requires the installation of EGPWS/TAWS on certain aeroplanes. In order to obtain the greatest safety benefit from EGPWS/TAWS and ensure that the system remains effective, the AOC holder should:
- (a) update software to the latest available standard;
 - (b) update databases to the latest available standard;
 - (c) ensure that the GNSS position is provided to EGPWS/TAWS;
 - (d) enable the EGPWS/TAWS geometric altitude function (if available);
 - (e) enable the EGPWS/TAWS peaks and obstacles function (if available); and
 - (f) implement any applicable service bulletins issued by manufacturers.
- 5.2 The AOC holder should also take other measures to ensure CFIT prevention through effective use of GPWS. These measures include, but are not limited to: crew training; use of standard operating procedures; crew reporting and AOC holder's investigation of spurious warnings; and implementation of a safety management system by the AOC holder.

6 SUMMARY

- 6.1 While without doubt the reduction of CFIT accidents is a major achievement, the risk of a CFIT accident remains higher than it should be. The shortcomings or deficiencies in equipment and procedures necessary for the prevention of CFIT, as described above, call for action by AOC holders to ensure they update their systems, a task that can be achieved at very little cost; and to request manufacturers to provide AOC holders with the necessary service bulletins that affect EGPWS/TAWS operation.
- 6.2 The measures cited above can considerably reduce the risk of CFIT accidents by reducing the possibility that no warning will be given when a prompt warning is required. Equally important, they can lower the risk of CFIT by reducing the possibility of navigation and position shift errors and the occurrence of false warnings.