Civil Aviation Authority of Nepal

Advisory Circular 02/2020			
Subject:	Guidance for Operators to Ensure Effectiveness of GPWS Equipment		
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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. This AC is issued in accordance with Rule 82 of Civil Aviation Rules 2002.

This AC may use mandatory terms such as "must", "shall" and "is/are required" so as to convey the intent of the regulatory requirements where applicable. The term "should" is to be understood to mean that the proposed method of compliance is strongly recommended, unless an alternative method of safety protection is implemented that would meet or exceed the intent of the recommendation.

1.1 Purpose

The purpose of this AC is to provide information to operators on factors that can reduce the effectiveness of ground proximity warning system (GPWS) equipment. It is designed to raise crew awareness and lower the risk of CFIT accidents by reducing the possibility that no warning will be given when a prompt warning is required; as well as reducing the possibility of navigation and position shift errors and the occurrence of false warnings.

1.2 Applicability

This document is applicable to all operators who are required to operate aeroplanes equipped with GPWS as per Flight Operations Requirements-Aeroplanes. These operators should establish procedures to ensure that the effectiveness of installed GPWS equipment is maintained to the required specifications.

1.3 Description of Changes

Not applicable.

2.0 REFERENCES

2.1 Reference Documents

The following reference material may be consulted for information purposes:

(1) Flight Safety Foundation – Current Safety Initiatives http://flightsafety.org/

(2) Commercial Aviation Safety Team (CAST) – Safety Enhancements
http://www.skybrary.aero/index.php/Commercial_Aviation_Safety_Team_(CAST)

(3) ICAO Annex 6 Part I and Part II

(4) Any other applicable regulatory and/or guidance material issued by CAAN

2.2 Cancelled Documents

Not applicable.

2.3 Definitions and Abbreviations

(1) The following **definitions** are used in this document:

(a) **Controlled Flight Into Terrain (CFIT):** Accidents, where a properly functioning aircraft under the control of a fully qualified and certificated crew is flown into terrain with no apparent awareness on the part of crew

(b) **Operator:** means a person, organisation or enterprise engaged in or offering to engage in an aircraft operation

(2) The following **abbreviations** are used in this document:

(a) **():** Indicates any version of the document (e.g. FAA AC 20-138() would indicate FAA AC 20-138(A), FAA AC 20-138(B), FAA AC 20-138(C) etc.)
(b) **AC:** Advisory Circular
(c) **AFM:** Aircraft Flight Manual
(d) **APRAST:** Asia Pacific Regional Aviation Safety Team
(c) **CFIT:** Controlled Flight into Terrain
(d) **COSCAP:** Cooperative Development of Operational Safety and Continuing Airworthiness Programme
(e) **DME:** Distance Measuring Equipment
(f) **FCOM:** Flight Crew Operating Manual
(g) **GNSS:** Global Navigation Satellite System
(h) **GPWS:** Ground Proximity Warning System
(i) **TAWS:** Terrain Awareness Warning System

3.0 BACKGROUND

(1) The material described in this Advisory Circular (AC) is based on previous information disseminated by the COSCAP and revised by the APRAST CFIT Sub-group. Several low-cost but crucial measures can be taken by stakeholders to reduce the likelihood of false GPWS warnings or, more seriously still, the system's failure to provide a valid warning. It is the responsibility of each individual operator to determine the applicability of the contents of this AC to each aeroplane and GPWS equipment installed, and their operation. Operators should refer to their Aeroplane Flight Manual (AFM) and/or Flight Crew Operating Manual (FCOM) for information applicable to specific configurations. If there should be any conflict between the contents of this AC and those published in the other documents describe above, then information contained in the AFM or FCOM will take precedence over that contained in this AC.

(2) The introduction of ground proximity warning system (GPWS) equipment in 1978 resulted in a significant reduction in controlled flight into terrain (CFIT) accidents. However, CFIT accidents do still occur, not only to those aeroplanes that have no

GPWS, but also to GPWS-equipped aeroplanes that encounter terrain rising too rapidly ahead of them or that descend below a safe approach path when in a landing configuration.

(3) A further step was taken with the development of GPWS with a forward looking terrain avoidance function, generally referred to as enhanced GPWS and known in the United States as Terrain Awareness and Warning System (TAWS). With the advent of enhanced GPWS/ TAWS in 1996, the number of CFIT accidents involving aircraft equipped with this technology was reduced drastically. However, not all aeroplanes have enhanced GPWS/ TAWS equipment installed and there has been several CFIT accidents occurring every year. Accordingly to IATA Safety Report 2011, 90% of the CFIT accidents were related to aircraft not equipped with enhanced GPWS/ TAWS.

(4) In order to derive the greatest safety benefit from GPWS equipage, operators are encouraged to adopt necessary measures and practices as stipulated in this AC.

4.0 SCOPE

(1) This advisory circular (AC) contains measures that will ensure the effectiveness of GPWS equipment. This AC is designed to lower the risk of CFIT accidents by reducing the possibility that no warning will be given when a prompt warning is required; as well as reducing the possibility of navigation and position shift errors and the occurrence of false warnings.

(2) Unless otherwise stated, the term "GPWS" in this AC refers to a Ground Proximity Warning System enhanced by a forward looking terrain avoidance function.

5.0 SOFTWARE UPDATE

(1) Perhaps the most easily rectified shortcoming involves the software utilized by GPWS. Software updates are issued regularly, yet industry sources reveal these are not being implemented by all operators, or are not installed in a timely manner. Aside from the fact 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) 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.

(3) Without information provided by the latest version of software, operation of GPWS 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.

6.0 DATABASE UPDATE

(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 GPWS may otherwise be jeopardized. Again, updates are issued for these databases on a regular basis, free of charge by equipment manufacturers. GPWS 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).

(2) Collectively, these various shortcomings in the software, databases and procedures that support GPWS 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.

7.0 ACTION BY OPERATORS

(1) In order to obtain the greatest safety benefit from GPWS, operators who are required to operate aeroplanes equipped with GPWS as per *Flight Operations Requirements-Aeroplanes* must establish certain practices directly related to the equipment in use.

This includes:

(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 GPWS;
(d) Enable the GPWS geometric altitude function (if available);
(e) Enable the GPWS peaks and obstacles function (if available); and
(f) Implement any applicable service bulletins issued by manufacturers.

(2) It is essential that other measures be undertaken 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 operator investigation of spurious warnings; and implementation of a safety management system by the operator.

8.0 INFORMATION MANAGEMENT

Not applicable.

9.0 DOCUMENT HISTORY

Not applicable.

10.0 CONTACT OFFICE

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