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Guidance Material on Measures to Improve the Effectiveness Of Enhanced Ground Proximity Warning System (EGPWS)/Terrain Awareness And Warning System (TAWS)

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These guidelines are developed by the Safety Enhancement Implementation Group (SEIG), as part of Middle East Regional Aviation Safety Plan (MID-RASP) 2020-2022 Edition Safety Enhancement Initiatives (Ref: G1-SEI-01: A1) developed by IATA in coordination with ICAO MID Regional Office and the Regional Aviation Safety Group - Middle East (RASG-MID).

Disclaimer

This document has been compiled by the MID Region civil aviation stakeholders to mitigate the operational impact of the Controlled Flight Into Terrain (CFIT) by providing guidance for civil aviation regulators and aircraft operators on actions that could be taken by stakeholders to reduce the likelihood of false warnings of Enhanced Ground Proximity Warning System (EGPWS) /Terrain Awareness And Warning System (TAWS) or, more seriously, the system's failure to provide a timely warning. It is not intended to supersede or replace existing materials produced by the National Regulator or in ICAO SARPs. The distribution or publication of this document does not prejudice the National Regulator's ability to enforce existing National regulations. To the extent of any inconsistency between this document and the National/International regulations, standards, recommendations or advisory publications, the content of the National/International regulations, standards, recommendations and advisory publications shall prevail**.**

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Measures to Improve the Effectiveness of
Enhanced Ground Proximity Warning System (EGPWS)/
Terrain Awareness and Warning System (TAWS)

1. BACKGROUND

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.

1.2   ICAO's first action in this regard can be traced to 1978, when requirements for equipping commercial air transport aircraft with GPWS were introduced into Annex 6 Part I International Commercial Air Transport - Aeroplanes. This led to a significant decrease in the number of CFIT occurrences, but not to their complete elimination. A significant advancement in technology was achieved with the development of GPWS with a forward-looking terrain avoidance function, generally referred to as Enhanced Ground Proximity Warning System (EGPWS) and known also as Terrain Awareness and Warning System (TAWS).

1.3   With the advent of EGPWS/ TAWS in 1996, there has been a significant reduction in the frequency of CFIT accidents. ICAO subsequently required that aircraft be equipped with this equipment and Annex 6 Part I currently requires all turbine-engine aero planes of a maximum certificated take-off mass more than 5 700 kg or authorized to carry more than nine passengers, to be equipped with a ground proximity warning system which has a forward-looking terrain avoidance function.

1.4   ICAO requires States to ensure that operators have procedures in place to ensure the integrity electronic navigation data products and that the operator continues to monitor both process and products. While EGPWS/TAWS data base would not be utilized for navigation purposes, it would be considered important to ensure that the equipment is functioning with the latest software and data base available.

1.5   There are several factors that can reduce the effectiveness of enhanced ground proximity warning system (EGPWS) equipment. Several measures can be taken by stakeholders to reduce the likelihood of false EGPWS warnings or, more seriously still, the system's failure to provide a timely warning.

2. ANALYSIS

2.1   CFIT is the second cause of fatal accidents. The industry has been working to reduce the CFIT accidents and during the last decade, the accident rate has fallen from **0.17 per million sectors in 2012 to 0.08 per million sectors in 2021**. Thanks to improvements in training, standards, technology, policies, and SOPs.
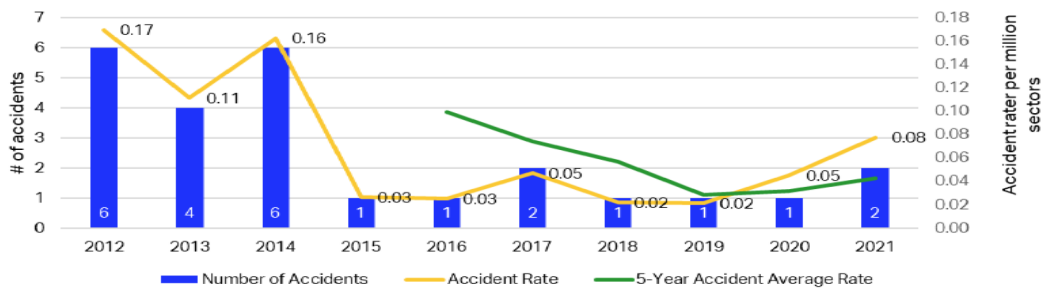
2.2   In 2019, IATA and Honeywell produced guidance on performance assessment of pilot compliance to EGPWS. In our continuing effort to ensure the applicability and quality of the published Guidance Material, together with Honeywell conducted a survey to investigate the barriers and enablers in the implementation of such guidance.

2.3   The shortcoming identified involves the software utilized by EGPWS/TAWS. Software updates are issued regularly, yet industry sources reveal these are not always being implemented by all operators or are not installed in a timely manner.

2.4   Application of software updates improves the characteristics of the equipment. Such improvements are possible based on operational experience and enable earlier warnings in situations that occur closer to the runway threshold where previously it was not possible to provide such warnings. Similarly, it is important to regularly update the obstacle, runway and terrain database provided by manufactures for use with their equipment.

2.5   EGPWS/TAWS equipment was designed to function with a position update system, but not all installations are linked to Global Navigation Satellite System (GNSS) receivers. While the required position data can be acquired by using an effective ground-based navaid network, such support for area navigation systems is not available everywhere. Use of GNSS eliminates the possibility of position.

3. RECOMMENDED ACTION

A number of recommendations are listed below to aid in CFIT risk reduction.

3.1   *Recommendations to Operators*:

3.1.1   *EGPWS* Software & Terrain Database are kept up to date:

- Operators should have a policy in place or a program of continuous maintenance that periodically checks the system operation, updates the runway, terrain and obstacle databases and EGPWS software to the latest available.

- Guidance to airline's Technical Operations dept. (Engineering & Maintenance) should emphasize the safety benefit that can be obtained by keeping the EGPWS software / terrain database up to date.

3.1.2   Operators should encourage the use of GNSS/GPS as a position source for the EGPWS.

3.1.3   Operators should publish a clear SOP for the use of terrain awareness display during critical phases of flight.

3.1.4   Train flight crews to respond immediately to a hard Enhanced Ground Proximity Warning System (EGPWS) warning, and respect and respond to EGPWS soft warnings. Use simulators to show their crews exactly how close terrain is when the EGPWS warning occurs to reinforce the need for an immediate response to the warning to avoid the terrain.

3.1.5   Encourage operators to use FDM or FOQA data to monitor proper responses by flight crew to EGPWS events and reinforce a policy of go-around from an unstable approach.

3.1.6   Operators are encouraged to have procedures in place to ensure that EGPWS equipment always remains activated and serviceable.

3.1.7   Operators are encouraged to report GPS interference or any disruption of radio altimeter operation to the appropriate national authorities, with a copy to faqirj@iata.org.

3.1.8   Operators to create awareness of the impact of GPS jamming or radio altimeter anomalies on aviation safety.

3.2   *Recommendations to States & Regulators*:

3.2.1   EGPWS Software & Terrain Database are kept up to date:

- ensure the navigation references are updated in accordance with WGS-84;

- ensure air operators have procedures in place to ensure that EGPWS/TAWS software and data bases (including obstacle, runway and terrain databases) are updated to the latest available standard; and

- ensure that air operators maintain and monitor the provision of most accurate positioning information to the EGPWS/TAWS system (e.g., encourage the broader use of GNSS input linked to EGPWS.

3.2.2   Terrain Display during Critical Phases of Flight Policy:

- to check if the terrain display SOP is implemented by operators.

3.2.3   Training for Flight Crew to respond to EGPWS Alerts:

- to check if the EGPWS training is performed in compliance with regulations.

APPENDIX A:

Guidance material Performance assessment of pilot response to Enhanced Ground Proximity Warning System (EGPWS)

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