COSCAP North Asia

Cooperative Development of Operational Safety & Continuing Airworthiness Programme

ADVISORY CIRCULAR FOR AIR OPERATORS

Subject: **REDUCED EFFECTIVENESS of TAWS/EGPWS EQUIPEMENT**

Date: **15 July 2008**

Initiated By: **COSCAP-NA**

AC No: **CNA 019 (Issue 1)**

1. PURPOSE. This advisory circular (AC) provides information to air operators on factors that can reduce the effectiveness of ground proximity warning system (GPWS) equipment. 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

2. BACKGROUND. 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 (see adjacent figure).

a. 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 the timely warning that has proven so valuable to accident avoidance is available all of the time.

b. The EGPWS/TAWS safety issues that have been identified concern the upkeep of soft-ware 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.

3. SOFTWARE UPDATE.

a. Perhaps the most easily rectified shortcoming involves the software utilized by EGPWS/TAWS. 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.

b. 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.

c. 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.

4. DATABASE UPDATE.

a. 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 jeopardized. 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).

b. 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.

5. ATIMETRY-BASED ERRORS.

a. 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.

6. ACTION BY AIR OPERATORS.

a. Aircraft operators can obtain the greatest safety benefit from EGPWS/TAWS by following certain practices directly related to the equipment in use. They should:

- update software to the latest available standard;
- update databases to the latest available standard;
- ensure that the GNSS position is provided to EGPWS/TAWS;
- enable the EGPWS/TAWS geometric altitude function (if available);
- enable the EGPWS/TAWS peaks and obstacles function (if available); and
- implement any applicable service bulletins issued by manufacturers.

b. 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.

7. SUMMARY.

a. 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 States, operators and manufacturers. States need to improve the provision of crucial terrain and aeronautical information, as required by ICAO standards; operators must update their systems, a task that can be achieved at very little cost; and manufacturers should provide operators with the necessary service bulletins that affect EGPWS/TAWS operation.

b. 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.

Signed by:

(Appropriate CAA Official)