ICAO APRAST/1 CFIT 01 SURVEY – IMPLEMENTATION OF GPWS-FLF

Background

As part of the Asia Pacific Regional Aviation Safety Team (APRAST)'s safety initiative to reduce the number of Controlled Flight Into Terrain (CFIT) accidents / incidents and to implement SEI APRAST/1: CFIT/01, we are conducting this survey to gather information on the status of the installation of Ground Proximity Warning System (GPWS) with Forward Looking Feature (FLF) within the APAC region. The equipage of GPWS-FLF system is an ICAO Annex 6 Standard.

Results of the survey will facilitate the development of the necessary documentations, such as guidance materials, so as to assist States in implementation of this ICAO Standard.

Submitted by:

State/Administration	
State Representative	
Appointment	
Email	
Telephone	
Date	

(1) **International Commercial Air Transport (CAT).** Has your State promulgated regulations to mandate the equipage of GPWS which has a ***forward looking terrain avoidance function*** as per Amendment No 21 and 27 to ICAO Annex 6 Part I for all turbine-engined and piston-engined aeroplanes (of a maximum certificated take-off mass in excess of 5,700kg or authorized to carry more than nine passengers)?

☐ Yes ☐ No

If answer is "no", what are your State's plans with respect to the promulgation of regulations to mandate the equipage of GPWS-FLF?

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(2) **International General Aviation.** Has your State promulgated regulations to mandate the equipage of GPWS which has a ***forward looking terrain avoidance function*** as per Amendment No 22 to ICAO Annex 6 Part II for all turbine-engined aeroplanes (of a maximum certificated take-off mass in excess of 5,700kg or authorized to carry more than nine passengers)?

☐ Yes ☐ No

If answer is “no”, what are your State’s plans with respect to promulgating regulations to mandate the equipage of GPWS-FLF?

(3) If answer to (1) and/or (2) is “yes”, please provide details on the number of aeroplanes registered in your State that are equipped with GPWS – FLF

(a) **International Commercial Air Transport**

i) Total number of aeroplanes that are above 5700Kg or authorized to carry more than nine passengers	
ii) Total number of aeroplanes in (i) that are equipped with GPWS - FLF	
iii) Expected deadline for full implementation (if applicable)	

(b) **International General Aviation**

i) Total number of aeroplanes that are above 5700Kg or authorized to carry more than nine passengers.	
ii) Total number of aeroplanes in (i) that are equipped with GPWS - FLF	
iii) Expected deadline for full implementation (if applicable)	

(4) If answer to (1) is “no”,

a) Has your State promulgated regulations to mandate the equipage of GPWS as per Amendment No 12 to ICAO Annex 6 Part I for all turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5,700kg or authorized to carry more than nine passengers?

☐ Yes ☐ No

b) If answer to (4a) is “yes”, please provide details on the number of aeroplanes registered in your State that are equipped with GPWS

International Commercial Air Transport

i) Total number of aeroplanes that are above 5700Kg or authorized to carry more than nine passengers	
ii) Total number of aeroplanes in (i) that are equipped with GPWS	

iii) Expected deadline for full implementation (if applicable)	

c) If answer to (4a) is “no”, what are your State with respect to promulgating regulations to mandate the equipage of GPWS?

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(5) If answer to (2) is “no”,

a) Has your State promulgated regulations to mandate the equipage of GPWS as per Amendment No 16 to ICAO Annex 6 Part II for all turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5,700kg or authorized to carry more than nine passengers?

☐ Yes ☐ No

b) If answer to (5a) is “yes”, please provide details on the number of aeroplanes registered in your State that are equipped with GPWS

International General Aviation

i) Total number of aeroplanes that are above 5700Kg or authorized to carry more than nine passengers	
ii) Total number of aeroplanes in (i) that are equipped with GPWS	
iii) Expected deadline for full implementation (if applicable)	

c) If answer to (5a) is “no”, what are your State with respect to promulgating regulations to mandate the equipage of GPWS?

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(6) Has your State developed guidance material to assist your operators to implement flight crew training programmes / procedures related to:

a) Responding to GPWS alerts / warnings (ref: COSCAP-SEA Advisory Circular: CSEA 001. Please see Annex A)

☐ Yes ☐ No

b) Awareness of factors that can reduce the effectiveness of GPWS and mitigating the effects of GPWS degradation (ref: COSCAP-SEA Advisory Circular: CSEA 019. Please see Annex B)

☐ Yes ☐ No

(7) Has your State developed guidance material to assist your operators to implement procedures related to ensuring GPWS software is current and that the GPWS equipment is serviceable (ref: COSCAP-SEA Advisory Circular: CSEA 019. Please see Annex B)

☐ Yes ☐ No

(8) If answer in (6) and/or (7) is "yes", please provide details on the number of CAT operators in your State that have implemented the flight crew training programme / procedures

i)	Total number of CAT operators	
ii)	Number of CAT operators that have implemented training programmes / procedures responding to GPWS alerts / warnings	
iii)	Number of CAT operators that have implemented training programmes on awareness of factors that can reduce the effectiveness of GPWS and mitigating the effects of GPWS degradation	
iv)	Number of CAT operators that have implemented procedures to ensure GPWS software is current and the GPWS equipment is serviceable	

(9) What are the challenges or obstacles that your State faced in the implementation of GPWS / GPWS-FLF?

(10) Does your State require assistance to implement the GPWS / GPWS-FLF requirements? If "yes", what type of assistance is required?

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COSCAP southeast asia Cooperative Development of Operational Safety & Continuing Airworthiness Programme

ADVISORY CIRCULAR

Subject: **GUIDANCE FOR OPERATORS ON TRAINING PROGRAMMES FOR THE USE OF TERRAIN AWARENESS AND WARNING SYSTEM (TAWS)**

Date: **01 August 2005**

Initiated By: **COSCAP-SEA**

AC No: **CSEA 001**

(Supercedes: Draft AC No. CSEA001, dated 17 September 2003)

1. PURPOSE

a. This advisory circular (AC) contains performance-based training objectives for Terrain Awareness and Warning System (TAWS) pilot training.

b. The training Objectives cover five areas: theory of operation; pre-flight operations; general in-flight operations; response to TAWS cautions; and response to TAWS Warnings.

c. The term 'TAWS' in this AC means a Ground Proximity Warning System (GPWS) enhanced by a forward looking terrain avoidance function. 'Alerts' include both 'cautions' and 'warnings'.

d. The contents of this AC are intended to assist operators who are required to develop and conduct training programmes. The information it contains has not been tailored to any specific aeroplane or TAWS equipment, but highlights features typically available where such systems are installed. It is the responsibility of each individual operator to determine the applicability of the contents of this AC to each aeroplane and TAWS equipment installed, and their operation. Operators should refer to their Aeroplane Flight Manual and/or Aeroplane/Flight Crew Operating Manual 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 described above, then information contained in the AFM or A/FCOM will take precedence over that contained in this AC.

2. RELATED CIVIL AVIATION REGULATIONS

(Please insert all related States regulations)

3. BACKGROUND

a. 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. It was with these shortcomings in mind that avionics manufacturers developed a solution to which the International Civil Aviation Organisation (ICAO) responded by publishing Standards and Recommendations concerning retrofit action it believes can or should be taken.

b. GPWS feeds inputs to its computer from a downwards-looking radio altimeter, an air data computer, an instrument landing system (ILS) glideslope signal, and flap and gear selector lever positions: its outputs include visual and aural alerts and warnings when it detects by rate-of-change of position that the aircraft is closing with terrain. To satisfy the ICAO requirement that GPWS should now include a predictive terrain hazard warning function, a terrain awareness and warning system has recently been developed. The predictive function is achieved by feeding the aeroplane's known position (as determined by a flight management system (FMS) or by a global positioning system (GPS)) to a terrain data base, enabling the computer to predict terrain ahead and to the side of the aeroplane's flight path. Terrain features can then be displayed to the flight crew. TAW therefore overcomes shortcomings associated with GPWS in that it produces earlier alerts and warnings of significant terrain that lie ahead at all stages of flight. Furthermore, with reference to terrain around airfields, it can warn of descent below safe vertical profiles when the aircraft is in a landing configuration and there is no ILS glideslope signal present. Pilots' situational awareness is greatly improved by means of terrain features displayed before them. This displayed information, related to flight path and altitude, means that the alerting and warning capabilities TAWS possesses are less likely to be needed than if GPWS alone were installed. (Note: the acronym EGPWS (Enhanced GPWS) that has been in use for some time describes only one TAWS solution - other solutions are now in the course of development or in production.)

4. SCOPE

a. The scope of this AC is designed to identify training objectives in the areas of: academic training; manoeuvre training; initial evaluation; and recurrent qualification. Under each of these four areas, the training material has been separated into those items which are considered essential training items and those which are considered desirable. In each area, objectives and acceptable performance criteria are defined.

b. No attempt is made to define how the training programme should be implemented. Instead, objectives are established that define the knowledge a pilot operating TAWS is expected to possess and the performance expected from a pilot who has completed TAWS training. However, the guidelines do indicate those areas in which the pilot receiving the training should demonstrate his/her understanding, or performance, using a real-time, interactive training device, ie a flight simulator. Where appropriate, notes are included within the performance criteria which amplify or clarify the material addressed by the training objective.

5. PERFORMANCE BASED TRAINING OBJECTIVES

a. TAWS Academic Training

This training is typically conducted in a classroom environment. The knowledge demonstrations specified in this section may be completed through the successful completion of written tests or by providing correct responses to non real-time computer based training (CBT) questions.

(1) Theory of operation

The pilot should demonstrate an understanding of TAWS operation and the criteria used for issuing cautions and warnings. This training should address the following topics:

(a) System Operation

Objective: To demonstrate knowledge of how TAWS functions.

Criteria: The pilot must demonstrate an understanding of the following functions:

(i) Surveillance

- The GPWS computer processes data supplied from an air data computer, a radio altimeter, an ILS/MLS/MM (multi-mode) receiver, a roll attitude sensor, and flap and gear selector position sensors.

- The forward looking terrain avoidance function utilises an accurate source of known aircraft position, such as may be provided by a flight management system (FMS) or global positioning system (GPS), and an electronic terrain database. The source and scope of the terrain, obstacle and airport data, and features such as the terrain clearance floor, the runway picker, and geometric altitude (where provided) should all be described.

- Displays required to deliver TAWS outputs include a loudspeaker for voice announcements, visual alerts (typically amber and red lights), and a terrain awareness display (that may be combined with other displays). In addition, means must be provided for indicating the status of TAWS and any partial or total failures that may occur.

(ii) Terrain Avoidance

- Outputs from the TAWS computer provide visual and audio synthetic voice cautions and warnings to alert the flight crew about potential conflicts with terrain and obstacles.

(b) Alert Thresholds

Objective: To demonstrate knowledge of the criteria for issuing cautions and warnings.

Criteria: The pilot should be able to demonstrate an understanding of the methodology used by TAWS to issue cautions and alerts and the general criteria for the issuance of these alerts t o include:

- Basic GPWS alerting modes specified in the ICAO Standard:

  Mode 1: excessive sink rate;
  Mode 2: excessive terrain closure rate:
  Mode 3: descent after take-off or go-around;
  Mode 4: unsafe proximity t o terrain;
  Mode 5: descent below ILS glide slope (caution only).

- An additional, optional alert mode:

  Mode 6: radio altitude call-out (information only).

- TAWS cautions and warnings that alert the flight crew to obstacles and terrain ahead of the aircraft in line with or adjacent to its projected flight path (forward looking terrain avoidance (FLTA) and premature descent alert (PDA) functions).

(c) TAWS Limitations

Objective: To verify that the pilot is aware of the limitations of TAWS.

Criteria: The pilot should demonstrate a knowledge and understanding of TAWS limitations identified by the manufacturer for the equipment model installed. Items might include:

- Navigation is not to be predicated on the use of the terrain display.

- Unless geometric altitude data is provided, use of predictive TAWS functions is prohibited when altimeter subscale settings display QFE.

- Nuisance alerts can be issued if the aerodrome of intended landing is not included in the TAWS airport database.

- In cold weather operations, corrective procedures should be implemented by the crew unless TAWS has in-built compensation such as geometric altitude data.

- Loss of input data to the TAWS computer could result in partial or total loss of functionality. Where means exist to inform the crew that functionality has been degraded, this should be known and the consequences understood.

- Radio signals not associated with the intended flight profile (eg ILS glide path transmissions from an adjacent runway) may cause false alerts.

- Inaccurate or low accuracy aircraft position data could lead to false or non annunciation of terrain or obstacles ahead of the aircraft.

- MEL restrictions should be applied in the event that TAWS becomes partially or completely unserviceable. (It should be noted that basic GPWS has no forward-looking capability.)

(d) TAWS Inhibits

Objective: To verify that the pilot is aware of the conditions under which certain functions of TAWS are inhibited.

Criteria: The pilot should demonstrate knowledge and understanding of the various TAWS inhibits including:

- A means of silencing voice alerts;

- A means of inhibiting ILS glide path signals (as may be required when executing a ILS back beam approach);

- A means of inhibiting flap position sensors (as may be required when executing an approach with the flaps not in a normal position for landing);

- A means for inhibiting the FLTA and PDA functions;

- A means for selecting or deselecting the display of terrain information;

- Together with appropriate annunciation of the status of each selection.

(2) Operating Procedures

The pilot should demonstrate the knowledge required to operate the TAWS avionics and interpret the information presented by TAWS. This training should address the following topics:

(a) Use of controls

Objective: To verify that the pilot can properly operate all TAWS controls and inhibits.

Criteria: Demonstrate the proper use of controls including:

- The means by which, before flight, any equipment self-test functions can be initiated
- The means by which TAWS information can be selected for display;
- The means by which all TAWS inhibits can be operated and what the consequent annunciation mean with regard to loss of functionality.

(b) Display Interpretation

Objective: To verify that a pilot understands the meaning of all information that can be annunciated or displayed by TAWS.

Criteria: The pilot should demonstrate the ability to properly interpret information annunciated or displayed by TAWS including:

- Knowledge of all visual and aural indications that may be seen or heard;
- Response required on receipt of a caution;
- Response required on receipt of a warning;
- Response required on receipt that partial or total failure of TAWS has occurred (including annunciation that the present aircraft position is of low accuracy).

(c) Use of Basic GPWS or Use of the Forward Looking Terrain Avoidance Function Only.

Objective: To verify that a pilot understands what functionality will remain following loss of the GPWS or of the forward looking terrain avoidance function.

Criteria: The pilot should demonstrate knowledge of the following:

- How to recognise uncommanded loss of the GPWS function, or how to isolate this function, and what level of CFIT protection then remains (essentially, the forward looking terrain avoidance function).

- How to recognise uncommanded loss of the forward looking terrain avoidance function, or how to isolate this function, and what level of CFIT protection then remains (essentially, basic GPWS).

(d) Crew Co-ordination

Objective: To verify that the pilot adequately briefs other crew members on how TAWS alerts will be handled.

Criteria: The pilot should demonstrate that the pre-flight briefing addresses procedures that will be used in preparation for responding to TAWS cautions and warnings including:

- What action will be taken, and by whom, in the event that a TAWS caution and/or warning is issued.

- How multi-function displays will be used to depict TAWS information at take-off, in the cruise, and for the descent, approach, landing (and any go-around). (This will be in accordance with procedures specified by the operator, who will recognize both that it may be more desirable that other data is displayed a t certain phases of flight, and that the terrain display has an automatic 'pop-up' mode in the event that an alert is issued.)

(e) Reporting Requirements

Objective: To verify that the pilot is aware of the requirements for reporting alerts to the controller and other authorities.

Criteria: The pilot should demonstrate the following:

- When, following recovery from a TAWS alert or caution, any transmission of information should be made to the appropriate air traffic control unit;

- What written report is required t o be made, how it is to be made, and whether any cross- reference should be made in the aircraft technical log and/or voyage report (in accordance with procedures specified by the operator) following a flight in which the aircraft flight path has been modified in response to a TAWS alert, or if any part of the equipment appears not to have functioned correctly.

(f) Alert Thresholds

Objective: To demonstrate knowledge of the criteria for issuing cautions and warnings.

Criteria: The pilot should be able to demonstrate an understanding of the methodology used by TAWS to

issue cautions and warnings and the general criteria for the issuance of these alerts to include:

- Awareness of the modes associated with basic GPWS including the input data associated with each.

- - Awareness of the visual and aural annunciations that can be issued by TAWS, and how to identify which are cautions and which are warnings.

b. TAWS Maneuver Training

The pilot should demonstrate the knowledge required to respond correctly to TAWS cautions and warnings. This training should address the following topics:

(1) Response to Cautions

Objective: To verify that the pilot properly interprets and responds to cautions.

Criteria: The pilot should demonstrate that he understands the need, without delay:

- To initiate action required to correct the condition that has caused TAWS to issue the caution and to be prepared to respond to a warning if this should follow.

- If a warning does not follow the caution, to notify the controller of the new position, heading and/or altitude/flight level of the aircraft, and what the commander intends to do next.

- The proper response to a caution might require the pilot:

  – to reduce a rate of descent and/or to initiate a climb;
  – to regain an ILS glide path from below, or to inhibit a glide path signal if an ILS is not being flown;
  – to select more flap, or t o inhibit a flap sensor if the landing is being conducted with the intent that the normal flap setting will not be used;
  – to select gear down;
  – to initiate a turn away from the terrain or obstacle ahead and towards an area free of such obstructions if a forward looking terrain display indicates this to be a good solution and the entire maneuver can be carried out in clear visual conditions.

(2) Response t o Warnings

Objective: To verify that the pilot properly interprets and responds to warnings.

Criteria: The pilot should demonstrate that he understands the need, without delay:

- To initiate a climb in the manner specified by the operator, and
- to maintain the climb until visual verification can be made that the aircraft will clear the terrain or obstacle ahead, or until above the appropriate sector safe altitude (if certain as to the location of the aircraft with respect t o terrain) even if the TAWS warning stops. If, subsequently, the aircraft climbs up through the sector safe altitude but the visibility does not allow the crew to confirm that the terrain hazard has ended, checks should be made to verify the location of the aircraft and to confirm that the altimeter subscale settings are correct,
- Also, and when the workload permits, the crew should notify the controller of the new position and altitude/flight level, and what the commander intends to do next.
- The manner in which the climb should be made will reflect the type of aircraft and the method specified by the aircraft manufacturer (but reflected in the operations manual) for performing the escape maneuver. Essential aspects will include the need for an increase in pitch attitude, selection of maximum thrust, confirmation that external sources of drag (e.g. spoilers/speedbrakes) are retracted, and respect of the stick shaker or other indication of eroded stall margin.
- TAWS warnings must never be ignored. However, the pilot's response may be limited to that appropriate for a caution only if the aeroplane is being operated by day in clear visual conditions, and it is immediately obvious to the pilot that the aircraft is in no danger in respect of its configuration, proximity to terrain or current flight path.

c. TAWS Initial Evaluation

(1) Pilot understanding of the academic training items should be assessed by means of a written test.

(2) Pilot understanding of the maneuver training items should be assessed in a flight simulator (if available) equipped with TAWS visual and aural displays and inhibit selectors similar in appearance and operation to those in the aircraft the pilot will fly, and the results assessed by a synthetic

flight instructor, synthetic flight examiner, type rating instructor or type rating examiner.

(3) The range of scenarios should be designed to give confidence that proper and timely responses to TAWS cautions and warnings will result in the aircraft avoiding a CFIT accident. To achieve this objective, the pilot should demonstrate taking the correct action to prevent a caution developing into a warning and, separately, the escape maneuver needed in response to a warning. These demonstrations should take place when the external visibility is zero, though there is much to be learnt if, initially, the training is given in 'mountainous' or 'hilly' terrain with clear visibility. This training should comprise a sequence of scenarios, rather than be included in line orientated flying training (LOFT).

(4) A record should be made, after the pilot has demonstrated competence, of the scenarios that were practiced.

d. TAWS Recurrent Training (Annual)

(1) TAWS recurrent training ensures that pilots maintain the appropriate TAWS knowledge and skills. In particular, it reminds pilots of the need to act promptly in response to cautions and warnings, and of the unusual attitude associated with flying the escape maneuver.

(2) An essential item of recurrent training is the discussion of any significant issues and operational concerns that have been identified by the operator. Recurrent training should also address changes to TAWS logic, parameters or procedures and to any unique TAWS characteristics of which pilots should be aware.

6. REPORTING PROCEDURES

a. Verbal Reports

Verbal reports should be made promptly to the appropriate air traffic control unit:

- Whenever any maneuver has caused the aircraft to deviate from an air traffic clearance;
- When, subsequent to a maneuver that has caused the aircraft t o deviate from an air traffic clearance, the aircraft has returned to a flight path that complies with the clearance;
- When air traffic issue instructions that, if followed, would cause the crew to maneuver the aircraft towards terrain or obstacle that, it would appear from the display that a potential CFIT occurrence is likely to result.

b. Written Reports

Written reports should be submitted in accordance with the operator's occurrence reporting scheme:

- Whenever the aircraft flight path has been modified in response to a TAWS alert (false, nuisance or genuine).

Written reports should be made in the aircraft technical log:

- Whenever a TAWS alert has been issued and is believed to have been false; or,
- if it is believed that a TAWS alert should have been issued but was not.

c. Within this AC, and with regard to reports:

- The term 'false' means that TAWS issued an alert that could not possibly be justified by the position of the aircraft in respect to terrain, and it is probable that a fault or failure in the system (equipment and/or input data) has been the cause.
- The term 'nuisance' means that TAWS issued an alert that was appropriate but not needed because the flight crew could determine by independent means that the flight path was at that time safe;
- The term 'genuine' means that TAWS issued an alert that was both appropriate and ' necessary.

These terms have value in assessing, only after the occurrence is over and to facilitate subsequent analysis, the adequacy of the equipment and the programs it contains. It is not intended that flight crew should attempt t o classify an alert into any of these three categories when visual and/or aural cautions or warnings are annunciated.

7. APPLICABILITY

All Operators who are required to operate aeroplanes equipped with TWAS as per the requirements of the Civil Aviation Regulations must ensure the flight crew are provided the minimum training and follow procedures as stipulated in this AC. The Operator is required to maintain relevant records of all ground and simulator training provided to the flight crew for perusal by the CAA as and when required.

Signed by: (Appropriate CAA Official)

COSCAP South East Asia Cooperative Development of Operational Safety & Continuing Airworthiness Programme

ADVISORY CIRCULAR FOR AIR OPERATORS

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

Date : **25 June 2008**

Initiated By : **COSCAP-SEA**

AC No : **CSEA - 019**

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)