

FIJI AERONAUTICAL INFORMATION CIRCULAR



Civil Aviation Authority of Fiji
Private Bag (NAP0354), Nadi Airport
Republic of Fiji
Tel: (679) 6721 555; Fax (679) 6721 500
Website: www.caaf.org.fj

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GUIDANCE ON THE EFFECTIVE USE OF GPWS

1. Background

- 1.1 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.
- 1.2 A further step was taken with the development of GPWS with a forward looking terrain avoidance function, generally referred to as enhanced GPWS or 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. According to IATA Safety Report 2011, 90% of the CFIT accidents were related to aircraft not equipped with enhanced GPWS/TAWS.
- 1.3 In order to derive the greatest safety benefit from GPWS equipage, operators are encouraged to adopt necessary measures and practices as stipulated in this AIC.

2. Applicability

- 2.1 All operators who are required to operate aeroplanes equipped with GPWS as per Air Navigation Regulation (ANR) 23 must establish procedures to ensure that the effectiveness of installed GPWS equipment is maintained to the required specifications.

3. Purpose

- 3.1 This AIC contains measures that will ensure the effectiveness of GPWS equipment.
- 3.2 The information contained in this AIC is also 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.

- 3.3 The AIC provides further information to 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.
- 3.4 The information contained within has not been tailored to any specific aeroplane or GPWS equipment, but highlights features which are typically available where such systems are installed. It is the responsibility of each individual operator to determine the applicability of the contents of this AIC 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 AIC and those published in the other documents described above, then information contained in the AFM or FCOM will take precedence over that contained in this AIC.

4. Definition:

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

5. References

- 5.1 Air Navigation Regulation (ANR) 23, (ANR) 44(7)(g), ANR 43(4)(e)(xxiii) and AIC 07/09 Ops para 4. dated 17 Dec 2009.

6. Software Update

- 6.1 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.
- 6.2 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.
- 6.3 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.

7. Database Update

- 7.1 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 jeopardised. 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 navigation 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 navigation-aid 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).

- 7.2 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 the authority, 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.

8. Altimetry Based Errors

- 8.1 Operation of GPWS 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.

9. Action by Operators

- 9.1 In order to obtain the greatest safety benefit from GPWS, operators who are required to operate aeroplanes equipped with GPWS as per the Air Navigation Regulation (ANR) 23 and the AIC 07/09 OPS Clause 4 dated 17 Dec 2009, must establish certain practices directly related to the equipment in use. This includes:

- 1) Update software to the latest available standard;
- 2) Update databases to the latest available standard;
- 3) Ensure that the GNSS position is provided to GPWS;
- 4) Enable the GPWS geometric altitude function (if available);
- 5) Enable the GPWS peaks and obstacle function (if available); and
- 6) Implement any applicable service bulletins issued by manufacturers.

- 9.2 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.