



Civil Aviation Authority  
**SAFETY NOTICE**  
Number: SN-2023/003



Issued: 28 April 2023

## Risk of Controlled Flight into Terrain during 3D BARO-VNAV and 2D Approaches (Altimeter Setting Procedures)

**This Safety Notice contains recommendations regarding operational safety.**

Recipients must ensure that this Notice is copied to all members of their staff who need to take appropriate action or who may have an interest in the information (including any 'in-house' or contracted maintenance organisations and relevant outside contractors).

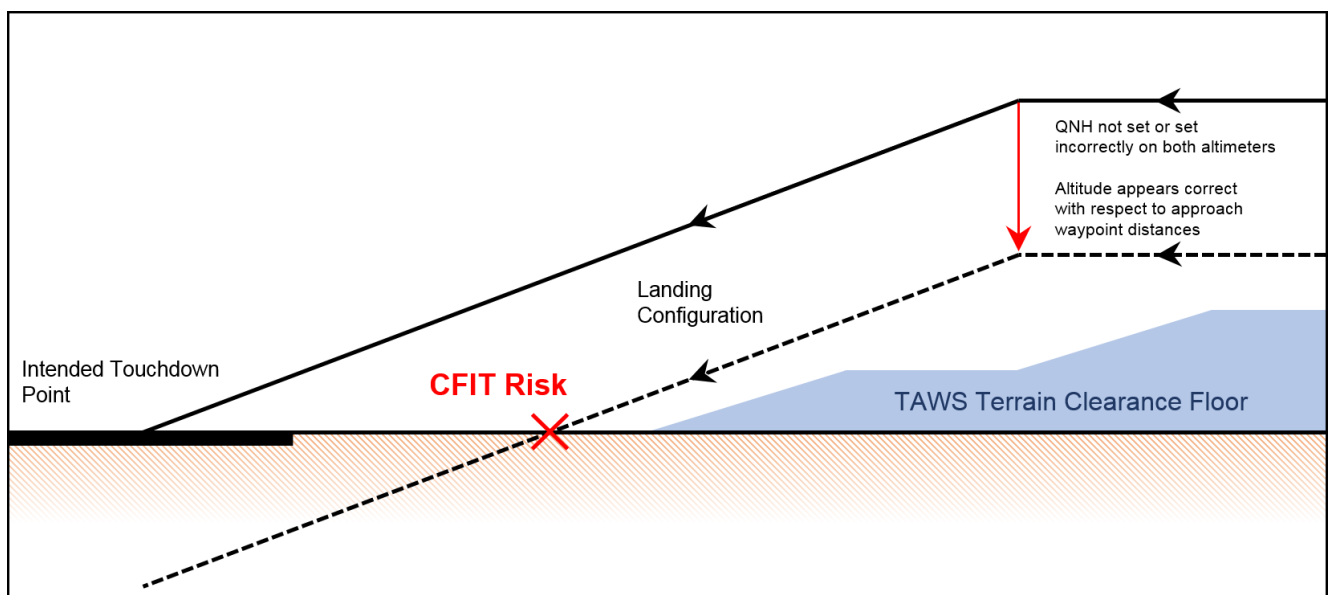
<b>Applicability:</b>	
<b>Aerodromes:</b>	Not primarily affected
<b>Air Traffic:</b>	All Air Traffic Control Staff
<b>Airspace:</b>	Not primarily affected
<b>Airworthiness:</b>	All CAMOs & Part 145s
<b>Flight Operations:</b>	All Operators and Pilots
<b>Licensed/Unlicensed Personnel:</b>	All ATOs and Registered Training Facilities

### 1 Introduction

- 1.1 The purpose of this Safety Notice is to draw renewed and refreshed attention to the risk of Controlled Flight into Terrain (CFIT) when flying instrument approach operations with the pressure altimeter sub-scale set to an incorrect pressure setting. This Safety Notice (SN) updates and replaces SN-2019/001 issued on 6 March 2019, which is revoked as of 28 April 2023..
- 1.2 On 23 May 2022, a serious incident occurred involving an Airbus A320 conducting an RNP BARO-VNAV approach to Runway 27R at Paris – Charles de Gaulle Airport (LFPG/CDG). During the approach, the aircraft encountered a 'near CFIT' event with incorrect QNH set and came within 6 feet of terrain approximately 1nm from Runway 27R. The [Preliminary Report](#) has been issued by the Bureau d'Enquêtes et d'Analyses (BEA).
- 1.3 EASA has also issued [SIB 2023-03](#) 'Incorrect Barometric Altimeter Setting' dated 9 March 2023.
- 1.4 The CAA considers that this risk can be mitigated by existing and emerging technical solutions in conjunction with proactive application of training, knowledge, and Pilot Competencies (PCs) coupled with effective Threat & Error Management (TEM).
- 1.5 Additional technical measures, such as TAWS improvements, have already been developed.

- 1.6 Non-precision approach procedures (NPAs) and approach procedures with vertical guidance (APVs) rely heavily on the accuracy of altitude information provided by the pressure altimeters. If the appropriate pressure setting is set incorrectly on the altimeter sub-scale, the aircraft could be significantly above or below the safe vertical profile as determined by the procedure.
- 1.7 The risk of setting incorrect QNH may increase in a congested R/T environment, during times of high cockpit workload, or when transitioning to an approach via a Standard Terminal Arrival Route (STAR).
- 1.8 It is emphasised that a Terrain Awareness Warning System (TAWS) may not provide a ground proximity alert close to an aerodrome when the aircraft is in the landing configuration.

## 2 Diagram



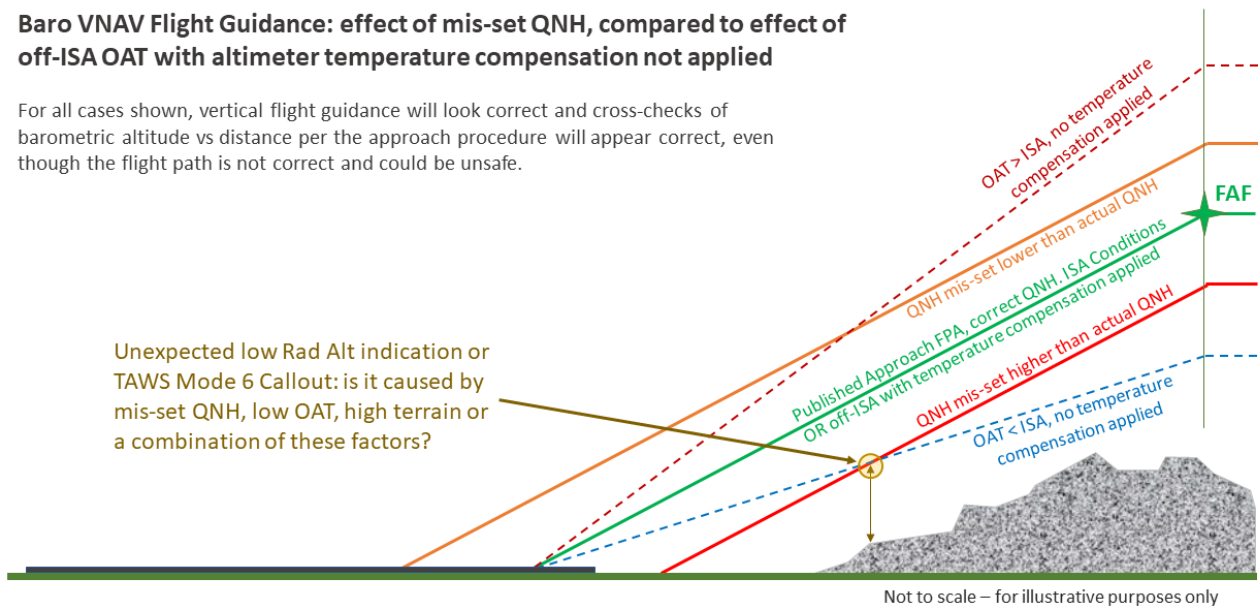
## 3 Actions to be Taken

- 3.1 Pilots should use effective Threat & Error Management (TEM) techniques to identify and mitigate against incorrect altimetry when preparing to fly an approach that relies directly on an accurate pressure altimeter sub-scale setting; (e.g. BARO-VNAV, IAN, MANAGED and 2D approaches).
- 3.2 Operators should ensure Standard Operating Procedures (SOPs) maximise Situational Awareness (SA) and make use of all available sources of information. As an example, pilots are reminded that the Radio Altimeter (RA) provides accurate AGL height information that can be highly pertinent in enhancing Situational Awareness (SA), especially in the last few miles prior to landing. This information can give timely indication that approach geometry may be incorrect. In certain circumstances the Radio Altimeter (RA) may be the only data that will be at variance. It is important to appreciate that when an incorrect QNH is set, checking Altitude against Distance from the Approach Plate will not – of itself – detect a vertical position error on a 2D or 3D BARO-VNAV approach.
- 3.3 Flight Crew Training should include technical training to ensure flight crew understand the effect of aircraft configuration on TAWS alerts. It should be emphasised that approaches conducted with an incorrect pressure altimeter sub-scale setting may lead to CFIT without a prior TAWS ground proximity alert. However, TAWS Mode 6 callouts activating during an approach at an unexpected Barometric Altitude, Radio Altitude (RA), or distance from the runway could be a possible indication of a mis-set QNH. For this reason, training should ensure flight crew understand the precise mechanisation of the Mode 6 callouts on their aircraft, and how they could help with mis-set QNH detection.

- 3.4 Operators should consider upgrading TAWS to incorporate the latest Terrain Clearance Floor (TCF) alert envelope as recommended by FAA Special Airworthiness Information Bulletin SAIB [NM-15-11](#) dated 13 March 2015 and any other TAWS improvements such as functionality to compare the corrected Barometric Altitude against GPS altitude early in the approach already available for some TAWS.
- 3.5 Operators should consider adding LPV approach capability to Flight Management Systems when available. Vertical guidance generated by SBAS (RNP APCH) or ILS / GBAS (GLS) is not vulnerable to an incorrect Barometric setting.
- 3.6 Depending on aircraft type and equipment standard, there may be other systems available to flight crew that could aid detection of mis-set QNH, including Vertical Situation Displays (VSD), HUD EFVS and Synthetic Vision Systems (SVS - on the PFDs or HUD). Operators may wish to consider reviewing and addressing this during training, particularly during flight simulator sessions where systems behaviour with a mis-set QNH can be demonstrated.
- 3.7 Operations at temperatures differing from ISA will cause Barometric Temperature Error. Even a small difference from ISA temperatures can cause the approach flightpath to be steeper or shallower than published. Whilst this is allowed for in instrument procedure design within charted limits, it changes the relationship between indicated Barometric Altitude and Radio Altitude (RA) during the approach. This might make it more difficult to detect a mis-set QNH or could give the appearance of a mis-set QNH when in fact the flightpath error is caused by non-ISA temperatures. The diagram below refers. For further information see [here](#).

**Baro VNAV Flight Guidance: effect of mis-set QNH, compared to effect of off-ISA OAT with altimeter temperature compensation not applied**

For all cases shown, vertical flight guidance will look correct and cross-checks of barometric altitude vs distance per the approach procedure will appear correct, even though the flight path is not correct and could be unsafe.



- 3.8 Flight Crew and Air Traffic Control Officer (ATCO) training should include how, why, and when MSAW (Minimum Safe Altitude Warning) alerts are generated as well as necessary actions and R/T calls as set out in [CAP 413](#) – Radiotelephony Manual. In addition, training should include reference to the [Barometric Pressure Setting Advisory Tool \(BAT\)](#) developed by [NATS](#).
- 3.9 Operators should ensure that 2D and 3D BARO-VNAV operations are captured within Safety Management Systems (SMS).

3.10 Operators and ANSPs should ensure that correct R/T phraseology is used.

#### **4 CAA Publicity**

4.1 The [CAA](#) has produced a video and podcast on this subject.

#### **5 Queries**

5.1 Any queries or requests for further guidance resulting from this communication should be addressed to [commsflightops@caa.co.uk](mailto:commsflightops@caa.co.uk).

#### **6 Cancellation**

6.1 This Safety Notice will remain in force until further notice.