

RASG-PA Safety Issue Alert

Increased Risk of Controlled Flight into Terrain due to Incorrect Altimeter Settings on RNAV Approach



RSIA-01

RASG-PA Safety Issue Alert 01 / 16 May 2024

Subject: Increased Risk of Controlled Flight into Terrain due to Incorrect Altimeter Settings on RNAV Approach

Threat: Potential Controlled Flight Into Terrain.

Intended Audience: Air carrier operators, flight crews, air navigation service providers (ANSPs), air traffic controllers and States' Civil Aviation Authorities.

Background: Recent serious events¹ have highlighted the importance of ensuring the accuracy of barometric altimeter setting when executing approach procedures that rely on it for vertical navigation. Vertical navigation such as RNP APCH to LNAV/VNAV minima, RNP AR APCH or vertical navigation that use the continuous descent final approach (CDFA) technique rely on BARO-VNAV equipment onboard to compute the vertical profile.

Due to the reliance of barometric altimeter by the vertical profile of an RNAV approach, an error of 1 hectopascal (hPa) or 0.0295 inches of mercury (inHg) in the QNH translates to a deviation of 28ft in the displayed altitude. For instance, the flight crew in the event of the Paris-Charles de Gaulle (CDG) airport in France, had an incorrect altimeter information with an error of +10hPa (0.30 inHg) which resulted in the aircraft flying 280ft below of the intended altitude. However, the displayed altitude was correct thus providing a false altitude information to the flight crew. The diagram in Figure 1 shows the difference between intended and actual path when an incorrect QNH (or QFE) is used.

The risk of Controlled Flight into Terrain (CFIT) increases when inaccurate barometric altimeter values are used to fly RNAV approaches, especially at airports

with no Instrument Landing Systems (ILS). The aircraft's proximity to the published RNAV approach path may not trigger a *Too Low Terrain* alert by the Terrain Awareness Warning System (TAWS) because the flight path remains outside of the Terrain Clearance Floor (TCF) alert envelope (fig.1) or is inoperative. Combined, these factors effectively eliminate an important safety barrier against CFIT.

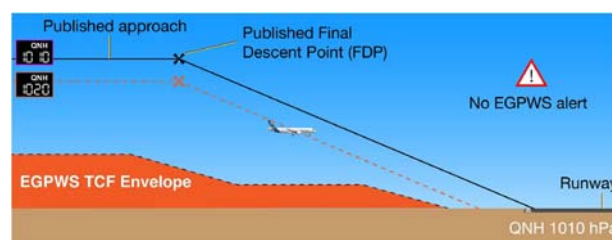


Figure 1: Example of the effects of an incorrect BARO altimeter setting²

An RNAV approach coupled with the ILS may help keep the aircraft off unsafe altitudes (as the ILS glide slope keeps the aircraft at a safe altitude); however, relying on the ILS alone does not necessarily mitigate the risk posed by an incorrect altimeter setting as it can still be a hazard even when executing an ILS approach. For example, executing an early go-around with an incorrect altimeter setting may result in the crew relying on the wrong altitude information still thus the potential of CFIT remains.

Although RASG-PA emphasized the use of TAWS to mitigate the risk of CFIT in the RASG-PA Safety Advisory (RSA) 07B³, recent events have highlighted a limitation in the system not addressed in the RSA. (See recommendations on the next page)

¹ Preliminary report: 9H-EMU, Airbus 320. Paris-Charles de Gaulle airport - 23 May 2022.
https://bea.aero/fileadmin/user_upload/BEA2022-0219_9H-EMU_preliminary_report_for_publication_EN_finalise.pdf

² Graphic courtesy of The Airbus Safety Magazine, November 2022- *Use the Correct BARO Setting for Approach*

³ RSA07B: Mitigations for CFIT (issued on October 2023)
<https://www.icao.int/RASGPA/Pages/RASGPA-SA.aspx>

Recommendations: To mitigate the risk of using an incorrect barometric altimeter setting, RASG-PA recommends the following:

To Air Carrier Operators:

- Ensure that flight crews are made aware of the importance of receiving and inputting accurate barometric altimeter settings when flying RNAV approaches (approaches using baro-VNAV function) to prevent CFIT accidents. If there is doubt, flight crews must query air traffic control to ensure the correct barometric altimeter setting is received, especially when flying into airports without digital ATIS (D-ATIS). Flight crews should be aware of potential transcription errors on the ATIS due to language, poor handwriting, etc. Ensure both pilots are independently verifying the altimeter setting.
- Given that the number one contributing factor of incorrect altimeter setting is flight crews not changing the departure airport's altimeter setting to the arrival airport's altimeter setting, operators should ensure crews are aware of this error and develop procedures to help pilots verify they use the landing airport's altimeter setting.
- Develop procedures to support flight crews in checking the consistency of the QNH with previous settings and other available sources (e.g. ATIS).
- Leverage the FDM/FOQA program to identify the prevalence of incorrect altimeter setting events to mitigate the risk.
- Be aware of the potential confusion of flight crews when flying to airports that use barometric pressure units different to the units they use in their domestic airports i.e. hectopascal (hPa) vs inches of mercury (inHg). To address this confusion, ensure flight crews are extra vigilant of the barometric pressure units they use when flying into locations that use different units.

To ANSPs:

- Ensure that air traffic controllers are aware of the importance of issuing accurate barometric altimeter settings to flight crews flying RNAV approaches (such as approaches that use baro-VNAV function) to prevent CFIT accidents.
- If the airport does not have a D-ATIS, ensure accurate and clear barometric information is recorded on the ATIS. When in doubt, re-issue the altimeter information directly to the flight crews.
- Ensure correct barometric altimeter settings are correctly read-back by flight crews.
- If the capability exists, consider the use of the barometric pressure settings that Mode S enhanced surveillance (EHS) equipped aircraft downlink to enable timely identification of aircraft operating with incorrect barometric altimeter setting.
- If the barometric information is not easily available and requires air traffic controllers to use conversion tables, consider changing this method by providing controllers with a direct reading method that is not susceptible to human error.
- Ensure that air traffic controllers are aware of the existence of the potential confusion associated with different barometric unit use among international flight crews. If controllers suspect that one of the flights under their control might be using different units, they should verify that flight crews are using the correct barometric units. When these errors are identified, ANSPs should communicate them to the operators' safety department to avoid re-occurrence and ensure that all crews flying to their locations are aware of the units used by the state's ANSP.
- Ensure that, when Minimum Safe Altitude Warning (MSAW) alerts are generated, controllers verify the aircraft's altitude and, if applicable, instruct the aircraft to climb immediately and re-issue the barometric altimeter information.

Note: In the context of the factors explained in this RSIA, air traffic controllers may be the only safety barrier against CFIT.

About RSIA: A RASG-PA Safety Issue Alert (RSIA) contains important safety information RASG-PA deemed important to share with the Pan-America region and may provide recommendations. The purpose of the RSIA is to timely inform air carriers, Air Navigation Service Providers (ANSPs), Airline and Pilot associations and Civil Aviation Authorities about a potential threat to safety in the region. RSIA's are designed to be concise while RASG-PA analyzes the safety issue further to develop comprehensive recommendations. RASG-PA members are advised to take note of the Alert to evaluate the occurrence of the identified safety issue in their operations with the purpose of mitigating it.