Main PBN REX: Paris CDG may 2022 near-CFIT

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SAFETY INVESTIGATION

Final report summary

Serious incident to the AIRBUS A320
registered **9H-EMU** and operated by Airhub Airlines
on Monday 23 May 2022
on approach to Paris-Charles de Gaulle airport (Val-d'Oise)

Transmission of incorrect altimeter setting (QNH) by air traffic service, near-collision with ground during satellite approach procedure with barometric vertical guidance

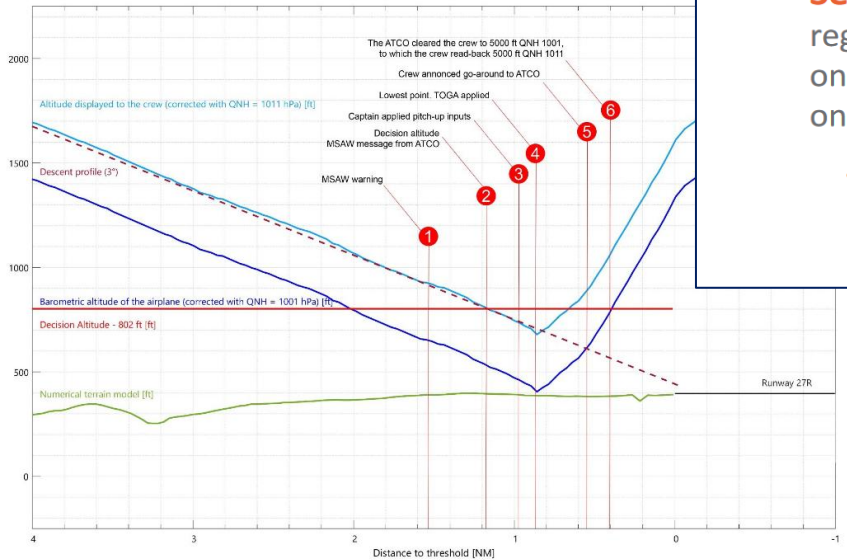

Figure 1: First approach profile, flight path computed from recorded flight parameters (source: BEA)

EUR OPS BULLETIN

Serial Number: **2023_001** Effective: **27 July 2023**

Subject: Risks related to altimeter setting errors during APV Baro-VNAV and non-precision approach operations

1. Introduction and scope

1.1 Recent incidents have highlighted that an erroneous altimeter setting can have serious consequences on flight safety during final approach operations. After recalling how aircraft barometric altitude is determined and used in certain approach operations, this bulletin lists a set of recommendations to mitigate altimeter setting errors.

EASA
European Union Aviation Safety Agency

Safety Information Bulletin

Operations – ATM/ANS

SIB No.: 2023-03

Issued: 09 March 2023

Subject: **Incorrect Barometric Altimeter Setting**

Ref. Publications:
None.

Applicability:
Aircraft operators and Air Navigation Service Providers.

Description:
Recent serious incidents have highlighted a concern on the effects of incorrect barometric altimeter settings when operating below the transition level. Operating with an incorrect altimeter

Safety first

The Airbus Safety magazine

Use the Correct BARO Setting for Approach

Using an erroneous barometric reference setting during approach may cause the aircraft to fly lower than the published approach

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DGAC SAFETY LEAFLET

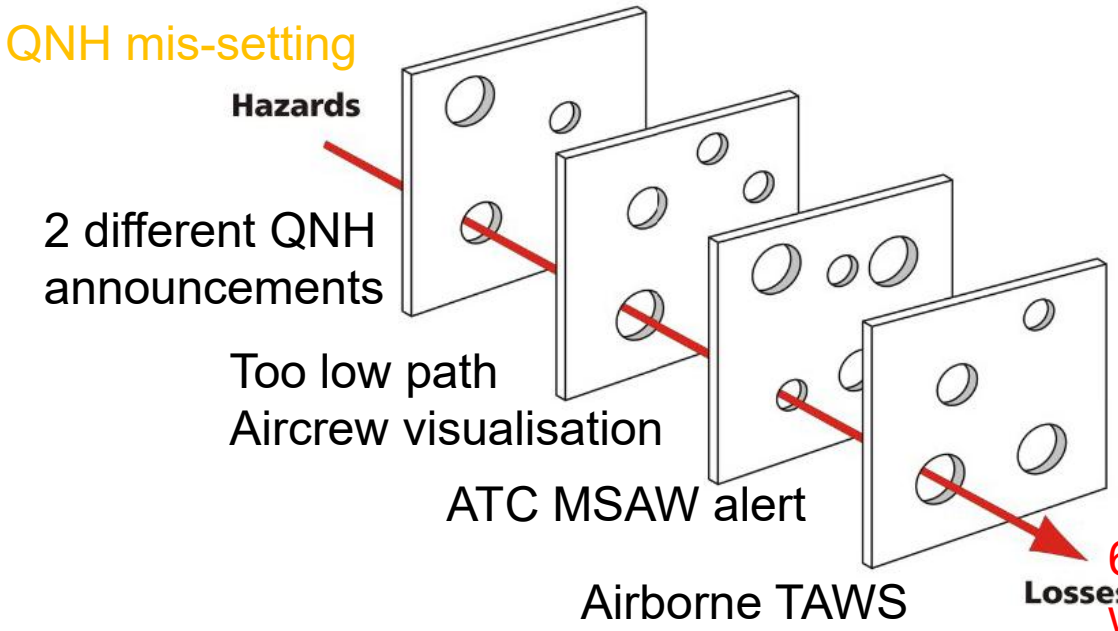
N° 2023/02

A safety Info Leaflet is a document widely distributed by DSAC, without regulatory obligation, whose purpose is to draw the attention of certain actors in the aviation sector to an identified risk or to promote best practices. This safety Info Leaflet is available on: https://www.ecologie.gouv.fr/info-securite-dgac

Operators concerned	Aircraft operators Instrument rated pilots Air Navigation Service Providers
Topic	Risks related to altimeter setting errors, in particular during APV baro-VNAV and non-precision approach operations

Issue with the absence of geometrical vertical guidance

- **What we observed in the case of Paris CDG near-CFIT:**

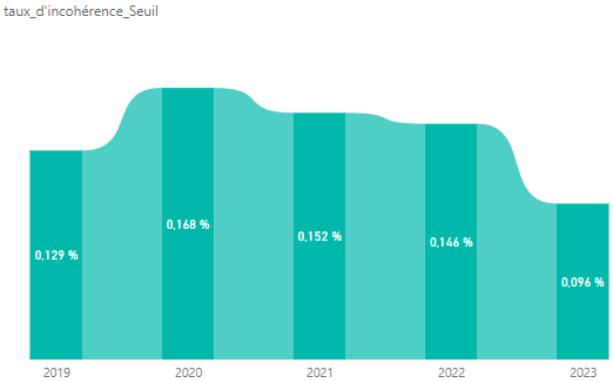


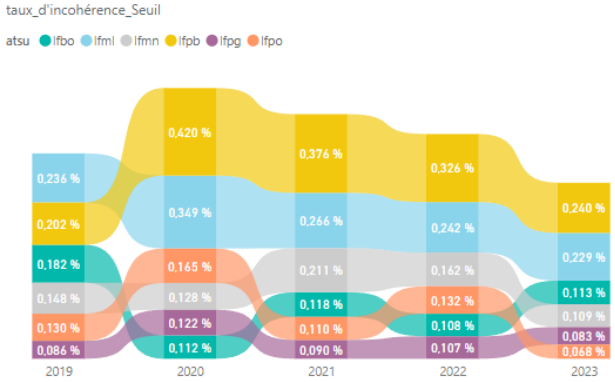
The only mitigation that saved the aircraft was a 50 ft add-on on the LNAV/VNAV **DH (360 ft published + 50 ft)**

6 ft above the ground well ahead of the runway

DSNA study: how really serious is the issue of QNH mis-setting ?

- A DSNA study was conducted in 2024 over **QNH data** recorded from **2019 to 2023** over **6 main airports** in France, which involved **1 694 266 flights** during this period.
  - **2269 occurences of mis-settings** with a discrepancy **larger than 2 hPa** were found in the data base.
- As a consequence, one of the main findings of this study is that the statistics of the **integrity risk** of QNH mis-setting at landing is **at the very low level of 10-3/approach**,
  - with a **10-4/approach risk** to have an undetected erroneous airborne **QNH mis-setting larger that 10 hPa (i.e. 280 ft vertical error).**



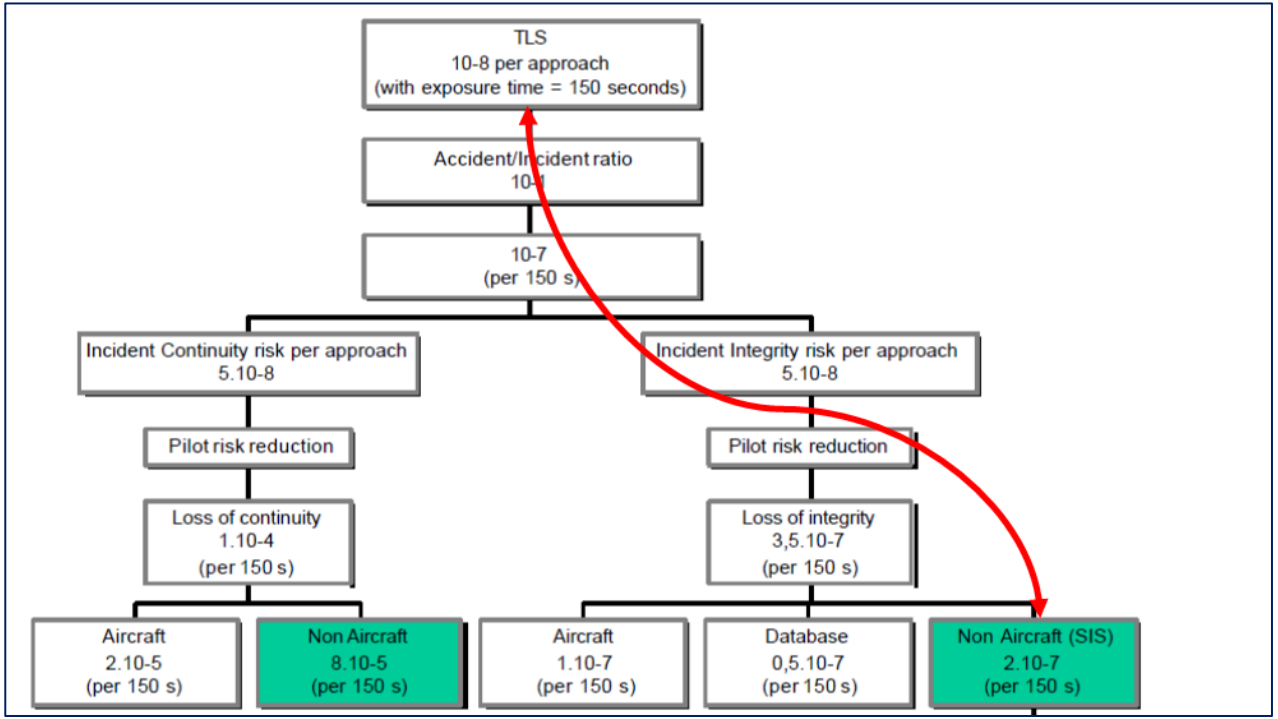


Impact of this very low 10^{-3}/approach integrity risk over ICAO defined TLS (Target Level of safety)

For SBAS/GBAS the integrity risk is <u>by design</u> around 10^{-7} /app, to meet the 10^{-8}/app TLS

↕

For BaroVNAV the integrity risk is <u>measured</u> around 10^{-3}/app, **meaning that the TLS is impacted by a factor 10 000 !**



A 2025 independent Eurocontrol Study confirms DSNA findings on the high level of barometric risk

An Algorithm for Identifying Altimeter Setting Errors from ADS-B Data

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***Abstract*—This study introduces an algorithm designed to detect barometric pressure setting (BPS) errors in large-scale flight data. The algorithm leverages Automatic Dependent Surveillance-Broadcast (ADS-B) data to detect deviations from the expected BPS values. A statistical model incorporating pilot-selected QNH**

contrast, is the true vertical distance above a reference surface such as the WGS84 ellipsoid. While geometric altitude is more unbiased [2], barometric altitude remains a primary reference due to its historical adoption and standardized procedures in

- The study analyzed landing operations over **378 EU airports during 31 days (which represented 747 353 flights)**

- The study found **196 occurrences of QNH mis-setting higher than 5 hpa,** over 747353 flights, thus a > 5hPa integrity risk of the order of **10-4 per approach**

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Also a qualitative analysis shows why, in Europe (and possibly other ICAO regions), the QNH risk seems significantly higher that in North-America.

- **NAM: The altimeter setting is given as inches of mercury (in Hg), not as hectopascals (hPa):** the vertical impact of most significant errors is reduced by a factor 3.
- **NAM:Transition level is FL180:** reducing the risk of inserting the QNH during a lower and higher workload phase of flight.
- **NAM:The language used (English) is the mother tongue of air traffic controllers and of a large proportion of pilots:** reducing the risk of transmission errors, read-back errors or incorrect information not being detected.
- **NAM:The PBN approach procedure are designed with TERPS criteria:** more conservative in term of LNAV/VNAV minima, alternatively to PANS-OPS.

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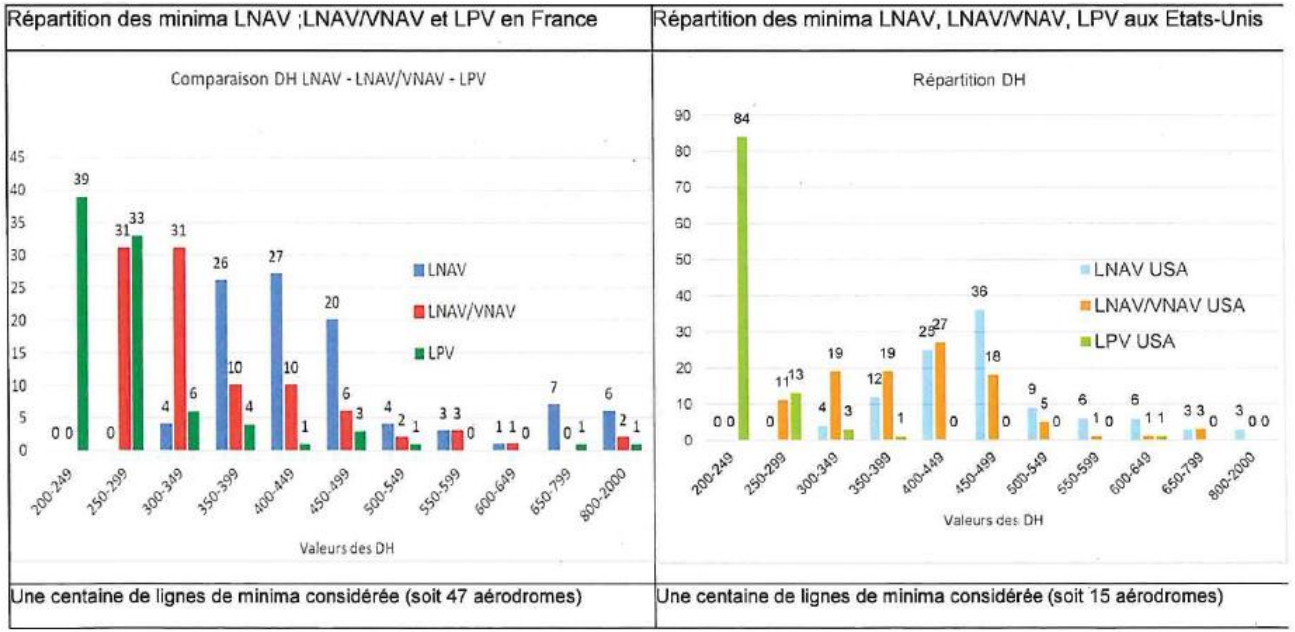
dgac DSNA

France surveillance authority (DSAC) now considers that too low DH of barometric based PBN ops is a safety issue

- **DSAC safety assessment was conducted + DSAC checked the distribution of LNAV/VNAV minima (DH)** obtained with TERPS in the USA and ICAO PANS OPS in France

  - **29 % LNAV/VNAV minima in USA** are inferior to 350 ft

  - **65 % LNAV/VNAV minima in France** are inferior to 350 ft



Consultation to raise all barometric based PBN minima in France

- As a consequence, DSAC has issued a consultation on 28 July 2025, informing of its plan **to raise all France airports barometric operational minima as follows:**
  - The published minimum descent heights (MDH) for LNAV approach procedures will be raised to 400ft where they are currently below this value.
  - The decision heights (DH) of LNAV/VNAV approach procedures will be raised to the higher of the following two values: 400 ft or the current value increased by 100 ft, without however being able to exceed the value of the MDH of an LNAV procedure on the same QFU.
  - The minimum DH value for RNP AR procedures will be increased to 350ft.
  - The runway visual range (RVR) values for LNAV and LNAV/VNAV procedures will be updated on the basis of these new DH values. The minimum RVR value for these procedures will be increased to 1500m.
- **An impact study in term of airport accessibility** has also been provided
- Consultation closed 19th September, final decision to be published in the AIP by Q4 2025**, decision implemented by DSNA from 2026**

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Consultation to raise all barometric based PBN minima in France

Aéroport	QFU	LNAV MDH actuelle	LNAV/VNAV DH actuelle	LNAV MDH future	LNAV/VNAV DH future	LNAV hausse MDH	LNAV/VNAV Hausse DH
Paris CDG	08L	430	340	430	430		90
	08R	450	340	450	440		100
	09L	460	340	460	440		100
	09R	390	340	400	400	10	60
	26L	420	340	420	420		80
	26R	490	340	490	440		100
	27L	490	340	490	440		100
	27R	490	340	490	440		100
Paris ORY	02	400	300	400	400		100
	06	430	310	430	410		100
	07	440	300	440	400		100
	20	400	290	400	400		110
	24	430	330	430	430		100
	25	420	310	420	410		100
Nice	04L (API 2,5%)	660	620	660	660		40
	04L (API 3%)	490	480	490	490		10
	04L (API 4%)	380	360	400	400	20	40
	04R (API 2.5%)	610	580	610	610		30
	04R (API 3%)	420	440	420	440		0
	04R (API 4%)	380	350	400	400	20	50
Marseille	13L API 2,5%)	540	460	540	540		80
	13R (API 2,5%)	590	500	590	590		90
	31L	1170	470	1170	570		100

Conclusion

- **EASA has also now taken France surveillance authority barometric concerns on-board**, and has launched its own analysis of barometric safety issues.

- We now **collectively** know that the barometric PBN landing technology cannot match the Target Level of Safety (TLS) for approaches in EU: **this is a major PBN paradigm change, which strongly increases in contrast the landing safety importance of SBAS.**

- The too low barometric operational minima designed through ICAO PANS-OPS (vs. TERPs) increases the risk: **the proposed France authority raise of minima will increase the role of SBAS to maintain the best airport accessibility, for PBN landings.**

- We need as a consequence a **faster adoption of SBAS by commercial aviation. We need everyone help: this is a EU safety issue.**

- We also need **industry** to workout **SBAS vertical guidance solutions for the most complex PBN landing applications,** such as RNP AR and RNP VPT.