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CHARGÉ
DES TRANSPORTS

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*Fraternité*

dgac direction générale de l'Aviation civile
DSNA

# EGNOS benefits in France

B Roturier – DGAC/DSNA France

# Introduction

- **DSNA, the French ANSP, is involved in a 3 step Performance Based Navigation (PBN) implementation process**
  - First step was compliance with A37/11 ICAO resolution, aiming in particular to generalize **approaches with vertical guidance + specific ILS rationalization**. *Completed.*
  - Second step is implementation of PBN all phases of flight in compliance with **EUR PBN regulation (PBN IR).** *Nearly completed (target end 2025).*
  - Third step aims to derive **new benefits from PBN, in particular related to greener aviation**, by implementing specific projects in close consultation with airspace users (CDO, RNP VPT, PBN to ILS) *In progress.*

# PBN Step 1. Early EGNOS benefits

# Performant vertical guidance + ILS rationalisation

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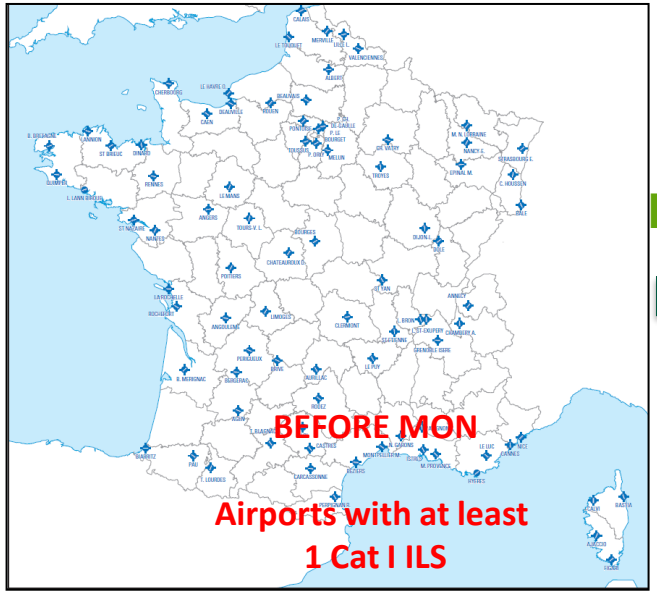
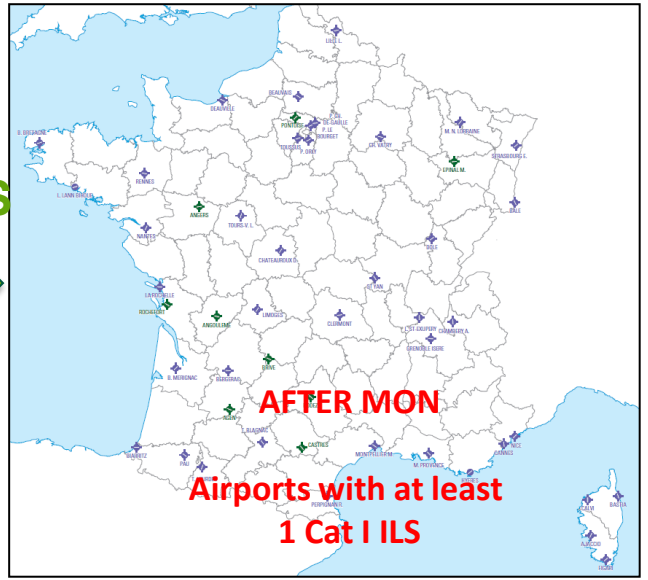
# Category I ILS rationalization (2010-2020)




116 ILS over 79 airports

EGNOS




64 ILS over 38 airports

# PBN Step 2. EU PBN regulation

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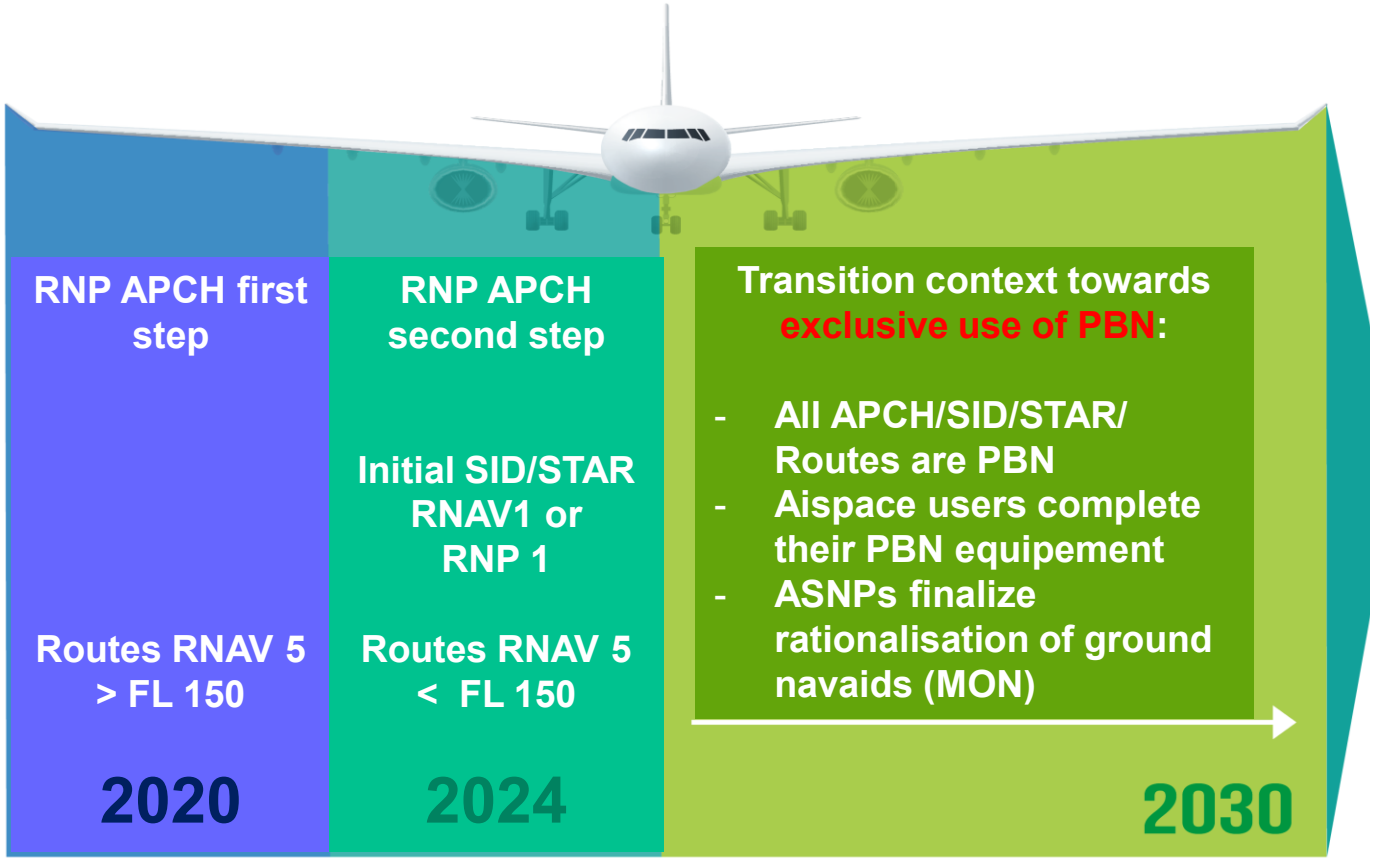
# Step 2: Current European PBN Implementing Rule



RÈGLEMENT D'EXÉCUTION (UE) 2018/1048

**2018**

**RNP APCH first step**

Routes RNAV 5 > FL 150

**2020**

**RNP APCH second step**

Initial SID/STAR RNAV1 or RNP 1

Routes RNAV 5 < FL 150

**2024**

**Transition context towards exclusive use of PBN:**

- All APCH/SID/STAR/ Routes are PBN
- Aispace users complete their PBN equipement
- ASNPs finalize rationalisation of ground navaids (MON)

**2030**

**EGNOS becomes the main landing system in Europe (Cat I)**

**Use of BaroVNAV if not EGNOS equipped**

**ILS Cat I serviceable only under contingency**

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# DSNA PBN transition plan

**The regulation requires a detailed implementation plan by ANSPs:**

- DSNA in charge of 70 to 80 airports for PBN implementation

- in addition, DSNA was also involved in many France AFIS airports RNP APCH publications

- DSNA is the EUR ANSP involved in the largest number of RNP APCH/SID/STAR design and implementation (regulation virtually implies publication of 865 PBN different items by DSNA)

# PBN current publications status @ AIRAC cycle 07/25

100% PBN IR conformity achieved by Nov 2025

- **RNP APCH: 70 airports, 174 IREs**
  - EASA criteria: 100 % implemented for 2020 target, 98% for 2024

100% PBN IR conformity achieved by May 2026

- **SID: 80 airports, 194 IREs**
  - EASA criteria: 90 % implemented
- **STAR: 80 airports, 192 IREs**
  - EASA criteria: 93 % implemented

# PBN Step 3. EGNOS vs. Environnemental benefits

# Step 3. DSNA Green Aviation policy

SBAS Compatible

# PBN to Final

# Paris ORY CDOs

***PARIS ORLY 2025***

***PARIS CDG ?***


PBN to ILS
DESCENTE DOUCE

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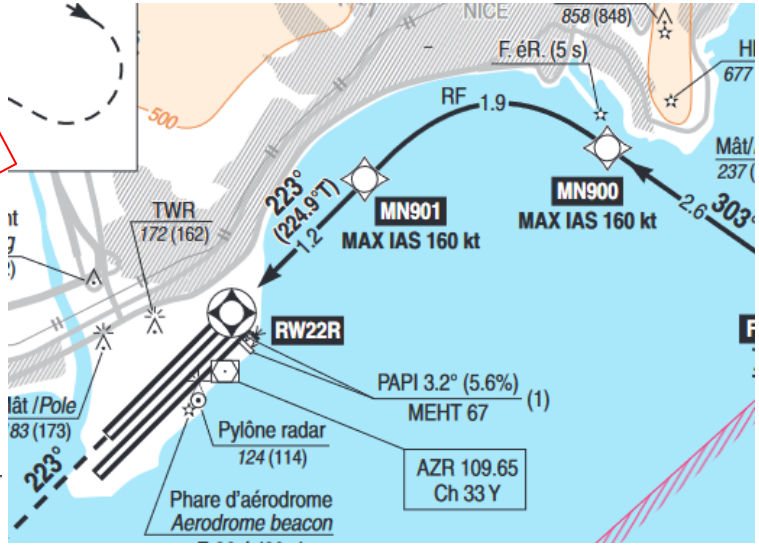
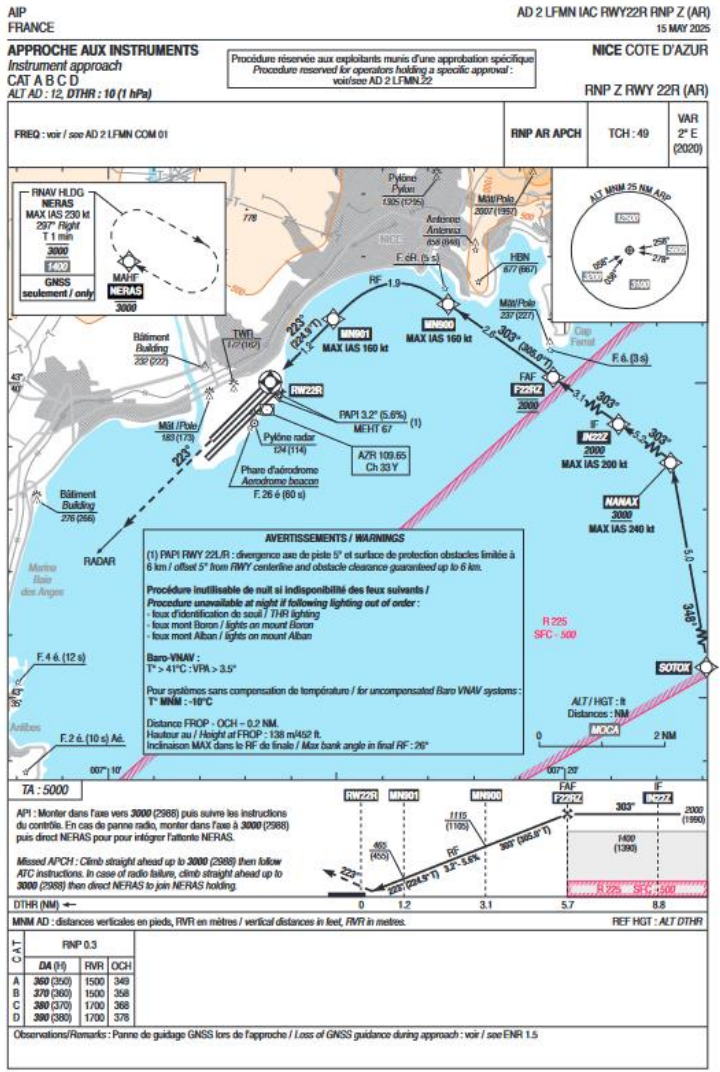
# RNP AR @ NICE

**Non (yet) SBAS Compatible**




| CAT | RNP 0.3 | | |
|---|---|---|---|
| | ***DA*** (H) | RVR | OCH |
| A | ***360*** (350) | 1500 | 349 |
| B | ***370*** (360) | 1500 | 358 |
| C | ***380*** (370) | 1700 | 368 |
| D | ***390*** (380) | 1700 | 378 |



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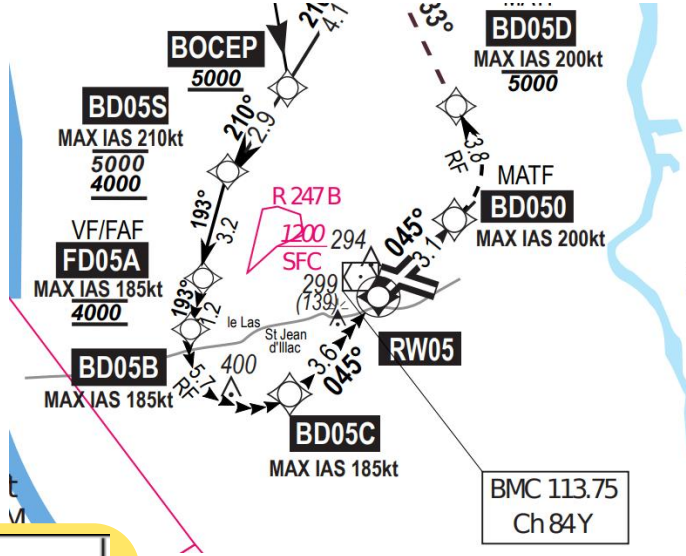
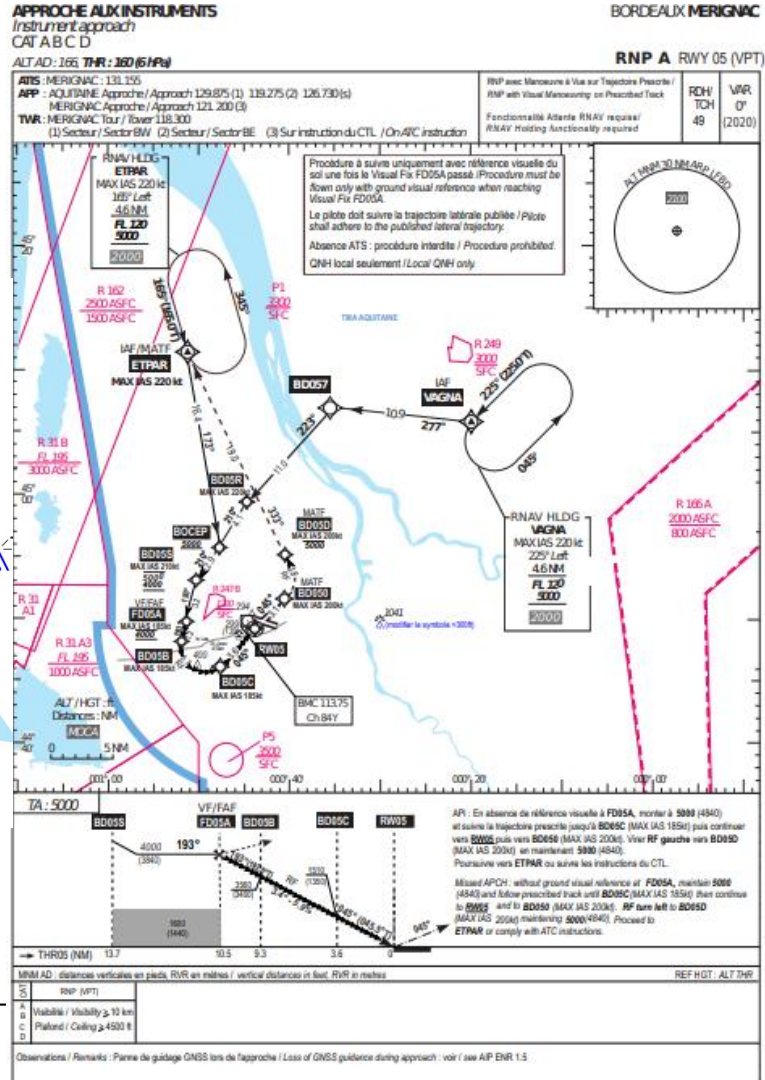
# RNP VPT @ BORDEAUX

**Non (yet) SBAS Compatible**




| CAT | RNP (VPT) |
|---|---|
| A B C D | Visibilité / *Visibility* ≥ 10 km<br>Plafond / *Ceiling* ≥ 4500 ft |



# Status of RNP VPT and RNP AR publications

| | RNP AR | RNP VPT |
|---|---|---|
| St Denis la Réunion | Published | |
| Ajaccio | Published | |
| Bordeaux | Published | Published |
| Nice | Published | |
| Marseille | Under study | Under study |
| Chambery | Published | |
| Calvi | Under study | |
| St Nazaire | Under study | |
| Pointe à Pitre | Under study | Under study |
| Bale Mulhouse | To be launched | To be launched |
| Paris CDG | Under study | |
| Nantes | Under study | |

# 20 years of PBN implementation:

# The main REX for France

# Main PBN REX: Paris CDG may 2022 near-CFIT

BEA
Bureau d'Enquêtes et d'Analyses
pour la sécurité de l'aviation civile
www.bea.aero
@BEA_Aero

**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**

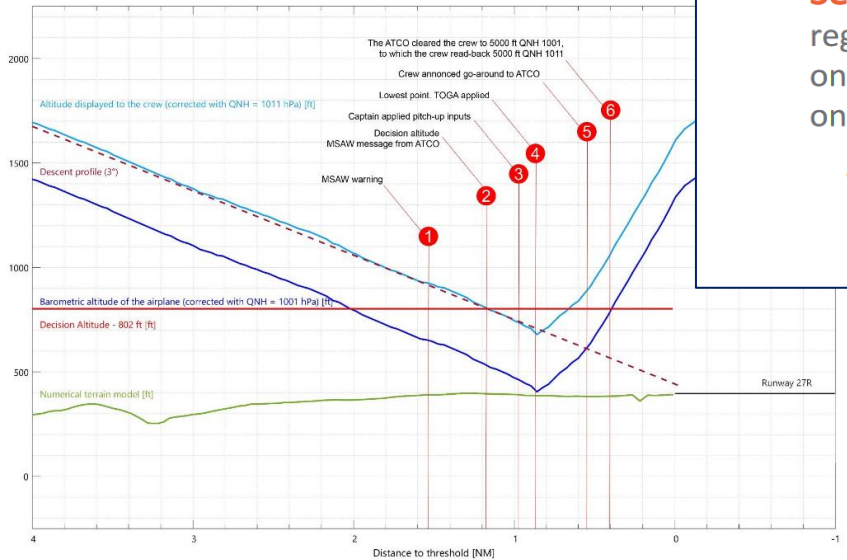



Figure 1: First approach profile, flight path computed from recorded flight parameters (source: BEA)

# 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

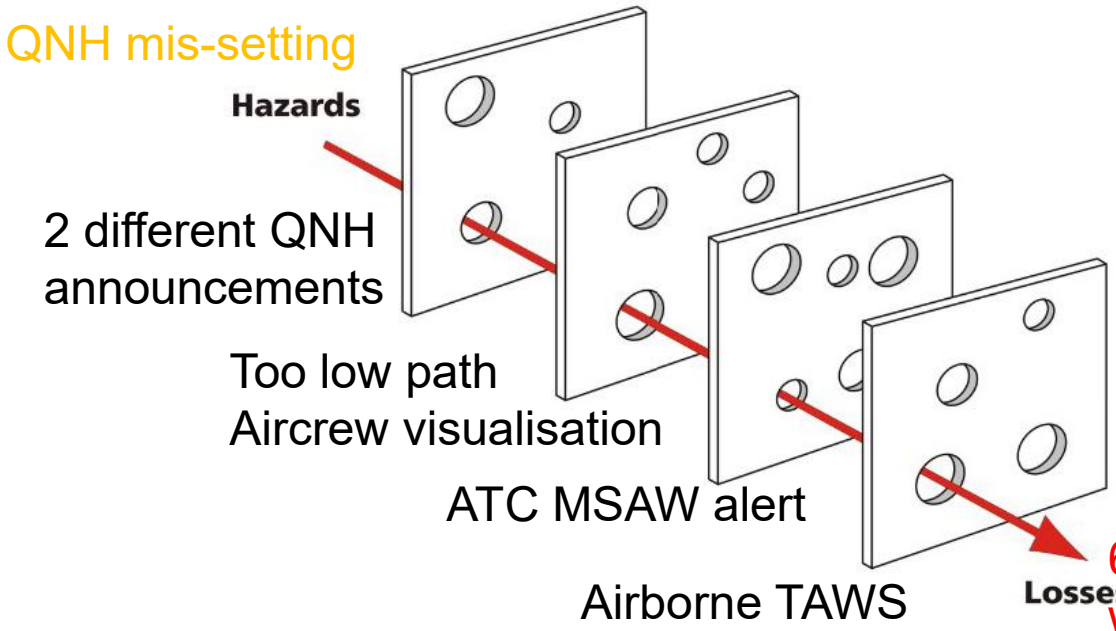
**N° 2023/02**

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<br>Instrument rated pilots<br>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:**

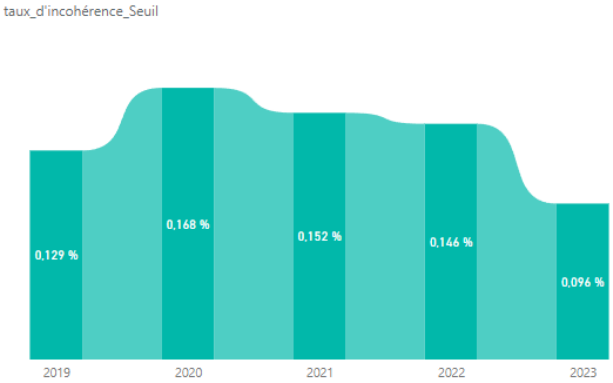


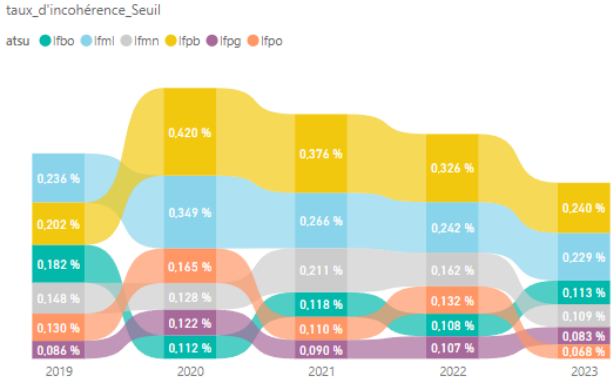

The only mitigation that saved the aircraft was a 50 ft add-on on the LNAV/VNAV **DH (360 ft published + 50 ft)**

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).**



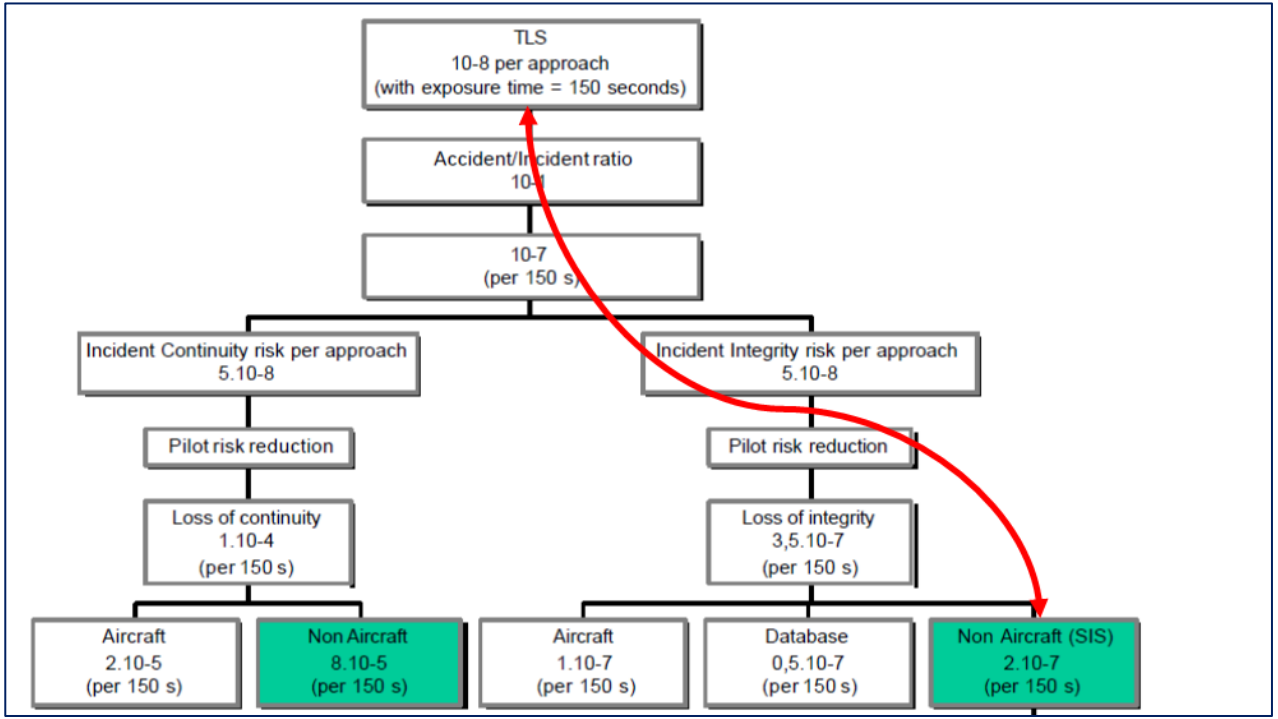



# Impact of this very low $10^{-3}$/approach integrity risk over ICAO defined TLS (Target Level of safety)

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**

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

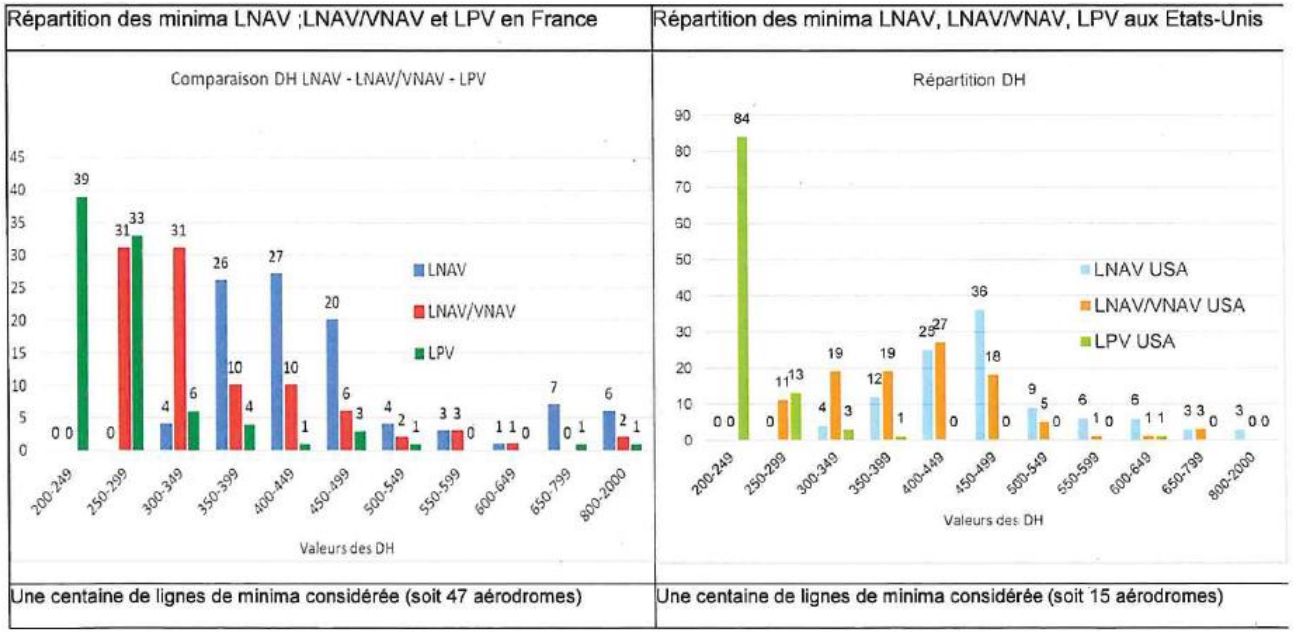
- **NAM: The altimeter setting is given as inches of mercury (in Hg), not as hectopascals (hPa):** the vertical impact of most significant errors is reduced by a factor 3.
- **NAM:Transition level is FL180:** reducing the risk of inserting the QNH during a lower and higher workload phase of flight.
- **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.

# 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.

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# Thank you! Questions?