First LPV 200 approach in Europe

Paris Charles de Gaulle

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PBN Implementation Status
PBN FOR APPROACHES
TARGETS FOR FRANCE

Modernizing/rationalizing French landing system infrastructure,
— improve safety, airport accessibility
— reduce ANSP’s costs (technology transition)

• PBN target for primary runways:
  — Best quality backup to ILS (outages, maintenance, renewal, etc...)
    • First LPV 200 published at Paris CDG March 2016 (4 runways)

• PBN target for secondary runways:
  — More direct paths, increased safety (vertical guidance in final),
    increased airport accessibility vs. conventional navaids

• PBN target for about 50 small/medium airports:
  — Cut landing infrastructure costs (ILS Cat I) by transitioning to PBN
    • LPV 200 now published at Cherbourg + others to come
PBN APPROACHES STATUS

• More than **200 runway ends** included in France PBN plan

• **GPS** implemented since 2004, **EGNOS** since 2011, **GPS + Barometric** vertical guidance since 2012

ICAPO
PBN RNP
APCH
A37-11
target

Yearly
achieved
rate
**PUBLISHED PBN PROCEDURES**

**Total France Sept 16**

- **221 PBN Runways:**
  - **217 GPS**
  - **138 EGNOS**
  - **6 LPV 200 EGNOS**
  - **73 GPS + Baro**
PBN with EGNOS supports France ILS CAT I rationalisation plan

2016: ILS reduced network

2016: Airports where the existing ILS Cat I is proposed to be replaced by a PBN approach with LPV

About 5 M€ yearly savings
Contributes to the French Landing Tax reduction program:
- 2018: 225,50 €
- 2017: 224,45 €
- 2016: 227,1 €
- 2015: 228,62 €
- 2014: 233,23 €
Charles de Gaulle LPV 200
PARIS CDG TARGETS

• The 8 ILS of the 8 CDG runways have to be replaced between 2016 and 2020
  – Decision to implement PBN, with vertical guidance required, as the main backup to mitigate ILS unavailability (around 2 month per ILS)
  – Implementing LPV 200 was an opportunity to demonstrate to the community the potential benefits of LPV over a major European airport
  – We also have LPV 200 early users (Vietnam Airlines A350, HOP ATR 42, SWISS Bombardier,...)

• Inaugural LPV 200 flight conducted the 3rd May 2016
  – With Airbus A350, a Falcon 2000X and an ATR42-600
Jean-Christophe Lair, Airbus Experimental Test Pilot: “Airbus is pleased to have demonstrated that the A350 XWB complies with the new RNAV (GNSS) approaches with satellite-based augmentation, as implemented at Paris Charles de Gaulle. **These approaches will be a valuable backup to the airport’s traditional ILS approaches** and will maximise runway availability for the A350 by maintaining CAT1 capability, down to 200ft decision height, even **when the ILS ground station is not available.**”

Eric Delesalle, ATR chief pilot: “The LPV system is much more stable and more reliable in terms of safety, but also more efficient than the ILS approach. It really makes a difference”

Jean-Louis Dumas, Dassault flight test pilot: “Lowering the LPV minima down to 200ft in Europe is a great improvement enabled by EGNOS, and is **very valuable for business aviation operations**”

Peter Koch, chief of the Bombardier C Series fleet at SWISS: “The accuracy and stability of the LPV guidance is impressive, as completely independent from ground installations. Lowering the LPV minima down to 200ft in Europe is a great improvement and very valuable. **The approach procedure is straight and simple, and there is no necessary changeover regarding the FGS with respect to conventional approach aids**”
CHANGING FROM LPV TO SBAS CATI

- Is it an easy-to-conduct change?
- Introduction of “LPV 200” procedures on French airports led to analyse in detail if and how the different bricks that are involved in procedures design and promulgation processes are impacted by the change.
MAIN BRICKS CONSIDERED BEFORE IMPLEMENTATION

- Procedure design criteria
- Aerodrome operating minima
- SBAS CATI
- Promulgation
- Procedure implementation
- ATCO training
- NOTAM
Change of criteria to assess obstacles in final:

- Same criteria as ILS (OAS and CRM) **because it is a precision procedure**
- No influence of the runway category on design criteria (precision RWY or non precision RWY)
- Change of FAS DB (VAL 35m)
- Same trajectory cannot always optimize both LPV and LNAV/VNAV minima

**Procedure designers need continuous training**
Depend on OCH value (PANS OPS)

Influenced by runway category (annex 14)

SBAS CAT I operation can be designed for

- Non-precision approach runways (DH ≥ 250ft)
- Precision approach runways (DH ≥ 200ft)

SBAS CATI procedure can be designed for a **Non-precision Runway** but the **DH shall be higher than 250ft**
No specific phraseology

Significant aspects to be pointed out to ATCOs

- SBAS CAT I lighting requirements are the same as for ILS CAT I
- SBAS CAT I operations do not require an ILS available on the runway

No specific training but some information to facilitate good understanding of the procedure.
On aerodromes with both legacy LPV and SBAS CAT I procedures, a NOTAM is published when SBAS CAT I unavailability is predicted

Only ONE SBAS NOTAM is published per aerodrome
CHARTING
Why SBAS Cat I is a significant evolution (a revolution?)
SBAS CAT I INCREASES VERY SIGNIFICANTLY AIRPORT ACCESSIBILITY - ABSENCE OF ILS

• At virtually no cost !!
  • Free Cat I signal falling from the sky

• People who continue claiming that GPS + Baro and SBAS are equivalent solutions, are misleading the community
  • See the performance difference at Paris CDG

• Statistically, every year, one of the main European airport (PCP) will have to support close to 2 months of ILS outage due to ILS life cycle/replacement period needed
  • Why is this significant SBAS Cat I advantage not taken on board for shaping the future of European network?
  • Why is IATA unable (up to now) to prepare the future to get progressively these benefits - at no cost?
SBAS INCREASES VERY SIGNIFICANTLY APPROACH SAFETY - ABSENCE OF ILS

- Many weak signals shows us that the other PBN technology supporting vertical guidance (GPS+ Baro) has the potential to create serious incident/accident:
  - **Internal airline reports:** pilot do mi-set QNH (typically 10 mb = 280 ft vertical error)
  - **Human factor analysis:** altimetry error is suspected to be a 20% contributor to large jet CFIT occurrences
  - **Flight Safety Foundation statistics:** “Barometric altimeter setting/reading. The incorrect setting or reading of the barometric altimeter has been associated with some CFIT accidents. The necessary data were available in only 16% of the accident reports or summaries. In five accidents (3.2% of the total sample), the barometric altimeter was set incorrectly. In only one accident (0.6%), was the barometric altimeter read incorrectly”
  - **Official incident reports:** many FSF reports, BEA Incident Report, Lyon St Exupéry Nov. 2009, ATR42, (19 mb mis-setting = 530 ft error), safety nets saved the aircraft
  - **Biarritz ATC QNH system mis-setting by Meteo France:** in 2013, 7 mb = 200 ft vertical error broadcasted by ATC during half a day

- If any SBAS or GBAS created such errors, they would be stopped instantaneously.
  - But when Baro is concerned, it seems that nobody really cares

- GPS+Baro is probably acceptable within a transition situation (meaning up to now), but not as a viable ILS backup strategy for the long term
  - In particular when free Category I signals flow from the sky
  - We are now in the XXIst century guys!