# PBN Program

## French Polynesia

# Progress Report n°4

December 2016

SNA/PF

## 1. Executive Summary

The implementation of Performance Based Navigation (PBN) in French Polynesia (SEAC PF) controlled airspace has been delivered over three major periods: short term (2012/2014), medium term (2015/2019) and long term (2020 and later). As a reminder, this plan is in keeping with the French PBN plan and with the French Coordinating Committee strategic guidelines for PBN.

Each phase enables progressively greater dependence on PBN (concepts and enablers) and ensures that the corresponding improvements to safety, efficiency and environmental impact are delivered to industry stakeholders.

The implementation of PBN in French Polynesia controlled airspace requires the allocation of significant resources by each of the key industry stakeholders and the SEAC PF / DSURV office. This investment is considered essential to securing the benefits for French Polynesia at the earliest opportunity. The benefits include:

- Safety improvements through greater adherence to a safe flight trajectory
- Efficiency improvements through changes to air route and approach procedure designs that minimize the air miles flown and enhance schedule reliability, provide greater conformance to the flight plan and reduce enroute traffic delays, which will collectively reduce total operating costs and improve on-time performance.
- Improved environmental performance through greater use of uninterrupted climb and descent trajectories which ensure that both Green House Gas (GHG) emissions and the noise footprint for aviation are minimized.

The key roles for stakeholders are:

**DSNA (Paris, France)** – Ensure that the relevant Safety Cases, DSAC processes, Civil Aviation Rules and guidance material enable a safe and efficient PBN environment that aligns with both International, regional and French standards.

**Aircraft Operators** – Ensure that investment in aircraft fleet capability is aligned with both the performance specifications outlined in this plan and the timeframe associated with each phase.

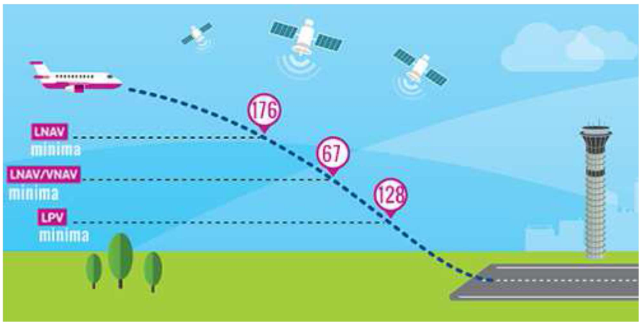
**SEAC PF** (French ANSP for French Polynesia) – Ensure that the local infrastructure (CNS/ATM capability) will support the airspace concepts and the performance specifications associated with each phase of PBN implementation.

**Aerodrome Operators** – Ensure the supporting aerodrome infrastructure for PBN operations is coordinated with aircraft operators and SEAC/PF.

**All Stakeholders ensure that sufficient trained and qualified personnel are available to support the implementation of PBN.**

## 2. Explanation of Terms

PBN stands for Performance Based Navigation. GNSS (Global Navigation Satellite Systems), such as GPS, notably contribute to PBN requirements in both en route and terminal areas:




## 3. Acronyms

The following is a list of acronyms used in this document:

ADS-B: Automatic Dependent Surveillance - Broadcast
ANSP: Air Navigation Service Provider
APCH: Approach
APV: Approach Procedures with Vertical Guidance
ATC: Air Traffic Control
ATM: Air Traffic Management
ATS: Air Traffic Service

Baro-VNAV: Barometric Vertical Navigation
CAA: Civil Aviation Authority
CNS/ATM: Communication Navigation Surveillance/Air Traffic Management
CTA: Controlled Airspace
DGAC: French Headquarter for Civil Aviation
DME: Distance Measuring Equipment
DSAC: French CAA
GHG: Greenhouse Gas
GNSS: Global Navigation Satellite System
ICAO: International Civil Aviation Organization
IFR: Instrument Flight Rules
ILS: Instrument Landing System
MOT: Ministry of Transport
NDB: Non Directional Beacon
OCA: Oceanic Control Area
PBN: Performance Based Navigation
PSR: Primary Surveillance Radar
RNAV: Area Navigation
RNP: Required Navigation Performance
RNP AR: Required Navigation Performance Authorisation Required
SEAC PF: ANSP for French Polynesia, part of French DGAC
SID: Standard Instrument Departure
SNA PF: ATS for SEAC PF
STAR: Standard Instrument Arrival
TMA: Terminal CTA
VOR: VHF Omni-directional Radio-range

## 4. Introduction

ICAO Assembly Resolution A36-23 urged each Member State to develop a national PBN implementation plan by the end of 2009, and for these plans, to include Approach Procedures with Vertical guidance (APV) for all instrument runway ends, either as the primary approach or as a back-up for precision approaches, by 2016.
Although a national plan has been defined for the implementation of PBN (Performance Based Navigation) operations in France, French Polynesia has chosen to perform its own version. Indeed, the objective is to meet the oceanic constraints, which are, in many ways, different from those in the mainland, and to fit in with the Asia/Pacific PBN Task Force working issues which SEAC/PF is contributing to.
The French Polynesia PBN Plan does not redefine the generalities included in the plan from France, but is rather a complementary one.
Finally, this road map must be used to support the transition towards RNAV, RNP concepts, specifically to ground technical equipment, embarked equipment investments and training needs.

### a) PBN Concept contribution

The PBN concept is contributing to optimize trajectories, which is essential to lower both fuel consumption and flight duration, while ensuring a high level of safety. The performance based navigation allows reducing separation standards applied between aircrafts. It is a means of increasing traffic flows within a same portion of airspace by avoiding costly upgrades on board the aircrafts.

To comply with those different challenges, new navigational specifications have been developed at an international level, to enhance performance, firstly due to RNAV surface navigation and more recently to RNP Required Navigation Performance. Those two are based on the use of new satellite navigation technologies (GNSS) and embarked systems. In comparison with RNAV, RNP features an additional function on board airplanes to monitor and alert performance degradation.

Here is what the ICAO PBN Manual (DOC 9613) tells us about PBN applications according to the flight phases.
The PBN concept not only reduces the fuel costs but also noise pollution and greenhouse gas emissions. Associated with a non-stop descent procedure, the plane is more silent during approach. Within inhabited areas, the use of RNP navigation specifications permit not to fly over areas exposed to noise. A plane will always be noisy, but it will be possible to make it drift off the course to where it will be less disturbing in terms of nuisance.

The PBN implementation, mainly based upon means of Satellite navigation, must be capable of redefining with stakeholders an infrastructure matching the future needs and cost control requirement.

### b) Coordinating activities

It is essential that the interest of all the partners of aviation is taken into account to define the PBN operations program in long term.
For French Polynesia PBN implementation, are associated for governance structure:

- Local: Air Tahiti Nui, Air Tahiti airlines, French Polynesian MOT, Military authorities and Tahiti Airport (ADT)

- National: DSNA and the PBN coordination committee sponsored by the DGAC (France).

- International: the PBN plan implementation is closely linked to the activities carried out by different international organizations (ISPACG), by ANSPs from adjacent FIR (namely KZAK and NZZO) and, at ICAO level, by the PAC Region members.

## 5. Present and Planned Capabilities

### Assessment of CNS / ATM infrastructure

French Polynesia stretches over a surface area of 12.5 million sq-km with 130 islands spread out. There are namely 3 state aerodromes (Tahiti-Faa'a, Raiatea, and, Bora Bora), 1 military, 9 private and 44 territorial.
The navigation aids have been the basis of IFR navigation for a long time throughout the various archipelagos in French Polynesia. NDB, VOR/DME and ILS, which are implemented, have

allowed the design of the overall ATS routes network and approach procedures that link numerous airfields.

Domestic network covers over a large area of the FIR, which is essentially an oceanic airspace with constraints in terms of:

- Controller-pilot communication (VHF/HF) and
- Navigation aids.

Indeed, in this airspace, conventional VOR/DME navigation aids located in Tahiti Leeward Islands, Huahine, Rangiroa and Hao leave Marquesas and Australes islands without DME means. 23 aerodromes in French Polynesia don't have any radio navigation aids and 19 have only a NDB type fix.

The radar installed in Tahiti has a 200 NM range, which represents only a small part of the FIR; thus, air traffic controllers get used to mixed separation standards and procedures according to the following scenarios:

- Lateral radar separation of 5 NM
- Procedural control of 100 NM lateral and of 10 to 15 min longitudinal separations
- Geographical lateral separation based on navigational equipment or ground visual
- 1000 ft vertical separation within RVSM Airspace (FL290 / FL 410)
- RNAV10 / RNP4 50/50 separations between aircrafts compliant
- Visual separation below FL 100
- GNSS separation for identified fleet

### Assessment of PBN Fleet Readiness

On November 2016, approximately 85% of the traffic is PBN capable:

- Air Tahiti ATR fleet: major domestic airline
- All international airlines with Tahiti services
- All corporate/business jets

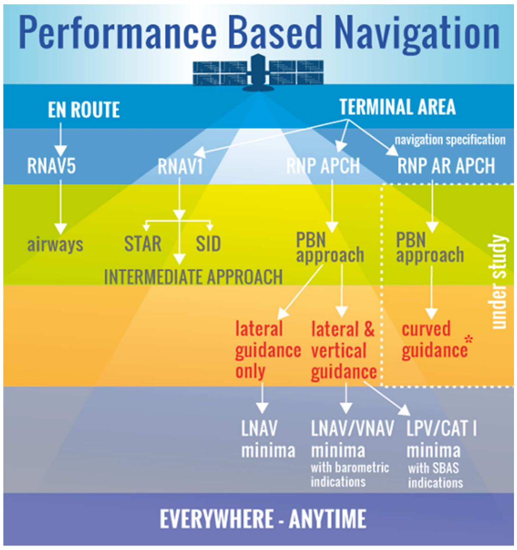
However further progress can be made for military aircrafts and General aviation: there are regular meetings in the processes of formulating and implementing policy. The needs of all categories of users of airspace and aviation infrastructure are given consideration in the planning.

## 6. Formulation of Regulations, Standards & Processes for Approval

As it has been previously announced, the French Polynesia PBN Plan does not redefine the generalities included in the plan from France, but is rather a complementary one.

So, Safety Cases, DSAC processes, Civil Aviation Rules and guidance material which enable a safe and efficient PBN environment are aligned with approved International standard under French DGAC authority.

## 7. PBN Operational Requirements & Implementation Strategy




I. From the needs that have been identified, SEAC/PF is developing a road map to implement the PBN Plan. This road map allows the carrying out of operations in compliance with international commitments.

It also must take into account the interests of the local stakeholders from the aeronautical community. Indeed, at this step, coordination is necessary, not only for its definition but also for its time-based deployment.

Future implementation studies for RNAV GNSS procedures in FIR TAHITI fields will take into account the following:

- Demands expressed by stakeholders: SNA/PF, ADT, DAC/PF and air operators.
- Available data identifying recent obstacles.
- Qualitative safety objectives (the improvement of approach conditions and operational minima), reduction of flight time (thus fuel consumption) and a reduction of $CO_2$ emissions.

II. Latest updates according to 2014/2016 roadmap:

- The PBN plan logic based on the equipment of all archipelagos is on-going: main distant airports are now RNAV GNSS equipped.
- 2015: year of the Austral archipelago (RURUTU and RAIVAVAE).
- 2015/2016: TAHITI FAAA publication of a BARO VNAV RWY 04, RNAV GNSS departure network
- Improvement of the existing RNAV GNSS network for Windward Islands: short tracks, vertical terminal phase and associated pattern

III. Following on from the implementation strategy, a roadmap is drawn up for 2017/2018.

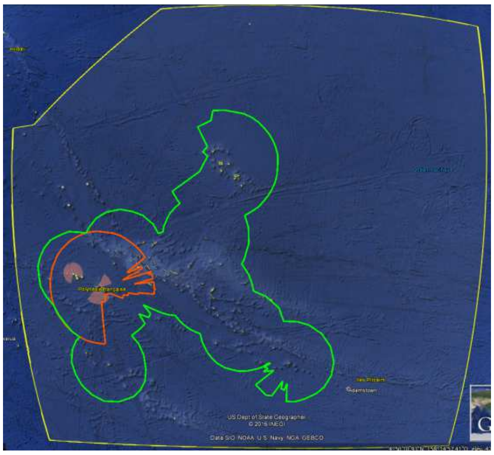
| Airport | OACI | Procedure | PBN Target |
|---|---|---|---|
| ANAA | NTGA | NDB 14/32 | 2018 |
| BORA BORA | NTTB | RNAV 11/29<br>NDB 29<br>NDB 11 | |
| FAKARAVA | NTGF | RNAV 05/23<br>NDB 05/23 | |
| FANGATAU | NTGB | NDB 08/25 | 2018 |
| HAO | NTO | RNAV 12/30<br>NDB 12/30 | |
| HIVA OA | NTMN | RNAV 02/20<br>NDB | |
| HUAHINE | NTTH | RNAV 07/25<br>NDB 07/25<br>VOR 07/25 | |
| MAKEMO | NTGM | NDB 11/29 | 2017 |
| MANIHI | NTGI | NDB 04/22 | 2017 |
| MAUPITI | NTTP | NDB 08 RNAV 08/26 | |
| MOOREA | NTTM | NDB 12 | 2018 |
| NAPUKA | NTGN | NDB 11/29 | 2018 |
| NUKU HIVA | NTMD | RNAV 06/24<br>NDB 06/24 | |
| RAIATEA | NTTR | RNAV 07/25<br>NDB 07<br>NDB 25 | |
| RAIVAVAE | NTAV | RNAV 06/24<br>NDB 06 | |
| RANGIROA | NTTG | RNAV 09/27<br>NDB 09/27<br>VOR 09/27 | |
| REAO | NTGO | NDB 11/29 | 2018 |
| RIMATARA | NTAM | NIL | 2017 |
| RURUTU | NTAR | RNAV 09/27<br>NDB 09 | |
| TAKAPOTO | NTGT | NDB 07/25 | 2018 |
| TAKAROA | NTKR | NIL | 2017 |
| TIKEHAU | NTGC | NIL | 2017 |
| TOTEGEGIE | NTGJ | NDB 12/30 | 2018 |
| TUBUAI | NTAT | RNAV 03/21<br>NDB 03 | |
| TUREIA | NTGY | NIL | 2017 |
| TAHITI FAAA | NTAA | ILS 04 / NDB 04<br>VOR 04/22<br>LNAV/ VNAV 04<br>LNAV/ VNAV 22 | |

- By the end of 2016, 57% of IFR RWY are PBN equipped

- New rules on AIR OPS for Airlines Operators create the need of IFR implementation on VFR previously approved fields. 2017 will be specifically dedicated to this issue.

## 8. Transition Strategies

- In addition to the PBN implementation plan, an ADS-B beacon deployment and related remote VHF antennas is on progress.



*Phase I 2017/2018: redlines*

*Phase II 2018/2020: green lines*

- With this project, the radar decommissioning and the VHF/HF transition is on track for the 2020 years.
- On the same time a navaid phase out for VOR/DME/ NDB has been examined. But as account must be taken of AIR OPS regulations and of the isolated nature of airports implementations, the current network will be maintained to offer a high level of safety.
- On the busiest area, Windward Islands, in order to optimize mixed-mode operations, a new RNAV GNSS routes system with redesigned RNAV STAR and SID is under project for 2017/2018.
- A training module and communication about RNAV GNSS has been developed by SNA PF and presented to Air Tahiti as part of the continued proficiency crew training.

## 9. Safety Assessment & Monitoring Requirements

As part of French DGAC, SEAC PF is subject to the rules laid down by French DGAC.
Regular auditing of PBN operations to assess compliance is managed by DSAC.

To renew SEAC PF certificate as ANSP (including PBN operations) for the next three years, a full audit took place on April 2016.

## 10. Expected Operational Benefits - specific implementations

- Reduced environmental impact: the synchronised integration of PBN and non-PBN air routes, airspace and aircraft is essential (specifically Windward Islands).
- Reduced separation standards for air traffic routes in oceanic and some portions of domestic en-route airspace.
- New opportunity and flexibility of airspace design in terminal area airspace: for instance RNP/AR APP in a complex environment.
- Reduced noise and fuel consumption through PBN enabled ATS routes and approach procedures.