



This document presents the performance-based navigation (PBN) deployment program in the New Caledonia airspace sector of NANDI Flight Information Region (FIR NFFF) as well as all aerodromes providing instrument flight procedures. This plan sets out navigation specifications choices and deadlines that have been selected, following a collaborative approach between the Air Navigation Service (SNA-NC) on the one hand, and all the airspace users on the other. This plan also proposes the deployment forecasts related to these procedures and is intended to be updated on a regular basis following an annual consultation between all stakeholders. The expected benefits, detailed below, are of safety, economic and environmental nature and will ultimately enable New Caledonia to be fully in line with the objectives of ICAO and France



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A. REGULATION

ICAO

The A37-11 resolution (“Performance Based Navigation global goals”) was adopted by the ICAO Assembly during the 37th meeting, in October 2010. The latter asks for ICAO Member States to implement air traffic services routes (ATS routes) and instrument flight procedures in line with the ICAO PBN concept. These principles are described in the performance-based navigation manual (PBN Manual, doc 9613).

In 2012, France has adopted a PBN plan outlining the objectives in terms of publication of both ATS routes and IFR procedures to meet the resolution. This plan, designed primarily for the metropolis, is not adapted to the New Caledonia context: absence of radar coverage, traffic and weather significantly different, etc.

New Caledonia wants to renew the air traffic circulation structure through this PBN plan to improve ATS services provided to the airspace users, while respecting the provisions of A37-11 resolution.

In addition, New Caledonia, as a member of the regional group ICAO ASPAC (Asia Pacific), complies with the directions taken by the latter via the PBNICG (PBN Implementation Coordination Group) regarding ATS routes and instrument flight procedures.

European Commission (EC) :

The EC will shortly establish rules regarding the PBN procedures deployment through a regulation (PBN IR) written by EASA. This text will not be directly applicable in New Caledonia, but will be transposed via the transport code, with possibilities of adaptation to cope with local specificities. The New Caledonia PBN plan will take into account when being updated any new requirements from this regulatory framework.

B. Air traffic evolution

During the last years, increases in both international and domestic traffic attest that the aviation activity in New Caledonia is in a steady growth.

Air traffic forecasts are optimistic for the coming years, supported by several projects: opening of a new commercial line to China, opening of Lifou Ouanaham to the international etc.

The deployment of PBN procedures must support this coming traffic growth in the best safety and efficiency conditions.

C. Airspace users equipment

1. Domestic flights

Airlines operating on domestic routes network undertook a process to equip their aircraft according to PBN requirements. The crew training is also planned, suggesting a full use of the PBN routes network in New Caledonia shortly.

However, as long as some aircraft in circulation will not be PBN compliant, an ATS routes network based on conventional navigation aids will be maintained. In order to keep connections to Loyalty islands and North of the main island available, this back-up network will have a vital role in case of GNSS failure (due to the fact that the PBN concept only relies on the GNSS sensor in New Caledonia).

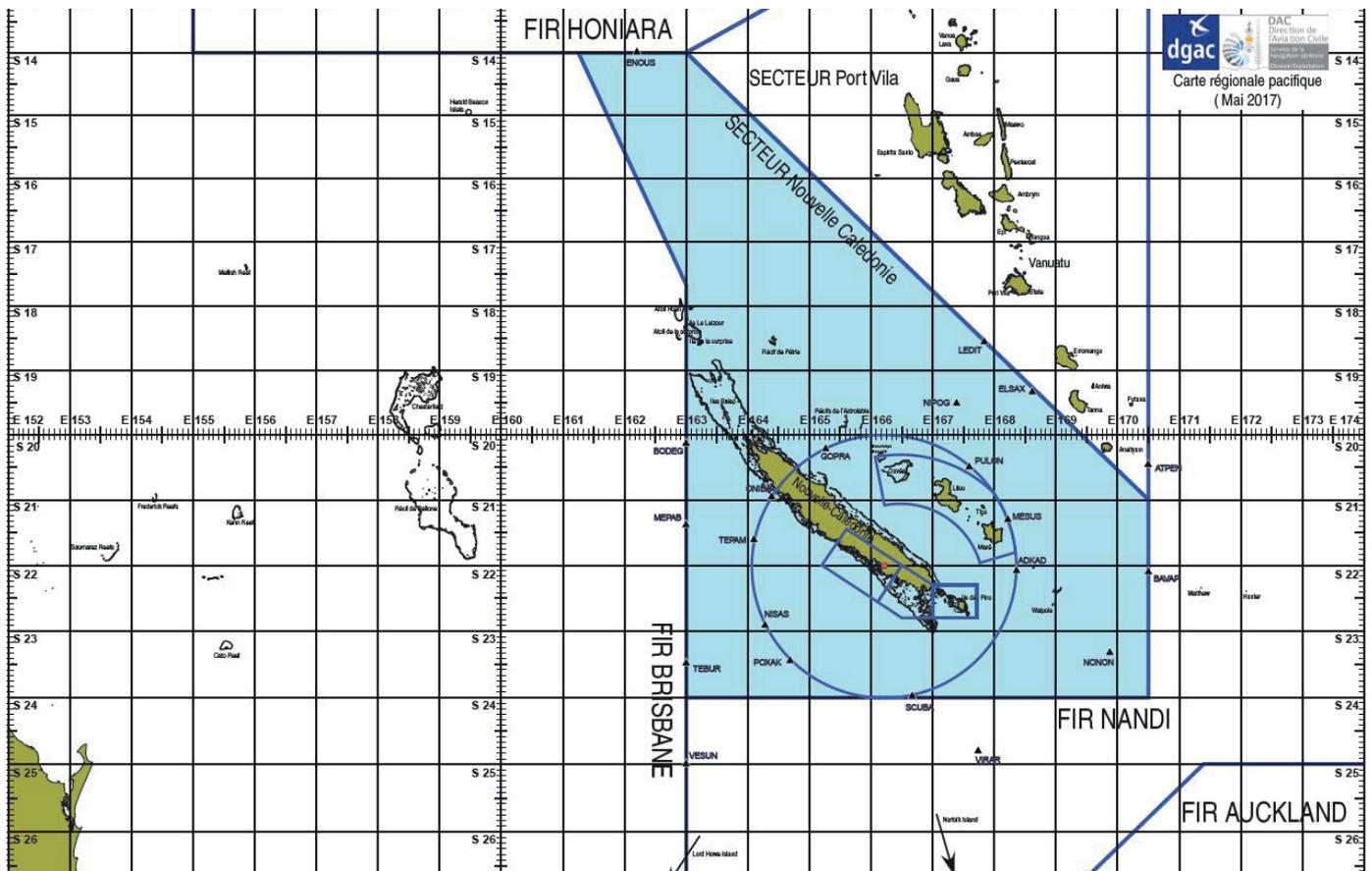
2. International flights

International flights with New Caledonia as destination land at Noumea La Tontouta airport. Related aircrafts and crew are already equipped and trained to fly PBN procedures

D. AIRSPACE

Airspace managed by SNA-NC, the New Caledonia sector, is located inside the Nandi FIR and is bounded as follows, from the ground to the flight level FL 245 (the boundaries of the area are provided in the AIP PAC N ENR2.1):

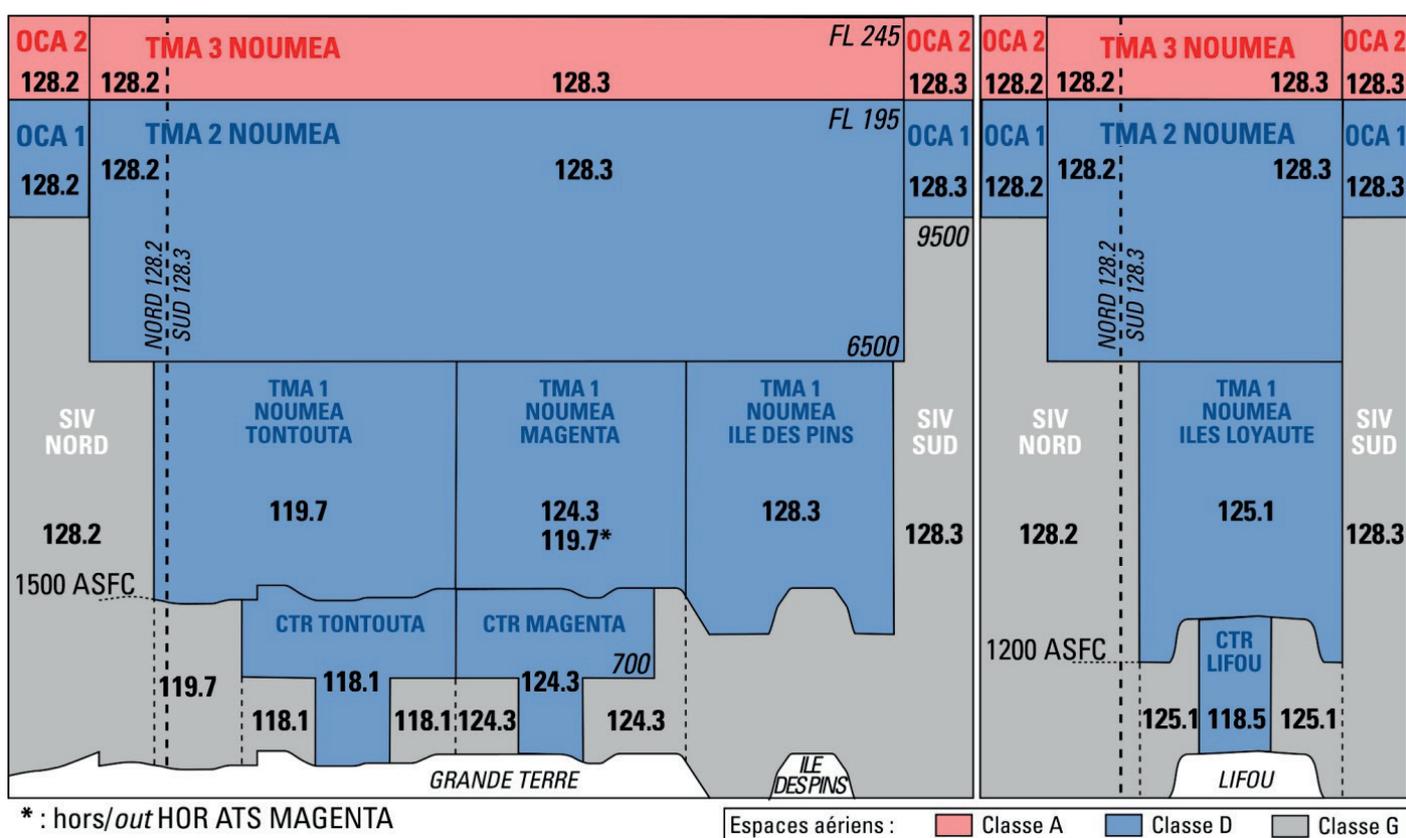
ATC service provided is based on a procedural control, due to unavailability of radar coverage. As a result, ATC service is based on strategic separations calculated between instrument flight procedures.



E. TECHNICAL INFRASTRUCTURE AVAILABLE TO SUPPORT ATS SERVICES IN NEW CALEDONIA

1. Communication infrastructure

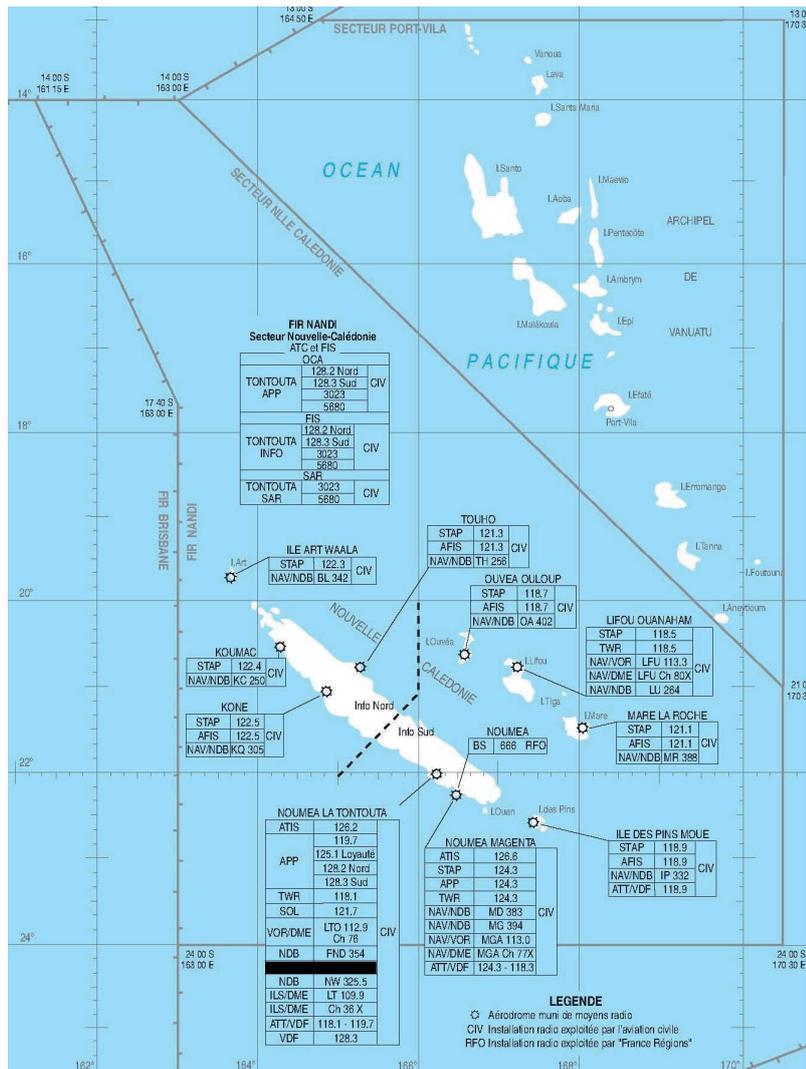
The New Caledonia sector radio coverage is very good and allows the establishment of permanent air-ground radio contact between aircrafts and ATC. However, some portions of airspace may be out of range because of the terrain.



2. Navigation infrastructure

Radio-navigation aids are spread all over New Caledonia lands, as shown in the following map (AIP PAC N, ENR 6.7)

These ground-based navigation aids provide a domestic and international ATS routes network, as well as conventional procedures.



Radio systems map, november 2015

3. Surveillance infrastructure

New Caledonia does not have primary nor secondary surveillance radar.

Implementation of ADS-B since 2010 continues with the WAM (Wide Area Multilateration) project, scheduled to be in service mid 2019. Immediate goal is to visualize traffic inside controlled airspace and then, at medium term, to provide ATC service based on 10Nm separation standard.

II - PBN IMPLEMENTATION

A - PBN CONCEPT

The PBN concept was developed by an ICAO working group in order to avoid proliferation of different navigation standards. Both harmonization and standardization were the key idea. At the end, operational requirements between the airlines, manufacturers and ANSP (Air Navigation Service Provider) was reached. The PBN Manual has been issued by ICAO in 2008.

This concept is based on a new navigation mode, the aRea NAVigation (RNAV : allowing to fly from waypoint to waypoint which do not depend on navigation aids), and on a definition of the Required Navigation Performance (RNP) through navigation specifications.

Combination of the RNAV concept and navigation specifications allows to define operations on all phases of the flight.

B- PBN APPLIED TO NEW CALEDONIAN CONTEXT

The PBN concept presented above and detailed in the PBN manual should be adapted to the New Caledonia context. For example, the absence of radar coverage does not allow consideration of «RNAV» navigation specifications for certain phases of flight. Therefore, «RNP» navigation specifications will be applied to flight procedures.

The lack of DME infrastructure available in New Caledonia does not allow the use of the DME / DME infrastructure as a positioning source for the PBN. The use of the «GNSS» sensor is therefore essential and mandatory when flying PBN procedures in New Caledonia.

All navigation specifications that can be used in New Caledonia are summarized in the table hereafter:

| Partie/ Chapitre | Spécification de navigation | Phase de vol | | | | | | | |
|---------------------|-------------------------------------|------------------------------------|-------------------------|---------|----------|---------------|------------------|--------------------------|--------|
| | | Océanique/ éloignée en route | Continental en route | Arrivée | Approche | | | | Départ |
| | | | | | Initiale | Intermédiaire | Finale | Interrompue ¹ | |
| B, Ch. 1 | RNAV 10 | 10 | | | | | | | |
| B, Ch. 2 | RNAV 5² | | 5 | 5 | | | | | |
| B, Ch. 3 | RNAV 2 | | 2 | 2 | | | | | 2 |
| B, Ch. 3 | RNAV 1 | | 1 | 1 | 1 | 1 | | 1 | 1 |
| | RNP 4 | 4 | | | | | | | |
| C, Ch. 2 | RNP 2 | 2 | 2 | | | | | | |
| C, Ch. 3 | RNP 1 ³ | | | 1 | 1 | 1 | | 1 | 1 |
| C, Ch. 4 | RNP avancée (A-RNP) ⁴ | 2 ⁵ | 2 ou 1 | 1 | 1 | 1 | 0,3 | 1 | 1 |
| C, Ch. 5 | RNP APCH ⁶ | | | | 1 | 1 | 0,3 ⁷ | 1 | |
| C, Ch. 6 | RNP AR APCH | | | | 1-0,1 | 1-0,1 | 0,3- 0,1 | 1-0,1 | |
| | RNP 0,3⁸ | | 0,3 | 0,3 | 0,3 | 0,3 | | 0,3 | 0,3 |

Application de spécifications de navigation par phase de vol



C- PBN IMPLEMENTATION GAINS WAITED IN NEW CALEDONIA

1. Safety

Approaches with Vertical guidance (APV) procedures offer to the users the possibility to perform 3D operations in the runway axis, significantly reducing the risk of non-stabilized approaches.

The designed procedures will also provide easily executable trajectories for users as they will benefit from the flexibility offered by area navigation (RNAV).

Finally, the reliability of the trajectories flown by the equipped and trained users, which is not to be anymore demonstrated today, will improve the repeatability of the trajectories, essential in a context of “no radar” ATS services.

2. Environnemental impact

The implementation of direct approach procedures (no longer requiring inversions such as NDB procedures for example) allows to reduce to the bare minimum the length of the trajectories, and de facto the fuel consumption of the aircraft. ATS routes network will be completely revised and will optimize the altitude and speed constraints inherent to the air traffic system.

PBN procedures, unlike conventional procedures, also allow taking into account population concentration in order to minimize the noise disturbance caused.

3. Aerodromes accessibility

PBN approach operations are an alternative mean to land offered to users. These approaches do not rely on radio-navigation aids and consequently do not suffer from the associated consequences (periodic maintenances, breakdowns, degradation of the quality of the signal during certain meteorological events etc.) They are a real asset for providing continuous access to all the New Caledonia territories.

In addition, operational minimum associated with PBN approaches, better than the ones associated with conventional approaches, also increase the accessibility of aerodromes.

4. Financial

PBN operations deployment offers an economic gain to all civil aviation stakeholders:

- Airspace users will be provided optimized and direct instrument flight procedures, decreasing the fuel consumption per flight ;
- Aerodrome operators will not be required any more to maintain some radio-navigation aids, depending on the airspace users' equipment.

D- COORDINATION OF ACTIVITIES FOR THE IMPLEMENTATION OF PBN OPERATIONS IN NEW CALEDONIA

Based on the needs and constraints identified, the SNA-NC has developed a master plan for the implementation of PBN operations in New Caledonia. This plan, detailed in the following section, should allow PBN operations to be deployed in line with New Caledonia's international commitments and the stakes mentioned previously.

However, interests of all civil aviation stakeholders should duly be taken into account through a concerted process of implementation. To this end, coordination of PBN activities at both local and international levels is proposed to all stakeholders by the SNA-NC.

1. Local level coordination of activities

In order to offer a forum and to ensure that all issues are well taken into account, the SNA-NC will propose to all stakeholders an annual meeting, the GT PBN NC.

This meeting will be an opportunity to review past, current and future actions concerning the implementation of PBN procedures in New Caledonia.

For example, feedback from the use of APV procedures or a review of the radio-navigation means rationalization can be made.

2. International level coordination of activities

The implementation of PBN procedures in New Caledonia will be closely linked to the various developments at ICAO, European and French level and the decisions that may be taken there.

The SNA-NC will report to the ICAO regional group ASPAC on the progress of the PBN plan in New Caledonia, as well as to DTA (Directorate of Air Transport).



III - PBN DEPLOYMENT MASTER PLAN

The following master plan is proposed for the implementation of PBN operations in New Caledonia and is established over three periods: 2018/2019, 2020/2021 and 2022/2023. The objectives are specified for the different phases of flight.

Note that no particular provision has been made for helicopter operations, since all local operators still operate in VFR. The SNA-NC is at the disposal of these users in case of future developments in this subject.

The Annex to this plan provides a summary of the deployment objectives.

A. 2018-2019 PERIOD

The objective of this first step is double: consolidate with all stakeholders the needs identified (in terms of PBN), through working groups attached to the GT PBN NC, and to continue the deployment of GNSS approaches.

The following paragraphs explain the type of PBN operations considered, the associated navigation specification, and any other relevant information.

1. Approach procedures

Navigation specification : RNP APCH.

Objectives: Deployment of baro-VNAV procedures on all IFR QFUs, in compliance with ICAO obligations. Priority will be given to Nouméa-La Tontouta, Nouméa-Magenta and the Loyalties Islands aerodromes.

The study of RNAV-ILS procedure is also on the agenda for Nouméa-La Tontouta.

Depending on aircraft equipment, crew training and demand coming from local airlines, RNP AR approach procedure projects may begin in Nouméa-La Tontouta and Nouméa-Magenta aerodromes.

Notes: Satellite Based Augmentation System (SBAS) approaches are not available in New Caledonia, for lack of appropriate satellite system in the region.

2. Departure procedures

Navigation specification : RNP 1.

Objectives : Deployment of RNP 1 SID procedures at Nouméa-La Tontouta and Nouméa-Magenta aerodromes, ensuring an optimal connection with the network of international and domestic ATS routes. The study of "POGO" PBN routes between these two aerodromes is also on the program.

3. Arrival procedures

Navigation specification: RNP 1.

Objectives: Deployment of RNP 1 STAR procedures at Nouméa-La Tontouta and Nouméa-Magenta aerodromes, ensuring an optimal connection with the network of international and domestic ATS routes.

B - 2020-2021 PERIOD

1. Approach procedures

Navigation specification: RNP APCH and RNP AR APCH.

Objectives: Deployment of the last baro-VNAV procedures on the whole territory of New Caledonia.

Deployment of RNP AR APCH procedures on relevant aerodromes (those where safety and accessibility can be increased): Nouméa-Magenta (runway 17) and Nouméa-La Tontouta (runway 29). These projects will be carried out in close collaboration with the partner airlines, the airport operators and the national supervisory authority.

2. Departure procedures

Navigation specification: RNP 1.

Objectives : Deployment of RNP 1 SID procedures on aerodromes with TMA, namely Ouvéa Ouloup, Lifou Ouanaham, Maré La Roche and Ile des Pins Moué.

3. Arrival procédures

Navigation specification: RNP 1.

Objectives: Deployment of RNP 1 STAR procedures on aerodromes with TMA, namely Ouvéa Ouloup, Lifou Ouanaham, Maré La Roche and Ile des Pins Moué.

C- 2022-2023 PERIOD

1. Domestic PBN routes

Navigation specification: RNP1 or RNP 2.

Objectives: Deployment of a domestic network of ATS routes, ordered by flow, allowing to link PBN departure and arrival procedures. Separations between these ATS routes, in a context of procedural control, will be optimized.

2. Approach

Navigation specification: RNP APCH.

Objectives: The possible completion of SBAS project launched by Australia and New Zealand will allow New Caledonia to develop APV SBAS approach procedures.



- ADS-B : Automatic Dependent Surveillance-Broadcast
- AIP : Aeronautical Information Publication
- APV : APproach with Vertical guidance
- ATC : Air Traffic Control
- ATS : Air Traffic Services
- DME : Distance Measuring Equipment
- DTA : Directorate of Air Transport
- EASA : European Aviation Safety Agency
- EC : European Commission
- FIR : Flight Information Region
- GNSS : Global Navigation Satellite System
- ICAO : International Civil Aviation Organization
- IFR : Instrument Flight Rules
- ILS : Instrument Landing System
- POGO : itinerary between two close and different aerodromes
- PBN : Performance Based Navigation
- RNAV : aRea NAVigation
- RNP : Required Navigation Performance
- SBAS : Satellite Based Augmentation System
- SID : Standard Instrument Departure
- SNA-NC : Service de la Navigation Aérienne Nouvelle Calédonie
- STAR : Standard Terminal Arrival Route
- TMA : Terminal Manoeuvring Area
- VFR : Visual Flight Rule
- WAM : Wide Area Multilateration

APPENDIX

| Airports and QFU | | RNP APCH (LNAV) | RNP APCH (baro-VNAV) | RNP AR | SID RNP1 | STAR RNP1 | domestic flights PBN |
|----------------------|----|-----------------|----------------------|------------|-----------|-----------|----------------------|
| Nouméa - La Tontouta | 11 | | 2018-2019 | | 2018-2018 | 2018-2019 | 2022-2023 |
| | 29 | | 2018-2019 | 2020-2021* | 2018-2019 | 2018-2019 | |
| Magenta | 17 | | 2018-2019 | 2020-2021* | 2018-2019 | 2018-2019 | 2022-2023 |
| | 35 | | 2018-2019 | | 2018-2019 | 2018-2019 | |
| Ile des pins | 10 | | 2022-2023 | | 2020-2021 | 2020-2021 | 2022-2023 |
| | 28 | | 2022-2023 | | 2020-2021 | 2020-2021 | |
| Koné | 27 | | 2022-2023 | | | | 2022-2023 |
| Koumac | 06 | 2020-2021 | 2020-2021 | | | | |
| Touho | 13 | | 2022-2023 | | | | 2022-2023 |
| | 31 | | 2022-2023 | | | | |
| Belep | 09 | 2022-2023* | 2022-2023* | | | | 2022-2023 |
| | 27 | 2022-2023* | 2022-2023* | | | | |
| Lifou | 12 | | 2018-2019 | | 2020-2021 | 2020-2021 | 2022-2023 |
| | 30 | | 2018-2019 | | 2020-2021 | 2020-2021 | |
| Ouvéa | 13 | 2018-2019 | 2018-2019 | | 2020-2021 | 2020-2021 | 2022-2023 |
| | 03 | 2018-2019 | 2018-2019 | | 2020-2021 | 2020-2021 | |
| Maré | 13 | 2018-2019 | 2018-2019 | | 2020-2021 | 2020-2021 | 2022-2023 |
| | 31 | 2018-2019 | 2018-2019 | | 2020-2021 | 2020-2021 | |
| Tiga | 16 | 2020-2021* | 2020-2021* | | | | 2022-2023 |
| | 34 | 2020-2021* | 2020-2021* | | | | |

| | | |
|--------|---|---|
| Legend | | : in effect |
| | | : unintended |
| | * | : effective date depend of operator's equipment |

