PBN Implementation and Transition Plan 2024/2030 for the Belgian part of Brussels FIR Version 2.3

Document identification	
Division	skeyes/Strategy and Implementation
Version	2. 3
Date	5/9/2023

Document status
☐ Working draft
☐ Draft
☒ Proposed issue
☐ Related issue

Document change record			
Version	**Sections / pages affected**	**Description of change**	**Date**
1.0	ALL	Initial issue approval BCAA	16.12.2020
2.0	ALL	Updated version	14.10.2022
2.1	2.1;2.3;5;6.3	Additional information (NM review)	20.04.2023
2.2		Update planning	18.08.2023
2.3		Minor changes	5.9.2023

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Introduction

Within the national transport strategy, it is the State's desire to ensure that the aviation sector is enabled to grow, meeting passenger demands, without impacting on the safety or capacity of the airspace whilst fulfilling our national environmental commitments.

To these ends, the Belgian State has elected to further implement performance-based navigation (PBN) applications within the national airspace. The European Regulatory requirement PBN IR (EU Regulation 2018/1048) as well as the ICAO Assembly Resolution 37-11, culminate in a need for a national PBN Transition Plan/PBN Implementation plan, respectively.

The National Service Provider, skeyes, is therefore tasked to develop a PBN Implementation and Transition Plan which meets national requirements, European regulatory obligations and international commitments.

The PBN implementation and transition plan 2024/2030 for the Belgian part of Brussels FIR will be the result of the collaboration between the state represented by BCAA, the ANSP skeyes and consultation of third parties:

An initial document is drafted by skeyes and reflects the navigation strategy at skeyes. The document defines the drivers for PBN Implementation. The reference scenario describes the current operations. Implementation objectives are formulated and describing the steps to ensure a smooth transition to PBN operations. The document also serves for the formal consultation of the stakeholders.

Contributions from operations, safety, etc. will complement the living document to a reference document and the way ahead to 2030. The PBN Implementation and Transition Plan and each update shall be submitted to the competent authority BCAA, and approved before the date from when the regulation shall apply.

The first release of the PBN Implementation and Transition Plan 2024/2030 (v1.0) focuses on the implementation of PBN procedures as this is the first step towards a full PBN environment. Compliance with the first deadline, 03th of December 2020, of the PBN IR is also demonstrated. The document has been submitted to the BCAA but approval is still pending (OCT2022) .

This document, a second release of the PBN Implementation and Transition Plan 2024/2030 describes the update and changes to the Plan. It also shows compliance with the PBN IR next deadline , 25th of January 2024 and has been aligned with the roadmap for wind energy (aiming to the mitigation of aeronautical constrains for the deployment of windmills) Version 2.1 incorporates the feedback from NM. At the meeting held on 20 July 2023, the Cabinet, BCAA and SKYES agreed to update the planning as described in Version 2.2.

General information regarding performance based navigation can be found at www.pbnportal.eu

1 Drivers for PBN implementation and transition plan 2020/2024/2030

1.1 Regulations

1.1.1 International drivers

ICAO Resolution 37/11 urges all States to implement RNAV and RNP air traffic services (ATS) routes and approach procedures in accordance with the ICAO PBN concept as laid down in the performance-based navigation (PBN) Manual (Doc 9613).

ICAO Doc 9750, the Global Air Navigation Plan (GANP) is described as ICAO's highest air navigation strategic document and the plan to drive the evolution of the global air navigation system.

It has the objective of a future harmonized global navigation capability based on area navigation (RNAV) and performance-based navigation (PBN) supported by the global navigation satellite system (GNSS).

GANP identifies PBN as the highest priority and outlines implementation issues involving PBN planning and implementation as part of the Aviation System Block Upgrades (ASBUs).

1.1.2 European regulations

The following legislation requires that ECAC States implement PBN operations:

EU Regulation 716/2014 (PCP IR) – Establishment of the Pilot Common Project (PCP) supporting the implementation of the European Air Traffic Master Plan. This regulation applies to EBBR.

The PCP was repealed by the EU regulation 2021/116 (CP1) Common Project One and no longer focuses on PBN or, implicitly, the navigation infrastructure. Consequently, the PBN IR has become the only PBN regulatory reference in the EU.

EU Regulation 2018/1048 (PBN IR) – Airspace usage requirements and operating procedures concerning performance-based navigation (PBN).

The regulation applies to EBAW, EBBR, EBCI, EBKT, EBLG, and EBOS.

The Commission regulation requires PBN operations to become the norm in all flight phases in a phased approach starting in 2020 for completion by 2030 the latest. Additionally, GNSS becomes the primary positioning source to be used by 2030, with other (ground-based) NAVAIDs relegated to secondary role.

A minimum network of ground-based NAVAIDs shall be retained beyond 2030 for contingency operations in the event of GNSS being unusable. During the transition, alternative means of navigation for non-PBN capable aircraft shall be foreseen.

The regulation sets an exception to the general rule of PBN being the 'norm' for Low Visibility Operations (LVO). CAT II/III landing systems, primarily predicated on ILS remain in service.

Hereafter, a tabulated resume of the EU regulation is provided:

PBN IR Article 4 & 7 Applicability with AUR.2005		Applies 03/12/2020	Applies 25/01/2024	Applies 06/06/2030
Art 4	Transition Plan *(or significant updates)* approved *(living document)*[1]	X[1]	X[1]	X[1]
AUR.2005 1/2/3	RNP APCH at IREs without Precision Approach (PA)	X		
	RNP APCH at all IREs (with PA)		X	
AUR.2005 4/5	RNAV 1 or RNP 1 (+ RF if required) SID and STAR - one per IRE		X	
	RNAV 1 or RNP 1 (+RF if required) for all SID and STARs			X
AUR.2005 6	RNAV 5 ATS Routes (excl. SIDs/STARs) at and above FL150[2]	X		
	RNAV 5 ATS Routes (excl. SIDs/STARs) below FL150		X	
AUR.2005 7	Helicopter RNP 0.3 or RNAV 1 or RNP 1 (+RF if required) SID/STAR - one per IRE		X	
	Helicopter RNP 0.3 or RNAV 1 or RNP 1 (+RF if required) for all SID/STAR			X
	Helicopter RNP 0.3 or RNAV 1 or RNP 1 ATS Routes (excl. SIDs/STARs) below FL150		X	

Note 1 - The transition plan will have several iterations; Article 4 requires that the draft/significant updates to the plan must be approved by the competent authority ***early enough*** *to provide sufficient time for the ANSPs to meet the identified implementation date. (Sufficient time would include accounting for the AIRAC cycle dates, publication and regulatory approval and compliance with other national requirements - see the PBN Portal for an example of the implementation scheduling and time required: https://pbnportal.eu/epbn/main/PBN-Tools/Planning-Estimation.html). The planned implementation dates detailed in the transition plans should be commensurate with the target date obligations.*

An RNP APCH includes LNAV,LNAV/VNAV and LPV minima.
Updated table (16MAR21). Note that CP 1 has removed any requirement for RNP 1 in ATM Functionality 1 (AF#1). Furthermore there are changes to the dates for the implementation SIDs and STARs at an PCP airport. Implementation of an RNP APCH at a PCP airport remains January 2024.

The Transition Plan will ensure the transition from current operations to PBN operations, as well as ensuring that the NAVAID infrastructure evolution supporting these operations is synchronised with the evolving operations.

ICAO Assembly resolution 37-11 requires states to develop a PBN Implementation Plan, while in the EU, the EU Regulation 2018/1048 requires states to develop a PBN Transition Plan. Given the direct-relationship of these regulations it is logical for the Belgian part of Brussels FIR to incorporate the PBN Implementation and Transition Plan into one document.

1.1.3 PBN Implementation Strategy for Belgium 2012

A PBN Implementation Plan describing the strategy for Belgium anno2012 was endorsed by the State and published by ICAO https://www.icao.int/safety/pbn/pages/pbn-implementation.aspx.

The PBN implementation strategy for Belgium (PBNISB) 2012 provides detailed information on PBN with a view to ensure a common understanding of the concept and expected benefits of PBN in a general context

The target of the Performance-Based navigation Implementation Strategy for Belgium 2012 is the establishment of a PBN environment with associated navigation infrastructure where the benefits offered by PBN operations are realized to the maximum extent. The transition was on a voluntary basis.

Since 2012 new ICAO and EASA regulations were published and the Implementation Plan requires updating to comply with the latest regulations.

The main achievement of the PBNISB is the publication of an aeronautical information circular (AIC) with the RNAV1 mandate in 2017 for STARs, SIDs and transition to final at EBBR, EBCI and EBLG.

AIC 005/2018: Introduction of RNAV 1 Mandate in the Belgian Part of the Brussels FIR
From 09 NOV 2017 an RNAV 1 operations approval or equivalent authorization will be required for all IFR GAT flights inbound and outbound to/from the following aerodromes: o Brussels Airport (EBBR) o Charleroi/Brussels South Airport (EBCI) o Liège Airport (EBLG) *From winter 2019 onwards, Belgocontrol, and the aerodromes referenced above, will establish an RNAV 1-only route network consisting of Standard Arrival Routes (STARs), transitions to Final Approach and Standard Instrument Departures (SIDs).*

1.2 Strategic objectives

PBN is a powerful design tool for routes and procedures: it allows routes to be placed in the most strategically beneficial location This single PBN benefit provides spin-off benefits in terms of capacity, safety, flight and ATM efficiency, aerodrome access, economical and potentially, environmental mitigation.

The goal of the PBN Transition and Implementation Plan 2024/2030 is the establishment of a full PBN environment within the Belgian part of Brussels FIR and at following aerodromes: EBAW, EBBR, EBCI, EBKT, EBLG and EBOS by the 6th of June 2030 at the latest , compliant with the regulation. As intermediate step a PBN compliant environment shall be established by 25th January of 2024 the latest. This implies that all required PBN procedures are implemented.
A full PBN environment implies the application of area navigation in all phases of flight, but also the rationalisation to a minimum operational network(MON) of ground-based NAVAIDs. Once the PBN compliant environment is implemented, NAVAIDs not part of the minimum operational network will be gradually withdrawn.

When the full PBN environment is realized, an optimization of the airspace (including a redesign of the routes independent from the ground-based infrastructure) while taking full benefits of PBN is taken into consideration, but not entirely covered in this document.

1.2.1 Safety benefits

An improvement in safety is expected through the deployment of RNP approaches with a vertical profile to replace conventional NPAs by reducing the risk of controlled flight into terrain
Safety is also enhanced by ensuring that the placement of ATS routes and instrument flight procedures serve both ATM and obstacle clearance requirements.
The flight paths are predictable and repeatable and require less pilot an controller workload.

1.2.2 Capacity benefits

Improved capacity is expected through the introduction of PBN SIDs and STARs, which will enable shorter track miles and will enable more flights to be handled at the same period of time.
Improved EN-route-terminal-approach connectivity is expected

1.2.3 Flights and ATM efficiency benefits

Improved flight efficiency is expected through the introduction of PBN SIDs and STARs, which will enable shorter track miles and CCO/CDO flight profiles and an efficient use of the airspace.
Improved EN-route-terminal-approach connectivity is expected

1.2.4 Aerodromes access

Improved access to aerodromes through the provision of new PBN SIDs and STARs and the introduction of RNP approaches.

1.2.5 Economic benefits

The establishment of a minimal navigational ground infrastructure reduces the costs for investment, maintenance and regular flight inspection.

1.2.6 Environmental benefits

Through the introduction of PBN SIDs and STARs, environmental benefits as saving fuel, reducing $C0_2$ emissions. Also the possibility to avoid specific areas is expected.

1.2.7 Land use planning benefits

The withdrawal of conventional procedures and the establishment of a minimal navigational ground infrastructure removes also the restrictions, associated with the procedures and NAVAIDs, on the erection of wind turbines (or other constructions). Restrictions associated to the minimal navigational ground infrastructure stay in force.

With the decision of 18 March 2022 on the acceleration of energy transition with a view to greater energy independence, the federal government wants to accelerate the production of renewable energy.

One of the measures that is being considered is to lower the thresholds (height restrictions, surface area and location of exclusion zones...) that exist at skeyes. A full PBN environment would free up space in areas currently not accessible as location for wind turbines. In particular, the decommissioning of the VOR infrastructure is an important factor contributing, but also the improved flexibility in designing PBN procedures. Consequently, an accelerated transition to full PBN is necessary.

2 Current operations vs. European regulations

In this chapter, the current operations, within the national airspace and at the Belgian aerodromes, serve as a baseline to evaluate compliance to the PBN IR (and previously also the PCP IR), as well as to understand the efforts needed to match such regulations in case of non-compliance.

2.1 Instrument flight procedures

The instrument flight procedure are detailed in the Belgium and Luxembourg Aeronautical Information Publication (AIP). The publication of 02th January 2020 is the reference document. Changes in the AIP between 02th January 2020 and 10 h of August 2023 are marked in blue.

In this section, the instrument flight procedures published in the AIP are compared with what should be published to comply with the EU PBN IR. At first instance, the national requirements have not been considered and only focusing on the European requirement. The dates of procedures for withdrawal or implementation are as proposed by the PBN IR. The actual implementation could be earlier and described in chapter 6

2.1.1 Helicopter routes

Within the Belgian Part of Brussels FIR, no helicopter routes are published or planned. Up till now, no single request was issued to publish such routes. The PBN plan does not prevent implementation of such routes when the need for them arises.

2.1.2 RNAV5 ATS routes

All ATS routes within the Belgian part of Brussels FIR are RNAV5 routes and compliant with PBN IR.

An editorial change of the naming 'B-RNAV' routes into 'RNAV5' routes in the AIP has been implemented on 10th of September 2020 .

Conventional En-route holdings, although not explicitly mentioned in the regulations, will be supplemented with RNAV overlay En-route holdings.

2.1.3 Published and planned instrument flight procedures

Transitions and missed approach are included in the EU definition of an instrument approach procedure[1]. RNAV1 holding, RNP APCH upgrade to SBAS CAT I (LPV200) and RNAV1 missed approach after ILS approach are not explicitly mentioned in the regulation, but they are an essential part of a PBN environment and incorporated in the plan.

2.1.3.1 EBAW

- EASA airport
- RWY11 = Non-precision approach RWY
  RWY29 = Precision approach RWY

Published conventional procedures	PBN IR: Withdrawn 2030
STAR	X
HOLDING	-
VOR RWY11	X(UNLESS REQUIRED FOR CONTINGENCY)
VOR RWY29	X
ILS RWY29 CAT I	X(UNLESS REQUIRED FOR CONTINGENCY)
SID RWY11	X
SID RWY29	X
Circling	X

Published PBN procedures	Planned PBN procedures	PBN IR: Implementation			Notes
		2020	2024	2030	
	RNAV1 STAR		X(one)	X(all)	Planned publication 02NOV2023
	RNAV1 HOLDING	-	-	-	
RNP RWY11 LNAV		√			
RNP RWY11 LNAV/VNAV		√			
RNP RWY11 LPV		√			
	RNP RWY11 RNAV1 missed approach (*)		X		
	RNP RWY29 LNAV		X		Planned publication 02NOV2023
	RNP RWY29 LNAV/VNAV		X		
	RNP RWY29 LPV (200)		X		
	RNP RWY29 RNAV1 missed approach (*)		X		
	RNAV1 SID RWY11		X(one)	X(all)	Planned publication 05OCT2023
	RNAV1 SID RWY29		X(one)	X(all))	
	RNAV1 transition to final (ILS) RWY29	-	-	-	

[1] Instrument approach procedure (IAP) means a series of predetermined manoeuvres by reference to flight instruments with specified protection from obstacles from the initial approach fix, or where applicable, from the beginning of a defined arrival route to a point from which a landing can be completed and thereafter, if a landing is not completed, to a position at which holding or en-route obstacle clearance criteria apply.

	RNAV1 missed approach ILS RWY29	-	-	-	

"X" to be implemented at (above mentioned) date / "V " already implemented/ "-" or " V not explicitly mentioned in IR and not implemented (-) or implemented (V).

PBN procedures are designed to the maximum possible extent as overlays of the conventional procedures.
Except conventional base turn procedures starting at the IAF above the aerodrome cannot be duplicated in RNAV1 and will be redesigned into RNAV1 transitions to final.
(*)Initially RNP APCH will be designed with a conventional missed approach as a contingency measure. The conventional missed approach of the RNP APCH and also the ILS will gradually be redesigned into an RNAV1 missed approach, identical for both procedures

2.1.3.2 EBBR

- EASA airport
- PCP airport
- RNAV1 mandate for SIDs, STARs and transitions to final
- RWY07L = Non-precision approach RWY but plans to upgrade to precision approach RWY
- RWY07R = Non-precision approach RWY
  RWY01, RWY19, RWY25L and RWY25R = Precision approach RWY
- The PBN requirements part of the PCP IR are withdrawn
    - The implementation date for RNP APCH to non-precision IRE at a PCP airport remains JAN 2024
    - The requirements for RNP1(+ RF) SIDs and STARs at PCP airport are changed into RNAV1 or RNP1(+RF)SIDs and STARs
    - The implementation date for all SIDs and STARs complies with the PBN IR deadlines

Published conventional procedures	PBN IR Withdrawn 2030	Notes
STAR	X	Planned publication 05OCT2023
HOLDING	-	
VOR RWY07L(only day)	X(UNLESS REQUIRED FOR CONTINGENCY)	
VOR RWY07R	X(UNLESS REQUIRED FOR CONTINGENCY)	
VOR RWY25L	X	
ILS RWY25L CAT II/III	Final remains (exempted)	
ILS RWY25R CATII/III	Final remains (exempted)	
ILS RWY01 CAT I	X(UNLESS REQUIRED FOR CONTINGENCY)	
ILS RWY19 CAT I	X(UNLESS REQUIRED FOR CONTINGENCY)	
SRA RWY01-RWY07L-RWY07R-RWY19-RWY25L-RWY25R	X	
SID RWY01	X	
SID RWY07L	X	Planned publication 05OCT2023
SID RWY07R	X	
SID RWY19	X	
SID RWY25L	X	
SID RWY25R	X	

Published PBN procedures	Planned PBN procedures	PBN IR Implementation			Notes
		2020	2024	2030	
RNAV1 STAR			√	√	RNAV1 holding Planned publication 05OCT2023
	RNAV1 HOLDING	-	-	-	
RNP RWY01 LNAV			√		
RNP RWY01 LNAV/VNAV			√		
RNP RWY01 LPV			√		
	RNP RWY01 LPV(200)		-		Planned publication 05OCT2023

	RNP RWY01 RNAV1 missed approach (*)		X		
	RNP RWY07L LNAV	~~X~~	X		Developed and submitted for approval
	RNP RWY07L LNAV/VNAV	~~X~~	X		
	RNP RWY07L LPV	~~X~~	X		
	RNP RWY07L RNAV1 missed approach	~~X~~	X		
	RNP RWY07R LNAV	~~X~~	X		Developed and submitted for approval
	RNP RWY07R LNAV/VNAV	~~X~~	X		
	RNP RWY07R LPV	~~X~~	X		
	RNP RWY07R RNAV1 missed approach	~~X~~	X		
RNP RWY19 LNAV			√		
RNP RWY19 LNAV/VNAV			√		
RNP RWY19 LPV			√		
	RNP RWY19 LPV(200)	-	-	-	Planned publication 05OCT2023
	RNP RWY19 RNAV1 missed approach (*)		X		
RNP RWY25L LNAV			√		
RNP RWY25L LNAV/VNAV			√		
RNP RWY25L LPV			√		
	RNP RWY25L LPV(200)	-	-	-	Planned publication 05OCT2023
	RNP RWY25L RNAV1 missed approach(*)		X		
RNP RWY25R LNAV			√		
RNP RWY25RLNAV/VNAV			√		
RNP RWY25R LPV			√		
	RNP RWY25R LPV (200)	-	-	-	Planned publication 05OCT2023
	RNP RWY25R RNAV1 missed approach(*)		X		
RNAV1 SID RWY01			X		
RNAV1 SID RWY07L			√	X	Planned publication 05OCT2023 : ALL SIDs
RNAV1 SID RWY07R			√	X	
RNAV1 SID RWY19			√	√	
RNAV1 SID RWY25L			√	X	
RNAV1 SID RWY25R			√	X	
	RNAV1 transition to final(ILS) RWY01	-	-	-	
	RNAV1 transition to final(VOR) RWY07L	-	-	-	
	RNAV1 transition to final(VOR) RWY07R	-	-	-	
	RNAV1 transition to final(ILS) RWY19	-	-	-	
	RNAV1 transition to final(ILS) RWY25L	-	-	-	

	RNAV1 transition to final(ILS) RWY25R	-	-	-	
	RNAV1 missed approach ILS RWY01	-	-	-	
	RNAV1 missed approach VOR RWY07L	-	-	-	
	RNAV1 missed approach VOR RWY07R	-	-	-	
	RNAV1 missed approach ILS RWY19	-	-	-	
	RNAV1 missed approach ILS RWY25L	-	-	-	
	RNAV1 missed approach ILS RWY25R	-	-	-	

"X" to be implemented at (above mentioned) date / "V " already implemented/ / "-" or " V not explicitly mentioned in IR and not implemented (-) or implemented (V).

PBN procedures are designed to the maximum possible extent as overlays of the conventional procedures.
(*)Initially RNP APCH will be designed with a conventional missed approach as a contingency measure. The conventional missed approach of the RNP APCH and also the ILS and VOR will gradually be redesigned into an RNAV1 missed approach, identical for both procedures

2.1.3.3 EBCI

- EASA airport
- RNAV1 mandate for SIDs, STARs and transitions to final
- RWY06 = Non-precision approach RWY
  RWY24 = Precision approach RWY

Published conventional procedures	PBN IR: Withdrawn 2030
STAR	X
HOLDING	-
VOR RWY06	X(UNLESS REQUIRED FOR CONTINGENCY)
VOR RWY24	X
ILS RWY24 CAT II/III	Final remains (exempted)
SID RWY06	X
SID RWY24	X
Circling	X

Published PBN procedures	Planned PBN procedures	PBN IR: Implementation			Notes
		2020	2024	2030	
RNAV1 STAR			V	V	
	RNAV1 HOLDING	-	-	-	
RNP RWY06 LNAV		V			
RNP RWY06 LNAV/VNAV		V			
RNP RWY06 LPV		V			
RNP RWY24 LNAV			V		
RNP RWY24 LNAV/VNAV			V		
RNP RWY24 LPV			V		
	RNP RWY24 LPV(200)	-	-	-	
RNAV1 SID RWY06			V	V	
RNAV1 SID RWY24			V	V	
	RNAV1 transition to final(ILS) RWY24	-	-	-	
	RNAV1 missed approach ILS RWY24	-	-	-	

"X" to be implemented at (above mentioned) date / "V " already implemented/ "-" or " V not explicitly mentioned in IR and not implemented (-) or implemented (V).

PBN procedures are designed to the maximum possible extent as overlays of the conventional procedures.
Except conventional base turn procedures starting at the IAF above the aerodrome cannot be duplicated in RNAV1 and will be redesigned into RNAV1 transitions to final.

2.1.3.4 EBKT

- EASA airport**,** exempted Article 2(7) of R(EU) 2018/1139
- RWY06 = Non-precision approach RWY
  RWY24 = Non-precision approach RWY

Published PBN procedures	Planned PBN procedures	PBN IR Implementation			Notes
		2020	2024	2030	
RNAV1 HOLDING		√			
RNP RWY24 LNAV RNP RWY24 LNAV/VNAV RNP RWY24 LPV		√ √ √			
RNAV1 SID RWY24			√		
	RNP RWY06 LNAV only	√			Effective 08OCT2020
	RNAV1 SID RWY06		√		Effective 08OCT 2020

At EBKT, 3D instrument approach operations to RWY06 is excessively difficult due to airspace restrictions and the RNP APCH is only down to LNAV minima .

2.1.3.5 EBLG

- EASA airport
- RNAV1 mandate for SIDs, STARs and transitions to final
- RWY04R = Precision approach RWY
  RWY22L = Precision approach RWY
  RWY04L = Non-instrument RWY(*)
  RWY22R = Precision approach RWY

Published conventional procedures	PBN IR: Withdrawn 2030	
STAR	X	Planned publication 07SEP2023
HOLDING	-	
VOR RWY04R	X	
VOR RWY22L	X	
ILS RWY04R CAT II/III	Final remains (exempted)	
ILS RWY22L CATII/III	Final remains (exempted)	
ILS RWY22R CAT I	X(UNLESS REQUIRED FOR CONTINGENCY)	
SID RWY04R/04L	X	Planned publication 07SEP2023
SID RWY22L/22R	X	
Circling	X	Planned publication 07SEP2023

Published PBN procedures	Planned PBN procedures	PBN IR: Implementation			Notes
		2020	2024	2030	
RNAV1 STAR			V	V	
	RNAV1 HOLDING	-	-	-	
RNP RWY04R LNAV			V		
RNP RWY04R LNAV/VNAV			V		
RNP RWY04R LPV(200)			V		Effective 21APR2022
RNP RWY22L LNAV			V		
RNP RWY22L LNAV/VNAV			V		
RNP RWY22L LPV(200)			V		Effective 21APR2022
RNP RWY04L LNAV (*)		-	V	-	
RNP RWY04L LNAV/VNAV (*)		-	V	-	
RNP RWY04L LPV (*)		-	V	-	
RNP RWY22R LNAV			V		
RNP RWY22R LNAV/VNAV			V		
RNP RWY22R LPV			V		
	RNP RWY22R LPV(200)	-	-	-	
RNAV1 SID 04(L)/R			V	V	
RNAV1 SID 22L/R			V	V	
	RNAV1 transition to RWY04L				Planned publication 07SEP2023
	RNAV1 transition to RWY04R	-	-	-	
	RNAV1 transition to RWY22L	-	-	-	
	RNAV1 transition to RWY22R	-	-	-	
	RNAV1 missed approach ILS RWY04R	-	-	-	

	RNAV1 missed approach ILS RWY22L	-	-	-	
	RNAV1 missed approach ILS RWY22R	-	-	-	

"X" to be implemented at (above mentioned) date / "V " already implemented/ "-" or " V not explicitly mentioned in IR and not implemented (-) or implemented (V).

PBN procedures are designed to the maximum possible extent as overlays of the conventional procedures.
Except conventional base turn procedures starting at the IAF above the aerodrome cannot be duplicated in RNAV1 and are redesigned into RNAV1 transitions to final.

(*) Feedback NM: "an RNP APCH procedure with 3 lines of minima is published at EBLG RWY04L since 2016. Therefore, RWY04L should be considered as an IRE and within the scope of the PBN IR". This change requires confirmation by BCAA.

2.1.3.6 EBOS

- EASA airport
- RWY08 = Precision approach RWY
  RWY26 = Precision approach RWY

Published conventional procedures	PBN IR: Withdrawn 2030
STAR	X
HOLDING	-
L RWY08	X
NDB RWY26	X
ILS RWY08 CAT I	X(UNLESS REQUIRED FOR CONTINGENCY)
ILS RWY26 CAT I	X(UNLESS REQUIRED FOR CONTINGENCY)
SID RWY08	X
SID RWY26	X
Circling	X

Published PBN procedures	Planned PBN procedures	PBN IR: Implementation			Notes
		2020	2024	2030	
RNAV1 STAR			V	V	
RNAV1 HOLDING			V		
RNP RWY08 LNAV			V		
RNP RWY08 LNAV/VNAV			V		
RNP RWY08 LPV(200)			V		
	RNP RWY08 RNAV1 missed approach (*)		X		
RNP RWY26 LNAV			V		
RNP RWY26 LNAV/VNAV			V		
RNP RWY26 LPV(200)			V		
	RNP RWY26 RNAV1 missed approach (*)		X		
	RNAV1 SID RWY08		X(one)	X(all)	
	RNAV1 SID RWY26		X(one)	X(all)	
	RNAV1 transition to final (ILS) RWY08/RWY26	-	-	-	
	RNAV1 missed approach ILS RWY08/RWY26	-	-	-	

"X" to be implemented at (above mentioned) date / "V " already implemented "-" or " V not explicitly mentioned in IR and not implemented (-) or implemented (V).
PBN procedures are designed to the maximum possible extent as overlays of the conventional procedures
Except conventional base turn procedures starting at the IAF above the aerodrome cannot be duplicated in RNAV1 and will be redesigned into RNAV1 transitions to final.
(*)Initially RNP APCH will be designed with a conventional missed approach as a contingency measure. The conventional missed approach of the RNP APCH and also the ILS will gradually be redesigned into an RNAV1 missed approach, identical for both procedures

2.1.4 Summary

The PBN IR applies to EBAW, EBBR, EBCI, EBKT, EBLG, and EBOS.

No helicopter routes are implemented or planned within the Belgian part of Brussels FIR and not further considered. Within the Belgian part of Brussels FIR, all ATS routes are RNAV5 routes and in line with PBN IR target date of 03th of December 2020).

Within the Belgian part of Brussels FIR, RNP APCH are implemented at IRE with non-precision approach at:

- EBAW RWY11
- EBCI RWY06
- EBKT RWY24
- EBKT RWY06 (from 08OCT2020)

and in line with PBN target date of 03th December 2020

Within the Belgian part of Brussels FIR and at a PCP airport, RNP APCH at IRE with non-precision approach shall be implemented the latest by the 25th of January 2024 to be in line with the PBN IR at

- EBBR RWY 07L
- EBBR RWY07R

Both procedures have been developed by skeyes and submitted to the BCAA for approval.

Within the Belgian part of Brussels FIR, RNP APCH are implemented at following IRE with precision approach at:

- EBBR RWY01
- EBBR RWY19
- EBBR RWY25R
- EBBR RWY25L
- EBCI RWY24
- EBLG RWY 04R
- EBLG RWY22L
- EBLG RWY22R
- EBOS RWY08
- EBOS RWY26

Or are ready for implementation the latest by 25th of January 2024 at:

- EBAW RWY29 (planned publication 02NOV2023)

All RNP APCH with conventional missed approach (EBAW,EBBR and EBOS) shall gradually be transformed into RNAV1 missed approach to be in line with the PBN IR..

RNAV1 STARs are implemented at EBBR, EBCI, EBLG and EBOS and in line with the PBN IR target dates of the 25th of January 2024/6th of June 2030. RNAV1 STARs are ready to be implemented at EBAW (planned publication 02NOV2023) and will be in line with the PBN IR target dates of the 25th of January 2024/6th of June 2030.

RNAV1 SIDs are implemented at EBCI, EBLG and EBKT and in line with the PBN IR target dates of the 25th of January 2024/6th of June 2030. At EBBR, RNAV1 SIDs for RWY19 are implemented. At least one RNAV1 SID per IRE from RWY07L, RWY07R, RWY25L and RWY25R is published. All SIDs, except from RWY01, are planned for implementation on the 05th of October 2023 and in line with the PBN IR target dates of the 25th of January 2024/6th of June 2030. RNAV1 SIDs EBBR RWY01 shall be developed to be in line with PBN IR target dates of the 25th of January 2024/6th of June 2030. RNAV1 SIDs are ready to be implemented at EBAW RWY11 (planned publication 05OCT2023) and will be in line with the PBN

IR target dates of the 25th of January 2024/6th of June 2030. RNAV1 SIDs at EBOS and EBAW RWY29 shall be developed to be in line with PBN IR target dates of the 25th of January 2024/6th of June 2030. In addition :

- RNAV En-route holdings shall be developed and implemented.
- RNAV1 holding, RNAV1 transitions to final and RNAV1 missed approach connected to a final conventional segment shall be developed, if not yet published.
- RNP APCH to LPV minima shall be upgraded to SBAS CAT I (LPV200), where possible.

2.2 PBN fleet capabilities

A PBN implementation is only successful if the majority of the fleet have all the capabilities required in the navigation specification intended by the implementation.

The threshold of flight capabilities to be successful depends on the navigation specifications and the local circumstances and shall be determined case by case.

The following navigation specifications are required by the IR:

- RNAV5 for ATS routes
- RNAV1 or RNP1 for SIDs, STARs and transitions to final
- RNAV1 or RNP1 for missed approach connected to a final conventional segment
- RNP APCH for approach

RNP1 could also require radius to fix (RF) functionality. RF functionality is not part of the flight plan and not available via the dashboard. If needed, an additional source should be consulted.

The analysis does not list all possibilities. It goes without saying that alternate options will be considered when the need arises or when fleet capabilities make their implementation feasible or desirable.

2.2.1 Flight capabilities EBBU: RNAV5

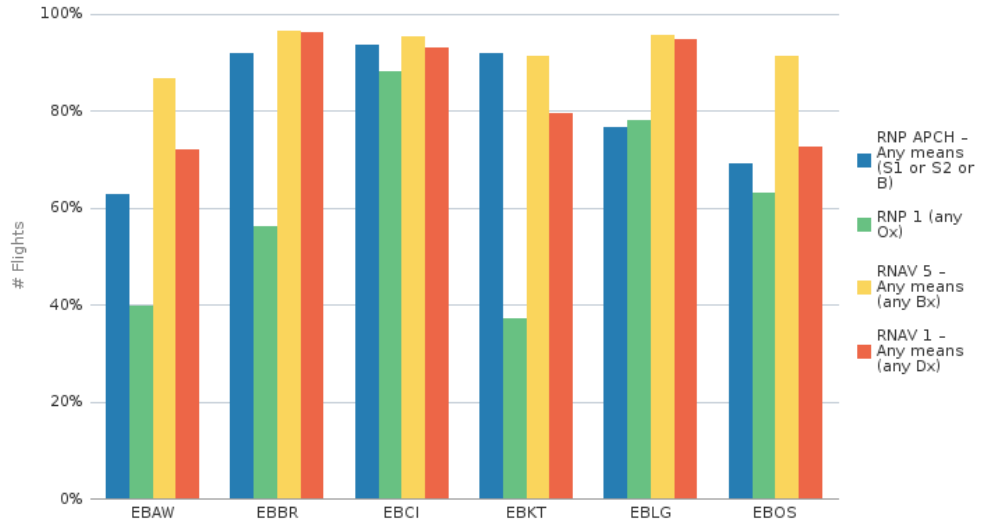
Source: Reported capabilities Eurocontrol CNS dashboard: EBBU - Q4/2019 – total flights

Month Date	Capability	# Flights	Total # Flights	% Capable Flights
October 2019	RNAV 5 – Any means (any Bx)	28794	30091	95.69%
October 2019	B4 - RNAV 5 VOR/DME	3476	30091	11.55%
October 2019	B3 - RNAV 5 DME/DME	3500	30091	11.63%
October 2019	B2 - RNAV 5 GNSS	4107	30091	13.65%
October 2019	B1 - RNAV 5 all permitted sensors	23642	30091	78.57%
November 2019	RNAV 5 – Any means (any Bx)	25901	26112	99.19%
November 2019	B4 - RNAV 5 VOR/DME	2841	26112	10.88%
November 2019	B3 - RNAV 5 DME/DME	2902	26112	11.11%
November 2019	B2 - RNAV 5 GNSS	3464	26112	13.27%
November 2019	B1 - RNAV 5 all permitted sensors	21567	26112	82.59%
December 2019	RNAV 5 – Any means (any Bx)	23608	25739	91.72%
December 2019	B4 - RNAV 5 VOR/DME	2515	25739	9.77%
December 2019	B3 - RNAV 5 DME/DME	2572	25739	9.99%
December 2019	B2 - RNAV 5 GNSS	3068	25739	11.92%
December 2019	B1 - RNAV 5 all permitted sensors	19760	25739	76.77%

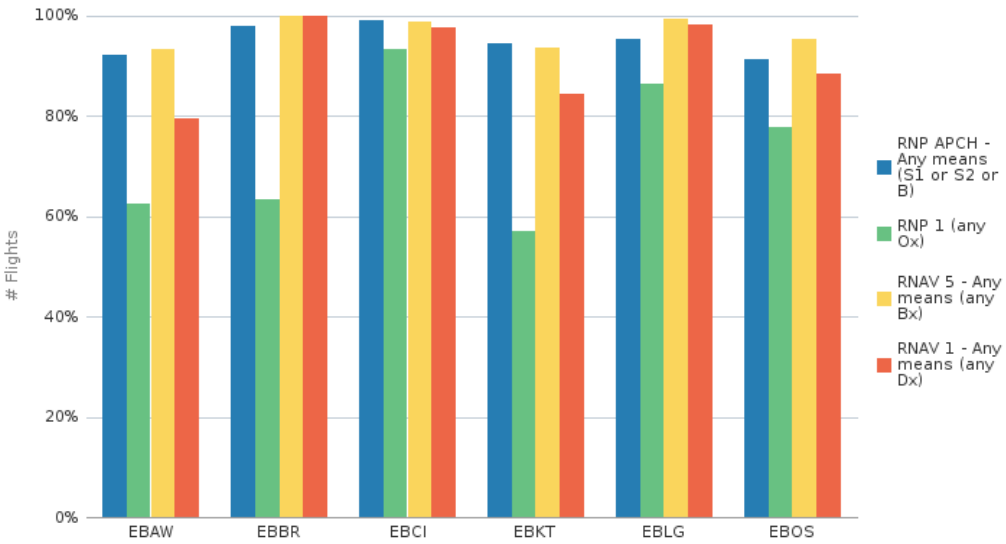
2.2.2 Flight capabilities per AD: RNAV5, RNAV1, RNP1 and RNP APCH

The data sample from Q4/2019 is supplemented with data from Q2/2022

Source: Reported capabilities Eurocontrol CNS dashboard : Per AD - Q4/2019 - total flights[1]



Source: Reported capabilities Eurocontrol CNS dashboard : Per AD – Q2/2022 - total flights



[1] Filters used for the analyses:

	PBN capabilites equal to **B1 - RNAV 5 all permitted sensors,B2 - RNAV 5 GNSS,B3 - RNAV 5 DME/DME,B4 - RNAV 5 VOR/DME,D1 - RNAV 1 all permitted sensors,D2 - RNAV 1 GNSS,D3 - RNAV 1 DME/DME,D4 - RNAV 1 DME/DME/IRU,O1 - Basic RNP 1 all permitted sensors,O2 - Basic RNP 1 GNSS,O3 - Basic RNP 1 DME/DME,O4 - Basic RNP 1 DME/DME/IRU,S1 - RNP APCH,S2 - RNP APCH with BARO-VNAV**
of	PBN Combined Capabilities is equal to **RNAV 1 – Any means (any Dx)** ; **RNAV 5 – Any means (any Bx)** ; **RNP 1 (any Ox)** ; **RNP APCH – Any means (S1 or S2 or B)**
of	COM NAV APR Aid Capabilities equal to **A - GBAS landing system,B - LPV (APV with SBAS)**
of	SUR Capabilities equal to **NONE**
Operation Type in Full equal to **Arrivals and Departures**	
Airport Code || ' - ' || Airport Name equal to **EBAW - ANTWERPEN DEURNE** ; **EBBR - BRUSSELS NATIONAL** ; **EBCI - CHARLEROI** ; **EBKT - WEVELGEM/KORTRIJK** ; **EBLG - LIEGE/LIEGE** ; **EBOS - OOSTENDE**	
Registered in Europe equal to **Y** ; **N**	
ICAO Flight Type equal to **G-General aviation** ; **M-Military** ; **N-Non-scheduled** ; **S-Scheduled** ; **X-Other**	

2.2.3 Detailed flight capabilities: Per AD, per sensor and additional info

Airport Code	Airport Name	Capability	# Flights Q4/2019	Total # Flights Q4/2019	% Capable Flights Q4/2019	# Flights Q2/2022	Total # Flights Q2/2022	% Capable Flights Q2/2022
EBAW	ANTWERPEN DEURNE	RNP APCH - Any means (S1 or S2 or B)	2124	3389	62.67%	5291	5758	91.89%
EBAW	ANTWERPEN DEURNE	RNP 1 (any Ox)	1349	3389	39.81%	3595	5758	62.43%
EBAW	ANTWERPEN DEURNE	RNAV 5 - Any means (any Bx)	2929	3389	86.43%	5368	5758	93.23%
EBAW	ANTWERPEN DEURNE	RNAV 1 - Any means (any Dx)	2437	3389	71.91%	4571	5758	79.39%
EBBR	BRUSSELS NATIONAL	RNP APCH - Any means (S1 or S2 or B)	50339	54839	91.79%	60488	61876	97.76%
EBBR	BRUSSELS NATIONAL	RNP 1 (any Ox)	30684	54839	55.95%	39191	61876	63.34%
EBBR	BRUSSELS NATIONAL	RNAV 5 - Any means (any Bx)	52770	54839	96.23%	61788	61876	99.86%
EBBR	BRUSSELS NATIONAL	RNAV 1 - Any means (any Dx)	52651	54839	96.01%	61668	61876	99.66%
EBCI	CHARLEROI	RNP APCH - Any means (S1 or S2 or B)	12242	13090	93.52%	20615	20849	98.88%
EBCI	CHARLEROI	RNP 1 (any Ox)	11520	13090	88.01%	19390	20849	93.00%
EBCI	CHARLEROI	RNAV 5 - Any means (any Bx)	12435	13090	95.00%	20546	20849	98.55%
EBCI	CHARLEROI	RNAV 1 - Any means (any Dx)	12157	13090	92.87%	20335	20849	97.53%
EBKT	WEVELGEM/KORTRIJK	RNP APCH - Any means (S1 or S2 or B)	731	798	91.60%	1802	1910	94.35%
EBKT	WEVELGEM/KORTRIJK	RNP 1 (any Ox)	295	798	36.97%	1087	1910	56.91%
EBKT	WEVELGEM/KORTRIJK	RNAV 5 - Any means (any Bx)	728	798	91.23%	1784	1910	93.40%
EBKT	WEVELGEM/KORTRIJK	RNAV 1 - Any means (any Dx)	632	798	79.20%	1609	1910	84.24%
EBLG	LIEGE/LIEGE	RNP APCH - Any means (S1 or S2 or B)	6895	9033	76.33%	9682	10169	95.21%
EBLG	LIEGE/LIEGE	RNP 1 (any Ox)	7040	9033	77.94%	8778	10169	86.32%
EBLG	LIEGE/LIEGE	RNAV 5 - Any means (any Bx)	8610	9033	95.32%	10084	10169	99.16%
EBLG	LIEGE/LIEGE	RNAV 1 - Any means (any Dx)	8543	9033	94.58%	9975	10169	98.09%
EBOS	OOSTENDE	RNP APCH - Any means (S1 or S2 or B)	1189	1721	69.09%	2323	2548	91.17%
EBOS	OOSTENDE	RNP 1 (any Ox)	1085	1721	63.04%	1981	2548	77.75%
EBOS	OOSTENDE	RNAV 5 - Any means (any Bx)	1567	1721	91.05%	2424	2548	95.13%
EBOS	OOSTENDE	RNAV 1 - Any means (any Dx)	1247	1721	72.46%	2245	2548	88.11%

Source: Reported capabilities on Eurocontrol CNS dashboard : Per AD, per sensor - Q4/2019 and Q2/2022 - total flights

Airport Code	Airport Name	Capability	# Flights Q4/2019	Total # Flights Q4/2019	% Capable Flights Q4/2019	# Flights Q2/2022	Total # Flights Q2/2022	% Capable Flights Q2/2022
EBAW	ANTWERPEN DEURNE	S2 - RNP APCH with BARO-VNAV	1562	3389	46.09%	3878	5758	67.35%
EBAW	ANTWERPEN DEURNE	S1 - RNP APCH	511	3389	15.08%	1728	5758	30.01%
EBAW	ANTWERPEN DEURNE	O4 - Basic RNP 1 DME/DME/IRU	0	3389	0.00%	0	5758	0.00%
EBAW	ANTWERPEN DEURNE	O3 - Basic RNP 1 DME/DME	67	3389	1.98%	160	5758	2.78%
EBAW	ANTWERPEN DEURNE	O2 - Basic RNP 1 GNSS	637	3389	18.80%	2298	5758	39.91%
EBAW	ANTWERPEN DEURNE	O1 - Basic RNP 1 all permitted sensors	707	3389	20.86%	1289	5758	22.39%
EBAW	ANTWERPEN DEURNE	D4 - RNAV 1 DME/DME/IRU	0	3389	0.00%	4	5758	0.07%
EBAW	ANTWERPEN DEURNE	D3 - RNAV 1 DME/DME	880	3389	25.97%	984	5758	17.09%
EBAW	ANTWERPEN DEURNE	D2 - RNAV 1 GNSS	1581	3389	46.65%	3131	5758	54.38%
EBAW	ANTWERPEN DEURNE	D1 - RNAV 1 all permitted sensors	816	3389	24.08%	1429	5758	24.82%
EBAW	ANTWERPEN DEURNE	B4 - RNAV 5 VOR/DME	829	3389	24.46%	847	5758	14.71%
EBAW	ANTWERPEN DEURNE	B3 - RNAV 5 DME/DME	874	3389	25.79%	827	5758	14.36%
EBAW	ANTWERPEN DEURNE	B2 - RNAV 5 GNSS	1980	3389	58.42%	3792	5758	65.86%
EBAW	ANTWERPEN DEURNE	B1 - RNAV 5 all permitted sensors	884	3389	26.08%	1497	5758	26.00%
EBAW	ANTWERPEN DEURNE	B - LPV (APV with SBAS)	844	3389	24.90%	3215	5758	55.84%
EBAW	ANTWERPEN DEURNE	A - GBAS landing system	369	3389	10.89%	34	5758	0.59%
EBBR	BRUSSELS NATIONAL	S2 - RNP APCH with BARO-VNAV	45053	54839	82.16%	55831	61876	90.23%
EBBR	BRUSSELS NATIONAL	S1 - RNP APCH	29182	54839	53.21%	35034	61876	56.62%
EBBR	BRUSSELS NATIONAL	O4 - Basic RNP 1 DME/DME/IRU	447	54839	0.82%	266	61876	0.43%
EBBR	BRUSSELS NATIONAL	O3 - Basic RNP 1 DME/DME	2442	54839	4.45%	545	61876	0.88%
EBBR	BRUSSELS NATIONAL	O2 - Basic RNP 1 GNSS	4605	54839	8.40%	4496	61876	7.27%
EBBR	BRUSSELS NATIONAL	O1 - Basic RNP 1 all permitted sensors	26364	54839	48.08%	35660	61876	57.63%
EBBR	BRUSSELS NATIONAL	D4 - RNAV 1 DME/DME/IRU	1318	54839	2.40%	739	61876	1.19%
EBBR	BRUSSELS NATIONAL	D3 - RNAV 1 DME/DME	3803	54839	6.93%	5943	61876	9.60%
EBBR	BRUSSELS NATIONAL	D2 - RNAV 1 GNSS	2434	54839	4.44%	3052	61876	4.93%
EBBR	BRUSSELS NATIONAL	D1 - RNAV 1 all permitted sensors	47048	54839	85.79%	57818	61876	93.44%
EBBR	BRUSSELS NATIONAL	B4 - RNAV 5 VOR/DME	5454	54839	9.95%	3680	61876	5.95%
EBBR	BRUSSELS NATIONAL	B3 - RNAV 5 DME/DME	5557	54839	10.13%	3845	61876	6.21%
EBBR	BRUSSELS NATIONAL	B2 - RNAV 5 GNSS	5612	54839	10.23%	5067	61876	8.19%
EBBR	BRUSSELS NATIONAL	B1 - RNAV 5 all permitted sensors	45762	54839	83.45%	56669	61876	91.58%
EBBR	BRUSSELS NATIONAL	B - LPV (APV with SBAS)	2441	54839	4.45%	4433	61876	7.16%
EBBR	BRUSSELS NATIONAL	A - GBAS landing system	2693	54839	4.91%	6243	61876	10.09%
EBCI	CHARLEROI	S2 - RNP APCH with BARO-VNAV	11664	13090	89.11%	19583	20849	93.93%
EBCI	CHARLEROI	S1 - RNP APCH	1211	13090	9.25%	2258	20849	10.83%
EBCI	CHARLEROI	O4 - Basic RNP 1 DME/DME/IRU	14	13090	0.11%	0	20849	0.00%
EBCI	CHARLEROI	O3 - Basic RNP 1 DME/DME	28	13090	0.21%	8	20849	0.04%
EBCI	CHARLEROI	O2 - Basic RNP 1 GNSS	1734	13090	13.25%	2946	20849	14.13%
EBCI	CHARLEROI	O1 - Basic RNP 1 all permitted sensors	10933	13090	83.52%	18118	20849	86.90%
EBCI	CHARLEROI	D4 - RNAV 1 DME/DME/IRU	60	13090	0.46%	6	20849	0.03%
EBCI	CHARLEROI	D3 - RNAV 1 DME/DME	233	13090	1.78%	15003	20849	71.96%
EBCI	CHARLEROI	D2 - RNAV 1 GNSS	714	13090	5.45%	1486	20849	7.13%
EBCI	CHARLEROI	D1 - RNAV 1 all permitted sensors	11294	13090	86.28%	18822	20849	90.28%
EBCI	CHARLEROI	B4 - RNAV 5 VOR/DME	513	13090	3.92%	483	20849	2.32%
EBCI	CHARLEROI	B3 - RNAV 5 DME/DME	505	13090	3.86%	497	20849	2.38%
EBCI	CHARLEROI	B2 - RNAV 5 GNSS	1417	13090	10.83%	2078	20849	9.97%
EBCI	CHARLEROI	B1 - RNAV 5 all permitted sensors	10948	13090	83.64%	18450	20849	88.49%
EBCI	CHARLEROI	B - LPV (APV with SBAS)	671	13090	5.13%	1527	20849	7.32%
EBCI	CHARLEROI	A - GBAS landing system	95	13090	0.73%	3234	20849	15.51%

Airport Code	Airport Name	Capability	# Flights Q4/2019	Total # Flights Q4/2019	% Capable Flights Q4/2019	# Flights Q2/2022	Total # Flights Q2/2022	% Capable Flights Q2/2022
EBKT	WEVELGEM/KORTRIJK	S2 - RNP APCH with BARO-VNAV	402	798	50.38%	1062	1910	55.60%
EBKT	WEVELGEM/KORTRIJK	S1 - RNP APCH	360	798	45.11%	926	1910	48.48%
EBKT	WEVELGEM/KORTRIJK	O4 - Basic RNP 1 DME/DME/IRU	0	798	0.00%	0	1910	0.00%
EBKT	WEVELGEM/KORTRIJK	O3 - Basic RNP 1 DME/DME	11	798	1.38%	88	1910	4.61%
EBKT	WEVELGEM/KORTRIJK	O2 - Basic RNP 1 GNSS	204	798	25.56%	839	1910	43.93%
EBKT	WEVELGEM/KORTRIJK	O1 - Basic RNP 1 all permitted sensors	91	798	11.40%	246	1910	12.88%
EBKT	WEVELGEM/KORTRIJK	D4 - RNAV 1 DME/DME/IRU	0	798	0.00%	0	1910	0.00%
EBKT	WEVELGEM/KORTRIJK	D3 - RNAV 1 DME/DME	294	798	36.84%	668	1910	34.97%
EBKT	WEVELGEM/KORTRIJK	D2 - RNAV 1 GNSS	526	798	65.91%	1325	1910	69.37%
EBKT	WEVELGEM/KORTRIJK	D1 - RNAV 1 all permitted sensors	99	798	12.41%	282	1910	14.76%
EBKT	WEVELGEM/KORTRIJK	B4 - RNAV 5 VOR/DME	337	798	42.23%	613	1910	32.09%
EBKT	WEVELGEM/KORTRIJK	B3 - RNAV 5 DME/DME	355	798	44.49%	585	1910	30.63%
EBKT	WEVELGEM/KORTRIJK	B2 - RNAV 5 GNSS	615	798	77.07%	1439	1910	75.34%
EBKT	WEVELGEM/KORTRIJK	B1 - RNAV 5 all permitted sensors	100	798	12.53%	337	1910	17.64%
EBKT	WEVELGEM/KORTRIJK	B - LPV (APV with SBAS)	413	798	51.75%	1191	1910	62.36%
EBKT	WEVELGEM/KORTRIJK	A - GBAS landing system	2	798	0.25%	67	1910	3.51%
EBLG	LIEGE/LIEGE	S2 - RNP APCH with BARO-VNAV	5329	9033	58.99%	5977	10169	58.78%
EBLG	LIEGE/LIEGE	S1 - RNP APCH	1688	9033	18.69%	4077	10169	40.09%
EBLG	LIEGE/LIEGE	O4 - Basic RNP 1 DME/DME/IRU	782	9033	8.66%	138	10169	1.36%
EBLG	LIEGE/LIEGE	O3 - Basic RNP 1 DME/DME	19	9033	0.21%	117	10169	1.15%
EBLG	LIEGE/LIEGE	O2 - Basic RNP 1 GNSS	324	9033	3.59%	1086	10169	10.68%
EBLG	LIEGE/LIEGE	O1 - Basic RNP 1 all permitted sensors	5938	9033	65.74%	7546	10169	74.21%
EBLG	LIEGE/LIEGE	D4 - RNAV 1 DME/DME/IRU	1237	9033	13.69%	208	10169	2.05%
EBLG	LIEGE/LIEGE	D3 - RNAV 1 DME/DME	533	9033	5.90%	1267	10169	12.46%
EBLG	LIEGE/LIEGE	D2 - RNAV 1 GNSS	420	9033	4.65%	1850	10169	18.19%
EBLG	LIEGE/LIEGE	D1 - RNAV 1 all permitted sensors	6891	9033	76.29%	7907	10169	77.76%
EBLG	LIEGE/LIEGE	B4 - RNAV 5 VOR/DME	1743	9033	19.30%	1061	10169	10.43%
EBLG	LIEGE/LIEGE	B3 - RNAV 5 DME/DME	1723	9033	19.07%	1162	10169	11.43%
EBLG	LIEGE/LIEGE	B2 - RNAV 5 GNSS	773	9033	8.56%	1905	10169	18.73%
EBLG	LIEGE/LIEGE	B1 - RNAV 5 all permitted sensors	6660	9033	73.73%	7963	10169	78.31%
EBLG	LIEGE/LIEGE	B - LPV (APV with SBAS)	227	9033	2.51%	1427	10169	14.03%
EBLG	LIEGE/LIEGE	A - GBAS landing system	117	9033	1.30%	50	10169	0.49%
EBOS	OOSTENDE	S2 - RNP APCH with BARO-VNAV	989	1721	57.47%	1584	2548	62.17%
EBOS	OOSTENDE	S1 - RNP APCH	454	1721	26.38%	972	2548	38.15%
EBOS	OOSTENDE	O4 - Basic RNP 1 DME/DME/IRU	16	1721	0.93%	0	2548	0.00%
EBOS	OOSTENDE	O3 - Basic RNP 1 DME/DME	34	1721	1.98%	15	2548	0.59%
EBOS	OOSTENDE	O2 - Basic RNP 1 GNSS	174	1721	10.11%	610	2548	23.94%
EBOS	OOSTENDE	O1 - Basic RNP 1 all permitted sensors	888	1721	51.60%	1370	2548	53.77%
EBOS	OOSTENDE	D4 - RNAV 1 DME/DME/IRU	26	1721	1.51%	2	2548	0.08%
EBOS	OOSTENDE	D3 - RNAV 1 DME/DME	128	1721	7.44%	160	2548	6.28%
EBOS	OOSTENDE	D2 - RNAV 1 GNSS	301	1721	17.49%	875	2548	34.34%
EBOS	OOSTENDE	D1 - RNAV 1 all permitted sensors	910	1721	52.88%	1368	2548	53.69%
EBOS	OOSTENDE	B4 - RNAV 5 VOR/DME	155	1721	9.01%	227	2548	8.91%
EBOS	OOSTENDE	B3 - RNAV 5 DME/DME	154	1721	8.95%	196	2548	7.69%
EBOS	OOSTENDE	B2 - RNAV 5 GNSS	604	1721	35.10%	1027	2548	40.31%
EBOS	OOSTENDE	B1 - RNAV 5 all permitted sensors	926	1721	53.81%	1378	2548	54.08%
EBOS	OOSTENDE	B - LPV (APV with SBAS)	213	1721	12.38%	629	2548	24.69%
EBOS	OOSTENDE	A - GBAS landing system	166	1721	9.65%	661	2548	25.94%

2.2.4 Summary

The NAV SPEC capability per flight required for different PBN operations increased significantly between Q4/2019 and Q2/2022.

+92%(Q4/2019) of the flights at EBBR are RNAV5 capable, 6% relies on "VOR/DME only" for RNAV5.

79%(Q2/2022) of the flights at EBAW are RNAV1 capable. 63%(Q2/2022) of the flights are RNP1 capable. An RNAV1 mandate is proposed for EBAW and will be mandatory from the 25JAN2024.

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92%(Q2/2022) of the flights at EBAW are RNP APCH capable of which 67% down to LNAV/VNAV and 56% down to LPV minima

All(Q2/2022) flights at EBBR are RNAV1 capable (RNAV1 mandate).
98%(Q2/2022) of the flights at EBBR are RNP APCH capable of which 90% down to LNAV/VNAV minima and only 7% down to LPV minima. .

98%(Q2/2022) of the flights at EBCI are RNAV1 capable (RNAV1 mandate).
99%(Q2/2022) of the flights at EBCI are RNP APCH capable of which 94% down to LNAV/VNAV minima and only 7% down to LPV minima. .

84%(Q2/2022) of the flights at EBKT are RNAV1 capable. An RNAV1 mandate is proposed for EBKT and will be mandatory from the 25JAN2024
94%(Q2/2022) of the flights at EBKT are RNP APCH capable of which 56% down to LNAV/VNAV and 62% down to LPV minima.

98%(Q2/2022)of the flights at EBLG are RNAV1 capable (RNAV1 mandate).
95%(Q2/2022) of the flights at EBLG are RNP APCH capable of which 59% down to LNAV/VNAV minima and only 14% down to LPV minima.

88%(Q2/2022) of the flights at EBOS are RNAV1 capable. An RNAV1 mandate is proposed for EBOS and will be mandatory from the 25JAN2024.

91%(Q2/2022) of the flights at EBOS are RNP APCH capable of which 62% down to LNAV/VNAV and 25% down to LPV minima.

A minor percentage of the flights at EBBR, EBCI, EBLG and EBOS are capable of RNP APCH to LPV minima. A significant increase of RNP APCH to LPV minima capability is needed before it could replace an ILS CAT I. It is proposed that ILS capability remains the primary means for landing until at least JUN2030.

A minor percentage of the flights is capable of RNAV1 DME/DME/(IRU) only and could be a limiting factor when implementing an RNAV1 missed approach at low altitudes.

A minor percentage of the flights is GBAS-capable (CAT I only), GBAS is currently not considered as an alternative for landing.

In comparison with previous quarterly reports, there is a significant increase of PBN capabilities and further increase is expected. Although it is too early to evaluate the impact of the COVID19 crisis and the energy crisis on the capabilities of the flights. On one hand it is expected that the older fleet will be taken out of the air earlier than planned, but on the other hand it can be also be expected that investment into new technologies onboard will be postponed.

2.3 Navigation infrastructure

In a full PBN environment, ground-based NAVAIDs provide a backup for GNSS and support contingency operations in case of GNSS becoming unusable.

During the transition to a full PBN environment, ground-based NAVAIDS will be provided either to support conventional navigation or to support DME/DME-based PBN capabilities.

This evolution offers the opportunity for a rationalization of the ground-based infrastructure and the maintenance of a minimum operational network (MON) which can efficiently provide these supporting services.

Each NAVAID type fulfils different operational roles and therefore, in order to plan the evolution of the navigation infrastructure, it is important to have a thorough picture of the type of operations that will still be enabled by each type of NAVAID during and after the transition.

2.3.1 GNSS and augmentation systems

Global navigation satellite system (GNSS) is to become the primary navigation infrastructure for PBN . GNSS is a generic term describing any satellite constellation that provides positioning, navigation and timing (PNT) on a global or regional basis.

Following systems are available:

- GPS (US): global GNSS
- BEIDOU(China): regional GNSS, currently expanding to provide global coverage
- GALILEO (EU): global GNSS in deployment phase
- GLONASS (Russian Federation): global GNSS

The optimistic planning that was considered at the time of the Eleventh Air Navigation Conference for all aircraft to be equipped with GNSS capability and for other GNSS constellations to be available, together with dual frequency and multi-constellation avionics capability being carried by aircraft, have not been realized. GPS is currently the only GNSS available for civil aviation within a great part of Western Europe. With suitable augmentation, this single frequency GNSS has the capability to support all phases of flight.

The current GNSS has an extremely high availability, although it does not have adequate resilience to a number of vulnerabilities, most notably (intentional and unintentional) radio frequency interference (RFI) and solar events causing ionospheric disturbances. Because the signal from GPS is commonly used by a myriad of applications, a deliberate interference of the GPS signal may not be directed at aviation. However, the by-product could be the loss of the signal-in-space (SIS) during a critical stage of flight. For this reason, contingency measures must be considered. As other satellite navigation constellations become available, the robustness of satellite navigation will improve. But the vulnerability can never be eliminated and it is essential that a ground-based navigation infrastructure capable of maintaining safety and continuity of aircraft operations, is available.

GNSS augmentation is any system that aids GNSS by providing accuracy, integrity, availability, or any other improvement to positioning, navigation, and timing and that is not inherently part of GNSS itself. Augmentation could be an Aircraft Based Augmentation Systems (ABAS), which includes as one option Receiver Autonomous Integrity Monitoring (RAIM), and Satellite Based Augmentation Systems (SBAS).
SBAS covers a regional size area and a geostationary satellite is used to transmit augmentation data to the end users. This means that SBAS can support most phases of flight. A RNP APCH down to LPV minima relies on GNSS and SBAS augmentation and provides as good a service as ILS down to CAT I performance

In Europe, space-based augmentation is provided by EGNOS. EGNOS SoL service is provided to Belgium and enables RNP APCH to LPV minima since September 2015. All published RNP APCH SBAS APV (LPV) shall be upgraded to SBAS CAT I (LPV200) where possible.

GBAS is a ground-based augmentation system used for precision landing. It is a GPS-dependent alternative to ILS, which uses a single GBAS airport ground station to transmit corrected GNSS data to suitably equipped aircraft to enable them to fly a precision approach. But it is not (yet) considered as an augmentation system for PBN operations. Nevertheless, GBAS is being certified to provide for CAT II/III operations and could be an alternative for ILS in the future. Although one system can serve multiple runway ends, it is still a very expensive system. At present GBAS landings are sparsely implemented within ECAC. . GBAS is out of scope of the PBN plan.

GNSS is to become the primary navigation infrastructure for PBN

2.3.2 NDB and L

Non-directional beacons (NDB) and locators (L) are part of conventional procedures but serve no role in PBN operations.

- Life cycle NDB: ± 30 years
- Initial investment: no plans
- Maintenance costs per year: NIL (monitoring)
- Flight inspection: NIL
- Between 2006-2009, a number of NDBs were replaced

2.3.2.1 MAK (NDB)

- BRNAV ROUTE (L607) as waypoint
- HOLDING entry and exit point to EBKT as waypoint
- EBLG conventional and RNAV1 STAR (KOK M) – *planned withdrawal 07SEP2023*
- EBOS conventional SID both RWY as exit point

2.3.2.2 SLV (NDB)

- Homing for EBSP

2.3.2.3 ONO (NDB) at EBOS

- EBOS conventional and RNAV1 STAR
- EBOS conventional and RNAV1 holding
- EBOS L/NDB RWY08 and RWY26(FAF)
- EBOS ILS RWY08 and RWY26 (FAF and co-located OM)
- EBOS RNP RWY08 and RWY26 as waypoint
- EBOS conventional SID from RWY08

2.3.2.4 DD (L) at EBOS

- EBOS L/NDB RWY08 and RWY26
- EBOS ILS RWY08 and RWY26
- EBOS RNP RWY26 (conventional missed approach)
- EBOS conventional SID from RWY26

2.3.2.5 OO (L) at EBOS

- EBOS L/NDB RWY08 and RWY26
- EBOS ILS RWY08 and RWY26
- EBOS RNP RWY08 (conventional missed approach)

2.3.2.6 ONW (NDB) at EBAW

- Co-located with OM ILS RWY29
- Conventional SID from RWY29 to SONDI
- Situational awareness for non RNAV-capable/non EFIS-equipped aircraft during ILS-approach

2.3.2.7 ONC (NDB) at EBCI

- Co-located with OM ILS RWY24
- Situational awareness for non RNAV-capable/non EFIS-equipped aircraft during ILS-approach

2.3.2.8 ONL (NDB) at EBLG

- Co-located with OM ILS RWY22L
- Situational awareness for non RNAV-capable/non EFIS-equipped aircraft during ILS-approach

2.3.2.9 OZ (L: RWY01), OP (L: RWY25R), OB (L: RWY25L) at EBBR

- Co-located with OM ILS
- Situational awareness for non RNAV-capable/non EFIS-equipped aircraft during ILS-approach

Due to a fire(summer 2022), OZ went out of service and withdrawn from the AIP.

Unless a specific need is justified and after implementation of:

- The withdrawal of the NDB/L approaches at EBOS:
- All conventional STARs, holding and SIDs including a NDB, are redesigned or replaced by RNAV1 STARs, holding and SIDs where the NDB-position could be replaced by a waypoint.
- Conventional procedures (IAF to IF) are redesigned into RNAV1 transitions to final (ILS)
- Missed approach (after a conventional or RNP APCH final segment) including a NDB are redesigned into a RNAV1 missed approach.

decommissioning of the NDBs and locators is envisaged.

It is imperative that PBN procedures are implemented ASAP so when a ground-based NAVAID becomes in-operative (and no intention/possibility to repair), there is a minor impact on the operations. Instead of the IR implementation date of JUN2030, **JAN2024 is proposed as latest implementation date for all RNAV1 STARs and SIDs.**

2.3.3 Phase out of the NDB and locator infrastructure

Decommissioning of the NDB/L infrastructure can only take place, when it is no longer part of relevant flight instrument procedures or for other specific needs. For this reason following approach is proposed:

Phase Ia: In a PBN environment NDB/L are replaced by a waypoint, if needed. Relevant flight procedures require a redesign, followed by an AIP publication..

Phase Ib: In parallel with the withdrawal of a NDB/L from the AIP, impacted conventional procedures shall also be withdrawn.

Phase II: Once the NDB/L is withdrawn from the AIP, the decommissioning follows

An evaluation period (6months to 1 year) is foreseen between the implementation of the PBN environment and the withdrawal of the NDB together with the impacted conventional procedures from the AIP

It is proposed to withdraw the NDB/L infrastructure as follows:

- ASAP **SLV, ONC, OB, OP** and **ONL**
- Q1/2024 Implementation of PBN departures at EBOS and EBAW.
- After evaluation the conventional procedures (incl. NDB approach) are withdrawn from the AIP. Simultaneously **ONO, ONW, OO , DD and MAK** are withdrawn from the AIP.

AIC 001/2023 with effective date 26th of January 2023 notified the planning of the withdrawal of the NDB/L infrastructure .

NDB/L are not part of the minimum operational network

2.3.4 VOR

VOR facilities should be withdrawn in the context of an overall PBN plan. However, VORs may be retained to serve the residual operational purposes.

- Lifespan new VOR ± 15years
- Initial investment:
- Maintenance costs per year:
- Flight inspection: 1/year

A VOR can be part of VOR/DME, VORTAC or VOR + TACAN.

A project for refurbishment/replacement of the VORs within Belgium was finalized by 2021.

The following NAVAIDs were not part of the project and are at the end of their life cycle:

- CIV
- KOK

These NAVAIDs are co-located with /close to a TACAN

The following NAVAIDs were part of the refurbishment plan but with a limited expected life-span:

- AFI
- BUN
- FLO
- HUL
- LNO
- NIK
- LGE

The following NAVAIDs were replaced by a new VOR:

- ANT
- BUB
- COA
- SPI
- GSY

2.3.4.1 AFI

- STAR EBBR – *planned withdrawal 05OCT2023*
- Holding EBBR (KERKY & NIVOR*) – planned withdrawal 05OCT2023*
- IAP EBBR to RWY01, RWY07L ,RWY 07R and RWY 19
- SID EBBR RWY07L and RWY25R – *planned withdrawal 05OCT2023*

2.3.4.2 ANT (MON)

- STAR EBAW, EBBR – *planned withdrawal 05OCT2023*
- Holding EBAW, EBBR – *planned withdrawal 05OCT2023*
- IAP EBAW to RWY11 and RWY29 (incl. final segment and missed approach)
- IAP EBBR to RWY01, RWY07L, RWY07R, RWY19, RWY25L and RWY25R (incl. RCF missed approach)
- SID EBBR RWY07L and RWY07R– *planned withdrawal 05OCT2023*

2.3.4.3 BUB (MON)

- En-route holding
- STAR EBCI
- IAP EBBR to RWY01, RWY07L, RWY07R, RWY19, RWY25L (incl. final segment and incl. RCF missed approach)

- SID EBAW RWY11 and RWY29
- SID EBBR RWY07R, RWY19, RWY25L and RWY25R– *planned withdrawal 05OCT2023*
- SID EBCI RWY24
- SID EBLG RWY04L/R and RWY22L/R– *planned withdrawal 07SEP2023*

2.3.4.4 BUN

- STAR EBAW, EBBR– *planned withdrawal 05OCT2023*
- Holding EBBR– *planned withdrawal 05OCT2023*
- IAP EBBR RWY19, RWY25L and RWY25R (incl. RCF missed approach)
- SID EBAW RWY11 and RWY29
- SID EBBR RWY07L, RWY07R,RWY19, RWY25L and RWY25R– *planned withdrawal 05OCT2023*

2.3.4.5 CIV

- STAR EBBR– *planned withdrawal 05OCT2023*, EBCI, EBLG – *planned withdrawal 07SEP2023*IAP EBBR RWY01, RWY07R (incl. RCF missed approach)
- SID EBBR RWY01, RWY07L, RWY07R, RWY19, RWY25L and RWY25R– *planned withdrawal 05OCT2023 (except RWY01)*
- SID EBCI RWY06 and RWY24
- SID EBLG RWY04L/R and RWY22L/R– *planned withdrawal 07SEP2023*

2.3.4.6 COA (MON)

- En-route holding
- STAR EBOS
- IAP EBOS RWY08 and RWY26 (incl. missed approach)
- SID EBOS RWY08 and RWY26

2.3.4.7 FLO

- STAR EBAW, EBBR– *planned withdrawal 05OCT2023*, EBCI
- Holding EBBR – *planned withdrawal 05OCT2023*
- IAP EBBR RWY01, 07L, 07R, 19, 25L and 25R (incl. RCF missed approach)
- SID EBCI RWY24
- SID EBLG RWY04L/R– *planned withdrawal 07SEP2023*

2.3.4.8 GSY (MON)

- en-route holding
- STAR EBCI, EBLG– *planned withdrawal 07SEP2023*
- Holding EBBR – *planned withdrawal 05OCT2023*, EBCI, EBLG – *planned withdrawal 07SEP2023*
- IAP EBBR RWY01
- IAP EBCI RWY06 and RWY24 (incl. final segment and missed approach)
- SID EBCI RWY06 and RWY24

2.3.4.9 HUL

- STAR EBBR – *planned withdrawal 05OCT2023*
- Holding EBBR (NIVOR) – *planned withdrawal 05OCT2023*
- IAP EBBR RWY01, RWY07R and RWY25L
- SID EBBR RWY01, RWY07L,RWY 07R,RWY19, RWY25L and RWY25R– *planned withdrawal 05OCT2023 (except RWY01)*

2.3.4.10 KOK

- STAR EBAW, EBBR– *planned withdrawal 05OCT2023*, EBCI, EBLG– *planned withdrawal 07SEP2023,* EBOS
- IAP EBOS RWY08(NDB)
- SID EBBR RWY01, RWY07L, RWY07R, RWY19, RWY25L andRWY25R– *planned withdrawal 05OCT2023 (except RWY01)*
- SID EBOS RWY08 and RWY26

2.3.4.11 LGE

- STAR EBLG– *planned withdrawal 07SEP2023*
- Holding EBLG
- IAP EBLG RWY04R and RWY22L/R (incl. final segment) – *planned withdrawal 07SEP2023 except VOR RWY22L and RWY04R*
- SID EBLG RWY04L/R and RWY22L/R– *planned withdrawal 07SEP2023*

Procedures are redesigned and the withdrawal of all conventional procedures relying on LGE , except the holding and VOR APCH, is planned on 07SEP2023, Decommissioning of LGE follows.

2.3.4.12 LNO

- STAR EBAW, EBBR– *planned withdrawal 05OCT2023*, EBCI, EBLG– *planned withdrawal 07SEP2023*
- SID EBBR RWY01, RWY07L, RWY07R, RWY19, RWY25L and RWY25R– *planned withdrawal 05OCT2023 (except RWY01)*
- SID EBCI RWY06 and RWY24
- SID EBLG 04L/R and RWY22L/R– *planned withdrawal 07SEP2023*

2.3.4.13 NIK

- En-route holding
- STAR EBAW, EBBR– *planned withdrawal 05OCT2023*, EBCI, EBLG– *planned withdrawal 07SEP2023*
- Holding EBBR (KERKY) – *planned withdrawal 05OCT2023*
- IAP EBBR RWY07R and RWY19
- SID EBAW RWY11 and RWY29
- SID EBBR RWY01, RWY07L, RWY07R, RWY19, RWY25L and RWY25R– *planned withdrawal 05OCT2023 (except RWY01)*
- SID EBOS RWY08 and RWY26

2.3.4.14 SPI (MON)

- SID EBBR RWY01, RWY07L, RWY07R, RWY19, RWY25L and RWY25R– *planned withdrawal 05OCT2023 (except RWY01)*
- SID EBCI RWY06 and 24
- SID EBLG RWY04L/R– *planned withdrawal 07SEP2023*

2.3.4.15 All VORs

- RNAV5 ATS routes: VOR/DME

Unless a specific need is justified and after implementation of:

- a VOR/MON.
- All conventional STARs, holding and SIDs including a VOR are redesigned as or replaced by RNAV1 STARs, holding and SIDs where the VOR position could be replaced by a waypoint.
- Conventional procedures (IAF to IF) are redesigned into RNAV1 transitions to final (ILS and if needed VOR)

- Missed approach (after a conventional or RNP APCH final segment) including a VOR are redesigned into a RNAV1 missed approach.

decommissioning of the VORs, except the VOR/MON, is planned.

It is imperative that PBN procedures are implemented ASAP so when a ground based-NAVAID becomes in-operative (and no intention to repair), there is a minor impact on the operations. Instead of the IR implementation date JUN2030, JAN2024 is proposed as latest implementation date for all RNAV1 STARs and SIDs..

2.3.5 Deployment of the VOR MON

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The definition of the VOR MON provides coverage for operations on

- VOR/DME for RNAV5 ATS routes within the FIR.
- Conventional NPA to serve non-capable aircraft, if no ILS is available.
- In terminal airspace as situational awareness
- The MON will not support all current conventional STARs and SIDs.
- Following VORs : ANT, BUB, GSY are needed for VOR approaches to RWYs where no ILS is available.

ANT, BUB, COA, SPI, and GSY are part of the VOR MON.

Decommissioning of the remaining VOR infrastructure can only take place, when it is no longer part of relevant flight instrument procedures or for other specific needs. For this reason following approach is proposed:

Phase Ia: In a PBN environment VORs are replaced by a waypoint. Relevant flight procedures require a redesign, followed by an AIP publication..

Phase Ib: In parallel with the withdrawal of a VOR from the AIP, impacted conventional procedures shall also be withdrawn.

Phase II: Once the VOR is withdrawn from the AIP, the decommissioning follows

An evaluation period (6months to 1 year) is foreseen between the implementation of the PBN environment and the withdrawal of the VOR together with the impacted conventional procedures from the AIP

It is proposed to withdraw the VORs not part of the VOR MON as follows:

- Q3/2023 :Implementation of PBN arrivals/transitions at EBLG, together with the withdrawal of conventional procedures and LGE from the AIP
- Q4/2023: Implementation of PBN arrivals and departures at EBBR.
  - After evaluation, the conventional departures and CIV are withdrawn from the AIP
- Q1/2024: Implementation of PBN transitions at EBBR.
  - After evaluation, the conventional arrivals/transitions and VORs AFI and HUL are withdrawn from the AIP
- Q1/2024 Implementation of PBN arrivals and departures at EBAW.
  - After evaluation, the conventional procedures and the VORs BUN, FLO and LNO are withdrawn from the AIP
- Q1/2024 Implementation of PBN departures at EBOS.
  - After evaluation, the conventional arrivals and VORs NIK and KOK are withdrawn from the AIP.

The withdrawal of VORs from the AIP will be announced in an AIC, once the PBN plan is approved.

Selected VORs are part of the minimum operational network for conventional and RNAV5 reversion operations

2.3.6 ILS (LLZ, GP and DME)

An ILS installation consists of a LLZ, GP and DME co-located with GP and/or markers (MM and OM).

According to the PBN IR, only when an ILS CAT II/III is available it shall be the primary means for landing and ILS CAT I operations is only intended as a reversion for RNP APCH in a full PBN environment

- Lifecycle ILS CAT III: ±15 years, ILS CAT I: ±20 years
- Average Initial investment: 1.5M Euro
- Maintenance costs per year:
- Flight inspection:

2.3.6.1 **ILS CAT I**

- EBAW ILS RWY29 CAT I (incl. DME and MM/OM)
- EBBR ILS RWY01 CAT I (incl. DME and MM/OM)
- EBBR ILS RWY19 CAT I (incl. DME)
- EBLG ILS RWY22R CAT I (incl. DME)
- EBOS ILS RWY08 CAT I (incl. DME)
- EBOS ILS RWY26 CAT I (incl. OM/MM)

2.3.6.2 ILS CAT II/III (exempted by PBN IR)

- EBBR ILS RWY25L CAT II/III (incl. DME and MM/OM)
- EBBR ILS RWY25R CAT II/III (incl. DME and MM/OM)
- EBCI ILS RWY24 CAT II/III (incl. DME and MM/OM)
- EBLG ILS RWY04R CAT II/III (incl. DME)
- EBLG ILS RWY22L CAT II/III (incl. DME and MM/OM)

ILS is only intended for operations along the final segment. The final segment shall be connected to the network with an RNAV1 transition to final and an RNAV1 missed approach.

An ILS could be replaced by a RNP APCH with BARO-VNAV but higher minima than for CAT I operations will apply.
To replace ILS CAT I operations with RNP SBAS CAT I (LPV200) by 2030 and having the same minima, a significant increase of the LPV equipage rate is needed. Currently, the fleet has limited capabilities (e.g. EBBR 7%) and it is unrealistic to assume it will be 100% by 2030. It is proposed to also keep ILS CAT I as the primary means for landing until at least 2030. In the coming years the future of the ILS installations beyond 2030 will be further investigated.

At least until 2030, ILS is part of the minimum operational network

2.3.7 DME

The current DME network supports conventional procedures and DME/DME fully supports PBN operations based on RNAV1 and RNAV5. Consequently, A network of DMEs is the most suitable ground-based PBN capability. DME/DME, where supported by an adequate DME infrastructure, provides a fully redundant capability to GNSS for RNAV applications, and if authorized by the State a suitable reversionary capability for RNP1 applications,.

- Lifecycle: ±15 years
- Estimated costs new: XXXXX
- Maintenance costs per year: XXXXX
- Flight inspection: XXXXX
- All DMEs part of the VOR renewal/refurbishment programme were renewed..

DME and IFP

- DME is part of conventional procedures.
- DME/DME for RNAV1 applications: STARs, Holding, transition to final, missed approach, SIDs.
- DME/DME is not (yet) allowed for RNP1 applications.
- DME/DME for RNAV5 application.

2.3.7.1 DME part of VOR/DME

- AFI, ANT, BUB, BUN, COA, FLO, GSY, HUL, (LGE), LNO, NIK and SPI
  When a VOR is decommissioned, the DME stays in place (except LGE) pending further rationalisation.

2.3.7.2 Stand alone DME

- LIE (new)

2.3.7.3 DME part of VORTAC or TACAN

- VORTAC: KOK , CIV
- TACAN: BBE, BBL and BFS

Use of these DME facilities is encouraged, if supported by the necessary authorisations and/or agreements.. The future use of the DME part of a TACAN, especially KOK, is being investigated.

2.3.7.4 Cross-border DME

Cross-border use of DME facilities is encouraged, if supported by the necessary authorisations and/or agreements..

2.3.7.5 DME part of ILS

Out of scope.

The existing DME infrastructure shall evolve towards a PBN ground based navigational infrastructure complementary to GNSS. DMEs are co-located with VORs or TACAN which creates certain limitations. As most VORs are decommissioned, this can be an opportunity to optimise the DME network.. To be operationally robust, an efficient DME network design should fill gaps and provide DME/DME coverage as low as possible A simulation with the DEMETER tool should demonstrate the coverage for each intended operation, especially at low altitudes (initial climb and missed approach),

2.3.8 Deployment of an optimization/rationalization plan for DME.

At present, the coverage at low altitude in the NW of BRUSSELS FIR is limited for RNAV1 operations. The necessity and feasibility for additional DMEs are being studied. Recent studies advice for 1 or 2 additional DMEs. At the same time the possibility to relocate an existing DME is being investigated.

DME is part of the minimum operational network

2.3.9 Summary

GNSS is to become the primary navigation infrastructure for PBN by the latest 2030.

The retention of a minimal network of ground-based NAVAIDs intends to allow the operation of non-PBN capable aircraft during the transition to PBN, as well as providing alternative means of navigation during contingency procedures for GNSS reversion in the event of a GNSS outage or GNSS interference.

This minimum operational network exists out of ILS installations for landing and a network made up of DME and VOR to ensure a minimum coverage within terminal and EN -route airspace.

The establishment of this network will be done through the following actions:

- Balancing the costs (initial investment and maintenance costs) associated with the needed infrastructure
- Withdrawal of the NDB infrastructure
- Withdrawal of the VOR infrastructure except VORs part of the MON
- Optimization of the DME infrastructure
- Keeping ILS as primary landing aid until at least June 2030
- Aligning the rationalization planning with equipment life cycles and PBN implementation planning.

2.4 Reversion plan for PBN operations

2.4.1 Primary and secondary means of navigation

A navigational infrastructure must ensure the safety of operations. The level of service to be provided during operations determines the extent of the infrastructure needed; this is especially the case in a reversion scenario. The basic philosophy implies that two independent navigational infrastructures shall provide means of navigation along each departure, arrival, transition, approach and landing or EN route segments of flight .

The table below describes the primary and secondary means of navigation considered in a full PBN environment.

Approach procedures			
FULL PBN environment	PRIMARY means of navigation	SECONDARY means of navigation	Remarks
EBAW APCH RWY11	RNP RWY11	VOR RWY11	MON: ANT
EBAW APCH RWY29	RNAV1 TRANSITION to final + ILS (final) RWY29 CAT I + RNAV1 missed approach	RNP RWY29	
EBBR APCH RWY01	RNAV1 TRANSITION to final + ILS (final) RWY01 CAT I + RNAV1 missed approach	RNP RWY01	
EBBR APCH RWY07L	RNP RWY07L	RNAV1 TRANSITION to final + VOR (final) RWY07L + RNAV1 missed approach	MON: BUB
EBBR APCH RWY07R	RNP RWY07R	RNAV 1 TRANSITION to final + VOR (final) RWY07R + RNAV1 missed approach	MON: BUB
EBBR APCH RWY19	RNAV1 TRANSITION to final + ILS (final) RWY19 CAT I + RNAV1 missed approach	RNP RWY19	
EBBR APCH RWY25L	RNAV1 TRANSITION to final + ILS (final) RWY25L CAT II/III + RNAV1 missed approach	RNP RWY25L	
EBBR APCH RWY25R	RNAV1 TRANSITION to final + ILS (final) RWY25R CAT II/III + RNAV1 missed approach	RNP RWY25R	
EBCI APCH RWY06	RNP RWY06	VOR RWY06	MON: GSY
EBCI APCH RWY24	RNAV1 TRANSITION to final + ILS (final) RWY24 CAT II/III + RNAV1 missed approach	RNP RWY24	

EBLG APCH RWY04L	RNP RWY04L	No reversion	
EBLG APCH RWY04R	RNAV1 TRANSITION to final + ILS (final) RWY04R CAT II/III + RNAV1 missed approach	RNP RWY04R	
EBLG APCH RWY22L	RNAV1 TRANSITION to final + ILS (final) RWY22L CAT II/III + RNAV1 missed approach	RNP RWY22L	
EBLG FINAL RWY22R	RNAV1 TRANSITION to final + ILS (final) RWY22R CAT I + RNAV1 missed approach	RNP RWY22R CAT I	
EBKT APCH RWY24	RNP RWY24	No reversion	EBOS as alternate
EBKT APCH RWY06	RNP RWY06	No reversion	
EBOS APCH RWY08	RNAV1 TRANSITION to final + ILS (final) RWY08 CAT I + RNAV1 missed approach	RNP RWY08 CAT I +	
EBOS APCH RWY26	RNAV1 TRANSITION to final + ILS (final) RWY26 CAT I + RNAV1 missed approach	RNP RWY26	
STARs, SIDs, HOLDINGs and en-route segments TRANSITIONs to conventional final and missed approach			
FULL PBN environment	PRIMARY means of navigation	SECONDARY means of navigation	Remarks
RNAV5 routes	GNSS	DME/DME	Also VOR/DME
RNAV en-route holding	GNSS	DME/DME	Also VOR/DME
RNAV1 STAR	GNSS	DME/DME	
RNAV1 HOLDING	GNSS	DME/DME	
RNAV1 SID	GNSS	DME/DME	
RNP1 SID/STAR	GNSS		Vectoring
RNAV1 TRANSITION to final*	GNSS	DME/DME	* RNP, ILS, LOC or VOR final
RNAV1 missed approach *	GNSS	DME/DME	

2.4.2 Summary

- RNAV5 is the means of navigation for EN-route using GNSS input and DME/DME or VOR/DME as reversion.

- RNAV1 is the means of navigation for STAR, HOLDING, SID, transition to final and missed approach within TMA using input from GNSS and DME/DME as reversion.

- RNP1 is the means of navigation for STAR, HOLDING, SID, transition to final and missed approach within the TMA using input from GNSS without reversion.

- In descending order, the means for navigation for approach/landing are:
    I. ILS CAT I/II/III
    II. RNP APCH (primary approach capability or as a back up to ILS):
        i. RNP APCH down to LPV minima: GNSS + SBAS
        ii. RNP APCH down to LNAV/VNAV minima: GNSS + BARO-VNAV
        iii. RNP APCH down to LNAV: GNSS only
    III. VOR or LOC

  RNP APCH is depending the available ground-based infrastructure as a primary means of navigation or as a backup. Apart from the RNP APCH , a conventional PA or NPA for each instrument runway end is available for landing, however not both of them.
  At EBKT, no reversion for the RNP APCH exists. EBOS is the alternate aerodrome.

3 Contingency operations during GNSS reversion in the event of a GNSS outage or GNSS interference

The required transition towards PBN increasingly supported by GNSS as the primary navigation infrastructure affects several PBN stakeholders. Air traffic controllers will need to adapt to controlling traffic using less vectoring and increased monitoring of aircraft performance on the strategically de-conflicted PBN routes published in the airspace structure. At the same time, air traffic controllers have to be aware of the risk of GNSS outages, the contingency procedures to be applied in this case and maintain the appropriate skills to manage the contingency

In case of GNSS outage, different contingency procedures are possible depending on the navigation aids & procedures available at the airports, as well as on the outage scenario (local, regional or national & international). Here below, the contingency procedures to be applied in priority are listed :

- When conventional procedures and navigational aids are available at the airport(s) impacted by the GNSS outage/disruption;
  - Vectoring into ILS or LOC with DME when available.
  - Vectoring into VOR approaches when available.
  - Visual approaches (incl. circling approaches) when possible.
  - At all Belgian public airports except at EBKT, radar control is provided. This means that all controllers are qualified and able to radar vector aircraft when needed, which will limit the impact on the air traffic in case of GNSS outage/disruption.
- GNSS outage at an airport without conventional procedures or equipment will effectively halt all normal IFR operations:
  - Diversion to an alternate airport not experiencing GNSS outage/disruption.
  - Diversion to an alternate airport equipped with conventional procedures & navigational aids.

Network effect:

- The impact of a GNSS outage/disruption on the network strongly depends on the outage scenario, i.e. the volume of traffic having to divert to an alternate airport. At diversion airports, the traffic volume is likely to increase during the outage/disruption period.
- In case of national & international GNSS outage/disruption, the impact will not only be limited to air traffic, some communication and surveillance applications (e.g. time stamping & ADS-B) supporting the general society will also become unavailable.

4 Transition considerations

During the transition, a mixed navigation environment, where conventional procedures are still needed for non-PBN capable users, introduces ATC complexity (ATC workload and associated automation system). The impact is depending on the density of traffic but also the ratio of mix conventional and PBN operations. For each change to the procedures/NAVAID infrastructure, adequate measures are needed.

Plans should be made to reduce the amount of available conventional procedures (especially SIDs) and even to consider the redesign of specific procedures, only suited for the non-capable aircraft to enable the phasing out.

- To make the transition from conventional navigation to PBN navigation smooth, as well as to support mixed operations during the transition to accommodate non-compliant aircraft, the existing ground-based navigational aids will initially be retained.
- Measures to be used to ensure smooth operations of non-capable aircraft:
    - Vectoring of controlled aircraft based on the use of an ATS surveillance system.
    - Current conventional navigation procedures. These procedures might need to be adapted.
    - All along the transition, feedback from flight crews and ATS units will be collected & the system performance continuously monitored, so the transition strategy might be tailored accordingly.

A series of trials will also be undertaken to progressively assess the feasibility & performance of the PBN transition at the different public Belgian airports

5 Stakeholders consultation

Article 4 of the PBN IR stipulates that providers of ATM/ANS shall consult all of the following parties on the draft transition plan and the draft of any significant updates thereof and take account of their views where appropriate::

- aerodrome operators, airspace users and representative organisations of such airspace users affected by the provision of their services;
- the Network Manager referred to in Article 3(1) of Regulation (EU) No 677/2011
- Providers of ATM/ANS that provide their services in adjacent airspace blocks/states.

After having carried out the consultation providers of ATM/ANS shall submit the results of the consultation, as well as the draft transition plan, or the draft significant update thereof, for approval to the competent authority responsible for the airspace concerned.
That competent authority shall verify whether the draft transition plan, or the draft significant update thereof, complies with the requirements of this Regulation Providers of ATM/ANS shall not establish or implement the transition plan or the significant update, before having been informed by that competent authority that it has approved the draft transition plan or draft significant update thereof.
The first target date of the PBN plan was 03th of December 2020, the second target date is 25th of January 2024.

skeyes is in charge of the consultation of the PBN Implementation and Transition Plan for the Belgian part of Brussels FIR with the support of the PBN Implementation Group 2 (PBNIG2).

The PBN implementation group was launched in 2012 as a collaboration BCAA-skeyes dealing with PBN implementation and consultation of third parties. The group was re-lanced in 2020 as "PBNIG2" and among its members are aerodrome operators, airspace users, representative organisations of affected airspace users and the BSA/BCAA.

In view of the Covid-19 related restrictions, it was not practical to organize a meeting of the new PBNIG2. At the same time, several PBN implementation related actions needed to be taken to meet upcoming mandatory deadlines. It was therefore decided to reach out to the members of the PBNIG in the form of dedicated Discussion Paper (DP), requesting their feedback. DP001 was meant to initiate the consultation process on the PBN plan and should be seen as a proposal. The PBNIG2 members were requested to send their feedback via correspondence.

Several comments to this discussion paper DP001 were received and discussed by the PBNIG2 during Spring 2020. The feedback of the discussion paper is integrated into a FAQ and consolidated into the 'implementation objectives' described in the next chapter. The FAQ was sent to all the members of PBNIG.

End of November 2020 the first formal consultation, initiated and coordinated by skeyes and as required by article 4, took place. skeyes aims to create a dynamic document describing the way ahead to 2030. Each and every significant update shall be transmitted to the stakeholders for consultation. In the current sanitary context and restrictions due to Covid-19, skeyes decided to provide a consultation paper by mail. 85 mails were sent to the stakeholders and 68% read or clicked on the mail. The detailed PBN Implementation and Transition plan for 2024/2030 was available on request.

skeyes only received questions/comments from Brussels Airport. The comments were of an explanatory nature and did not alter the proposed plan. skeyes responded by providing the detailed plan and the relevant EU regulations by mail .

By the end of December the consolidated plan (v1.0) was sent to BCAA for approval.

A draft version of the PBN plan (v0.3)[1] was sent to the Network manager in June 2020 and following feedback received.

NM has internally reviewed this comprehensive and interesting document in coordination with the Navigation team. Please find below our feedback for your consideration:

- *Concerning 2020 requirements, we note that:*
  - *RNAV5 is fully implemented in ATS routes above FL150 as per PBN.AUR.2005 (6). There is just an editorial change of the naming of the routes to be implemented in the AIP by DEC 2020.*
  - *All NPA IREs have already RNP APCH procedures with 3 lines of minima implemented or planned to be implemented.*

    Exceptions are EBBR RWY07L and RWY07R, as EBBR is a PCP airport and 2024 is the proposed deadline. There is a plan to upgrade EBBR RWY07L to a precision approach RWY and RNP APCH procedures in both RWY07L and RWY07R are ready for permanent publication. For your information, an EC web seminar on SESAR deployment took place last 28th of April. During the seminar the PCP regulation was reviewed and the EC proposed for Common Project 1 to exclude the enhanced terminal airspace using RNP-based operations (AF1) due to entry into force of a dedicated EU PBN implementing regulation. This decision may affect those NPA IREs for the concerned PCP airports. We will monitor the situation and keep you informed.

    Finally, many thanks for the additional information on EBKT implementation plans, as this airport is exempted in the EASA list of airports, nevertheless we are monitoring the status of PBN implementation activities at all ECAC airports.
  - *No helicopter route is published or planned to be published in the Brussels FIR.*
- *Concerning 2024 and 2030 requirements, we note that:*
  - *Some sections need to be complete in further updates of the plan (e.g. infrastructure issues, contingency, etc)*
  - *RNAV5 is also implemented in all ATS routes (excluding SIDs and STARs) below FL150.*
  - *RNAV1 SID and STAR routes are either implemented or planned to be implemented in all concerned IREs. We note that EBBR RNAV1 SID procedures are not permanently published today. We also take note on the proposal in section 3.2.4 to implement RNAV1 instead of RNP1 procedures at EBBR because of the low equipage rate. The requirement is to implement RNP1 SID procedures by 2024, as EEBR is a PCP airport. We will check this scenario in further updates of the plan.*
  - *All PA IREs have either RNP APCH procedures with 3 lines of minima implemented or planned to be implemented by JAN 2024 as the latest. Some of those procedures are currently ready for publication.*
- *Please find some recommendations for future versions of the plan:*

For completeness and as required in Article 4 of the PBN IR, the consultation process with NM should be added in the plan (for instance, in section 6 – Stakeholder consultation).

[1] The version 1.0 has no significant changes compared to version v0.3. of the PBN plan. Mainly target dates, editorial changes and explanatory notes based on the feedback discussion paper PBNIG and NM.

A draft version of the PBN plan (v2.0)[1] was sent to the Network manager in January 2023 and following feedback received.

Many thanks for submitting the updated version (v2.0) of the PBN Implementation and Transition Plan of Skeyes (Belgian part of Brussels FIR) for consultation with NM.
This is a very detailed, well-structured and complete document that shows the excellent work undertaken by Skeyes concerning the implementation of the PBN requirements.

Following our internal review, the outcome is as follows:

- The NM consultation on this version of the document is **complete**.

Attached to this message you will find a Word document with our detailed comments, conclusions, recommendations (item 8) and collected information based on this version of the plan. In the document, you will find two Excel files embedded which contain an extract of the information available in the PBN map tool.

The list of NM recommendations (item 8) for further updates of the plan is as follows:

- **RNP APCH**:
  - Update the information in section 2.3.1 on EBOS RWY26 (page 22): RNP APCH with LNAV is currently published in A.I.P Belgium.
  - Update the statement regarding EBLG RWY 04L as non-IRE (Page 20): Note that instrument approach procedures (RNP APCH) are published, hence RWY04L should be considered as IRE (within the scope of the PBN IR).
- **Contingency measures**: Assess the supporting Surveillance and Communication infrastructure in the event of a GNSS failure.
- **Consultation process:** update the contents of section 5 with the outcome of this consultation with NM.

Should you have any queries on this feedback or the attached document, do not hesitate to contact us at pbntransitionplan@eurocontrol.int

All recommendations are included in version v2.1, except for the contingency measures which are still under development.

In order to have a collective agreement of the transition plans, all the PBN transition plans and related information received by NM are uploaded, after their review, on the ERNIP Database. No further comments were received.

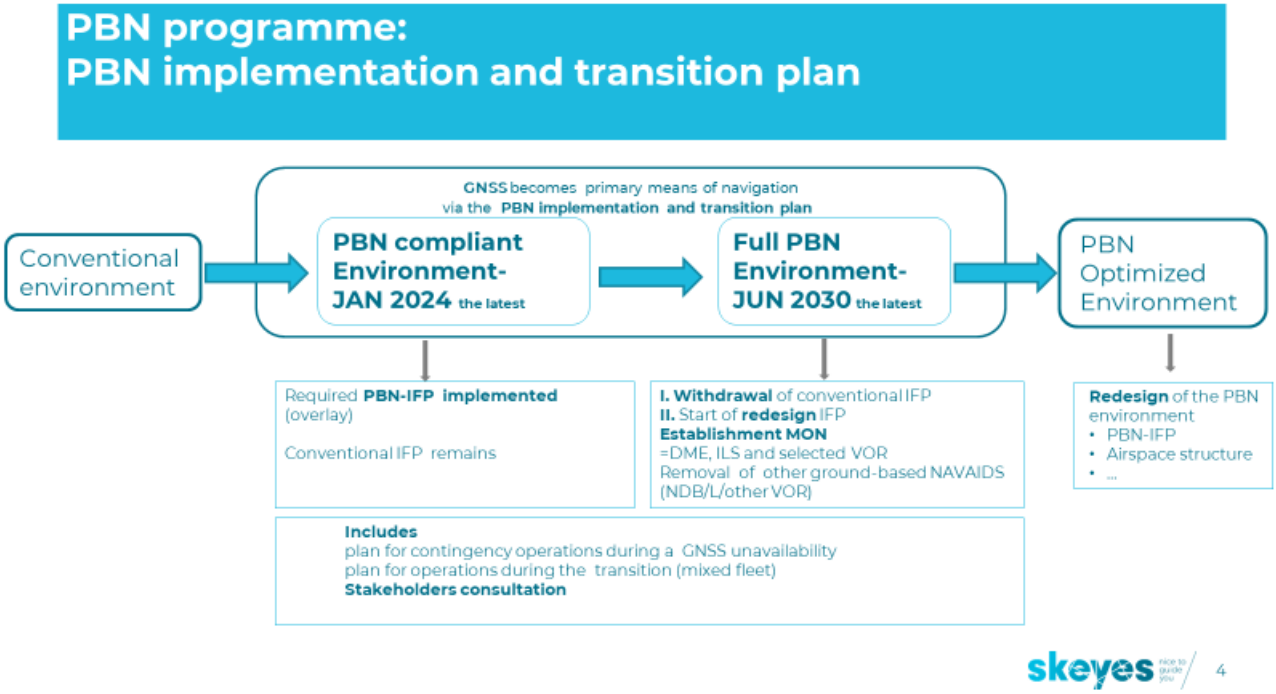
Providers of ATM/ANS in adjacent airspace blocks/states are consulted on a case-by-case basis.

At present(September 2022), approval by the BCAA of version 1.0 is still pending. In the meantime, skeyes is preparing further implementation. A second stakeholders consultation is postponed until the approval of the PBN plan.

[1] The version 1.0 has no significant changes compared to version v0.3. of the PBN plan. Mainly target dates, editorial changes and explanatory notes based on the feedback discussion paper PBNIG and NM.

6 Implementation objectives

The analysis of current operations has identified that the following changes to the airspace operations will enable the State to comply with the ICAO resolution 37/11 and EU regulation 2018/1048 as well as meeting the national goals. These "drivers for change" can be translated into national objectives. Dates for implementation have been identified, splitting up the national objectives. First a "PBN Compliant" environment at the aerodromes is created not later than January 2024. This is to be followed by a "Full PBN" environment not later than June 2030. Accordingly, the transition plan is split into three parts: a short-term part finalized by December 2020, a medium-term part extending to January 2024 and a long-term part, extending to June 2030.



6.1 Short-term part up to 03th December 2020

Within the Belgian part of Brussels FIR, the ATS routes and instrument flight procedures are already in line with the PBN IR target date of the 3rd of December 2020 and no further action Is required.

6.2 Medium-term part up to 25th January 2024 – PBN Compliant environment

6.2.1 Aerodromes concerned

The following civil aerodromes located in the Belgian part of the Brussels FIR shall form a PBN compliant environment by the latest 25th of January 2024, which is a target date specified in the PBN IR

- Antwerpen – EBAW
- Brussels – EBBR
- Charleroi – EBCI
- Kortrijk – EBKT
- Liège – EBLG
- Oostende – EBOS

6.2.2 PBN compliance

The current PBN-status in the Belgian part of the Brussels FIR is described in §2.1.

In addition to the current PBN-status, PBN compliance at the aerodromes listed above is to be achieved by implementing following elements for each instrument runway end (IRE) – non exhaustive list:

- RNAV1 STAR (all)
- RNAV1 holding
- RNP APCH down to LNAV, LNAV/VNAV and LPV minima
- RNAV1 transition to final approach segment (RNP, ILS-and if needed VOR)
- RNAV1 missed approach after final approach segment (RNP, ILS and if needed VOR)
- RNAV1 SID (all)
- RNAV1 replaced by RNP1+RF if proven additional benefits for STARs, transitions and SIDs

In addition to the PBN-compliant procedures, following procedures will remain available:

- Conventional STARs, Holdings and SIDs for as long as considered necessary
- Conventional final approach: ILS CAT I and CAT II/III approach as primary means of navigation into each precision approach runway
- Or conventional non precision approach (NPA) into each IRE as secondary means of navigation (where no ILS is available)

The plan is based on the following considerations:

- A minimum of two independent navigational infrastructure shall provide navigation for each departure, arrival, approach and landing.
- For each IRE, two instrument approaches will be provided: one GNSS-dependent, and one independent of GNSS.
- The preferred method of navigation for landing shall be primarily ILS, followed by RNP APCH and thirdly the conventional NPA.
- RNP approaches to LPV minima shall be compliant with SBAS CAT I (LPV200) wherever possible.
- The target navigation specification for STARs, holding, transitions and SIDs shall be RNAV1. RNP1 may be considered whenever required, and the airborne capabilities make an implementation possible
- PBN procedures are designed to the maximum possible extent as lateral and vertical overlays of the conventional procedures but will gradually be redesigned to reflect more the current operations (e.g. 'as vectored').
- Conventional base turn procedures starting at the IAF above the aerodrome (all except EBBR) cannot be duplicated in RNAV1 and will be redesigned into RNAV1 transitions to final.

The plan does not prevent implementation of other PBN-applications (e.g. rotorcraft routes) when the need for them arise. Airborne capability will be a key factor in determining their adoption.

6.2.3 Deviations from the Implementing Regulation

The following deviations from the applicable Implementing Regulation are proposed:

- All (not only one) STARs and SIDs PBN compliant by January 2024
- Besides ILS CAT II/III , ILS CAT I also remains the primary means for landing until at least 2030.

6.2.4 Fleet capabilities

In order to endure that the fleets concerned are appropriately equipped by the January 2024 deadline, an RNAV1 mandate is proposed for all IFR GAT flights inbound and outbound to/from these aerodromes: EBAW, EBKT and EBOS (in addition to the one which already exists for EBBR, EBCI and EBLG).On 10 August 2023, an AIC was published announcing that as from 25 JAN 2024 an RNAV 1 Operations Approval or equivalent authorization will also be required for all IFR GAT flights inbound and outbound to/from to all public aerodromes in the Belgian part of the Brussels FIR

6.2.5 Navigation infrastructure evolution

The following actions in respect of the navigation infrastructure are initiated but only fully realised during the next phase:

- A Minimum operational network (MON) based on VOR/DME/ILS is to be maintained to provide a fall-back in case of GNSS outage during the transition period and beyond. The purpose of the MON is to provide an optimum basic navigation capability independent of GNSS at national level. The PBN plan contains the elements of the MON as proposed. Deviations, although resulting in a reduced operational redundancy, may be considered
- Withdrawal all NDBs and Locators
- Withdrawal all VORs except those required for the MON. It is proposed to keep the VOR-stations ANT, BUB, COA, GSY and SPI .
- Optimize an adequate DME network to support RNAV1 operations
- Keep ILS installations until 2030 at least.

6.2.6 Provisions for non-PBN capable users

Conventional procedures are maintained for the benefit of non-PBN capable users. PBN mainly affects IFR GAT-operations. It does not affect either VFR-flights and/or OAT.

6.3 Long-term part up to 6th of June 2030– Full PBN environment

6.3.1 Aerodromes concerned

The following aerodromes located in the Belgian part of the Brussels FIR shall form the full PBN environment by the latest the 6th of June 2030, which is the target date specified in the PBN IR.

- Antwerpen – EBAW
- Brussels – EBBR
- Charleroi – EBCI
- Kortrijk – EBKT
- Liège – EBLG
- Oostende – EBOS

6.3.2 Phase 1: withdrawal of conventional procedures

As soon as this is feasible and after the establishment of the PBN compliant environment, the withdrawal of conventional procedures will take place in parallel with the withdrawal of VORs, NDBs (and Locator beacons). At the same time, impacted SIDs and STARs are withdrawn. The impacted approaches relying on these NAVAIDs, are also withdrawn. Note that ILS will remain in service for the landing.

6.3.3 Phase 2: initiation of the redesign of procedures and airspace.

The PBN instrument flight procedures have been overlays of the conventional procedures and as such, did not necessarily fully realize the potential benefits of performance based navigation. In this phase the overlay procedures should be redesigned so that they may provide all the possible benefits of PBN. It is initiated as soon as the conventional procedures are withdrawn and before the PBN IR target date of 6th of June 2030 is reached. However, it will only be fully realised in the next phase, the PBN Optimization.

Rationale for this two-step implementation: the structure of the airspace, especially at the regional airports, does not allow rapid deployment of PBN procedures, taking advantage of all their inherent possibilities. This is because changing the existing airspace structure is a quite lengthy process. Moreover, the dual traffic situation with aircraft capable and not capable of flying them, led to the current situation. It is assumed that a re-design of the (regional) airspaces will be easier to be performed once virtually all flights will be capable of flying RNAV1 and RNP-approaches.

6.3.4 Navigation infrastructure evolution

The activities started under the medium-term part of the plan are to be completed as early as practicable.

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6.3.5 Provisions for non-PBN capable users

In this part of the plan, minimal conventional procedures or radar vectoring shall still be available to support flights not covered by the quoted EU-regulations for PBN,

6.4 Implementation roadmap

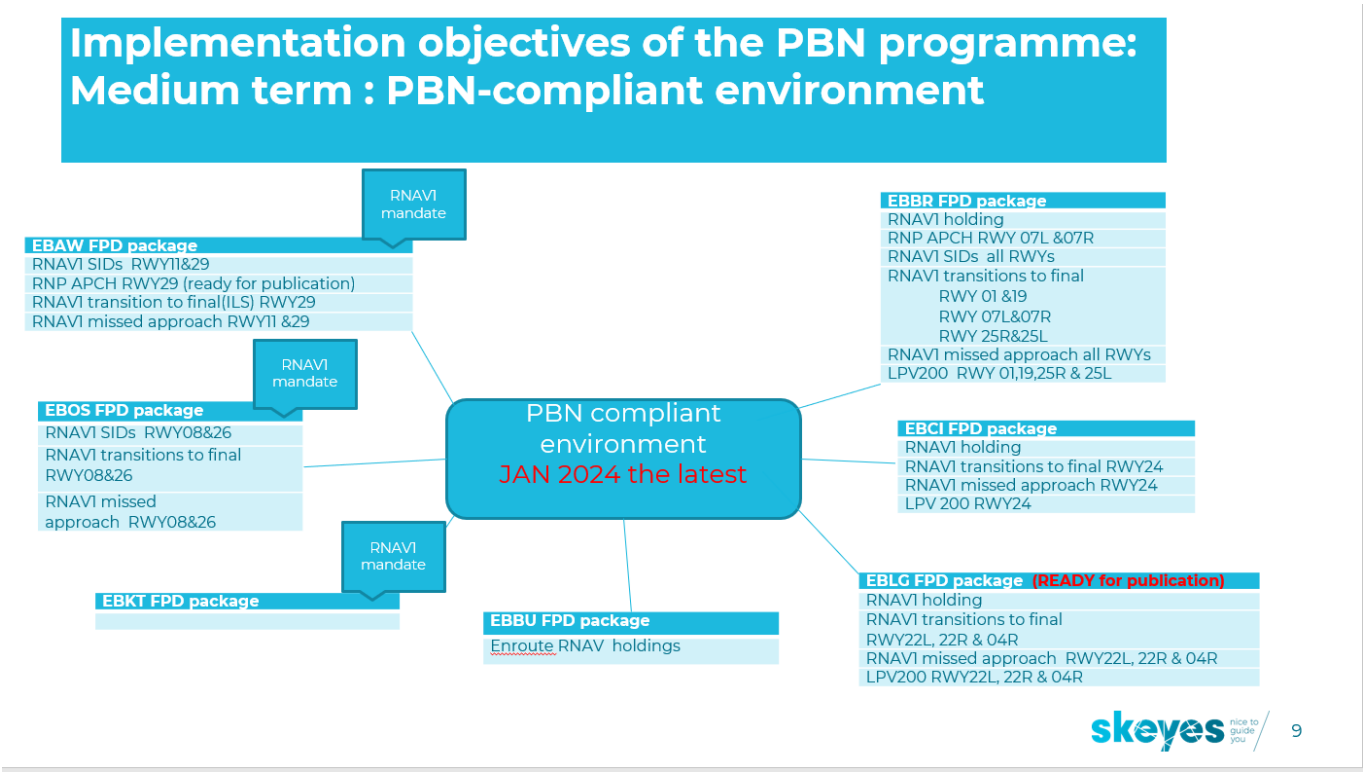
The dates proposed in the National plan could differ from the ones specified in the IR PBN, which a summarised for each IFP in section 2.1.3. The withdrawal or implementation of some procedures and NAVAIDS are foreseen to take place before the dates specified in the European regulations.

Following flight procedure design(FPD) packages are defined to enable the creation of a PBN compliant environment.

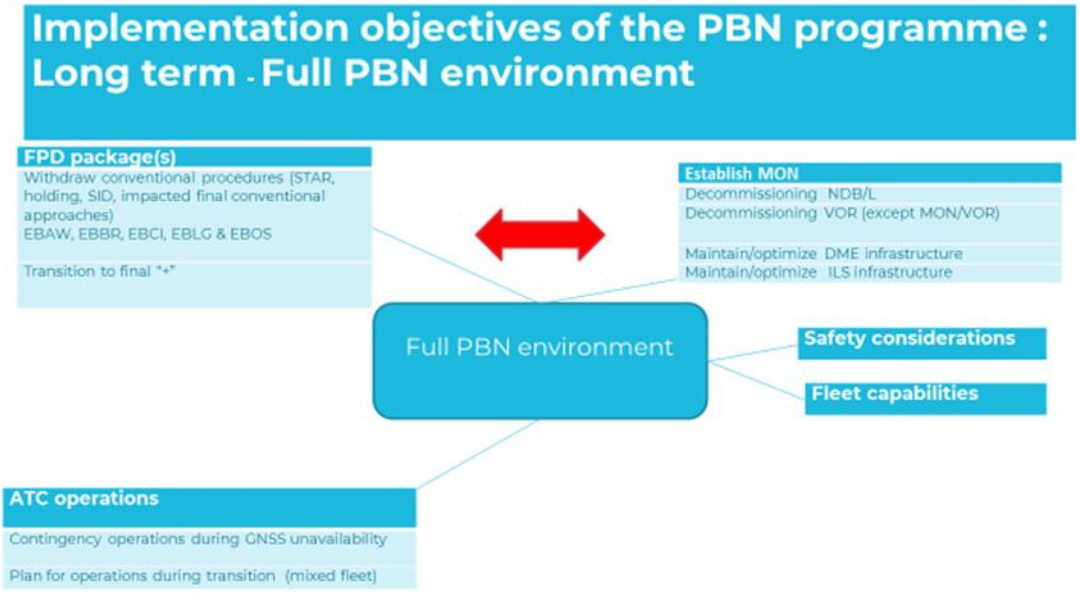
Other packages are being defined to enable the transition to a Full PBN environment.

- Establishment of MON
- Withdrawal of the NAVAIDS, not part of the MON
- Withdrawal of conventional IFP
- Etc.

6.4.1 Implementation roadmap covering compliance with the mid-term objectives by 25 JAN 2024



6.4.2 Implementation roadmap covering compliance with the long term objectives by 06 JUN 2030



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6.4.3 Implementation roadmap : EBBU and per Aerodrome

6.4.3.1 EBBU

FPD package	Implementation date	Remark
RNAV en-route holding		2024
Withdrawal conventional EN-route holding	TBD	

Navigational infrastructure	Implementation date	Remark
Withdraw NDB MAK , SLV	TBD	When PBN compliant environment and related procedures withdrawn
Withdraw VOR : AFI, BUN, CIV, FLO, HUL, KOK, LNO, NIK Withdraw LGE	TBD Q3/2023 planned	When PBN compliant environment and related procedures withdrawn
MON : VOR : ANT, BUB, COA, GSY, SPI		
Maintain/optimize DME infrastructure • Additional DME coverage for the NW of Belgium	TBD	

6.4.3.2 EBAW

FPD package	Implementation date	Remark
RNAV1 mandate	25 JAN 2024 the latest	Planned AIC publication 10AUG2023
RNP APCH RWY29	25 JAN 2024 the latest	Planned publication 02NOV2023
RNAV1 STAR and holding	25 JAN 2024 the latest	Planned publication 02NOV2023
RNAV1 SIDs RWY11 RNAV1 SIDs RWY29	25 JAN 2024 the latest	Planned publication RWY11 05OCT2023
RNAV1 Transition to finalRWY29	25 JAN 2024 the latest	
RNAV1 missed approach RWY 11 for RNP APCH RNAV1 missed approach RWY29 for ILS & RNP APCH	25 JAN 2024 the latest	

Withdrawal conventional procedures • SID, STAR and holding • VOR RWY29 • Baseturn to ILS RWY29 • Circling Retained conventional procedures • Final segment ILS RWY29 • VOR RWY11	TBD	

Navigational infrastructure	Implementation date	Remark
Withdraw NDB ONW	TBD	When PBN compliant environment and related procedures withdrawn
MON: VOR ANT ILS RWY29		

6.4.3.3 EBBR

FPD package	Implementation date	Remark
RNAV1 HOLDING	25 JAN 2024 the latest	Planned publication 05OCT2023
RNP APCH RWY07L RNP APCH RWY07R	25 JAN 2024 the latest	BCAA Approval pending
RNAV1 SID RWY01 & RWY19 RNAV1 SID RWY07L & RWY07R RNAV1 SID RWY25L & RWY25R	25 JAN 2024 the latest	Planned publication 05OCT2023, except RWY01
RNAV1 Transitions to final RWY01 & RWY19 RNAV1 Transitions to final RWY07L & RWY07R RNAV1 Transitions to final RWY25L & RWY25R	25 JAN 2024 the latest	
RNAV1 missed approach RWY01 & RWY19 for ILS & RNP APCH RNAV1 missed approach RWY07L & RWY07R for VOR & RNP APCH RNAV1 missed approach RWY25L & RWY25R for ILS & RNP APCH	25 JAN 2024 the latest	
RNP APCH SBAS CATI (LPV200) RWY01, RWY19,RWY25L & RWY25R	25 JAN 2024 the latest	Planned publication 05OCT2023

Withdrawal conventional procedures • SID, STAR and holding • SRA • VOR RWY25R Retained conventional procedures • Final segment ILS RWY01, RWY19, RWY25R, RWY25L, • Final segment VOR RWY07L, RWY07R	TBD	Planned publication 05OCT2023 for SID, STAR and holding

Navigational infrastructure	Implementation date	Remark
Withdraw L : OP, OB Withdraw VOR: AFI, HUL	TBD	When PBN compliant environment and related procedures withdrawn
MON: VOR BUB, ILS RWY01, RWY19, RWY25R, RWY25L		

6.4.3.4 EBCI

FPD package	Implementation date	Remark
RNAV1 HOLDING	25 JAN 2024 the latest	
RNAV1 Transitions to final RWY24	25 JAN 2024 the latest	
RNAV1 missed approach ILS RWY24	25 JAN 2024 the latest	
RNP APCH SBAS CAT I (LPV200) RWY24	ASAP	
Withdrawal conventional procedures • SID, STAR and holding • VOR RWY24 • Baseturn to ILS RWY24 • Circling Retained conventional procedures • Final segment ILS RWY24 • VOR RWY06	TBD	

Navigational infrastructure	Implementation date	Remark
Withdraw NDB ONC	TBD	When PBN compliant environment and related procedures withdrawn
MON: VOR GSY ILS RWY24		

6.4.3.5 EBKT

FPD package	Implementation date	Remark
RNAV1 mandate	25 JAN 2024 the latest	Planned AIC publication 10AUG2023
EBKT RNP RWY06	08 OCT 2020	
RNAV1 SID RWY06	08 OCT 2020	

Navigational infrastructure	Implementation date	Remark
NIL		

6.4.3.6 EBLG

FPD package	Implementation date	Remark
RNAV1 HOLDING	Planned Q3/2023	Planned publication 07SEP2023
RNAV1 Transitions to final,RWY04L, RWY04R, RWY22L and RWY22R	Planned Q3/2023	
RNAV1 missed approach ILS RWY04R, RWY22L and RWY22R	Planned Q3/2023	
RNP APCH with SBAS CAT I(LPV200) RWY22R	TBD	
Withdrawal conventional procedures • SID, STAR and holding • VOR RWY22L, RWY04R • Baseturn to ILS RWY22L, RWY22R, RWY04R • Circling Retained conventional procedures • Final segment ILS RWY22L, RWY22R, RWY04R	TBD	Planned publication 07SEP2023 except VOR RWY04R and RWY22L

Navigational infrastructure	Implementation date	Remark
Withdraw NDB ONL	TBD	When PBN compliant

Withdraw VOR LGE		environment and related procedures withdrawn
MON: ILS RWY22L, RWY22R, RWY04R		

6.4.3.7 EBOS

FPD package	Implementation date	Remark
RNAV1 mandate	25 JAN 2024 the latest	Planned AIC publication 10AUG2023
RNAV1 SIDs RWY08 & RWY26	25 JAN 2024 the latest	
RNAV1 Transitions to final RWY08 & RWY26	25 JAN 2024 the latest	
RNAV1 missed approach ILS and RNP RWY08 & RWY26	25 JAN 2024 the latest	
Withdrawal conventional procedures • SID, STAR and holding • NDB RWY08, RWY26 • Baseturn to ILS RWY08, RWY26 • Circling Retained conventional procedures • Final segment ILS RWY08, RWY26	TBD	

Navigational infrastructure	Implementation date	Remark
Withdraw NDB/L ONO, OO, DD	TBD	When PBN compliant environment and related procedures withdrawn
MON: ILS RWY08, RWY26		

Appendix A: List of abbreviations & glossary of terms

See PBNIG2 : Abbreviations and definitions PBNIG2-DOC001 (Vo.3)

Appendix B: Supporting documents

Performance Based Navigation (PBN): Implementation Strategy for Belgium 2012

EU: Commission Implementing Regulation 716/2014 on the establishment of the Pilot Common Project
supporting the implementation of the European Air Traffic Management Master Plan

EU: Commission Implementing Regulation 2018/1048 laying down airspace usage requirements and operating
procedures concerning performance based navigation

ICAO - Doc 8168 - Volume II - Aircraft Operations - Volume II - Construction of Visual and Instrument Flight Procedures –
Air Navigation Services - Aircraft Operations (PANS-OPS)

ICAO - Doc 9992 - Manual on the Use of Performance-Based Navigation (PBN) in Airspace Design - First Edition

ICAO - Doc 9613 - Performance-Based Navigation (PBN) Manual - Edition 4 / 03/2013
Url : http://www.icao.int/publications/Pages/catalogue.aspx

ICAO - Doc 7030 - Regional supplementary Procedures - Edition 5 / 07/2011
Url : http://www.icao.int/publications/Pages/catalogue.aspx

EUR ICAO - Doc 25 – Guidance material for the implementation of RNP Approach operations

The PBN handbook series
(I)European Airspace Concept Handbook for the Implementation of Performance Based Navigation (PBN) Edition 3.0
Url : http://www.eurocontrol.int/sites/default/files/publication/files/handbook-pbn-implement-2013-ed-3a.pdf

(II)European RNAV1 Infrastructure handbook

(III) European PBN Route Spacing handbook -

(IV) European NAVAID Infrastructure Planning handbook including MON

(V) European PBN Implementation and Transition Planning handbook

(VI) European GNSS contingency /Reversion handbook for PBN Operations

(VII) European Handbook for RNP Approach

Appendix C PBNIG2 TOR

Working group	PBN Implementation Group 2		
Acronym	PBNIG2	Associated Domain	ORG
Creation Date:	15/07/2020	End date	N/A
Chair:	BCAA	Secretary:	BCAA
Co-chair:	skeyes		
ToR Approved by	Members of PBNIG	Date	15/07/2020

- TERMS OF REFERENCE
-

Authority

The PBNIG2 is created by BCAA, Directorate Airspace, Airports, Environment & Supervision, and it reports directly to it via the Head of Airspace Department.

Purpose of the PBNIG2

With due regard to the international obligation for Belgium to implement PBN, especially obligation included in the EU regulation 2018/1048 as well as the relevant provision of ICAO, the PBNIG2 is being established to undertake all co-ordination and support work related to this obligation as well as to monitor the progress of the implementation. The work of PBNIG2 should be seen as a continuation of the efforts of the now terminated PBNIG1 which was set up for a similar purpose.
The Group shall foster a sphere of co-operation based on trust and professionalism to ensure successful and timely PBN implementation in Belgium.
The Group shall create a work schedule, to be approved by BCAA, within 2 months of its creation, and will conduct its business in accordance with this schedule.

On request of BCAA the group may execute any other task related to PBN implementation.

The PBNIG2 shall remain in existence as long as BCAA considers its work useful and beneficial for the successful implementation on PBN in Belgium.

Chairmanship

The chairmanship for PBNIG2 is provided by BCAA.
BCAA may request skeyes to appoint a co-chair with a specific expertise and knowledge in PBN to support the BCAA chairperson. In that case the sharing of the Chair's responsibility shall be agreed between the appointed Chairpersons. The Chair may be recalled by BCAA at any time if his/her performance in the sole opinion of BCAA is not satisfactory.

If one of the Chairpersons is unavailable for any reason or is recalled by the delegating organization, a co-chair ad interim shall be appointed by the respective organization as soon as possible but in any case, not later than 2 calendar months following the withdrawal of the previous Chair. Such appointment shall automatically terminate the mandate of the Chair ad interim. In case of the absence of the Co-chair from BCAA, BCAA may decide that the other Chairperson from skeyes shall assume all responsibilities and may act alone for a period not exceeding 6 calendar months.

Secretary

The Secretary and back-office support for PBNIG2 is provided by BCAA.

Membership

The PBNIG2 shall initially be constituted of civil and military aviation experts, delegated by organizations with interest in the implementation of PBN in Belgium.

Each Organization wishing to participate in the work of PBNIG2 may delegate one member to the group. In meetings this member may be accompanied by additional experts as needed.

The PBNIG2 members may propose additional temporary members to handle specific files.

Duties of PBNIG2 Members

PBNIG2 members are expected to attend the PBNIG2 meetings, actively participate in the discussions, help prepare discussion and position papers, undertake tasks related to PBN implementation as may be assigned by the group and in general facilitate and support PBN implementation in Belgium.

Expert groups

The PBNIG2 may establish expert group(s) to address particular issues that can be handled more efficiently in a smaller formation. Such expert groups will normally comprise just 3-4 people and a rapporteur, have a clearly described mandate and a deadline by which it must complete its work.

Meeting arrangements

The PBNIG2 shall be free to establish its meeting schedule to best fit the objectives and time scales contained in the work schedule. It is expected that the PBNIG2 will hold not more than 2 regular meetings per year. Special and ad-hic meetings may be held additionally if required. Maximum use shall be made of modern electronic means of communications and the minimizing the costs for all stakeholders involved shall be a priority. Meetings shall be physical or by electronic conferencing tools (Skype), whichever is considered more effective for the Agenda to be treated.

General working arrangements

The PBNIG2 will conduct its business by the close engagement of its members also between meetings. This may involve ad-hoc teleconferences, the initiation and conduct of consultations, evaluation of consultation results, etc. While the burden on PBNIG2 Members will be kept to a minimum, active support is expected from them in the context of the various PBN implementation activities.

Reporting

The PBNIG2 shall provide the following reports:

- Meeting Summaries – Approved by the Chairs and submitted to Group members and Observers and also sent to BCAA, the report produced by the Secretary summarizes the issues addressed and the conclusions reached at each of the Group's meetings.
- Special Progress Reports – Approved by the Chairs and submitted to Group members and Observers and also sent to BCAA, the Special Progress Reports describe progress being achieved with specific, high priority/importance items that is of common interest in the context of PBN implementation.
- Special Reports – Compiled on the request of BCAA and approved by the Chairs, Special Reports contain information concerning the PBNIG work as requested by BCAA.

Complaints

Should any aviation stakeholder in Belgium, or an international organization or any other person or organization with a substantive interest in the implementation of PBN have a complaint

concerning the work of the Group, such complaint shall be submitted to BCAA for examination and possible action.

Participation

- ABELAG AVIATION
- Air Service Liège
- IATA
- Defence Belgium (MIL)
- A4E
- KBAC/ACRB
- VVMV
- Airport Charleroi
- Airport Luik
- Airport Oostende
- Airport Antwerpen
- Airport Brussel
- Airport Kortrijk
- MUAC
- ERA
- Skeyes
- Sowaer
- BCAA
- Ostend Air College
- New CAG Air Academy
- Noordzee Helikopters Vlaanderen
- Airborne trading as Skywings
- Elite Pilot Training Center (EPTC)
- TUI Fly Academy Brussels
- Aero-Kiewit
- Propeller