Implementation of Performance Based Navigation (PBN) Ukraine strategy and roadmap 2013 – 2025

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Formal basis

ICAO

36th ICAO Assembly: Resolution A36/23 has been agreed.
Resolution A36/23 was superseded in 2010 by the 37th ICAO Assembly Resolution A37/11.

EUROCONTROL

Local Single Sky Implementation (LSSIP) Plan - Ukraine (previously known as LCIP) document:
- NAV03: Implementation of Precision Area Navigation RNAV (P-RNAV);
- NAV10: Implement Approach Procedures with Vertical Guidance (APV).

National

Precision area-navigation (RNAV1) implementation for standard instrument departures and arrivals procedures is envisaged by Ukraine Airspace Use State System Development Program for 2010-2014 (Ukraine Cabinet enactment under 13/01/2010 №44) for KYIV/Boryspil', Kharkiv, Donets'k, Simferopol', L'viv, Odesa and Dnipropetrovs'k aerodromes.

SAA Activity on PBN Implementation

Order Jan, 13 2010 #11 established national TF:

Ukraine PBN taskforce:
State Aviation Administration of Ukraine
Ukrainian State Air Traffic Service Enterprise
Ukraine International Airlines
KYIV/Borispil' International Airport
National Aviation University
Antonov Design Bureau

Meetings every two months

Few seminars took place for airspace users and stakeholders

The European Union's Programme for Ukraine

Twining Projects - Support to the Integration of Ukraine in the Trans-European Transport Network TEN-T

Deliverable: Implementation of Performance Based Navigation (PBN) Ukraine strategy and roadmap 2013 – 2025
Lively Document, current version 1.0

PBN Implementation Plan in Ukraine 2013-2025

The Plan consist of:

1. Introduction

2. Strategic objectives

3. General implementation strategy

4. Initial State of PBN implementation

5. Navigation application of RNAV and RNP ICAO specifications

6. Aircraft navigation capability

7. Action by the Authorities and industry

8. Action plan for authorities and stakeholders

Implementation of Performance Based Navigation (PBN)
Ukraine strategy and roadmap 2013 – 2025

Approval list

Chairman of SAAU	Anatolii KOLISNYK	
Senior Deputy Chairman of the SAAU	Oleksandr GRECHKO	
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Director, Flight Standards Directorate of the SAAU	Oleksandr LISNYAK	
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Director, Airworthiness and Type certification Directorate of the SAAU	Oleksandr BILCHUK	
Director, Legal and Administrative Directorate SAAU	Victor ROMANCHUK	

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Strategic objectives

- to improve flight safety by recognition of multi-constellation GNSS navigation with a backup ground-based infrastructure;

- to develop an interoperable harmonized CNS/ATM system supported by modern ATM techniques, flow performance metrics and perspective CNS capabilities;

- to improve airports accessibility with GNSS/APV approaches;

- to improve operational efficiency by implementation of CDO, Free Routes and ETA concepts;

- to protect environment by reducing fuel emission, noise pollution over sensitive areas.

Initial principles to implement PBN in Ukraine airspace

- RNAV/RNP specifications to be introduced in all types of airspace;

- mandate RNAV-1 for all (international) IFR traffic in TMA's of international aerodromes in Ukraine as a basis for optimized arrival and departure procedures ultimately by 2016;

- conventional non-precision (NPA) procedures of instrument runways of international aerodromes are supplemented with RNP approach procedures that provide vertical guidance (APV) by means of barometric (Baro-VNAV) or satellite altimetry (SBAS-VNAV) ultimately by 2016;

- airspace users shall hold airworthiness and an operational approval by their national supervisory authority to conduct RNAV/RNP operations;

- GNSS Signal in Space (SIS) performance in Ukrainian airspace to be monitored and to that regard promoting the extension of EGNOS coverage to Ukraine.

PBN Implementation Planning Principles

Three areas of applicability

En-Route Airspace
Terminal Airspace
Approach Operations

Three time perspectives

Short-Term (now – 2015)
Medium-Term (2016 – 2019)
Long-Term (2020+)

Regular Revision by National PBN TF

Twice a year

Consultation

It was decided to upload National PBN Plan to the official SAA of Ukraine website as soon as it's officially published

Implementation Roadmap en-route continental airspace

Area of applicability	*Short-Term (Now – 2015)*	*Medium-Term (2016- 2019)*	*Long-term (2020+)*
Continental en-route	RNAV 5	RNAV 1	A-RNP

FIRs	Short-term RNAV spec.	*Year*	Medium-term RNAV spec.	Year	Long-term RNAV spec.	Year
Kyiv FIR	RNAV 5	+	RNAV 1	2016*	A-RNP	t.b.d.
L'viv FIR	RNAV 5	+	RNAV 1	2016*	A-RNP	t.b.d.
Odesa FIR	RNAV 5	+	RNAV 1	2016*	A-RNP	t.b.d.
Simferopol' FIR	RNAV 5	+	RNAV 1	2016*	A-RNP	t.b.d.
Dnipropetrovs'k FIR	RNAV 5	+	RNAV 1	2016*	A-RNP	t.b.d.

+*Currently ICAO specification RNAV 5 is in the airspace above FL275.*

*Tentative

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Implementation of arrival and departure procedures in TMA's at main international aerodromes

Airport	Short-term	Year	Medium-term	Year	Long-term	Year
Kyiv/Borispol`	RNAV 1 introduction	*1st Qua 2012*	RNAV 1 mandatory Introduction of A-RNP	*2016* *2016*	A-RNP mandatory	*t.b.d.*
KYIV (Zhuliany) [UKKK]	RNAV1 introduction	*Mid 2013*	RNAV 1 mandatory	*2017**	Introduction A-RNP	*t.b.d.*
L'viv	RNAV 1 introduction	*Mid 2012*	RNAV 1 mandatory	*2017**	Introduction A-RNP	*t.b.d.*
Donets'k	RNAV 1 introduction	*1st Qua 2012*	RNAV 1 mandatory	*2017**	Introduction A-RNP	*t.b.d.*
Dnipropetrovs'k	RNAV 1 introduction	*Mid 2012*	RNAV 1 mandatory	*2018**	Introduction A-RNP	*t.b.d.*
Kharkov	RNAV 1 introduction	*Mid. 2012*	RNAV 1 mandatory	*2018**	Introduction A-RNP	*t.b.d.*
Odesa	RNAV 1 introduction	*End 2013*	RNAV 1 mandatory	*2018**	Introduction A-RNP	*t.b.d.*
Simferopol'	RNAV 1 introduction	*End 2013*	RNAV 1 mandatory	*2018**	Introduction A-RNP	*t.b.d.*

*Tentative

PBN Implementation Planning – Approach (1)

Classification of aerodromes (37):

• **High traffic density, being mainly international operations**
  KYIV (Boryspil`) [UKBB] (1)

• **Medium traffic density, being mainly international operations**
  Dnipropetrovs'k [UKDD], Donets'k [UKCC], Kharkiv (Osnova) [UKHH], KYIV (Zhuliany) [UKKK], L'viv [UKLL], Odesa [UKOO], Simferopol' [UKFF] (7)

• **Low traffic density / domestic**
  Chernivtsi [UKLN], Ivano-Frankivs'k [UKLI], Luhans'k [UKCW], Mariupol' [UKCM], Mykolaiv [UKON], Rivne [UKLR], Uzhhorod [UKLU], Vinnytsa (Gavryshivka) [UKWW], Poltava [UKHP], Sevastopol' (Bel'bek) [UKFB], Sumy [UKHS] (11)

• **Cargo Operations/Test Flights**
  Kryvyi Rih (Lozuvatka) [UKDR], KYIV (Antonov-1) [UKKT], KYIV (Antonov-2) [UKKM], Lymans'ke [UKOM], Dzhankoi [UKFY], Kirovohrad [UKKG], Kremenchuk (Velyka Kokhnivka) [UKHK], Kharkiv (Sokolnyky) [UKHD], Zaporizhzhia (Mokraya) [UKDE] (9)

• **GA/Sport/AFIS (in accordance to AIC A 08/11 effective 16 DEC 2011)**
  Cherkasy [UKKE], Kerch [UKFK], Khmel'nyts'kyi [UKLH], Ternopil' [UKLT], Berdians'k [UKDB], Simferopol' (Zavods'ke) [UKFW], Zhytomyr (Ozerne) [UKKO], Severodonets'k [UKCS]

Implementation strategy for introduction of PBN Approach procedures

Airport Type	Short-term now – 2015	Medium-term 2016 - 2019	Long-term 2020+	
International airport *High traffic density*	NPA APV Baro-VNAV	APV SBAS-VNAV SBAS CAT I	GBAS CAT I	Implementation dependent on the level of aircraft NAV equipage (present and future) operating to/from the specific airport.
International airports *Medium traffic density*	NPA	APV Baro-VNAV	APV SBAS-VNAV	
Domestic airports *Low traffic density*		NPA APV Baro-VNAV	APV SBAS-VNAV	
Cargo & Business airports *Low traffic density*		NPA	APV Baro-VNAV APV SBAS-VNAV	
GA/Sport/AFIS	N/A	N/A	N/A	

PBN Implementation – current state (1)

Mostly inspired by UkSATSE due current challenges

Increasing percentage of modern aircraft

Capacity requirements

Outdated NDB infrastructure

Less cockpit & ATCo workload

Aeronautical Information Circular (AIC 05/11 dated 10 November 2011) in which RNAV 1 (P-RNAV) is being introduced in the TMA's of 7 international aerodromes in 2012.
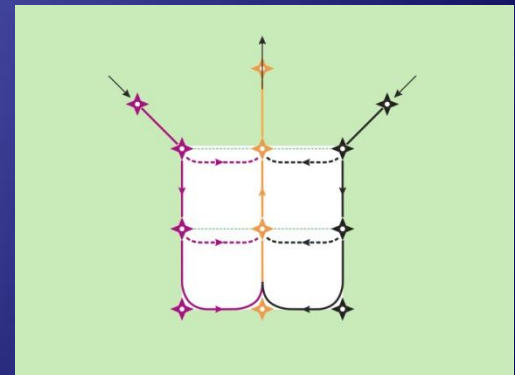
Considerations:

Altitudes are not less than MSA

Radar Coverage

DME/DME Coverage

RNAV 1 Departures & Arrivals only

RNAV 1 Arrival procedures connected to ILS final approach (trombone)

PBN Implementation – current state (2)

Enroute

Due to local regulation for GNSS operations to be supported with DME/DME coverage as a back-up infrastructure RNAV 5 (B-RNAV) currently introduced in all Ukrainian FIRs above FL275

Terminal

Kyiv TMA	AIRAC AMDT 04/12 EFF 31 MAY 2012
Donets'k TMA	AIRAC AMDT 04/12 EFF 31 MAY 2012
Kharkiv TMA	AIRAC AMDT 03/12 EFF 03 MAY 2012
Dnipropetrovs'k TMA	AIRAC AMDT 05/12 EFF 23 AUG 2012
L'viv TMA	AIRAC AMDT 07/12 EFF 13 DEC 2012
Odesa TMA	approved and submitted for publication (2013)
Simferopol' TMA	approved and submitted for publication (2013)

RNAV 1 in Terminal Airspace Activity

3 Implementation Plans for RNAV 1 Introduction: (KYIV – Pilot Project, Eastern Region (3 aerodromes), L'viv.

National Safety Case has been done for Pilot RNAV 1 Project

Training program & Training of ATCos

Ground & Flight Validation

SAA Decision (Order Marh, 30, 2012 #258)

1200 m (4000')

Post Implementation Monitoring

ATCos Point of view

Less RT workload & Less Vectoring

Direct-To Function

Predictable Manoeuvres

Transition to final technique followed by ILS strait-in approach is respected (especially for SOIR)

Crews Point Of View

FMS controlled Flights

Shortcuts are not always advantages (clearances for longer waypoints sequence are well appreciated)

Expect RNP approaches after RNAV 1 arrival to be able to fly in a seamless environment

Further Activity

Airlines started to change their passive position in term of RNAV & RNP introduction due to requirements to comply this specification in different European states

Introduction of "best equipped – best served" principle

PBN has become an enabler for Free Route (2014), CDO (UKBB - NOV 2013)

More DMEs to be installed

Upgrade a flight laboratory to validate SBAS/Baro APV approaches

Lessons Learned

Difficulty with bi-lingual version

It's the only way ahead to have National PBN Implementation plan as a living document, which has to be updated on a regular basis. Following to this conclusion It's not always easy task to support both versions of the National PBN Implementation plan:

On one hand you have to provide English version for wide aviation community

On the other hand you have to provide up-to-date version in Ukrainian due to institutional issues

ANSP & Airlines – different understanding

After assessment it was observed that airlines not always understand the difference between pre-PBN understanding of PBN. Many of airline experts were surprised with completely new content of ICAO document with the same number (9613)

Two absolutely different ICAO documents (9613):

Many AFM contain a performance table with RNP value. Airlines often consider this RNP value as an airworthiness (and even operational approval) for RNAV & RNP specification.

Lessons Learned

Resource limitations

SAA experts involved in many different activities and very busy, it's not always possible to keep the same person in PBN TF and the same for airlines.

Therefore ANSP becomes the driven force for PBN implementation.

DME/DME coverage

New DMEs deployment is usually an upgrade of conventional navigation infrastructure. Fortunately, the configuration of conventional navaids was surprisingly good even for RNAV applications in KYIV TMA.

Institutional issues

In contrast to European states (EASA) certification and operational approval has to be provided by national CAA. Currently TGL 10 rev 1.

GPS and GLONASS

Recognize GNSS as the primary means of navigation for all phases of flight: en-route, arrival/departure, approach and landing.

Thank You for your Attention!