International Civil Aviation Organization

The Second Meeting of ICAO Asia/Pacific Performance Based Navigation Implementation Coordination Group (PBNICG/2)

Bangkok, Thailand, 11-12 June 2015

Agenda Item 2: Global and Regional PBN Updates
Agenda Item 5: State's PBN Implementation Progress

PROPOSAL FOR PBN IMPLEMENTATION PROGRESS REPORT FORM

(Presented by Secretariat)

SUMMARY

This paper presents a draft of PBN Implementation Progress Report Form which satisfies global and regional PBN implementation reporting requirements. It also proposes to use a spread sheet table as well as the reporting form to ease the data management for APAC Regional Seamless ATM Plan. Action by the meeting is in paragraph 3.1.

1. INTRODUCTION

1.1 During the First Meeting of ICAO Asia and Pacific PBN Implementation Coordination Group (PBNICG/1) which was held in Beijing China from 10 to 12 March 2015, the secretariat presented a working paper on data gathering requirement specified in the Terms of Reference (TOR) of PBNICG to be used in the air navigation reports and regional performance dashboard.

1.2 The meeting reviewed the paper and raised an action to enhance the PBN Implementation Progress Report template which was used by Asia and Pacific PBN Task Force (APAC PBN TF) so that it can fulfil global and regional PBN reporting requirements (see Action 1/4 of PBNICG/1).

2. DISCUSSION

2.1 With the support from States in APAC region and APAC Regional Office, APAC RSO drafted a template for PBN Implementation Progress Report (see **Appendix A**). It is based on the PBN related elements in the APAC Regional Seamless ATM Plan and information on the State's PBN Implementation Status in *integrated* Safety Trend Analysis and Reporting System (*i*STARS) 2.0 SPACE. References of each element which was provided in the previous progress report of APAC PBN TF is removed instead the element number of each element of APAC Regional Seamless ATM Plan is provided to be used to find the requirement of implementation (see **Appendix C**).

2.2 However, there were several concerns. One was on the degree of information required. In other words, if the amount of information required is high, it may discourage States to provide information. On the contrary, if the small amount of information is required, it may not satisfy

current information requirement, even though States are easy to fill the blank in the template. Also, it cannot be used for the comparison with the information in *i*STARS which uses data from Jeppesen (see **Appendix B).**

2.3 Another was the alignment of APAC Regional Seamless ATM Reporting form, especially online information provision format. It is related to PBN approaches and routes. Also in the proposed template, the definition on "planned" was asked to be provided. The other issue is whether GLS is included in the category of PBN approaches (see **Appendix D**).

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) review the proposed draft template for PBN Implementation Progress Report in Appendix A and PBN Implementation Report Form (spread sheet format) aligned with APAC Regional Seamless ATM Reporting Form in Appendix D;

b) discuss and decide the options in Appendix A and concerns in Appendix D; and

c) agree to adopt them as a regional reporting form for data gathering specified in the Terms of Reference (TOR) of PBNICG.

…….

Appendix A. Draft Template for PBN Implementation Progress Report

PBN IMPLEMENTATION PROGRESS REPORT

State: (Name of State) Date: (DD/MM/YY)

PBN Focal Point

Focal Point: (Name, Designation, Mailing Address, Email, Phone, Fax)

State PBN Implementation Plan

Status: Developed (☐ Yes/ ☐ No)
Submitted (☐ Yes/ ☐ No)

Note(s): (States may include information on publication date and location for State PBN Implementation Plan and other relevant information.)

(Reviewed by PBN ICG)

BPE1	BPE2	BPE3	BPE4	BPE5	BPE6	BPE7	BPE8	BPE9	BPE10	BPE11
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

(Comment :)

90 - Continuous Descent Operations (CDO)
100 - Continuous Climb Operations (CCO)

Status:

Airport Name	Runway End	CDO	CCO	Implementation Target
		☐	☐	
		☐	☐	

Note(s): (States may include information on recent CDO/CCO implementation.)

110 - Performance-based Navigation (PBN) Approach

(Option A)

Total number of instrument runway ends (international and domestic airports):	6

		Date of complete implementation (planned or actual)	Number of procedures planned	Number of procedures published	Percentage (%)	Comment
Number of instrument runway ends with	APV/Baro	31-May-16	3	2		☐
	APV/SBAS		0	0		☐
	LNAV only	17-Jan-99	1	1		☐
	GLS (if applicable)					

(Option B)

Status:

Airport Name	Runway End	LNAV only	APV /Baro	APV /SBAS	RNP AR	RNAV/ RNP VA	Unknown PBN	GLS (if applicable)	Implementa-tion Target
		☐	☐	☐	☐	☐	☐		
		☐	☐	☐	☐	☐	☐		

Note(s): (States may include information on recent publications of new PBN approach procedures.)

120 - Standard Instrument Departures/ Standard Terminal Arrivals (SID/STAR)

Status:

Airport Name	Runway End	SID	STAR	Implementation Target
		☐	☐	
		☐	☐	

Note(s): (States may include information on recent publications with new PBN arrival/departure procedures.)

140 - Performance-based Navigation (PBN) Routes

(Option A)

Total number of ATS routes (international and domestic routes):	6

		Date of complete implementation (planned or actual)	Number of procedures planned	Number of procedures published	Percentage (%)	Comment
Number of routes with	RNAV 10	17-Jan-99	18	18		
	RNAV 5					
	RNAV 2					
	RNP 4					
	RNP 2					
	RNP 1					
	RNP AR					
	A-RNP					

(Option B)

Status (A):

Navigation Specification	Implementation Target (Planned or Actual)	# of Planned Routes	# of Published Routes	Percentage (%)	Comment
RNAV 10					
RNAV 5					
RNAV 2					
RNP 4					
RNP 2					
RNP1					
RNP AR					
A-RNP					

Status (B):

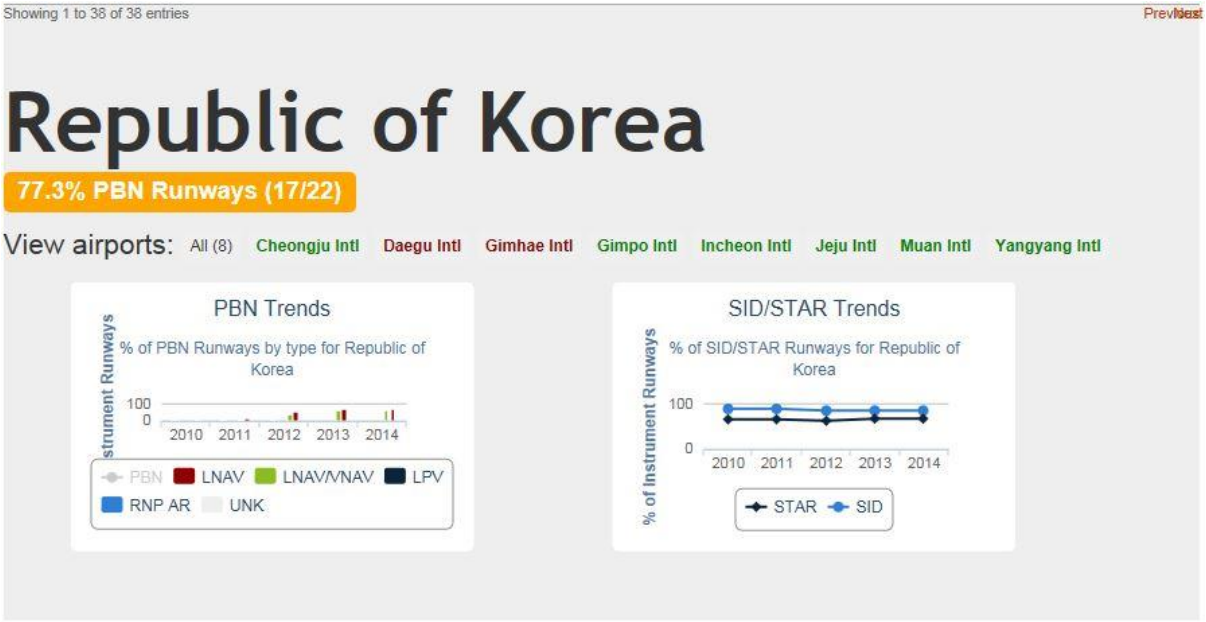
FIR Name	ATS Route Name		Navigation Specification	Published	Implementation Target	Coordinated with Neighboring FIR
	Old	New				
				☐		☐ Yes, ☐ No, ☐ N/A
				☐		☐ Yes, ☐ No, ☐ N/A
				☐		☐ Yes, ☐ No, ☐ N/A

Note(s): (States may include information on recent publications with new PBN routes.)

Do you use UPR/Flex Tracks? ☐ Yes ☐ No

— — — end — — —

Appendix B. Example of State's PBN Implementation Progress Status in *i*STAR 2.0 SPACE



Cheongju Intl (RKTU)

100% PBN Runways (2/2)

	PBN	LNAV	LNAV/VNAV	LPV	RNP AR	Unknown PBN	SID	STAR
RWY 06R								
RWY 24L								
RWY 06L	✔	✔					✔	
RWY 24R	✔	✔					✔	

Yangyang Intl (RKNY)

100% PBN Runways (1/1)

	PBN	LNAV	LNAV/VNAV	LPV	RNP AR	Unknown PBN	SID	STAR
RWY 15							✔	
RWY 33	✔	✔	✔				✔	✔

Daegu Intl (RKTN)

0% PBN Runways (0/3)

	PBN	LNAV	LNAV/VNAV	LPV	RNP AR	Unknown PBN	SID	STAR
RWY 13L								
RWY 31R								
RWY 31L								
RWY 13R								

Gimhae Intl (RKPK)

0% PBN Runways (0/2)

	PBN	LNAV	LNAV/VNAV	LPV	RNP AR	Unknown PBN	SID	STAR
RWY 18L								
RWY 36R								
RWY 18R								
RWY 36L								

Gimpo Intl (RKSS)

100% PBN Runways (4/4)

	PBN	LNAV	LNAV/VNAV	LPV	RNP AR	Unknown PBN	SID	STAR
RWY 14L	✔	✔	✔				✔	✔
RWY 32R	✔	✔	✔				✔	✔
RWY 14R	✔	✔	✔				✔	✔
RWY 32L	✔	✔	✔				✔	✔

Incheon Intl (RKSI)

100% PBN Runways (6/6)

	PBN	LNAV	LNAV/VNAV	LPV	RNP AR	Unknown PBN	SID	STAR
RWY 16	✔	✔	✔				✔	✔
RWY 34	✔	✔	✔				✔	✔
RWY 15L	✔	✔	✔				✔	✔
RWY 33R	✔	✔	✔				✔	✔
RWY 15R	✔	✔	✔				✔	✔
RWY 33L	✔	✔	✔				✔	✔

Jeju Intl (RKPC)

100% PBN Runways (2/2)

	PBN	LNAV	LNAV/VNAV	LPV	RNP AR	Unknown PBN	SID	STAR
RWY 13 ⓘ								
RWY 7	✔	✔	✔				✔	✔
RWY 25	✔	✔	✔				✔	✔
RWY 31 ⓘ							✔	

Muan Intl (RKJB)

100% PBN Runways (2/2)

	PBN	LNAV	LNAV/VNAV	LPV	RNP AR	Unknown PBN	SID	STAR
RWY 1	✔	✔	✔				✔	✔
RWY 19	✔	✔	✔				✔	✔

Appendix C. PBN related Elements and Requirements of APAC Regional Seamless ATM Plan

90	**Continuous Descent Operations (B0-CDO)**	7.3 CDO operations should be considered for implementation at all high density international aerodromes after analysis, based on a performance-based approach.		<table><tr><th></th><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th></tr><tr><td>1</td><td>√</td><td>√</td><td>√</td><td>√</td><td>**√**</td><td>-</td></tr><tr><td>2</td><td>√</td><td>√</td><td>√</td><td>-</td><td>√</td><td>-</td></tr><tr><td>3</td><td>√</td><td>√</td><td>√</td><td>**√**</td><td></td><td></td></tr><tr><td>4</td><td>√</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr><tr><td>5</td><td>√</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr><tr><td>6</td><td>**√**</td><td>√</td><td>√</td><td>**√**</td><td></td><td></td></tr><tr><td>7</td><td>√</td><td>**√**</td><td></td><td></td><td></td><td></td></tr></table>	**Main impacts** • People: Airspace designers, ANSP procedures designers, Flight Procedures designers, Flight crew, ATCO • Procedures: ANSP, Airspace users • Systems: Avionics, Ground Systems, Navaid infrastructure **Main requirements/guidance** • ICAO Continuous Descent Operations (CDO) Manual (Doc 9931) • ICAO Performance Based Navigation Manual (ICAO Doc 9613) • ICAO PBN operational approval guidance material • ICAO Doc 9868 (PANS training) Note: Since RNP AR Approaches require significant training, ANSPs should work closely with airspace users to determine where RNP AR approaches are to be implemented.
100	**Continuous Climb Operations (B0-CCO)**	7.3 CCO operations should be considered for implementation at all high density international aerodromes after analysis, based on a performance-based approach.		<table><tr><th></th><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th></tr><tr><td>1</td><td>√</td><td>√</td><td>√</td><td>√</td><td>**√**</td><td>-</td></tr><tr><td>2</td><td>√</td><td>√</td><td>√</td><td>-</td><td>√</td><td>-</td></tr><tr><td>3</td><td>√</td><td>√</td><td>√</td><td>**√**</td><td></td><td></td></tr><tr><td>4</td><td>√</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr><tr><td>5</td><td>√</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr><tr><td>6</td><td>**√**</td><td>√</td><td>√</td><td>**√**</td><td></td><td></td></tr><tr><td>7</td><td>√</td><td>**√**</td><td></td><td></td><td></td><td></td></tr></table>	**Main impacts** • People: Airspace designers, ANSP procedures designers, Flight Procedures designers, Flight crew, ATCO • Procedures: ANSP, Airspace users • Systems: Avionics, Ground Systems, Navaid infrastructure **Main requirements/guidance** • ICAO Continuous Descent Operations (CDO) Manual (Doc 9931) • ICAO Performance Based Navigation Manual (ICAO Doc 9613) • ICAO PBN operational approval guidance material • ICAO Doc 9868 (PANS training) Note: Since RNP AR Approaches require significant training, ANSPs should work closely with airspace users to determine where RNP AR approaches are to be implemented.

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<td>110</td>
<td>Performance -based Navigation (PBN) Approach (B0-APTA)</td>
<td>7.5 Where practicable, all high density aerodromes with instrument runways serving aeroplanes should have approaches with vertical guidance (APV). should have:
a) precision approaches; or
b) approaches with vertical guidance (APV), either RNP APCH with Barometric Vertical Navigation (Baro–VNAV) or augmented GNSS (SBAS or GBAS; or
c) when an APV was not practical, straight-in RNP APCH with Lateral Navigation (LNAV)</td>
<td>7.14 RNP 0.3 arrival/departure, approach and/or en-route transiting procedures should be
considered at high density aerodromes with rotary wing operations.

7.16 Where practicable, all aerodromes with instrument runways serving aeroplanes should have (ASBU Priority 2):
a) precision approaches; or
b) APV, either RNP APCH with Barometric Vertical Navigation (Baro–VNAV) or augmented GNSS (SBAS or GBAS); or
c) when an APV is not practical, straight-in RNP APCH with LNAV</td>
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</td>
<td>Main impacts
• People: Airspace designers, ANSP procedures designers, Flight Procedures designers, Flight crew, ATCO
• Procedures: ANSP, Airspace users
• Systems: Avionics, ANSP Ground Systems, SBAS and GBAS infrastructure
Main requirements/guidance
• ICAO Annex 11
• ICAO Annex 10
• ICAO PANS-OPS Volume 1
• ICAO PBN Manual
• ICAO GNSS Manual
• ICAO Manual on Testing of Radio Navigation Aids (Doc 8071), Volume II
• ICAO Quality Assurance Manual for Flight Procedure Design (Doc 9906)
• ICAO Doc 9868 (PANS training)
Notes:
• the APAC PBN Plan Version 3 required RNP APCH (with Baro-VNAV) for 30% of instrument runways by 2010 and 50% by 2012 (priority should be given to airports with operational benefits); and RNP APCH with Baro-VNAV or APV in 100% of instrument runways by 2016.
• For avionics consider Basic IFR Avionics (TSO C129 with RAIM), Basic IFR GNSS receivers with Baro VNAV, SBAS avionics (TSO C145/146), GBAS receivers (TSO C161/162)</td>
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<td>120</td>
<td>Standard Instrument Departures/ Standard Terminal Arrivals (SID/STAR) (B0-CCO)</td>
<td>7.4 All international high density aerodromes should have RNAV 1 (ATS surveillance environment) or RNP 1 (ATS surveillance and non-ATS surveillance environments) SID/STAR.</td>
<td>7.15 All international aerodromes should have RNAV 1 (ATS surveillance environment) or RNP 1 (ATS surveillance and non-ATS surveillance environments) SID/STAR.</td>
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Main impacts

People: Airspace designers, ANSP procedures designers, Flight Procedures designers, Flight crew, ATCO
Procedures: ANSP, Airspace users
Systems: Avionics, ANSP Ground Systems, SBAS and GBAS infrastructure

Main requirements/guidance

ICAO Annex 11
ICAO Annex 10
ICAO PANS-OPS Volume 1
ICAO PBN Manual
ICAO GNSS Manual
ICAO Manual on Testing of Radio Navigation Aids (Doc 8071), Volume II
ICAO Quality Assurance Manual for Flight Procedure Design (Doc 9906)
ICAO Doc 9868 (PANS training)

Note: the Asia/Pacific PBN Plan Version 3 required RNAV 1 SID/STAR for 50% of international airports by 2010 and 75% by 2012 (priority should be given to airports with RNP Approach); and RNAV 1 or RNP 1 SID/STAR for 100% of international airports and 70% of busy domestic airports where there are operational benefits by 2016.
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<td>130</td>
<td>Performance -based Navigation (PBN) Visual Departure and Arrival Procedures - REGIONAL</td>
<td></td>
<td>7.19 PBN procedures that overlay visual arrival and departure procedures should be established where this provided an operational advantage.</td>
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Main impacts

People: Airspace designers, ANSP procedures designers, Flight Procedures designers, Flight crew, ATCO
Procedures: ANSP, Airspace users
Systems: Avionics, ANSP Ground Systems, SBAS and GBAS infrastructure

Main requirements/guidance

ICAO Annex 11
ICAO Annex 10
ICAO PANS-OPS Volume 1
ICAO PBN Manual
ICAO GNSS Manual
ICAO Manual on Testing of Radio Navigation Aids (Doc 8071), Volume II
ICAO Quality Assurance Manual for Flight Procedure Design (Doc 9906)
ICAO Doc 9868 (PANS training)

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<td>140</td>
<td>Performance -based Navigation (PBN) Routes (B0-FRTO)</td>
<td>7.9 All ATS routes should be designated with a navigation performance specification to define the CNS/ATM operational environment. The ATS route navigation performance specification selected should be the least stringent needed to support the intended operation. When obstacle clearance or ATC separation requirements demand, a more stringent navigation specification may be selected. ATS routes should be established in accordance with the following PBN specifications:
• Category R airspace – RNP 4, RNP 10 (RNAV 10) (other acceptable navigation specifications – RNP 2 oceanic); and
• Category S airspace – RNP 2 or RNAV 2 (other acceptable navigation specifications – RNAV 5).</td>
<td>7.22 All en-route controlled airspace should be designated as being exclusive PBN airspace with mandatory carriage of GNSS utilising RNP navigation specifications, except for State aircraft. Such implementation mandates should be harmonised with adjacent airspace. ATS routes
should be established in accordance with the following PBN specification:
• Category R and S airspace – RNP 2</td>
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<td>Main impacts
• People: Flight crew, ATCO, Airspace Planners, Airspace users
• Procedures: ANSP (letters of agreement, airspace, AIP/AIC), Airspace users
• Systems: Avionics (Flight following/monitoring), ANSP Ground Systems (support of Flexible Routing)
Main requirements/guidance
• ICAO Annex 11
• ICAO Annex 10
• ICAO PANS-OPS Volume 1
• ICAO PBN Manual
• ICAO GNSS Manual
• ICAO Manual on Testing of Radio Navigation Aids (Doc 8071), Volume II
• ICAO Quality Assurance Manual for Flight Procedure Design (Doc 9906)
• ICAO Doc 9868 (PANS training)

Note: The possibility of a regional mandate of PBN should be considered</td>
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<td>150</td>
<td>Performance -based Navigation (PBN) airspace - REGIONAL</td>
<td>7.8 All Category R and S upper controlled airspace, and Category T airspace supporting high density aerodromes should be designated as non-exclusive or exclusive PBN airspace as appropriate. This is to allow operational priority for PBN approved aircraft, harmonised specifications and to take
into account off-track events such as weather deviations, with priority implementation for high density FIRs.</td>
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<td>Main impacts
• People: Flight crew, Airspace users, Civil aviation authorities, ANSP
• Procedures: ANSP
• Systems: Avionics, ANSP Ground Systems
Main requirements/guidance
• ICAO Annex 11
• ICAO Annex 2</td>
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PBN IMPLEMENTATION PROGRESS REPORT

State: (Name of State) Date: (DD/MM/YY)

PBN Focal Point

Focal Point: (Name, Designation, Mailing Address, Email, Phone, Fax)

State PBN Implementation Plan

Status: Developed (☐ Yes/ ☐ No)

Submitted (☐ Yes/ ☐ No)

Note(s): (States may include information on publication date and location for State PBN Implementation Plan and other relevant information.)

(Reviewed by PBN ICG)

BPE1	BPE2	BPE3	BPE4	BPE5	BPE6	BPE7	BPE8	BPE9	BPE10	BPE11
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

(Comment :)

90 - Continuous Descent Operations (CDO)
100 - Continuous Climb Operations (CCO)

Status:

Airport Name	Runway End	CDO	CCO	Implementation Target
		☐	☐	
		☐	☐	

Note(s): (States may include information on recent CDO/CCO implementation.)

110 - Performance-based Navigation (PBN) Approach

(Option A)

Total number of instrument runway ends (international and domestic airports):	6

Date of complete implementation (planned or actual)	Number of procedures planned	Number of procedures published	Percentage (%)	Comment

Number of instrument runway ends with	APV/Baro	31-May-16	3	2	☐
	APV/SBAS		0	0	☐
	LNAV only	17-Jan-99	1	1	☐
	GLS (if applicable)				

(Option B)

Status:

Airport Name	Runway End	LNAV	LNAV/ VNAV	LP	LPV	RNP AR	RNAV/ RNP VA	Unknown PBN	Implementation Target
		☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	

Note(s): (States may include information on recent publications of new PBN approach procedures.)

120 - Standard Instrument Departures/ Standard Terminal Arrivals (SID/STAR)

Status:

Airport Name	Runway End	SID	STAR	Implementation Target
		☐	☐	
		☐	☐	

Note(s): (States may include information on recent publications with new PBN arrival/departure procedures.)

140 - Performance-based Navigation (PBN) Routes

(Option A)

Total number of ATS routes (international and domestic routes):	6

		Date of complete implementation (planned or actual)	Number of procedures planned	Number of procedures published	Percentage (%)	Comment
Number of routes with	RNAV 10	17-Jan-99	18	18		
	RNAV 5					
	RNAV 2					
	RNP 4					
	RNP 2					
	RNP 1					
	RNP AR					
	A-RNP					

(Option B)

Status (A):

Navigation Specification	Implementation Target (Planned or Actual)	# of Planned Routes	# of Published Routes	Percentage (%)	Comment
RNAV 10					
RNAV 5					
RNAV 2					
RNP 4					
RNP 2					
RNP1					
RNP AR					

A-RNP					

Status (B):

FIR Name	ATS Route Name		Navigation Specification	Published	Implementation Target	Coordinated with Neighboring FIR
	Old	New				
				☐		☐ Yes, ☐ No, ☐ N/A
				☐		☐ Yes, ☐ No, ☐ N/A
				☐		☐ Yes, ☐ No, ☐ N/A

Note(s): (States may include information on recent publications with new PBN routes.)

Do you use UPR/Flex Tracks? ☐ Yes ☐ No

— — — end — — —

PBN implementation plan developed		☐ Yes	☐ No
PBN implementation plan submitted:		☐ Yes	☐ No

Include all this in the seamless report. This is related to items on PBN.

BPE 1	BPE 2	BPE 3	BPE 4	BPE 5	BPE 6	BPE 7	BPE 8	BPE 9	BPE 10	BPE 11	Comment
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

Boxes should be tickable

Total number of instrument runway ends (international and domestic airports):	6

110- Performance-based Navigation (PBN) Approach

Number of instrument runway ends with	Date of complete implementation (planned or actual)	Number of procedures planned	Number of procedures published	Comment
APV/Baro	31-May-16	3	2	
APV/SBAS		0	0	
LNAV only	17-Jan-99	1	1	
GLS (if applicable)				

Target: APV (Baro-VNAV and/or augmented GNSS), including LNAV only minima (primary approach or back-up for precision approaches): 30% all instrument runway ends by 2010, 70% 2014; 100% by 2016

max value 999

Include all this in the seamless report directly (or as a separate webpage if not doable).
This is related to item 110

Total number of routes (international and domestic routes):	

140- Performance-based Navigation (PBN) Routes

Number of routes with	Date of complete implementation (planned or actual)	Number of routes planned	Number of routes published	Comment
RNAV 10	17-Jan-99	18	18	For category R airspace RNP 4 or RNP 10 (RNAV 10) or RNP 2 oceanic
RNAV 5				
RNAV 2				
RNP 4				
RNP 2				
RNP 1				
RNP AR				
A-RNP				

Include all this in the seamless report directly (or as a separate webpage if not doable).
. This is related to item 140

max value 999

Do you use UPR/Flex Tracks	☐ Yes	☐ No

Boxes