International Civil Aviation Organization
North American, Central American and Caribbean Office

WORKING PAPER

ANI/WG/3 — WP/08
4/03/16

Third NAM/CAR Air Navigation Implementation Working Group Meeting (ANI/WG/3)
Mexico City, Mexico, 4 to 6 April 2016

Agenda Item 4: **Follow-up, Performance Evaluation and Monitoring of the NAM/CAR Regional Performance Based Air Navigation Implementation Plan (NAM/CAR RPBANIP) Targets**
4.1 Progress Reports of the Task Forces and the ANI/WG

PRELIMINARY PROGRESS REPORT BY PBN TASK FORCE

(Presented by the ANI/WG PBN TF Rapporteur)

EXECUTIVE SUMMARY

This Working Paper presents the progress achieved by the Performance-Based Navigation (PBN) Task Force since its creation in the First NAM/CAR Air Navigation Implementation Working Group (ANI/WG/1) Meeting. Following the work programme of the Task Force and its deliverables, the note includes the results for these deliverables and recommendation for improving the Task Force function and coordination.

Action:	The suggested action is presented in Section 4
Strategic Objectives:	• Safety • Air Navigation Capacity and Efficiency • Environmental Protection
References:	• NAM/CAR Regional Performance-Based Air Navigation Implementation Plan (RPBANIP) • Final report of Twenty-sixth Directors of Civil Aviation of the Eastern Caribbean Meeting (E/CAR/DCA/26), New Orleans, United States, 1-3 December 2015 • Final report of Second NAM/CAR Air Navigation Implementation Working Group Meeting (ANI/WG/2), Puntarenas, Costa Rica, 1 - 4 June 2015 • Final report of Fourteenth Directors of Civil Aviation of the Central Caribbean Meeting (C/CAR/DCA/14), Kingston, Jamaica, 11 - 13 May 2015 • Performance-Based Navigation (PBN) Implementation Status Survey for the NAM/CAR Region (2015)

1. Introduction

1.1 During the ANI/WG/2 Meeting, it was decided that the two main areas requiring a concentrated effort from the PBN taskforce were:

a) Upper Airspace Re-design; and
b) PBN training

1.2 Following the ANI/WG/2 Meeting, the PBN Taskforce adjusted its working methodology by creating Points-of-Contact (PoCs) to coordinate the efforts of each Sub-region in their development of their upper airspace plans.

The PoC for Central America is:
- Mr. Edwin Jimenez – Costa Rica

The PoC for Central Caribbean is:
- Mr. Ruddy Romo Segui – Cuba

The PoC for the Eastern Caribbean Region is:
- Mr. Riaaz Mohammed – Trinidad and Tobago

1.3 Since this working paper is being submitted prior to the ICAO/IATA/CANSO PBN Harmonization, Modernization and Implementation Meeting scheduled for 28 March - 1 April 2016, it will be amended as a Discussion paper during the Ad hoc meetings of the ANI/WG/3 and the appropriate recommendations will be made.

1.4 The PBN taskforce will update the Regional Performance Objectives (RPOs) (see **Appendix A**) for the implementation of PBN in the Region and will submit at the ANIWG/3 Meeting.

1.5 The PBN taskforce will revise its action plan and it will be provided during the ANI/WG/3 meeting.

2. PBN TF Progress and results

2.1 Following the poor response by NACC States and Territories to the first PBN Survey, State Letter Ref: EMX0129 (28 February 2014), an updated PBN survey Ref: EMX0654 dated 14 July 2015, was promulgated by the ICAO NACC Regional Office (RO) with the intention of acquiring information from those States/Territories which did not respond to the first survey, as well as receiving updated information from those which had. Based on very poor responses the survey submission period was extended by the NACC RO through State Letter Ref: EMX0882 dated 26 August 2015. According to information received from ICAO NACC RO, 17 States/Territories/Organizations which have provided response were:

- Aruba, Bahamas, Barbados, Belize, Bermuda, Canada, Cuba, Curaçao, French Antilles, Grenada, Honduras, Jamaica, Saint Vincent and the Grenadines, Trinidad and Tobago, United States and United Kingdom and COCESNA

2.2 The results of the PBN Survey **(Appendix B**) of those States/Territories/Organizations that submitted a response shows the following:

- Only three (3) did not have some type of PBN programme/plan in place
- 41.2% have published a PBN plan
- 64.7% have personnel appropriately trained
- Most have greater than 50% of Runways (RWY) with PBN procedures
- Apart from Canada, Cuba and United States, the percentage of operators using PBN procedures is 50% and below.
- The percentage of operators equipped to utilize PBN procedures is very high in some States/Territories/Organizations, but also very low is others.
- The availability of Continuous descent operations (CDO) and Continuous Climb Operations (CCO) is very low, approximately 23.5%
- The display of PBN capabilities in the Air Traffic Control (ATC) situation display is also very low, 17.6%
- 70.6% of States/Territories/Organizations utilize Collaborative Decision Making (CDM) in their PBN planning
- Only 58.8% of States have PBN training programmes for Pilots/Air Traffic Controllers (ATCOs) etc.
- Over 70% of States request assistance in PBN implementation in the following areas:
    - Design and implementation expertise
    - Training/technical assistance
    - Design of PBN procedures
    - Air traffic flow management (ATFM) and PBN integration
    - Equipment for efficient implementation

2.3 The current airspace structure within the Caribbean Region shows a lack of Air Traffic Management (ATM) harmonization which does not facilitate efficient coordination and provision of ATC service. ICAO in collaboration with IATA and CANSO have organized a Performance-Based Navigation (PBN) Harmonization, Modernization and Implementation Meeting to be convened at the Embraer Facility in Fort Lauderdale, Florida, from 28 March to 1 April 2016. The purpose of this meeting is to harmonize an efficient PBN route structure and begin the implementation process. It is expected that Air Navigation Service Providers (ANSPs) will submit their proposals prior to the meeting and that during the meeting the proposals will be discussed and amended where necessary. A Proposal for Amendment (PfA) for the implementation of new PBN routes and removal of obsolete and inefficient conventional routes will be developed, accordingly. An update on this activity will be provided during the ANI/WG/3 Meeting.

2.4 The Central American Region advised that in February 2016, they reviewed a comprehensive project called *Central American Airspace Reorganization Analysis (ARESAC)*, which consisted on defining the division of 6 sub-projects as well as the planning, schedule, and development timeframes of the different stages of the project implementation in the Central American Region. The meeting defined the managers responsible for each sub-project. In accordance with the Planning, Design, Validation and Implementation methodology, the dates below were projected:

- Phase 1: Planning: 7 February to 29 July 2016
- Phase 2: Design: 1 August to 18 November 2016
- Phase 3: Validation: 21 November 2016 to 10 February 2017
- Phase4: Implementation: 13 February to 30 June 2017

2.5 In November 2015, Trinidad and Tobago hosted a technical PBN workshop aimed at delivering basic PBN training and providing the platform for the Terminal Control Areas (TMAs) within the E/CAR Subregion to collaborate on a lower Airspace Design Concept. Jamaica, United States, ICAO and CANSO also participated at this Workshop. For some of the States, it was the first time that they had the opportunity to participate in an airspace concept design exercise and it was a great learning opportunity. The PBN taskforce will coordinate similar events in the other two sub-regions to cater for States that are having issues with their airspace concept planning.

3. PBN Taskforce Recommendations

3.1 States/Territories/Organizations need to continue engaging in the CDM process with all stakeholders when re-designing their airspace.

3.2 States/Territories should continue to provide data to ICAO NACC RO and the PBN Taskforce on developments in their airspace.

3.3 The RPOs for PBN implementation included in the NAM/CAR RPBANIP should be amended to reflect the current state of implementation as well as future plans of the Region.

3.4 Appropriate recommendations relating to PBN harmonization will be provided on the update to this Working paper on the Discussion paper during the ANI/WG/3.

4. Suggested Actions

4.1 The Meeting is invited to:

a) Evaluate the progress of the PBN TF;
b) review and support the PBN TF recommendations indicated in Section 3; and
c) propose any other actions as deem necessary.

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1. IMPLEMENTATION OF PERFORMANCE BASED NAVIGATION (PBN)				
Benefits				
Environment	• Reductions in fuel consumption			
Efficiency	• Ability of aircraft to conduct flight more closely to preferred trajectories • Increase in airspace capacity • Facilitate the utilization of advanced technologies (e.g., FMS based arrivals) and ATC decision support tools (e.g., metering and sequencing)			
Strategy				
ATM Component	**TASK DESCRIPTION**	**START-END**	**RESPONSIBLE**	**STATUS**
AOM	a) Implement Collaborative Decision-Making (CDM) process in coordination with stakeholders	2013- 2016	States, Territories, Int. Orgs	Valid
	b) Implement PBN airspace concept for oceanic, continental and terminal areas in accordance with the ICAO PBN Manual	2013- 2016	States, Territories, ~~Int. Orgs~~	Valid
	c) Update Letters of Agreement between ATC units	2013- 2016	States, Territories, ~~Int. Orgs~~	Valid
	d) Publish regulations and procedures for PBN operational approval	2013- 2016	States, Territories, ~~Int. Orgs~~	Valid
	e) Evaluate and implement PBN requirements for ATC automated systems, as required	2013- 2016	States, Territories, ~~Int. Org~~	Valid
	f) Analyze and enhance air communication, navigation (ground navaids GNSS) and surveillance infrastructure in accordance with PBN requirements	2013- 2018	States, Territories, ~~Int. Orgs~~	Valid
	g) Develop and implement PBN training programme for pilots, ATCOs, operators and regulators, as well as implementation of GNSS technologies	2013- 2018	States, Territories, ~~Int. Orgs~~	Valid
	h) Optimize the ATS route structure through implementation of RNAV routes between major city pairs with navigation specification RNAV-5 /2 for en-route operations	2013- 2016	States, Territories, ~~Int. Orgs~~	Valid
	i) Implement CDOs/CCOs for SIDs/STARS in terminal areas based on RNAV 1-2 and RNP 1-/2 navigation specification, as required	2013- 2016	States, Territories, ~~Int. Org~~	Valid
	j) Design and implement PBN APV in accordance with Assembly Resolution A37-11	2013- 2016	States, Territories, ~~Int. Orgs~~	Valid
	k) Conduct PBN safety assessment based ATC simulations (fast time and/or real time), live trials, etc., as required	2013- 2016	States, Territories, ~~Int. Orgs~~	Valid
	l) Develop performance measurement programme	2013- 2016	States, Territories, ~~Int. Orgs~~	Valid
	m) Develop post-implementation PBN Safety Assessment Programme	2013- 2016	States, Territories, ~~Int. Orgs~~	Valid
	n) Monitor implementation progress	2013- 2020	States, Territories, ~~Int. Orgs~~	Valid
GPIs	GPI/5: Performance-Based Navigation; GPI/7: Dynamic And Flexible ATS Route Management; GPI/8: Collaborative Airspace Design And Management; GPI/10: Terminal Area Design and Management; GPI/11: RNP and RNAV SIDS and STARS; and GPI/12: FMS-Based Arrival Procedures			

Comment [RM1]: Following the meeting in Fort Lauderdale in March, I suggest that this task could be considered completed.

Comment [RM2]: I suggest the target end date be extended to 2019

Comment [RM3]: This is still achievable. The meeting in Fort Lauderdale followed by ANIWG/3 should assist with gaining the required momentum for updates to LOAs to be completed by DEC 2016

Comment [RM4]: Many States have already completed this and it is not difficult to have this task completed by DEC 2016

Comment [RM5]: I suggest extending this date to 2017. A technical study on ATM systems and the presentation of data to ATCOs may be required

Comment [RM6]: I suggest the date be extended to 2020. Report from SACCSA project needs to be taken into consideration

Comment [RM7]: This ongoing. Many training programs have been conducted in the region over the last three years

Comment [RM8]: I suggest the target date be extended to 2019. There have been some work already completed. A complete reorganization of the airspace is an extensive project that will require time

Comment [RM9]: I suggest 2018. Some States have already implemented. Some are just beginning.

Comment [RM10]: Majority of States are on target or completed

Comment [RM11]: This is a part of the airspace concept plan, design, validate and implement methodology. Will have to extend the date to match the project target date

Comment [RM12]: Will be a part of the airspace redesign project plan

Comment [RM13]: Will be part of the airspace redesign project plan

Comment [RM14]: This will be ongoing

Survey of Performance-Based Navigation (PBN) Implementation Status
Evaluation of Results

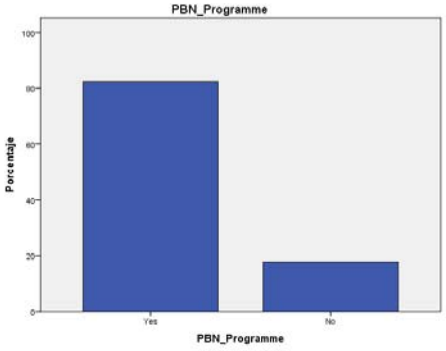
ICAO NACC Regional Office distributed a Survey of Performance-Based Navigation (PBN) Implementation Status to NACC States on 14 July 2015 (See **Attachment**).
A filled survey was received from 16 States (Aruba, Bahamas, Barbados, Belize, Bermuda, Canada, Cuba, Curaçao, French Antilles, Grenada, Honduras, Jamaica, Saint Vincent and the Grenadines, Trinidad and Tobago, United States and United Kingdom) and COCESNA. The evaluation of the results is presented in this document.

1. Does your State/Organization have a PBN programme/project in progress?

82.4% of the States/Organization have a PBN programme/project in progress. Only 3 States don't have a PBN programme/project in progress

PBN Programme in progress

		Frequency	Percentage
Valid	Yes	14	82.4
	No	3	17.6
	Total	17	100.0

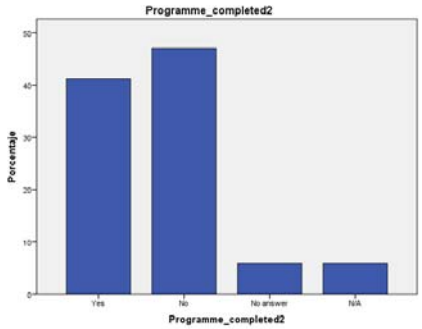


2. Has your State/Organization PBN programme/project been completed and published?

41.2% of the States/Organization have a completed and published PBN programme/project.

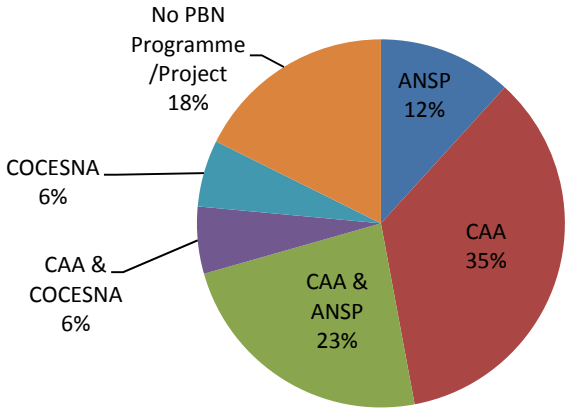
PBN Programme completed

		Frequency	Percentage
Valid	Yes	7	41.2
	No	8	47.1
	No answer	1	5.9
	N/A	1	5.9
	Total	17	100.0



3. *Who developed your PBN programme/project?*

35% of the PBN programmes/projects have been developed by the CAA of the State, and 23% by the CAA in collaboration with an ANSP.



4. *Have your ANSP personnel been trained and qualified on the procedures?*

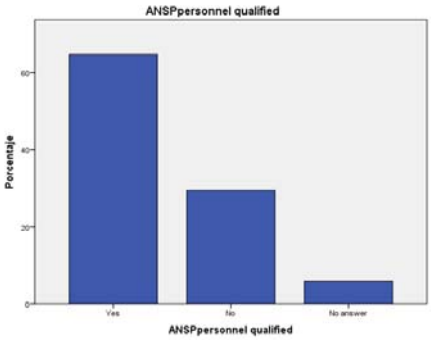
64.7% of the States/Organization ANSP personnel have been trained and qualified on the procedures. According to the comments, the personnel are trained on:

- PANS/OPS
- PBN Procedures

Two of them mentioned ICAO training on PBN.

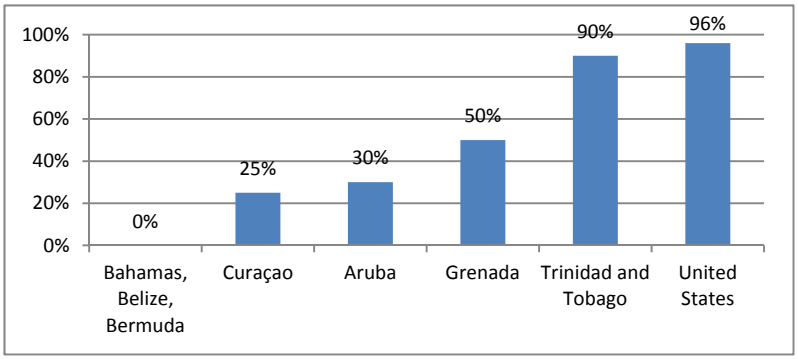
ANSP Personnel Qualified

		Frequency	Percentage
Valid	Yes	11	64.7
	No	5	29.4
	No answer	1	5.9
	Total	17	100.0



5. *What percentage of your operators have been qualified/authorized to use PBN procedures?*

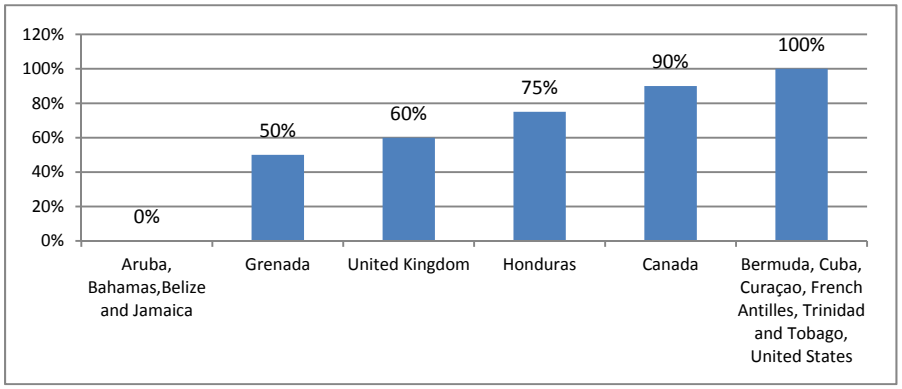
The following graph shows the percentage of operators qualified/authorized to use PBN procedures for each State.



5 States/Organization: No answer
2 States/Organization: Unknown
2 States/Organization = N/A

6. What percentage of international aerodromes has implemented PBN approach procedures in your State/Organization?

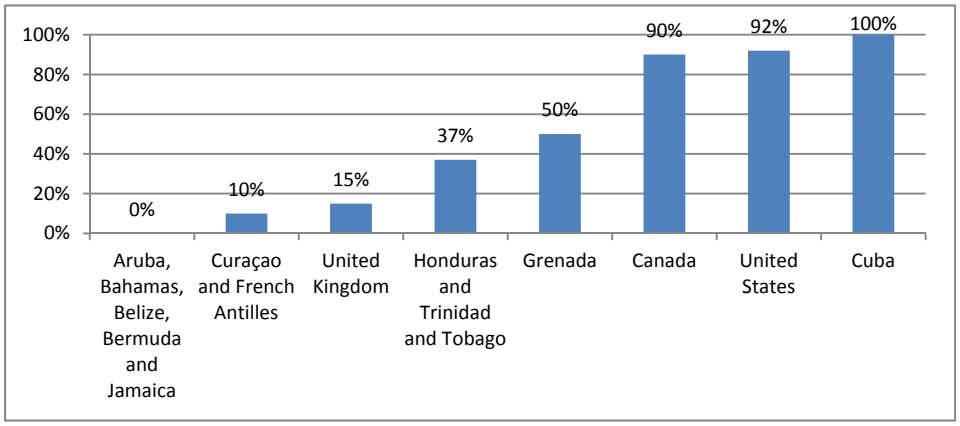
The following graph shows the percentage of international aerodromes that have implemented PBN approach procedures for each State.



1 State/Organization: No answer
2 States/Organization : N/A

7. What percentage of your air operators is using PBN approach procedures implemented in your State/Organization?

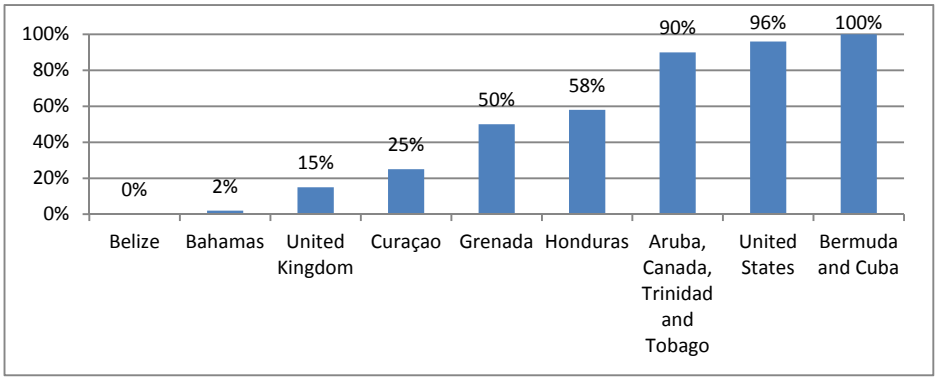
The following graph shows the percentage of air operators using PBN approach procedures implemented for each State.



3 States/Organization: Unknown

8. What percentage of your operators is equipped for using PBN procedures?

The following graph shows the percentage of operators equipped for using PBN procedures for each State.



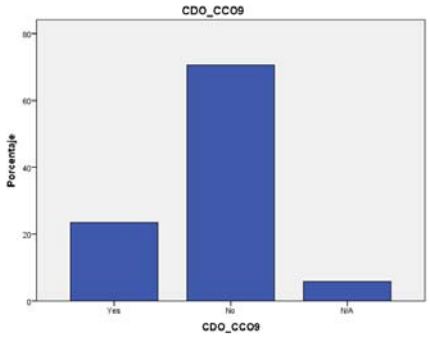
4 States/Organization: Unknown
1 State/Organization: N/A

9. Did your State/Organization implement Continuous Descent Operations/Continuous Climb Operations (CDO/CCO)?

23.5% of the States/Organization have implemented CDO/CCO. Most of the States who have not yet implemented CDO/CCO are in the planning stages and comment on the need of discussions and collaboration with stakeholders.

CDO/CCO

		Frequency	Percentage
Valid	Yes	4	23.5
	No	12	70.6
	N/A	1	5.9
	Total	17	100.0

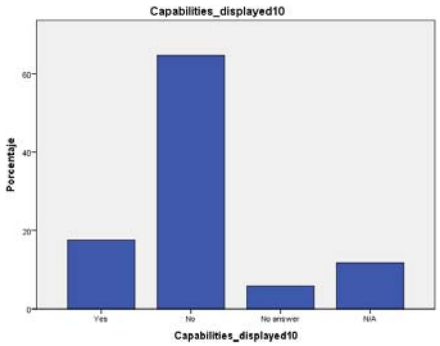


10. Are the aircraft PBN capabilities clearly displayed in the ATC situational awareness workstation?

17.6% of the States/Organization consider the aircraft PBN capabilities are clearly displayed in the ATC situational awareness workstation.

Capabilities displayed

		Frequency	Percentage
Valid	Yes	3	17.6
	No	11	64.7
	No answer	1	5.9
	N/A	2	11.8
	Total	17	100.0

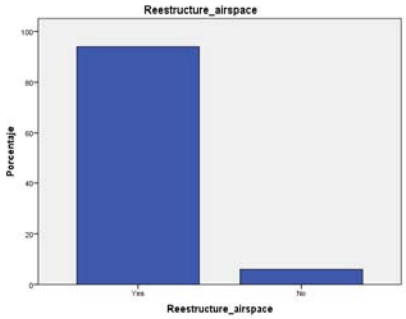


11. Does your State/Organization plan PBN implementation to re-structure/revise the airspace under your jurisdiction? (en-route, terminal, approach). Please comment as appropriate.

94.1% of the States/ Organization plan PBN implementation to re-structure/revise the airspace under their jurisdiction.

Restructure/revision of airspace

		Frequency	Percentage
Valid	Yes	16	94.1
	No	1	5.9
	Total	17	100.0

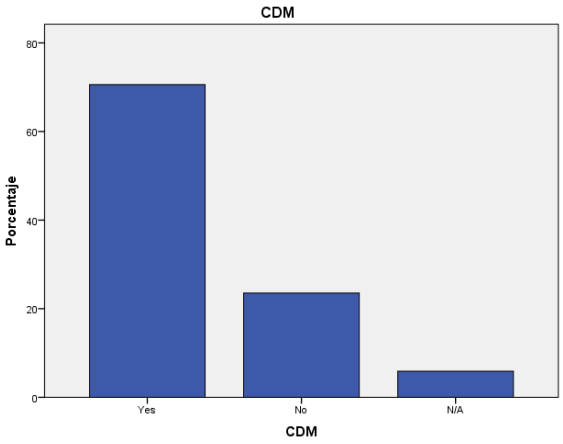


12. Does your State/Organization encourage Collaborative Decision Making (CDM) with stakeholders regarding PBN development/implementation matters?

70.6% of the States/Organization encourage Collaborative Decision Making (CDM) with stakeholders regarding PBN development/implementation matters.

CDM

		Frequency	Percentage
Valid	Yes	12	70.6
	No	4	23.5
	N/A	1	5.9
	Total	17	100.0



13. List the PBN training programmes implemented for pilots, controllers and/or other officers in your State/Organization.

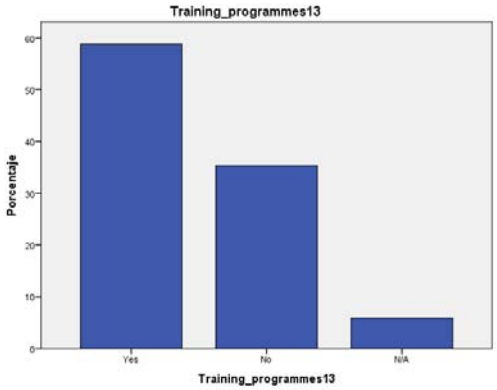
58.8% of the States/Organization have PBN training programmes implemented for pilots, controllers and/or other officers.

Some of the training programmes mentioned are:

- PBN Workshops
- Visit to Airline Simulators by ATCOs
- Training in the operational aspects for ATCOs
- OJT before and post implementation date
- Training programmes for Design Specialists
- ICAO PBN implementation Workshop
- ICAO PBN Airspace Design Workshop
- ICAO PBN OPS Approval Workshop
- ICAO PBN WEB training
- Principles of PBN Instrument Approach Procedure Design
- RNAV 1

Training_programmes

		Frequency	Percentage
Valid	Yes	10	58.8
	No	6	35.3
	N/A	1	5.9
	Total	17	100.0



14. Does your State/Organization require assistance in a particular area/field of PBN design/implementation expertise? (specify)

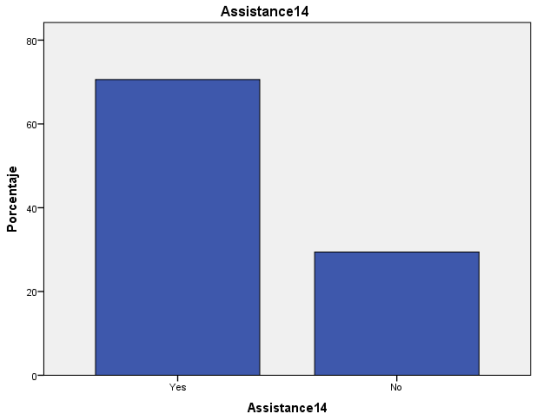
70.6% of the States/Organization require assistance in a particular area/field of PBN design/implementation expertise

Assistance

		Frequency	Percentage
Valid	Yes	12	70.6
	No	5	29.4
	Total	17	100.0

Some of the areas/fields where assistance is required are:

- Design and implementation expertise
- ATFM-PBN Implementation Navaids/equipment needed for effective and efficient implementation
- Training and Technical assistance required
- Design of PBN approach / departure procedures using automated software

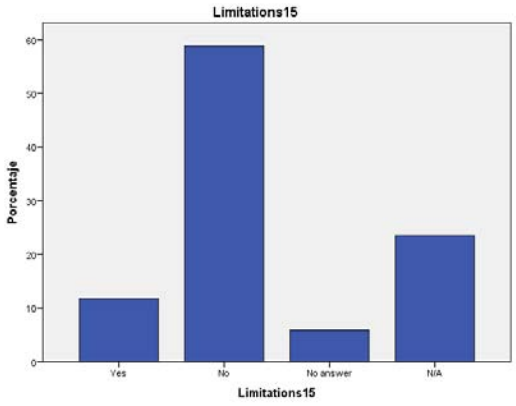


15. Are there any limitations (continuous use) to the current PBN published procedures within your FIR? (i.e. date/time, etc.) if so, please explain

11.8% of the States/Organization consider to have limitations (continuous use) to the current PBN published procedures within their FIR.

Limitations

		Frequency	Percentage
Valid	Yes	2	11.8
	No	10	58.8
	No answer	1	5.9
	N/A	4	23.5
	Total	17	100.0



REGIONAL PERFORMANCE-BASED NAVIGATION (PBN) IMPLEMENTATION SURVEY

State/Organization: _____

Date: _____

Num.	Question	Answer		Remarks
		Yes	No	
1	Does your State/Organization have a PBN programme/project in progress? (specify).	☐	☐	
2	Has your State/Organization PBN programme/project been completed and published?	☐	☐	
3	Who developed your PBN programme/project?	☐	☐	
4	Have your ANSP personnel been trained and qualified on the procedures?	☐	☐	
5	What percentage of your operators has been qualified/authorized to use PBN procedures?	☐	☐	
6	What percentage of international aerodromes have implemented PBN approach procedures in your State/Organization?	☐	☐	
7	What percentage of your air operators is using PBN approach procedures implemented in your State/Organization?	☐	☐	
8	What percentage of your operators are equipped for using PBN procedures?	☐	☐	
9	Did your State/Organization implement Continuous Descent Operations/Continuous Climb Operations (CDO/CCO)? Please comment as appropriate.	☐	☐	
10	Are the aircraft PBN capabilities clearly displayed in the ATC situational awareness workstation?	☐	☐	
11	Does your State/Organization plan PBN implementation to re-structure/revise the airspace under your jurisdiction? (en-route, terminal, approach). Please comment as appropriate.	☐	☐	
12	Does your State/Organization encourage Collaborative Decision Making (CDM) with stakeholders regarding PBN development/implementation matters?	☐	☐	
13	List the PBN training programmes implemented for pilots, controllers and/or other officers in your State/Organization.	☐	☐	

Num.	Question	Answer		Remarks
14	Does your State/Organization require assistance in a particular area/field of PBN design/implementation expertise? (specify)	☐	☐	
15	Are there any limitations (continuous use) to the current PBN published procedures within your FIR? (i.e. date/time, etc.) if so, please explain	☐	☐	

Note: Feel free to add relevant comments or documents regarding the PBN implementation in your State/Organization.

— END —