CNS/ATM
Tutorial 6A

PBN IMPLEMENTATION

SUMMARY

This paper proposes high-level performance objectives to lead regional and state implementation of PBN in a structured manner, and aligned with the Global Air Navigation Plan.

1. INTRODUCTION

1.1 The Assembly Resolution A36-23 established global goals for the implementation of performance based navigation (PBN). This paper presents PBN performance objectives that would facilitate the implementation of PBN in accordance with the Global Plan (Doc 9750) and ICAO vision for an integrated Global ATM system.

2. BACKGROUND

2.1 Implementation of RNP and area navigation (RNAV) took different directions in the past in different regions and States. In particular, the definitions and concepts related to RNP and RNAV and the naming conventions associated with RNP varied from State to State and from region to region. This variation of implementation resulted in a lack of harmonization between RNP and RNAV applications in different areas of the world.

2.2 The RNP Special Operational Requirements Study Group (RNPSORSG), which was created in May 2007 to act as a focal point for addressing several issues related to RNP/RNAV, developed the *Performance Based Navigation Manual* (Doc 9613) that is currently in final draft. In order to expedite implementation, State letter AN 11/45-07/22 dated 27 April 2007 concerning guidance material for the issuance of PBN operational approvals was released.

2.3 The 36th session of the ICAO Assembly recognized that implementation of approaches with vertical guidance (APV) is still not widespread, that the global air navigation plan has identified global plan initiatives (GPIs) to concentrate on the incorporation of advanced aircraft navigation capabilities into air navigation infrastructure and that continued development of diverging navigation specifications would result in safety and efficiency impacts and penalties to States and industry. The Assembly adopted Resolution A36-23 to support speedy implementation of PBN globally. The resolution urged all States to implement RNAV and RNP air traffic services (ATS) routes and approach procedures in accordance with the ICAO PBN concept laid down in Doc 9613.

3. PBN performance objectives

3.1 The Assembly Resolution A36-23 which calls for States to develop a PBN implementation plan by 2009, is geared towards achieving the global PBN performance objectives. These performance objectives are required so as to ensure that the PBN implementation effort by PBN taskforce and States is aligned with Global ATM operational concept and also meets regional and national

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requirements. It should be noted that the first objective, the development of the regional implementation plan has already been completed by the PBN Taskforce.

3.2. Consequently, to facilitate a structured development of PBN implementation, the following three PBN Performance Objectives and associated tasks listed in the appendix hereto are need to be adopted:

a) Optimization of the ATS route structure in en-route airspace;

b) Optimization of the ATS route structure in terminal airspace; and

c) Implementation of vertically guided RNP approaches

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APPENDIX

REGIONAL PERFORMANCE OBJECTIVES /NATIONAL PERFORMANCE OBJECTIVES FOR PBN

REGIONAL PERFORMANCE OBJECTIVES /NATIONAL PERFORMANCE OBJECTIVES OPTIMIZATION OF THE ATS ROUTE STRUCTURE IN EN-ROUTE AIRSPACE					
Benefits					
Environment Efficiency	• reductions in gas emissions; • ability of aircraft to conduct flight more closely to preferred trajectories; • increase in airspace capacity; • facilitate utilization of advanced technologies (e.g., FMS based arrivals) and ATC decision support tools (e.g., metering and sequencing), thereby increasing efficiency.				
Strategy					
ATM OC COMPONENTS	**TASKS**	**TIMEFRAME**		**RESPONSIBILITY**	**STATUS**
		START	**END**		
AOM	Develop regional Implementation plan				
	Develop regional action plan				
	Develop Airspace Concept based on PBN regional implementation plan, in order to design and implement a trunk route network, connecting major city pairs in the upper airspace and for transit to/from aerodromes, on the basis of PBN, e.g. RNAV 10 and RNAV 5, and taking into account interregional harmonization				
	Develop State PBN implementation plans				
	Develop performance measurement plan				
	Formulate safety plan				
	Establish collaborative decision making (CDM) process				
	Publish national regulations for aircraft and operators approval using PBN manual as guidance material				
	Identify training needs and develop corresponding guidelines				
	Formulate system performance monitoring plan				
	Implementation of ATS routes enroute				
	monitor implementation progress in accordance with PBN implementation plan and State implementation plan				

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linkage to GPIs	GPI/5: performance-based navigation, GPI/7: dynamic and flexible ATS route management, GPI/8: collaborative airspace design and management			

REGIONAL PERFORMANCE OBJECTIVES /NATIONAL PERFORMANCE OBJECTIVES OPTIMIZATION OF THE ATS ROUTE STRUCTURE IN TERMINAL AIRSPACE				
Benefits				
Environment **Efficiency**	• reductions in gas emissions; • ability of aircraft to conduct flight more closely to preferred trajectories; • increase in airspace capacity; • improved availability of procedures • facilitate utilization of advanced technologies (e.g., FMS based arrivals) and ATC decision support tools (e.g., metering and sequencing), thereby increasing efficiency.			
Strategy				
ATM OC COMPONENTS	**TASKS**	**TIMEFRAME START-END**	**RESPONSIBILITY**	**STATUS**
AOM	Develop regional Implementation plan			
	Develop regional action plan			
	Develop State PBN implementation plan			
	Develop Airspace Concept based on PBN regional implementation plan, in order to design and implement optimized standard instrument departures (SIDs), standard instrument arrivals (STARs), holding and associated instrument flight procedures, , on the basis of PBN and, in particular RNAV 1 and Basic-RNP 1			
	Develop performance measurement plan			
	Formulate safety plan			
	Establish collaborative decision making (CDM) process			
	Publish national regulations for aircraft and operators approval using PBN manual as guidance material			
	Identify training needs and develop corresponding guidelines			
	Formulate system performance monitoring plan			
	-develop a regional strategy and work programme for implementation of; and			
	Implementation of SIDs and STARs		State	
	monitor implementation progress in accordance with PBN implementation roadmap and State implementation plan			

linkage to 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.			

REGIONAL PERFORMANCE OBJECTIVES /NATIONAL PERFORMANCE OBJECTIVES IMPLEMENTATION OF VERTICALLY GUIDED RNP APPROACHES				
Benefits				
Environment **Efficiency** **Safety**	• reductions in gas emissions; • increased accessibility to aerodromes, including continuity of access • increased runway capacity • Reduced pilot workload • Availability of reliable lateral and vertical navigation capability			
Strategy				
ATM OC COMPONENTS	**TASKS**	**TIMEFRAME START-END**	**RESPONSIBILITY**	**STATUS**
AOM	***Approach***			
	Develop regional Implementation plan			
	Develop regional action plan			
	Develop State PBN implementation plan			
	Develop Airspace Concept based on PBN regional implementation plan, in order to design and implement RNP APCH with Baro-VNAV in accordance with assembly resolution A36-23, and RNP AR APCH where beneficial			
	Develop performance measurement plan			
	Formulate safety plan			
	Establish collaborative decision making (CDM) process			
	Publish national regulations for aircraft and operators approval using PBN manual as guidance material			
	Identify training needs and develop corresponding guidelines			
	Implementation of APV procedures	present - 2016	State	
	Formulate system performance monitoring plan			
linkage to 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.			

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