International Civil Aviation Organization

SP AFI/08-WP/11
18/8/08

WORKING PAPER

SPECIAL AFRICA-INDIAN OCEAN (AFI) REGIONAL AIR NAVIGATION (RAN) MEETING

Durban, South Africa, 24 to 29 November 2008

Agenda Item 6: Development of a set of comprehensive work programmes in the air navigation field, aimed at improving efficiency of the air navigation system (Efficiency Committee)

PBN IMPLEMENTATION PERFORMANCE OBJECTIVES

(Presented by the Secretariat)

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

Action by the meeting is in paragraph 4.

1. INTRODUCTION

1.1 Assembly Resolution A36-23 established global objectives for the implementation of performance-based navigation (PBN). The sixteenth meeting of the AFI Planning and Implementation Regional Group (APIRG/16) established a PBN task force (TF) to develop a regional PBN implementation plan and assist the States with PBN implementation. This paper calls for the approval of PBN performance objectives in order to focus the PBN implementation effort and to ensure that implementation is in accordance with the global plan initiatives (GPIs) of the *Global Air Navigation Plan for CNS/ATM Systems* (Global Plan, Doc 9750) and the ICAO vision for a global air traffic management (ATM) system as envisaged in the *Global Air Traffic Management Operational Concept* (Doc 9854), that is harmonized and interoperable.

2. BACKGROUND

2.1 Implementation of required navigation performance (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 Eleventh Air Navigation Conference (22 September to 3 October 2003, Montreal, Canada) took note of this lack of harmonization in the implementation of RNP and RNAV and recommended that ICAO address this issue and also expedite the implementation of RNP and RNAV in a harmonized manner (Recommendation 6/5 refers).

2.3 Based on Recommendation 1/1 of the fourth meeting of the Global Navigation Satellite System Panel (GNSSP/4), the RNP Special Operational Requirements Study Group (RNPSORSG) was created on 10 June 2003 by the Air Navigation Commission (163-10) to act as the focal point for addressing several issues related to RNP/RNAV. The RNPSORSG developed the concept of PBN in May 2007.

2.4 RNPSORSG developed the Performance Based Navigation Manual that is currently in final draft. In order to expedite implementation, State letter AN 11/45-07/22, Guidance Material for the Issuance of PBN Operational Approvals was issued on 27 April 2007. The letter enclosed relevant guidance from the manual to facilitate implementation of air traffic services (ATS) routes and flight procedures based on PBN.

2.5 APIRG/16 held in Rubavu, Rwanda from 19 to 23 November 2007, discussed various issues related to the implementation of PBN in the AFI Region. The Group was provided with the details of the PBN concept in the context of a performance-based global ATM system, the benefits of PBN, recent actions by ICAO at the global and regional levels regarding PBN implementation and what role APIRG, the States and stakeholders should play relating to implementation.

2.6 The group recalled that at the 36th Session of the ICAO Assembly held at Montreal, Canada from 18 to 28 September 2007, it was recognized that implementation of approaches with vertical guidance was still not widespread, that the global air navigation plan had identified GPIs to concentrate on the incorporation of advanced aircraft navigation capabilities into the 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 therefore, adopted Resolution A36-23 to support speedy implementation of PBN globally. The resolution urges all States to implement RNAV and RNP ATS routes and approach procedures in accordance with the ICAO PBN concept laid down in the PBN Manual.

3. DISCUSSION

3.1 Regional planning process

3.1.1 In the AFI Region, PBN implementation planning is conducted by the AFI PBN TF. The work is conducted in accordance with the GPIs of the Global Plan and the ICAO vision for an integrated ATM system, harmonized and interoperable, as established in Doc 9854. The regional PBN implementation plan must meet the following objectives:

a) to ensure that the implementation of the navigation item of the CNS/ATM system is based on clearly established operational requirements;

b) to avoid undue multiple equipment on the aircraft and/or multiple systems on ground;

c) to avoid the need for multiple airworthiness and operational approvals for intra- and inter-regional operations; and

d) to explain in detail the contents of the Regional Air Navigation Plan (ANP) and of the Regional CNS/ATM Plan, describing potential navigation applications.

3.2 Current Implementation

3.2.1 As an early step toward PBN implementation before establishment of the PBN TF, one pair of RNP 10 (RNAV 10) routes was established in May 2006 with excellent results. These routes, informally known as Red Carpet I (RC I) routes, were the first long-range AFI RNAV routes

anchored by points at the South Africa/Botswana border and the Mediterranean coast in Algeria and Tunisia. A second pair of RNAV RNP-10 (RNAV 10) routes was implemented in 2007. These routes are also serving the southern African and European Regions but on a more easterly course than RC I.

3.2.2 In order to continue optimizing the PBN structure over Africa current efforts are leading toward an implementation of additional RNAV (RNP 10) routes on a generally east-west direction. The PBN Task Force will continue this work through the existing process based on weekly telecons.

3.3 PBN performance objectives

3.3.1 APIRG/16 recalled Assembly Resolution A36-23 which calls for States to develop a PBN implementation plan by 2009, geared towards achieving the global PBN implementation performance objectives. These objectives are required as the PBN implementation planning effort needs to fit into a harmonized and interoperable global system and needs to reflect the necessary activities to support airspace concepts that meet regional strategic implementation requirements.

3.3.2 As a result of the foregoing and to enable a structured AFI PBN implementation, high-level performance objectives are required. On this basis, the meeting is invited to adopt the following recommendation to guide the work of APIRG on PBN.

Recommendation 6/x — PBN performance objectives

That the AFI Planning and Implementation Regional Group (APIRG) adopt the following three PBN Performance Objectives and associated tasks as contained in the Performance Framework Forms in the appendix to this paper:

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.

4. ACTION BY THE MEETING

4.1 The meeting is invited to approve the draft Recommendation at paragraph 3.3.2 above.

— — — — — — — —

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**	• reduction 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 START-END**	**RESPONSIBILITY**	**STATUS**
AOM	***En-route airspace***	2008		
	• develop regional implementation plan	1Q 2008 – 1Q 2009	PBN TF	In progress
	• develop regional action plan	1Q 2009	PBN TF	Not started
	• develop airspace concept based on AFI 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			
	• harmonize State and PBN implementation plans with regional plan			
	• 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		Region/States	In progress
	• monitor implementation progress in accordance with AFI PBN implementation plan 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			

REGIONAL PERFORMANCE OBJECTIVES/NATIONAL PERFORMANCE OBJECTIVES OPTIMIZATION OF THE ATS ROUTE STRUCTURE IN TERMINAL AIRSPACE				
Benefits				
Environment **Efficiency**	• reduction 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	***En-route airspace***	2008		
	• develop regional implementation plan	1Q 2008 – 1Q 2009	PBN TF	In progress
	• develop regional action plan	1Q 2009	PBN TF	Not started
	• develop State PBN implementation	1Q 2009 – 4Q 2009	State	
	• develop airspace concept based on AFI PBN roadmap, in order to design and implement a 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 SIDs and STARs		State	
	• monitor implementation progress in accordance with AFI 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; GPI/12: FMS-based arrival procedures			

REGIONAL PERFORMANCE OBJECTIVES/NATIONAL PERFORMANCE OBJECTIVES OPTIMIZATION OF VERTICALLY GUIDED RNP APPROACHES				
Benefits				
Environment **Efficiency**	• reduction 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	***En-route airspace***	2008		
	• develop regional implementation plan	1Q 2008 – 1Q 2009	PBN TF	In progress
	• develop regional action plan	1Q 2009	PBN TF	Not started
	• develop State PBN implementation	1Q 2009 – 4Q 2009	State	
	• develop airspace concept based on AFI PBN 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			
	• identify training needs and develop corresponding guidelilnes			
	• 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; GPI/12: FMS-based arrival procedures			

— END —