International Civil Aviation Organization

THE ELEVENTH MEETING OF PERFORMANCE BASED NAVIGATION IMPLEMENTATION COORDINATION GROUP (PBNICG/11)

Bangkok, 27 - 29 March 2024

Agenda Item 4: States' PBN Implementation Progress and the challenges faced by the States and lessons learnt

MALAYSIA PBN IMPLEMENTATION PROGRESS

(Presented by **Malaysia**)

SUMMARY

This paper presents information on the latest progress of PBN implementation in Malaysia. It summarized the implementation status of PBN SID, STAR and PBN Approach at airports within Kuala Lumpur and Kota Kinabalu Flight Information Regions (FIRs).

1. INTRODUCTION

1 Performance-based navigation (PBN) in Malaysia has been meticulously structured through a phased plan developed back in 2012, strategically categorized into short-term, medium-term, and long-term phases. This structured timeline was designed to ensure a systematic and efficient implementation of PBN across Malaysia's aviation sector, aligning with international standards set by the International Civil Aviation Organization (ICAO) and addressing the specific needs and capabilities of the country's airspace management.

As of the latest updates, Malaysia is in the final phase of its Performance-Based Navigation (PBN) Implementation Plan, a significant milestone reflecting the country's commitment to modernizing its air navigation system in line with global standards. This final phase is characterized by the comprehensive integration of PBN across all levels of Malaysia's airspace management, emphasizing the achievement of a fully optimized, efficient, and environmentally sustainable air traffic system.

2. IMPLEMENTATION STATUS

2.1 Malaysia PBN Implementation Status

Ensuring that PBN procedures are implemented and operationalized across all sectors of Malaysia's airspace, providing uniform navigation standards and enhancing the efficiency of air traffic operations.

Malaysia has made significant progress, with the current status at around 85% completion. Setting a target to achieve 100% implementation by the end of 2025 demonstrates Malaysia's commitment to modernizing its air navigation system and aligning with international standards.

With only 15% remaining to reach full implementation, Malaysia is likely to focus on addressing any remaining challenges, such as infrastructure upgrades, regulatory compliance, and stakeholder engagement, to ensure a smooth transition to PBN operations across all sectors of its airspace.

Table 1.0: Matrix of PBN Implementation in Malaysia

NO	INTERNATIONAL AIRPORT	ICAO CODE	RWY	PBN SID	PBN STAR	PBN APPROACH		
						LNAV	LNAV/ VNAV	RNP (AR)
1	Kuala Lumpur International	WMKK	14L	✓	✓	✓	✓	
			32R	✓	✓	✓	✓	✓
			14R	✓	✓	✓	✓	
			32L	✓	✓	✓	✓	
			15	✓	✓	✓	✓	
			33	✓	✓	✓	✓	✓
2	Penang International	WMKP	04	✓	✓	✓	✓	✓
			22	✓	✓	✓	✓	✓
3	Langkawi International	WMKL	03	✓	N/U	✓	✓	✓
			21	N/U	✓	N/U	N/U	N/U
4	Senai International	WMKJ	16	✓	✓	✓	✓	✓
			34	✓	✓	N/U	N/U	✓
5	Kuching International	WBGG	07	✓	✓	✓	✓	✓
			25	✓	✓	✓	✓	✓
6	Kota Kinabalu International	WBKK	02	✓	✓	✓	✓	✓
			20	✓	✓	✓	✓	✓

NO	DOMESTIC AIRPORT	ICAO CODE	RWY	PBN SID	PBN STAR	PBN APPROACH		
						LNAV	LNAV/ VNAV	RNP (AR)
7	Alor Setar / Sultan Abdul Halim	WMKA	04	N/U	✓	✓	✓	✓
			22	✓	N/U	N/U	N/U	N/U
8	Kota Bharu/Sultan Ismail Petra	WMKC	10	✓	✓	✓	✓	✓
			28	✓	✓	✓	✓	✓
9	Kuantan	WMKD	18	✓	✓	✓	✓	
			36	✓	✓	✓	✓	
10	Ipoh/Sultan Azlan Shah	WMKI	04	✓	N/U	✓	✓	✓
			22	N/U	✓	N/U	N/U	N/U
11	Malacca	WMKM	03	✓	✓	✓	✓	
			21	✓	✓	✓	✓	
12	Kuala Terengganu/ Sultan Mahmud	WMKN	04	✓	✓	✓	✓	✓
			22	✓	✓	✓	✓	✓
13	Subang/Sultan Abdul Aziz Shah	WMSA	15	✓	✓	✓	✓	
			33	✓	N/U	✓	✓	
14	Bintulu	WBGB	17	✓	✓	✓	✓	✓

			35	✓	✓	✓	✓	✓
15	**Miri**	WBGR	02	✓	✓	✓	✓	✓
			20	✓	✓	✓	✓	✓
16	**Sibu**	WBGS	13	✓	✓	✓	✓	✓
			31	✓	✓	✓	✓	✓
17	**Labuan**	WBKL	14	✓	✓	✓	✓	✓
			32	✓	✓	✓	✓	✓
18	**Sandakan**	WBKS	08	✓	✓	✓	✓	
			26	✓	✓	✓	✓	✓
19	**Tawau**	WBKW	06	✓	✓	✓	✓	✓
			24	✓	✓	✓	✓	✓
20	**Mukah**	WBGK	15	✓	✓	✓	✓	
			33	✓	✓	✓	✓	

Legend:	
✓	Implemented
✓	In Progress
N/U	Not Usable

2.2 Malaysia Future Plan

Malaysia's next steps towards enhancing its air navigation system through the implementation of RNP-AR, venturing into satellite-based navigation systems like GBAS (Ground-Based Augmentation System) and incorporating Continuous Descent Operations (CDO) and Continuous Climb Operations (CCO) into Instrument Flight Procedure (IFP) design. Each of these initiatives contributes to improving flight efficiency, reducing environmental impact, and enhancing safety.

Improvement on Flight Track by Implementing RNP-AR

Reducing Track Miles: The introduction of RNP-AR procedures allows aircraft to fly precisely defined flight paths without relying on ground-based navigation aids. By enabling shorter and more direct routes, RNP-AR can significantly reduce track miles, leading to fuel savings and decreased emissions.

Enhanced Flight Efficiency: Implementing RNP-AR procedures in complex terrain or congested airspace can improve access and flexibility for flight operations, thereby enhancing overall air traffic management and reducing delays.

Currently, CAAM has successfully implemented the RNP-AR procedure in 15 aerodromes throughout Malaysia as in table 1.0.

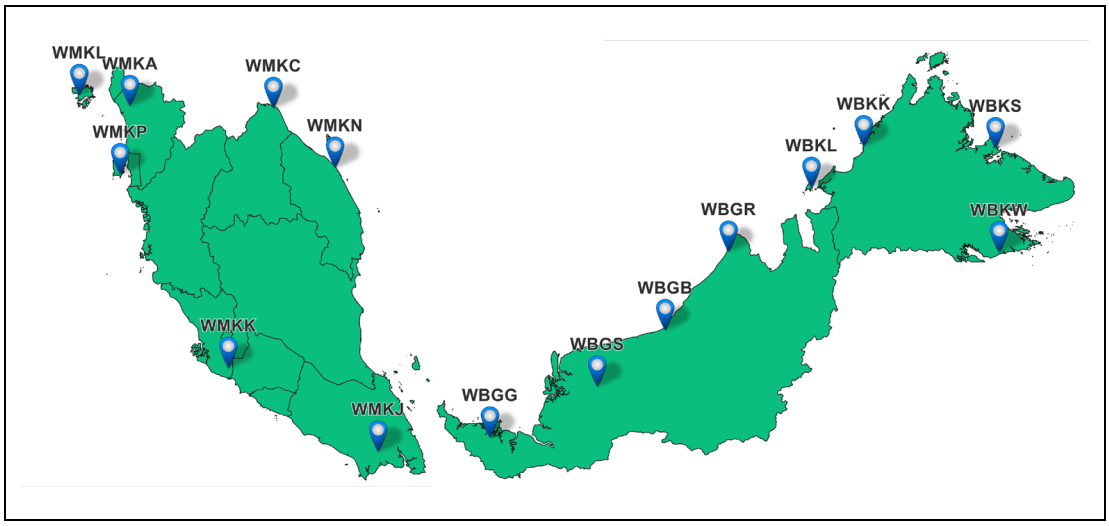

Figure 1: Location of Airports with RNP AR Procedure

Satellite-based Navigation: GBAS

Malaysia has installed GBAS equipment at Kuala Lumpur International Airport (KLIA) to enhance the precision and reliability of aircraft on GNSS navigation, especially during the approach and landing phases. However, the process of drafting procedures and regulations as well as addressing factors like Ionospheric Effects and GNSS Monitoring is crucial for the successful integration of GBAS into Malaysia's aviation infrastructure.

Currently, Malaysia is in the process of collaborating with the Malaysian National Space Agency and local universities with expertise in satellite technology. This collaboration is to leverage domestic expertise and resources in advancing GBAS implementation. These partnerships can facilitate research and development initiatives, technology transfer, and capacity-building efforts, ultimately enhancing Malaysia's capabilities in satellite navigation and aviation infrastructure.

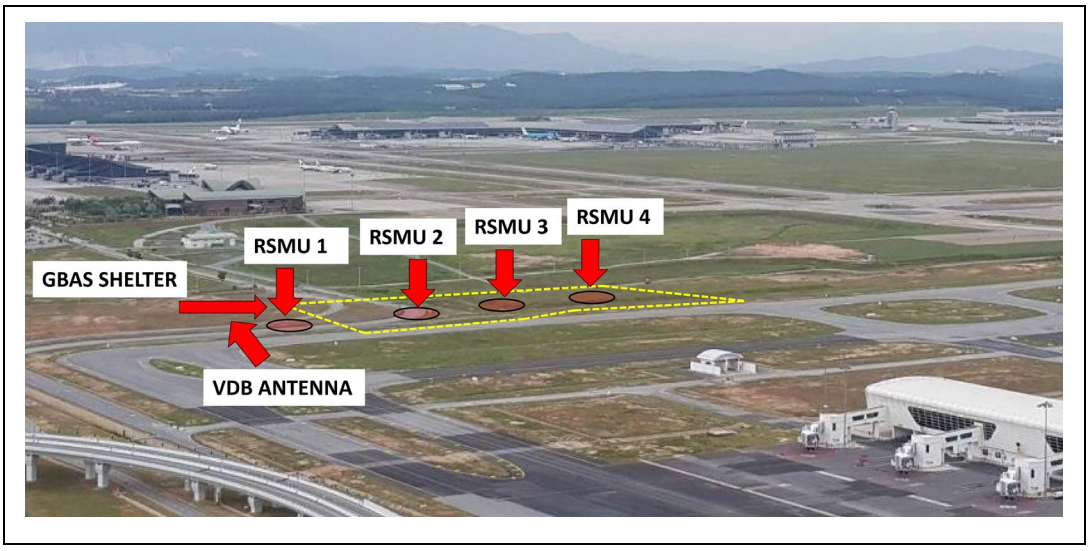

Figure 2: GBAS Equipment Location at KLIA

Incorporating CDO & CCO in IFPs Design

CCO and CDO allow aircraft to optimise engine performance and reduce fuel consumption. Incorporating CDO and CCO into IFP design not only enhances operational efficiency but also contributes to emissions reduction.

Along with the implementation of new IFP based on PBN, Malaysia has included CCO & CDO elements in the study and design. However, due to the terrain, limitation of the airspace volume and the air traffic pattern, have affected the CCO & CDO in the IFP designs.

3. CONCLUSION

Malaysia has made significant progress in implementing Performance-Based Navigation (PBN) systems, particularly at Kuala Lumpur International Airport. Overall, Malaysia's PBN implementation status reflects significant progress in adopting advanced navigation technologies to enhance air navigation safety and efficiency. By leveraging domestic expertise and fostering collaboration between government, academia, and industry stakeholders, Malaysia aims to further advance its PBN implementation for the benefit of aviation industries and promoting sustainable growth in air transportation.

4. ACTION REQUIRED BY THE MEETING

4.1 The meeting is invited to:

a) note the information contained in this paper; and
b) discuss any relevant matters as appropriate.

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