

Performance Based Navigation



AIRNAVIGATION

ARISE PLUS CIVIL AVIATION PROJECT

Support ASEAN ATM Master Plan – Workshop 2: ASEAN-Wide Implementation of Agreed Initiatives

10 – 12 September 2018, Bangkok, Thailand

Performance Based Navigation Route

Presented by: Cambodia & Laos

Outline



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- I. Introduction
- II. PBN Route Implementation in ASEAN
- III. Overview of the ASEAN Readiness for the PBN Route Implementation
- IV. PBN Route Implementation Requirements
- V. Challenges for ASEAN

Introduction



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- The Third Strategic Planning Group (SPG/3), held in Penang (Malaysia) in March, 2018 agreed to work toward the implementation of the 5 ASEAN Wide Implementation initiatives by having AMSs to take the lead in the implementation of each initiative.
- The SPG/3 agreed to have Malaysia as the lead for the AIDC, Thailand & Singapore as the lead for ATFM, AIM and CRV.
- Cambodia and Laos have been in charge of leading the PBN Route Implementation.

Introduction (cont)



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- The continue growth of aviation increases demands on airspace capacity therefore emphasizing the need for optimum utilization of available airspace. The Performance Based Navigation (PBN) concept specifies aircraft RNAV system performance requirements in terms of accuracy, integrity, availability, continuity and functionality needed for proposed operations in the context of a particular Airspace Concept.
- ICAO Assembly resolution A37-11 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 the Performance-based Navigation (PBN) Manual (Doc 9613).

Introduction (cont)



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- The Navigational Specification and time frame specified in the ASEAN ATM Master Plan for the PBN Routes are:
 1. Phrase I: 1/1/2018 – 31/12/2020: RNAV2/RNP2
All ATS routes serving major aerodromes should be designated as RNAV2 or RNP2 (other acceptable - RNAV5)
 2. Phrase II: 1/1/2018 – 31/12/2022: RNP2
PBN ATS routes serving major aerodromes should be designated as RNP2.

Introduction (cont)



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Status of PBN Implementation Plan/Implementation submitted to ICAO Asia-Pac (as of 6 March 2017 from PBNICG/3)

States	Date & version submitted
Brunei	None
Cambodia	01 September 2011 older version (24 Jan 2017 part of the ATM Master Plan)
Indonesia	29 June 2009, 26 April 2011
Laos	11 July 2008, 03 August 2011
Malaysia	08 July 2008, 15 January 2010, 11 April 2011, 20 November 2012
Myanmar	27 April 2011
Singapore	07 July 2008, 02 October 2009, 30 December 2016
Thailand	08 July 2008, 13 July 2009, 31 January 2017
Vietnam	Cambodia, Laos and Vietnam IP for APANPIRG/23 - not a plan

PBN Route Implementation in ASEAN



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Implementation target and Navigational Specifications

States	Navigation Specifications for En-route	Phase I	Progress	Phase II	Progress
Brunei	To be provided	To be provided	No report	To be provided	No report
Cambodia	RNAV2/RNP2	Started-31/12/2020	15%	Started-31/12/2022	-
Indonesia	RNAV2/RNP2	Started-31/12/2018	No report	Started-31/12/2020	No report
Laos	RNAV2/RNP2	28/12/2018-31/12/2018	10%	31/12/2020-31/12/2022	5%
Malaysia	RNAV2/RNP2	Started-31/12/2009	No report	Not planned	No report
Myanmar	RNAV2/RNP2	Started-31/12/2018	No report	TBC	No report
Singapore	RNAV2/RNP2	Started-1/06/2019	No report	Started-31/12/2020	No report
Thailand	RNAV2/RNP2	Started-8/12/2018	60%	Started-7/11/2019	20%
Vietnam	RNAV2/RNP2	Started-31/12/2018	No report	Started-31/12/2020	No report

Overview of the ASEAN Readiness for the PBN Route Implementation



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Terminal Area & Enroute Infrastructure

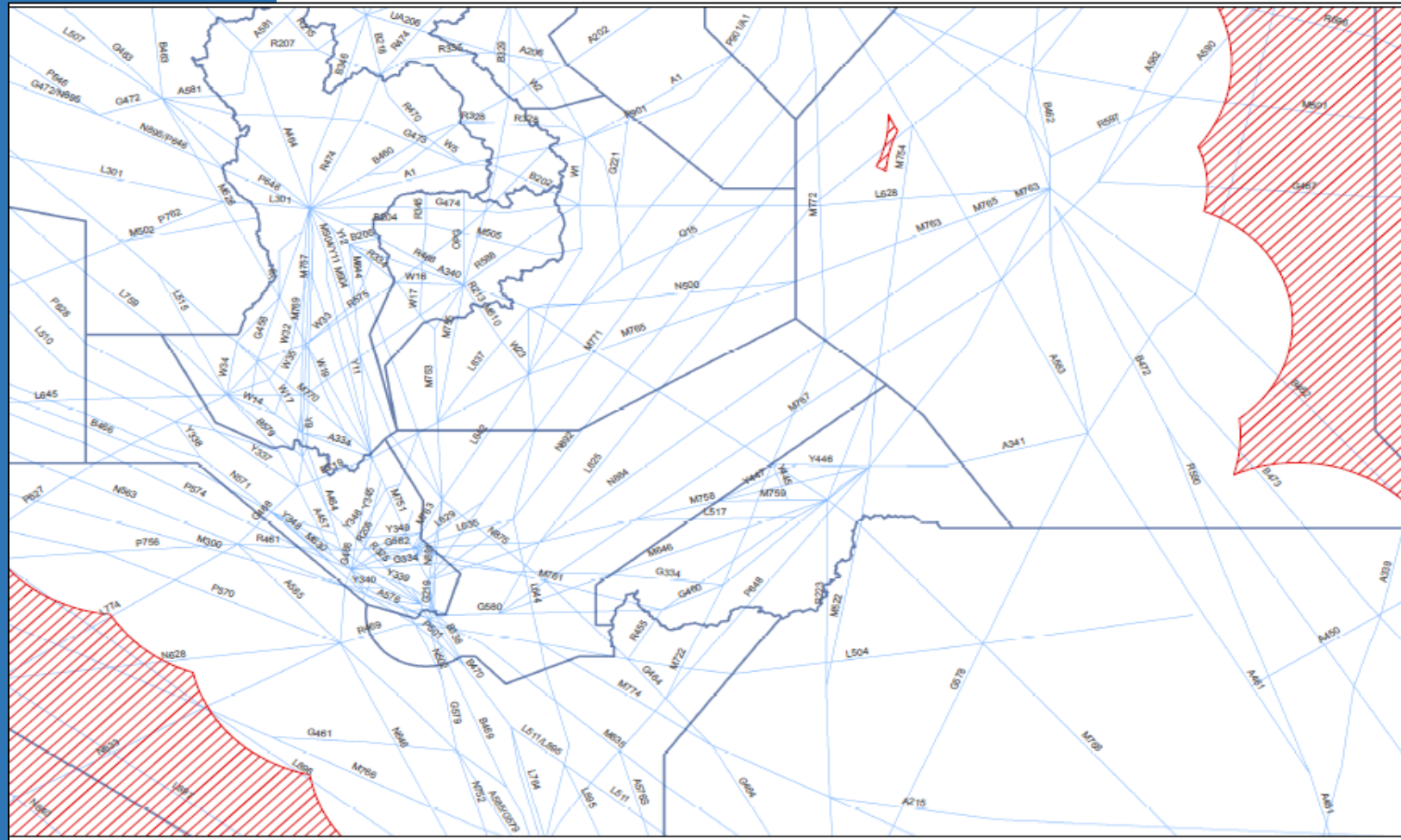
Item	TMA Name	Serving Aerodrome	Nav Spec	Nav Infrastructure Support (Terminal)	Nav Infrastructure Support (Enroute)	Remarks
1	Bangkok	VTBS, VTBD	RNAV 1	GNSS or DME/DME/IRU	SSR/ADS-B	
2	Phuket	VTSP	RNAV 1	GNSS or DME/DME/IRU	SSR/ADS-B	
3	Chiang Mai	VTCC	RNP 1	GNSS	SSR/ADS-B	Non RADAR Area
			RNAV 1	GNSS or DME/DME/IRU	SSR/ADS-B	
4	Yangon	VYYY	RNAV 1	GNSS	SSR/ADS-B	
5	Mandalay	VYMD	RNAV 1	GNSS	SSR/ADS-B	
6	Nay Pyi Taw	VYNT	RNAV 1	GNSS	SSR/ADS-B	
7	Kuala Lumpur	WMKK	RNAV 1	GNSS	SSR/ADS-B	
8	Phnom Penh	VDPP	RNAV 1	GNSS	SSR/ADS-B	
9	Siem Reap	VDSR	RNAV 1	GNSS	SSR/ADS-B	
10	Jakarta	WIII, WIHH, WILL, WIRR, WARS, WICC, WICD	RNAV 1	GNSS	SSR/ADS-B	SID/STAR
11	SUB	WARR	RNAV 1	GNSS	SSR/ADS-B	SID/STAR
12	Bali	WADD, WADL	RNAV 1	GNSS	SSR/ADS-B	SID/STAR
13	Ujung Pandang					Request for missing Information
14	Vientiane TMA	VLVT	RNAV	VOR/DME/ILS/GNSS	SSR/ADS-B	
15	Luang Phabang TMA	VLLB	IFR	VOR/DME/ILS	SSR/ADS-B	
16	Savannakhet CTR	VLSK	IFR	VOR/DME/NDB	SSR/ADS-B	
17	Pakse TMA	VLPS	RNAV	VOR/DME/ILS/GNSS	SSR/ADS-B	
18	Changi	WSSS	RNAV 1	GNSS	SSR/ADS-B	
19	Tan Son Nhat	VVTS	RNAV 1	GNSS	SSR/ADS-B	
20	Manila	RPLL	RNAV 1, RNP 1	GNSS	SSR/ADS-B	
21	Mactan	RPVM	RNP 1	GNSS	SSR/ADS-B	

Overview of the ASEAN Readiness for the PBN Route Implementation (cont)



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Surveillance Gap



Overview of the ASEAN Readiness for the PBN Route Implementation



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- **PBN Route Implementation in Mekong Region**

With respect to ATS route network enhancement, PBN En-route harmonization has been a one of the key concerns as reflected by previous efforts made in the Mekong Region such as agreement to convert conventional bidirectional routes into parallel unidirectional RNAV5 route structure for main city pairs, supported by RNAV5 routes to smaller cities between Cambodia, Lao PDR and Viet Nam. Currently, the application of RNAV2 specification is proposed for many new international and domestic routes within the Mekong Region

PBN Route Implementation Requirements



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- Airspace Structure
- Navigational Aids
- Ops Approval
- Aircraft equipage
- ATC Training & procedures
- PBN Airspace Concept Development
- Quality Assurance for PBN Instrument Flight Procedure Design (IFP)
- PBN Safety Assessment

Key Challenges for ASEAN



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- Airspace Structure (Route Network based on conventional Navaids) - PBN Airspace
- Navaids Infrastructure availability
- Ops Approval
- Aircraft equipage (traffic complexity)
- ATC Training (lack of CBT for the PBN Implementation)
- National PBN Implementation Plan

Key Challenges for ASEAN



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Five Initiatives: Required ASEAN-wide Harmonized Implementation

Initiatives	Comments	Phrase I Progress	Comments	Phrase II Progress
PBN Routes	Lao PDR is currently drafting its national PBN Implementation plan, one of the main focus is dedicated on the development of the ATS PBN route from VLVN-VLLB. The Plan will cover the other main ATS routes serving major aerodromes. (Laos)/Thailand Implemented some ATS routes (RNAV5) for serving major aerodromes since 2010 (Thailand)/Myanmar is going to implement RNP2 based city-paired routes among 5 major airports as per Myanmar PBN Implementation Plan (Myanmar)	9%	Upon completing of Phrase I, the proposed updating B329 to N639 would be a great step to create PBN Routes network among Cambodia, Laos and Vietnam (Laos)/Thailand will re-designate some existing ATS Routed within BKK FIR to be RNAV 2 or RNP 2 as necessary and designate all current RNAV 5 route according to AIP-Thailand (ENR 3.3-1) with appropriate navigation specification and re-structure the ATS routes system within Bangkok FIR and coordinate with the neighboring countries regarding the development of international ATS route within 2019 (Thailand)	3%

Moving forward the implementation of ASEAN PBN Routes

- Request AMSs to nominate 2 PBN experts as POCs (CAA & ANSP) for the PBN Routes Implementation and send to Cambodia and Laos as the co-lead country.
- Questionnaire prepared by the co-lead country would be distributed to the POCs to seek the PBN Routes specification (RNAV5/RNP2) for the ATS routes serving major aerodrome.

Thank You!

