International Civil Aviation Organization

The Fourth Meeting of ICAO Asia/Pacific Performance based Navigation Implementation Coordination Group (PBNICG/4)

Bangkok, Thailand 14-16 March 2017

Agenda Item 6:   States' PBN Implementation Progress

b)   Review and adoption of PBN Implementation Progress Report results

THAILAND PBN IMPLEMENTATION

(Presented by Thailand)

SUMMARY

This paper discusses the progress of PBN implementation within Thailand. The paper notes the revision of Thailand PBN Implementation Plan, the completion of Thailand's PBN approach implementation at all international instrument runway ends, where practicable, as ICAO Assembly Resolution 37/11. The paper also discusses the progress of PBN implementation, including PBN approaches, SIDs and STARs, at other terminal airspaces and the progress of PBN implementation in en-route airspaces in Thailand.

1.   **Introduction**

1.1   Resolution A37-11 of the 37th Session of the ICAO General Assembly requested Member States to develop national Performance Based Navigation (PBN) implementation and to implement RNAV and RNP air traffic services (ATS) routes and approach procedures in accordance with the ICAO PBN Manual (Doc 9613).

1.2   To provide appropriate guidance for air navigation service providers in the APAC Region, airspace operators and users, regulating agencies, and international organizations on the evolution of navigation capabilities as one of the key systems supporting air traffic management, Asia and Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) adopted Regional PBN Implementation Plan targeted in short, medium and long term.

2.   **Thailand PBN Implementation Plan**

2.1   In June 2009, Thailand's National Working Group for PBN and GNSS Implementation had approved Thailand PBN Implementation Plan. This PBN Implementation Plan aims to provide aviation stakeholders with appropriate implementation guidance and timelines to allow proper preparation for PBN implementation within the Bangkok Flight Information Region (FIR). The Plan is well aligned with the Asia/Pacific Regional PBN Implementation Plan developed by ICAO Asia/Pacific PBN Task Force and 2007 and 2010 ICAO Assembly Resolutions.

2.2   In January 2017, Thailand has submitted a revised Thailand PBN Implementation Plan to ICAO Asia/Pacific Regional Office. The plan has been revised to be line with the Regional Asia/Pacific Seamless ATM Plan Version 2.0 which has been approved by APANPIRG/27 in

September 2016. The following diagram and table depict selected PBN navigation specifications and targeted TMA implementations as outlined in the revised Thailand PBN Implementation, respectively.

En-Route										
Asia Pacific Seamless ATM Plan					Phase 1				Phase 2	
2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020

RNAV 5

RNAV 2

Possible RNP 2

Terminal										
Asia Pacific Seamless ATM Plan					Phase 1				Phase 2	
2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020

RNAV 1 SID/STAR at International Airports — RNAV 1 to RNP 1 Transition

RNAV 1 SID/STAR at Domestic Airports* — RNAV 1 to RNP 1 Transition

RNP 1 SID/STAR at Non-Radar Airports*

Approach										
Asia Pacific Seamless ATM Plan					Phase 1				Phase 2	
2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020

RNP APCH (with Baro VNAV) at International Airports

RNP APCH (with Baro VNAV) at Domestic Airports

RNP AR APCH at selected Airport*

GBAS at selected Airport**

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3. Progress of PBN Implementation in Terminal Airspaces

3.1   The following table shows the list of twelve (12) international aerodromes as listed in the Asia-Pacific Regional Air Navigation Plan (APAC ANP) at which PBN approach procedures have been implemented or expected to be in operations by the end of 2017.

No.	Airport Name	ICAO Code	Runway Designator	LNAV	LNAV/ VNAV	RNP AR	GLS
1	Chiang Mai	VTCC	18	✓	□	□	□
			36	✓	□	□	□
2	Chiang Rai	VTCT	03	✓	□	□	□
			21	✓	□	□	□
3	Don Mueang	VTBD	03L	N/A	N/A	2017	□
			03R	N/A	N/A	2017	□
			21L	✓	✓	2017	□
			21R	✓	✓	2017	□
4	Hat Yai	VTSS	08	✓	□	2017	□
			26	✓	□	2017	□
5	Khon Kaen	VTUK	03	✓	□	□	□
			21	✓	□	□	□
6	Krabi	VTSG	14	N/A	N/A	2017	□
			32	✓	□	2017	□
7	Phitsanulok	VTPP	14	✓	✓	□	□
			32	✓	✓	□	□
8	Phuket	VTSP	09	✓	✓	2017	□
			27	✓	✓	2017	□
9	Surat Thani	VTSB	04	✓	□	□	□
			22	✓	□	□	□
10	Suvarnabhumi	VTBS	01L	✓	✓	□	2020+
			01R	✓	✓	□	2020+
			19L	✓	✓	□	2020+
			19R	✓	✓	□	2020+
11	Ubon Ratchathani	VTUU	05	✓	✓	□	□
			23	✓	✓	□	□
12	U-Tapao	VTBU	18	✓	✓	□	□
			36	✓	✓	□	□

Note: N/A indicates that the PBN approach procedure could not be implemented at that runway end due to terrain or airspace limitations.

3.2   RNP-AR procedures are currently being developed for four airports namely Hat Yai, Phuket, Krabi and Don Mueang. The implementation of RNP-AR procedures at these airports are subject to further regulatory approval process to be determined by the Civil Aviation Authority of Thailand (CAAT).

3.3   A GBAS system is planned to be installed at Suvarnabhumi Airport to support GLS operations at four runway ends, currently being served by ILS. The target date for GLS implementation at Suvarnabhumi Airport is 2020, by which time the third runway, currently being built, is expected to be operational. Then the GBAS will support Category I precision approach operations at all six runway ends of the airport.

3.4   The following table shows the list of the other 27 aerodromes not listed in the APAC ANP at which PBN approach procedures have been implemented or expected to be in operation by the end of 2017.

No.	Airport Name	ICAO Code	Runway Designator	LNAV	LNAV/ VNAV	RNP AR	GLS
1	Buriram	VTUO	4	2017	2017	□	□
			22	2017	2017	□	□
2	Chumphon	VTSE	6	2017	2017	□	□
			24	2017	2017	□	□
3	Nakhon Ratchasima	VTUW	6	✓	□	□	□
			24	✓	□	□	□
4	Nakhon Si Thammarat	VTSF	1	✓	✓	□	□
			19	✓	✓	□	□
5	Narathiwat	VTSC	2	✓	□	□	□
			20	✓	□	□	□
6	Phetchabun	VTPB	18	2017	2017	□	□
			36	2017	2017	□	□
7	Ranong	VTSR	2	✓	□	□	□
			20	N/A	N/A	□	□
8	Roi Et	VTUQ	18	2017	2017	□	□
			36	2017	2017	□	□
9	Samui	VTSM	17	✓	□	□	□
			35	✓	□	□	□
10	Udon Thani	VTUD	12	✓	□	□	□
			30	✓	□	□	□
11	Hua Hin	VTPH	16	✓	□	□	□
			34	N/A	N/A	□	□
12	Krabi	VTSG	14	N/A	N/A	□	□
			32	✓	□	□	□
13	Lampang	VTCL	18	✓	□	□	□
			36	✓	□	□	□
14	Loei	VTUL	1	N/A	N/A	□	□
			19	2017	2017	□	□
15	Mae Hong Son	VTCH	11	N/A	N/A	□	□
			29	N/A	N/A	□	□
16	Mae Sot	VTPM	9	N/A	N/A	□	□
			27	✓	□	□	□
17	Nakhon Phanom	VTUW	15	✓	✓	□	□
			33	✓	✓	□	□
18	Nan	VTCN	2	2017	2017	□	□
			20	2017	2017	□	□
19	Pattani	VTSK	8	✓	□	□	□
			26	✓	□	□	□
20	Phrae	VTCP	1	✓	□	□	□
			19	N/A	N/A	□	□
21	Sakon Nakhon	VTUI	5	N/A	N/A	□	□
			23	✓	□	□	□
22	Sukhothai	VTPO	18	2017	2017	□	□
			36	2017	2017	□	□
23	Surat Thani	VTSB	4	✓	□	□	□
			22	✓	□	□	□
24	Surin	VTUJ	1	N/A	N/A	□	□
			19	N/A	N/A	□	□
25	Tak	VTPT	9	2017	2017	□	□
			27	2017	2017	□	□
26	Trang	VTST	8	✓	□	□	□
			26	N/A	N/A	□	□
27	Trat	VTBO	5	N/A	N/A	□	□
			23	✓	□	□	□

3.5   The following table shows the list of the aerodromes at which PBN SID/STARs have been implemented or expected to be in operation by the end of 2017.

No.	Airport Name	ICAO Code	Runway Designator	SID	STAR
1	Chiang Mai	VTCC	18	2017	2017
			36	✓	✓
2	Chiang Rai	VTCT	03	□	✓
			21	□	□
3	Don Mueang	VTBD	03L	✓	✓
			03R	✓	✓
			21L	✓	✓
			21R	✓	✓
4	Hat Yai	VTSS	08	2017	2017
			26	2017	2017
5	Khon Kaen	VTUK	03	✓	□
			21	✓	□
6	Krabi	VTSG	14	✓	□
			32	✓	✓
7	Lampang	VTCL	18	✓	□
			36	✓	□
8	Mae Sot	VTPM	09	□	□
			27	✓	□
9	Nakhon Ratchasima	VTUW	06	✓	□
			24	✓	□
10	Nakhon Si Thammarat	VTSF	01	✓	□
			19	✓	□
11	Phitsanulok	VTPP	14	2017	□
			32	2017	□
12	Phuket	VTSP	09	✓	✓
			27	✓	✓
13	Ranong	VTSR	02	✓	□
			20	✓	□
14	Suvarnabhumi	VTBS	01L	✓	✓
			01R	✓	✓
			19L	✓	✓
			19R	✓	✓
15	Ubon Ratchathani	VTUU	05	✓	□
			23	✓	□
16	U-Tapao	VTBU	18	2017	2017
			36	2017	2017

In general, a PBN SID is designed together with a PBN Approach, whereas in case of a PBN STAR, it depends on the operational needs of that particular aerodromes.
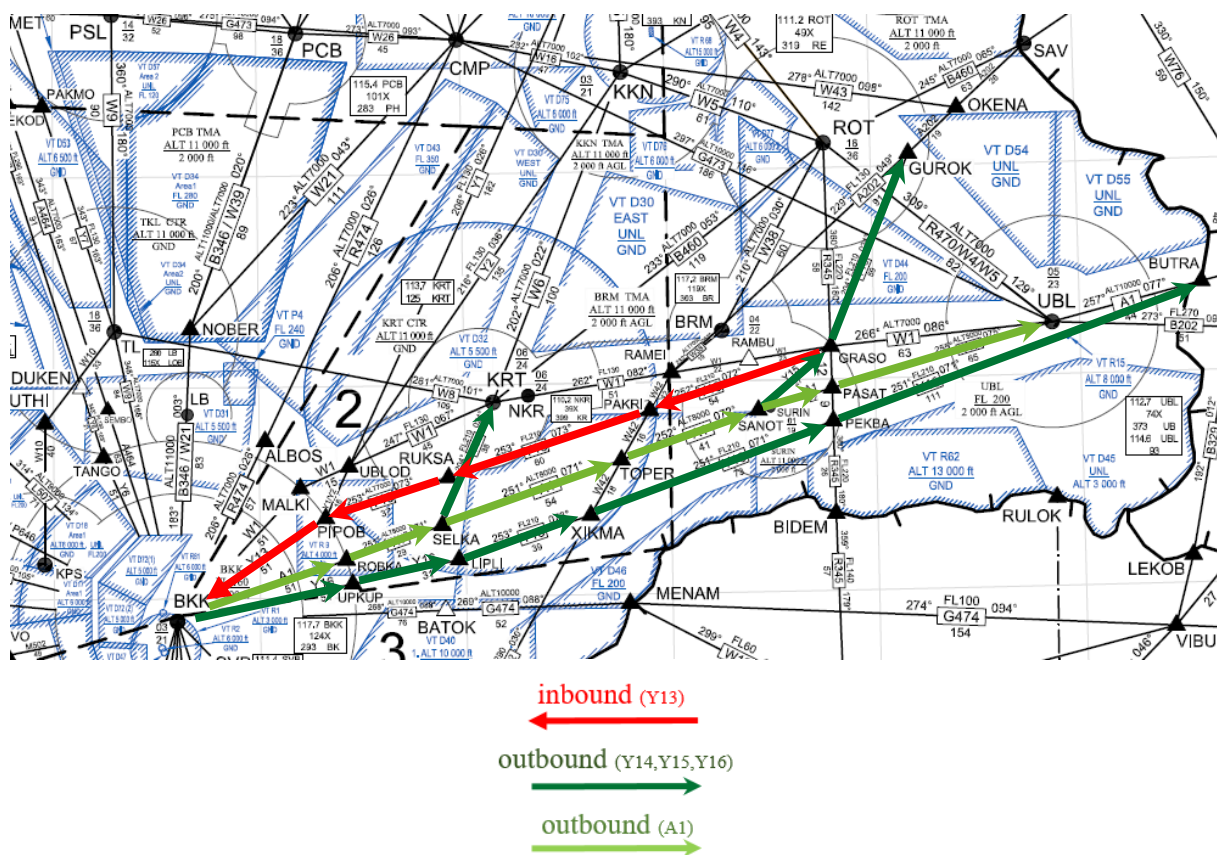
4.   Progress of PBN Implementation in En-route Airspace

4.1   In 2013 Thailand has established unidirectional RNAV-5 routes connecting from Phuket to Bangkok (Y5 Route) and between Bangkok and Chiang Mai (Y6 and Y7 Routes). The unidirectional routes are designed to increase airspace efficiency based on the PBN concept and the flexible use of airspace (FUA) concept. Moreover, these routes are created to reduce aircraft fuel consumption and green gas emission and to enhance safety and improve flow capacity of air traffic operations.

4.2   In 2014, Thailand has established five additional unidirectional RNAV-5 routes (Y8, Y9, Y10, Y11 and Y12) connecting Bangkok with southern destinations. These routes are designed based on the PBN concept and the flexible use of airspace (FUA) concept to enhance safety and improve flow capacity of air traffic operations between Bangkok and major cities in the southern part of Thailand, as well as other international destinations south of Thailand.

4.3   In 2015, the Y9 and Y10 routes have been upgraded from domestic to international routes, M769 and M757 respectively, connecting between Bangkok FIR and Kuala Lumpur.   The upgrade have improved flow capacity between Bangkok and Malaysia. Similar new PBN unidirectional routes between Bangkok FIR/Yangon FIR and Bangkok FIR/Phnom Penh FIR are being coordinated and expected to be implemented within the year of 2017.

4.4   In December 2016, four additional unidirectional RNAV-5 routes, the Y13, Y14, Y15 and Y16, have been established to improve flow capacity for the ACC sectors east of Bangkok TMA. Y13 serves the inbound traffic from the east while Y14, Y15 and Y16 serve the outbound traffic from Bangkok to its eastern destinations. The following figure illustrates the directional flows of the new PBN routes, as well as the outbound flow of A1 route.

inbound (Y13)

outbound (Y14,Y15,Y16)

outbound (A1)

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5. **Action by the Meeting**

5.1   The meeting is invited to:

      a)   note the progress of PBN implementation in Thailand

      b)   discuss any relevant matters as appropriate.

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