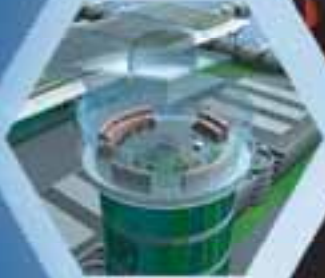


# Performance Based Navigation Implementation in Thailand

Present by **AEROTHAI**



# Thailand WG on PBN&GNSS



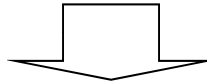
Since May 2007, Thailand National Working Group on PBN & GNSS Implementation consists of representatives from:

- DCA Thailand
- Airlines
- Thai Pilots' Association
- Airports of Thailand
- Aeronautical Radio of Thailand



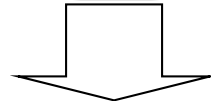
### **Area 1: Policy & Implementation Planning**

- **Conduct feasibility**, e.g. why should we implement PBN and GNSS? How much would it cost?
- **Define roadmap**, e.g. where and when should we implement?
- **Address regulatory issues**, e.g. what regulations/legislations are needed?



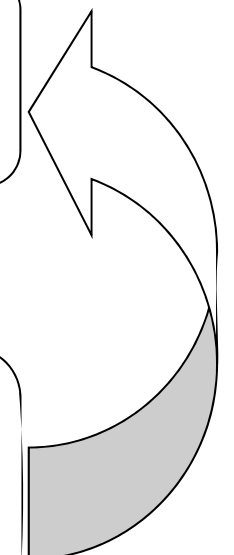
### **Area 2: Establishments of Standards and Requirements**

- **Identify/Establish standards**, e.g. how should we implement? What actions are needed to be done? Who are responsible for doing what?

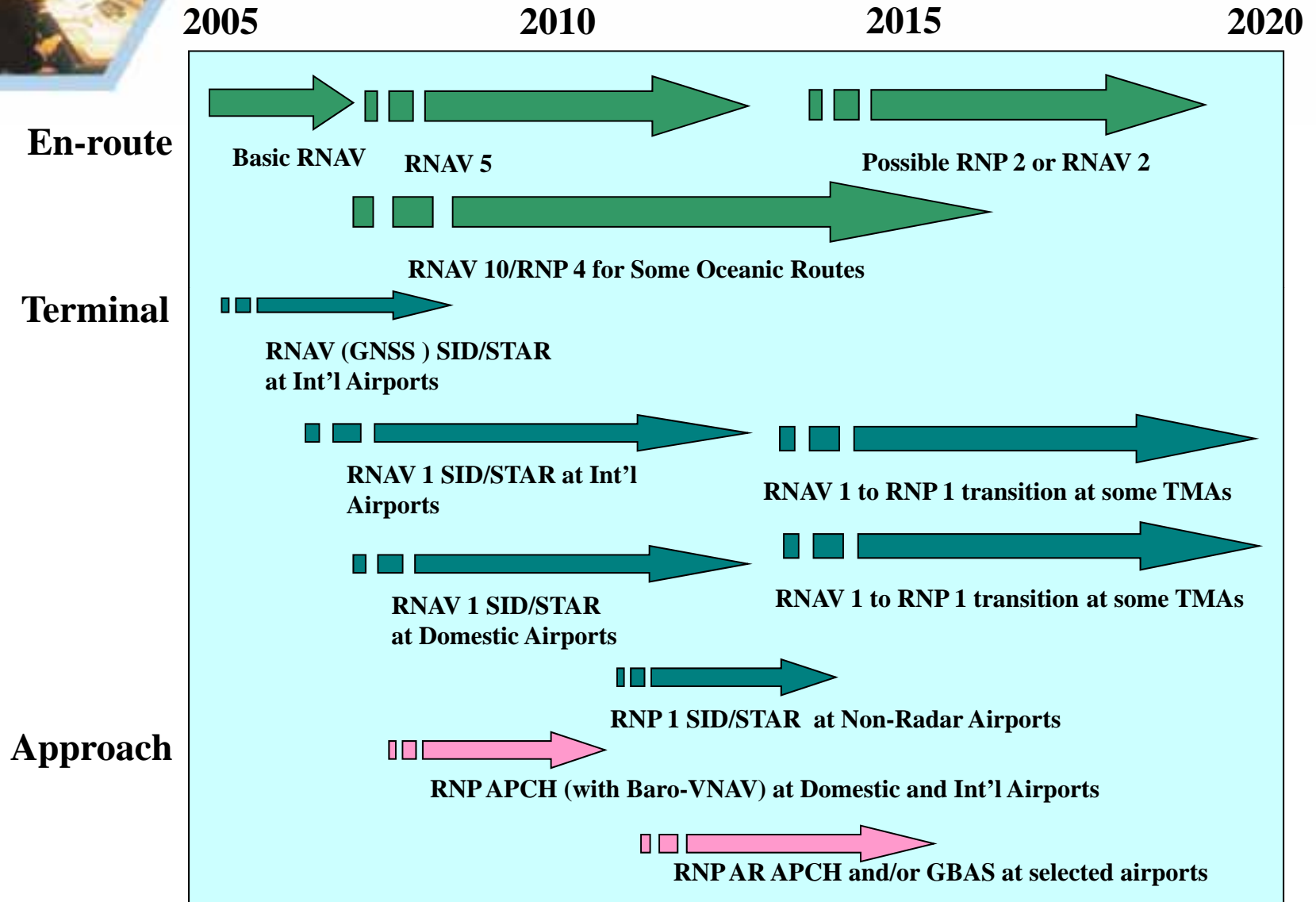


### **Area 3: Communication with Stakeholders**

- **Notify stakeholders**, e.g. let other people know what we have planned and accomplished.
- **Gather feedback**, e.g. what do other stakeholders think? How can we improve what we have done?



# Thailand PBN Roadmap





## **PBN TMA Implementation**

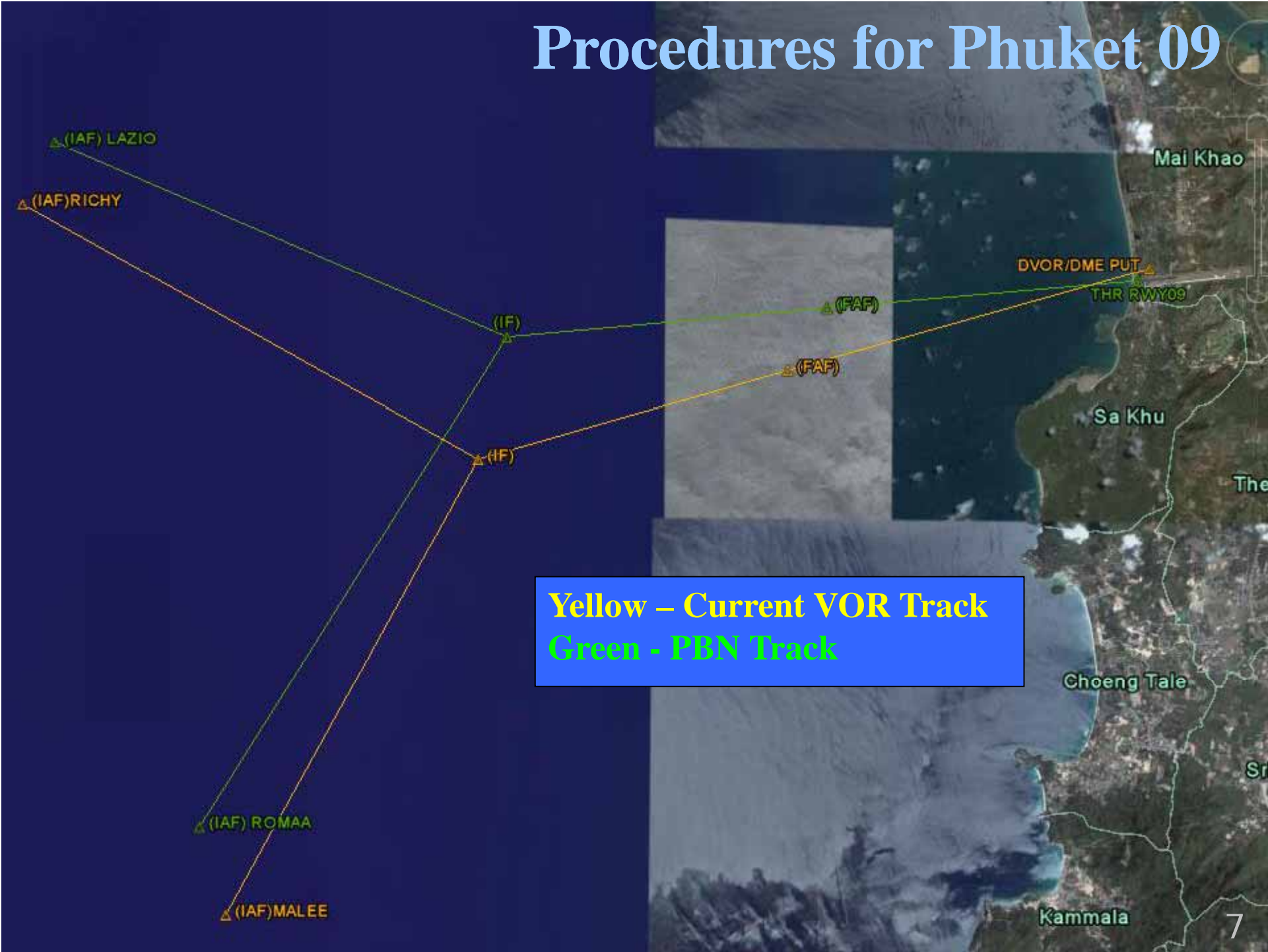


# Thailand PBN Plan



<b>Terminal Areas</b>	<b>Progress</b>
Phuket	Operation since January 2009
Hat Yai	Operation since December 2009
Samui	Operation since May 2010
Chiang Mai	Design Completed and Successfully Flight Validated
Krabi	Design Completed
Suvarnabhumi	2010-2012
Don Mueang	2010-2012
Lumpang	Being Designed
Udonthani	Being Designed
Chiang Rai	Being Designed
Khon Kaen	Being Designed

# Procedures for Phuket 09

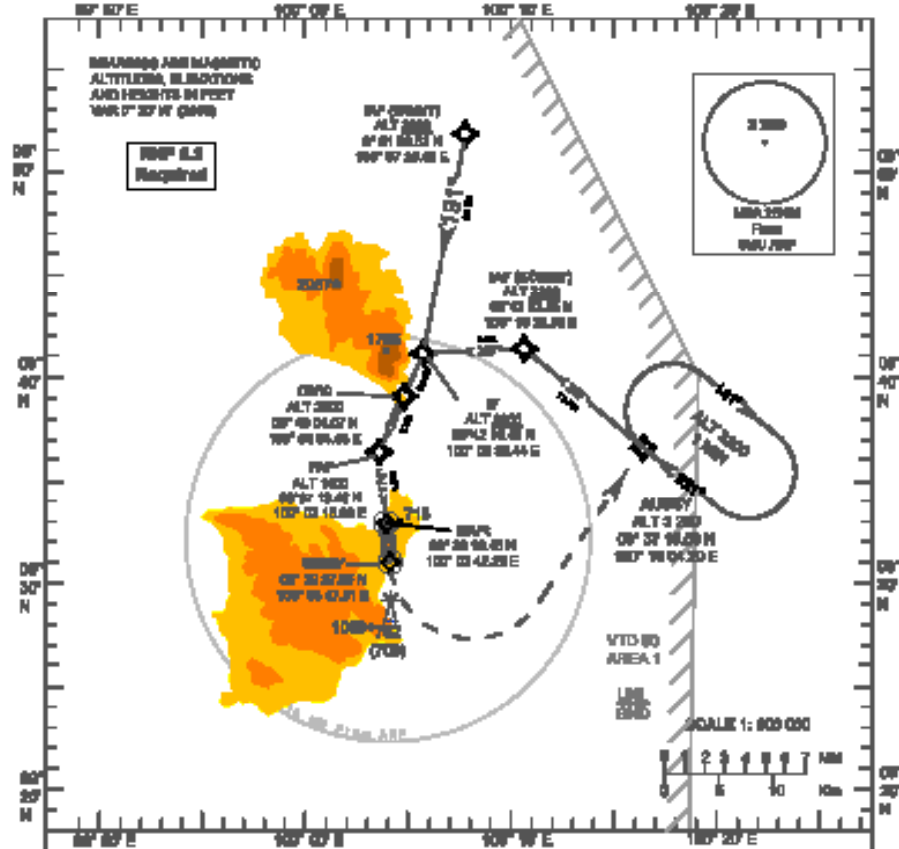


**Yellow – Current VOR Track**  
**Green - PBN Track**

INSTRUMENT AERODROME ELEV 64 E  
 APPROACH HEIGHTS RELATED TO  
 CHART-EGAO THIR RWY 17 ELEV 48 E

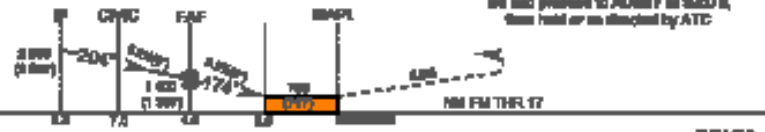
APP 15LS  
 TWY 11RS

SURATTAN (VTOR)  
 RWY (08RS) RWY 17



TR 11 08H

Missed Approach :  
 Climb straight ahead to over THIR 200, turn  
 left and proceed to ALBURY at 3000 E,  
 then hold or as directed by ATIS



5000 E  
 (THIR RWY 17)

GRADE	A	B	C	Distance to T-O	5 NM	10 NM	15 NM	20 NM	25 NM	30 NM
LNW	760 (717)			Altitude	760	900	1000	1100	1200	1300
Climb	300 (280)	400 (310)		Ground Speed (GS)	180	120	140	160	180	200
				FAF-5000 4 NM	(710)	2:34	2:29	1:45	1:38	1:30
				Rate of descent (ft/min)	340	360	740	800	800	1000

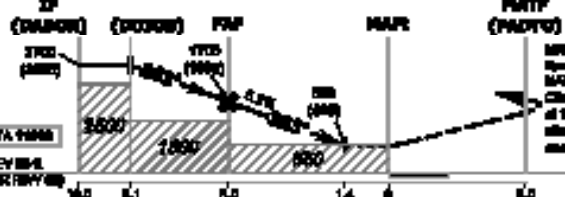
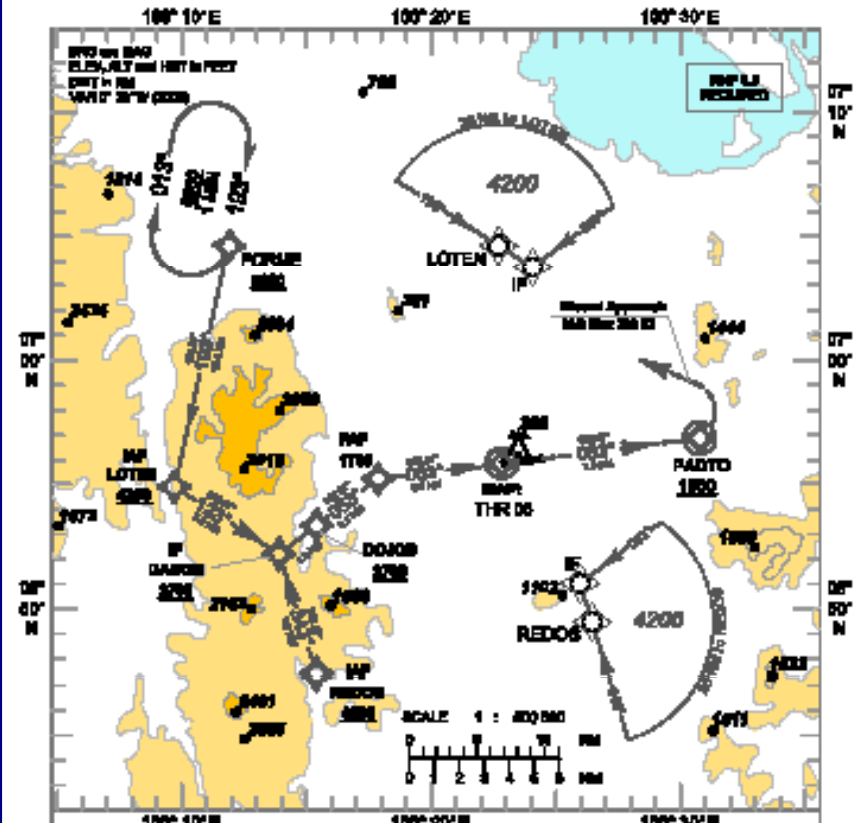
INSTRUMENT AERODROME ELEV. 80 E  
 APPROACH HEIGHTS RELATED TO  
 CHART-EGAO THIR RWY 08 ELEV. 50 E

APP 1 15LS, 20LS  
 TWY 11LS, 20LS  
 ATIS 15LS, 20LS

SORONGLA / HAT YAI INTL (VTOR)

RWY (08RS) RWY 08

DRAFT



Missed Approach :  
 Climb straight ahead to  
 3000 MSL, then left and  
 hold or as directed by ATIS

GRADE	A	B	C	D	Distance to T-O	5 NM	10 NM	15 NM	FAF	4 NM	3 NM	2 NM
LNW	350 (340)				Altitude	350	340	300	1700	1200	1070	750
Climb (GS/MSL)	300 (280)	350 (340)	700 (640)	700 (640)	Ground Speed (GS)	180	120	140	180	180	180	200
					Rate of descent (ft/min)	340	360	400	740	800	800	1000
					FAF-5000 4 NM	(340)	3:00	2:50	2:00	1:50	1:40	1:30



# Safety and Efficiency Improvements with PBN



<b>Phuket (VTSP)</b>	<b>Conventional</b>	<b>PBN</b>
Runway 27	1.4-degree ILS offset	Straight-in approach
Runway 09	6-degree VOR offset	Straight-in approach
	OCA at 850 feet	OCA at 750 feet

<b>Samui (VTSM)</b>	<b>Conventional</b>	<b>PBN</b>
Runway 17	Straight-in yet through unstable weather area	Straight-in approach, yet able to side-step to avoid the unstable weather area

<b>Hat Yai (VTSS)</b>	<b>Conventional</b>	<b>PBN</b>
Runway 08	Unavailable due to mountainous terrain	Straight-in approach

<b>Chiang Mai (VTCC)</b>	<b>Conventional</b>	<b>PBN</b>
Runway 18	VOR circling approach with high circling OCA/H	Runway aligned approach

# Thailand PBN Plan



Target Year	Terminal Area
2012	VTSF - Nakhon si Thammarat
2012	VTSB - Surat thani
2012	VTBO - Trat
2012	VTSC - Narathiwat
2013	VTPO – Sukhothai
2013	VTPP – Phitsanulok
2013	VTSR - Ranong
2013	VTUU - Ubon Ratchathani
2013	VTCH - Mae Hong Sorn



## PBN En-route Implementation

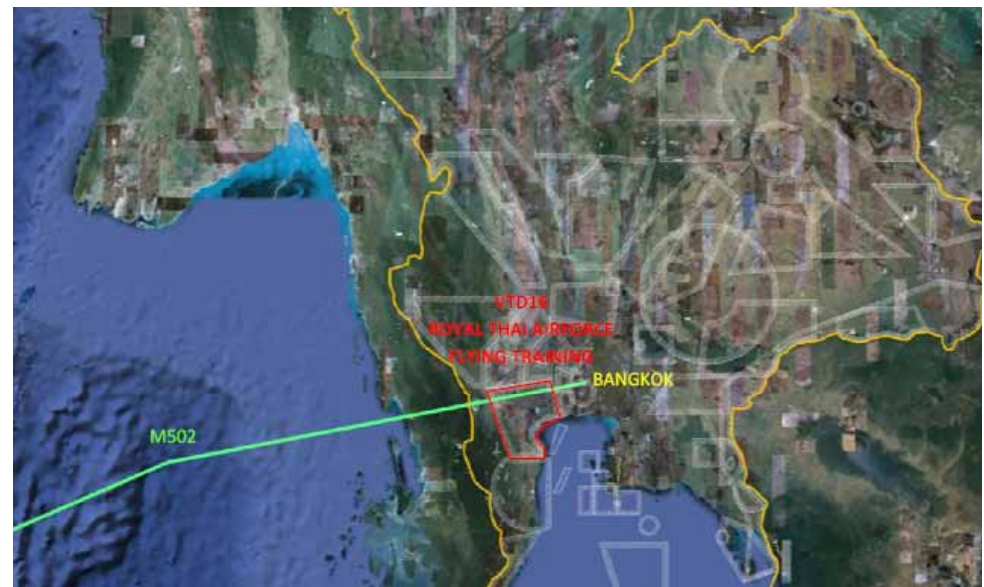


# PBN En-route



*M752 connecting Suvarnabhumi with Australia*

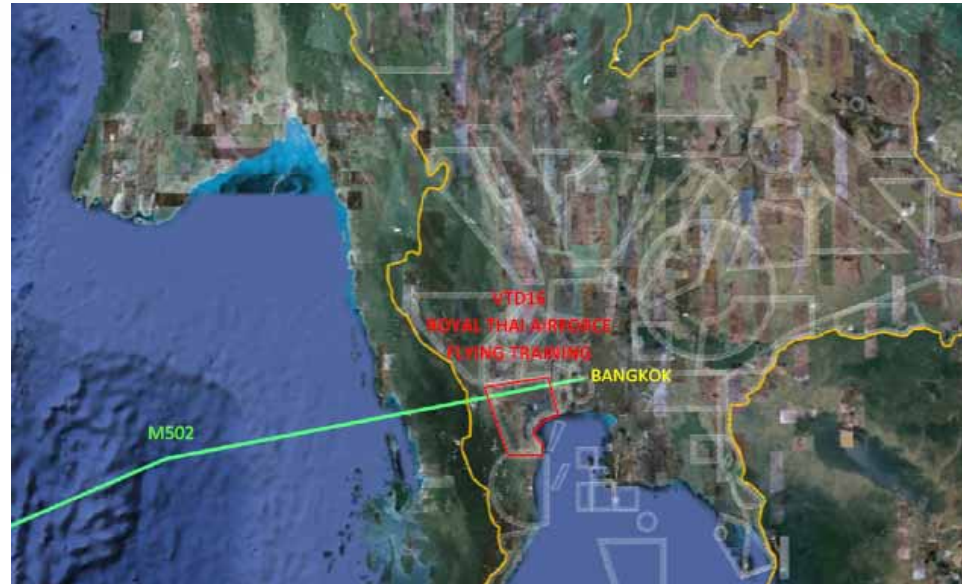
*Expect RNAV-5 Navigation Specification*



*M502 connecting Suvarnabhumi with South Asia*

*Expect RNAV-5 Navigation Specification*

# PBN En-route



Route	Number of Flight (Month)	Reduce Fuel Burn (Month)	Reduce Carbon Emission (Month)
Suvarnabhumi – Male	24 Flights	~1,488 Kg	~5,208 Kg

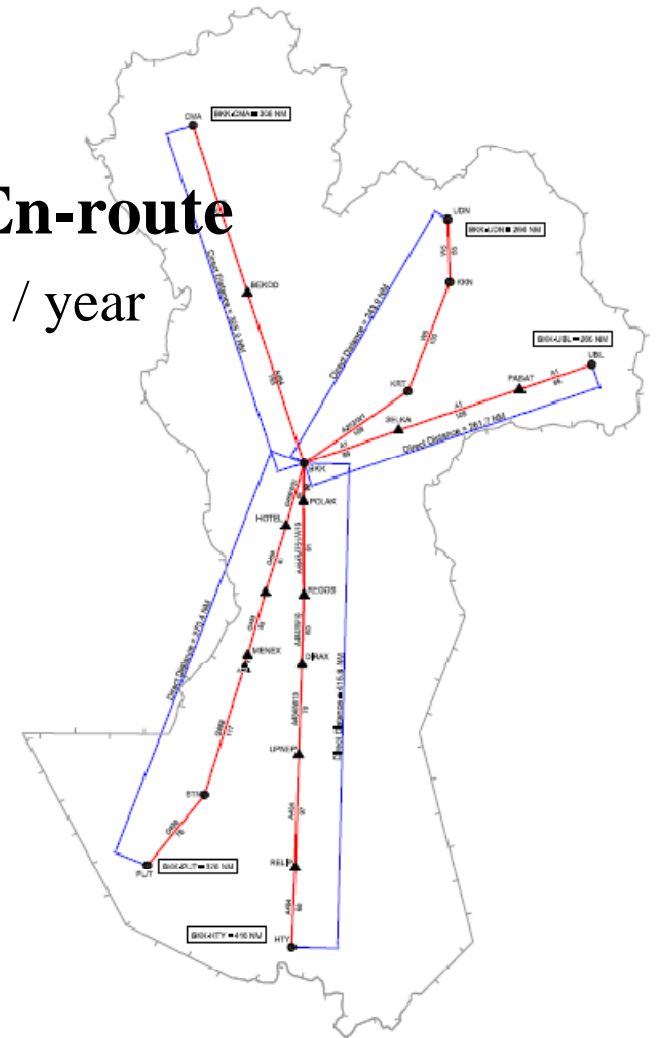
**Fuel Saving from M502:** Data from Bangkok Airways



- On-Going Initiatives : **PBN Domestic En-route**

- *Domestic Enroute* : 2.2 mil kg of fuel save / year estimated

- Bangkok – Phuket
- Bangkok – Samui – Hat Yai
- Bangkok – Chiang Mai
- Bangkok – Udon Thani
- Bangkok – Ubon Ratchathani
- Implementation On-going



# PBN En-route: International



- On-going Initiatives : **PBN International Routes via ICAO**
  - *Bay of Bengal – ICAO BOB Reduced Separation Minima*
  - *South China Sea – ICAO South China Sea Route Review Task Force*



# **AEROTHAI in International PBN Community**





## An Active Member of International PBN Community



### Thailand as an active member of international PBN community

- Active Participating State for ICAO Asia-Pacific Flight Procedure Program
  - Member of ICAO FPP Steering Committee
- First country to be selected for ICAO PBN Go-team Visit in 2010
- Host of ICAO Instrument Flight Procedure Panel Meeting in 2010
- Member of ICAO Navigation System Panel
- Rapportuer of ICAO Asia-Pacific PBN Task Force
- Co-Chair of APEC GNSS Implementation Team
- Designated ICAO PBN Airspace Concept Instructor
- Honorary Member, US National Executive Committee for Space-Based Positioning, Navigation, and Timing

# Success Overseas



- PBN training for Nepal, Bhutan, Myanmar, Mongolia and Cambodia
- PBN & GNSS training for ATC, engineer, flight inspection pilots to Mongolia
  
- PBN and GNSS flight validation services for 16 PBN Procedures for CAA Chinese Taipei
- PBN route design for Bhutan
- GNSS interference validation for Nepal

