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# Practical PBN Implementation - from an ATM perspective

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# Design Principles

There have been too many IFP designs which are not developed using a whole-of-system philosophy!





# Design Principles

- States must ensure that IFP design processes include **consultation** with and **consideration** of input at the earliest stage from affected:
  - Regulators
  - Aerodrome Operators;
  - ANSPs (ATC units and navigation aid providers);
  - Airspace Users (not just airlines but military and GA as well).



# Seamless ATM Plan

This is an excerpt from the mark-up, showing clarifications:

- There are still conventional routes being established!

## En-route Airspace

~~7.20~~ All Category R and S upper controlled airspace, and Category T airspace should, unless approved by the State, require the carriage of an operable ~~;~~

~~7.21~~ mode S transponder within airspace where Mode S radar services are provided, ~~and~~

~~7.227.23~~ ACAS and TAWS (APAC ASBU Priority 2).

~~7.237.24~~ All en-route controlled airspace should be designated as being exclusive PBN airspace

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## Asia/Pacific Seamless ATM Plan V1.1

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with mandatory carriage of GNSS utilising RNP navigation specifications, except for State aircraft. Such implementation mandates should be harmonised with adjacent airspace. PBN ATS routes should be established in accordance with the following PBN specification:

- Category R and S airspace – RNP 2.

# Seamless ATM Plan

This is an excerpt from the mark-up, showing clarifications:

- But we emphasised PBN..

7-97.8 All ATS routes should be designated with a navigation performance specification to define the CNS/ATM operational environment. The ATS route navigation performance specification selected should be harmonised and utilise the least stringent requirement needed to support the intended operation. When obstacle clearance or ATC separation requirements demand, a more stringent navigation specification may be selected. As far as practicable, all new ATS Routes designed after June 2013 (adoption of the seamless ATM plan v1.0) should be PBN Routes in accordance with the following specifications and PBN ATS routes designed after June 2013 (adoption of the seamless ATM plan v1.0) should be established in accordance with the following PBN specifications: (note to be removed later – this para means that conventional routes can still be established, and has been clarified)

- Category R airspace – RNP 4, RNP 10 (RNAV 10) (other acceptable navigation specifications – RNP 2 oceanic); and
- Category S airspace – RNAV 2 or RNP 2 (other acceptable navigation specifications – RNAV 5).

*Note 1: RNP 2 is expected to be utilised before Phase 2, when the RNP 2 instrument procedure design, -ATC separation standards and operational approval are in place.*

*Note 2: within Category R airspace, transition to RNP 4 or RNP 2 oceanic specifications is recommended at the earliest opportunity. RNP 2 oceanic requires dual independent installations, plus CPDLC and ADS-C.*



# ATS Routes

It is evident that many administrations are struggling with the problem of PBN specifications and PBN design as many:

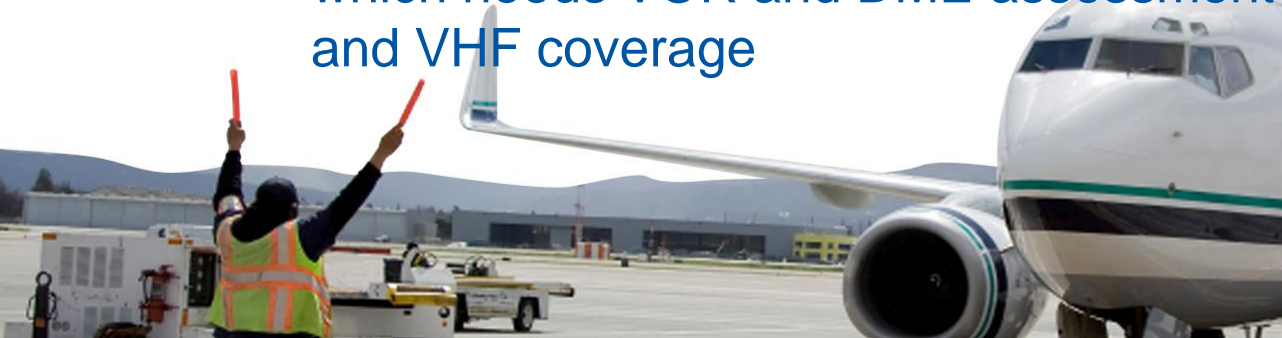
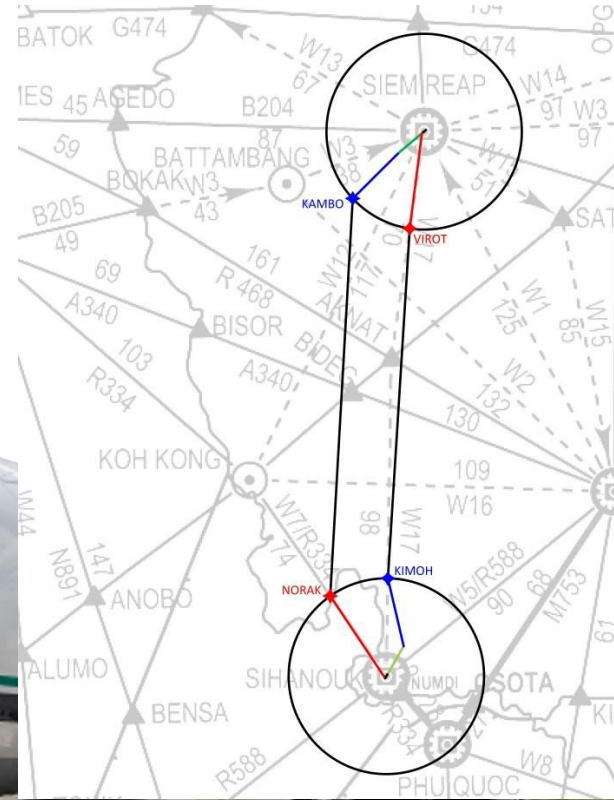
- do not know which specification to use (so PBN in a page is helpful but there are still misunderstandings);
- simply overlay procedures onto traditional route structures; and
- do not understand the difference between the 'N' and the 'ATM' in 'CNS/ATM'.





# ATS routes

- It's a question whether States do proper route assessment to determine if the geometry of the nav aids supports the proposal, particularly if it is RNAV 5 - which needs VOR and DME assessment and VHF coverage

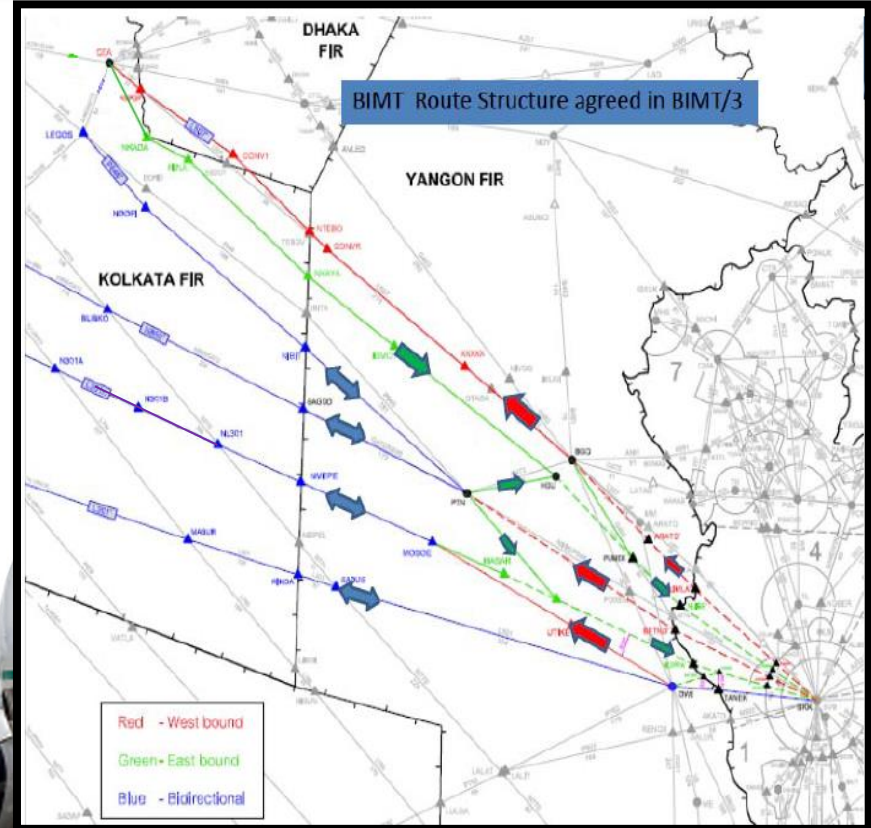






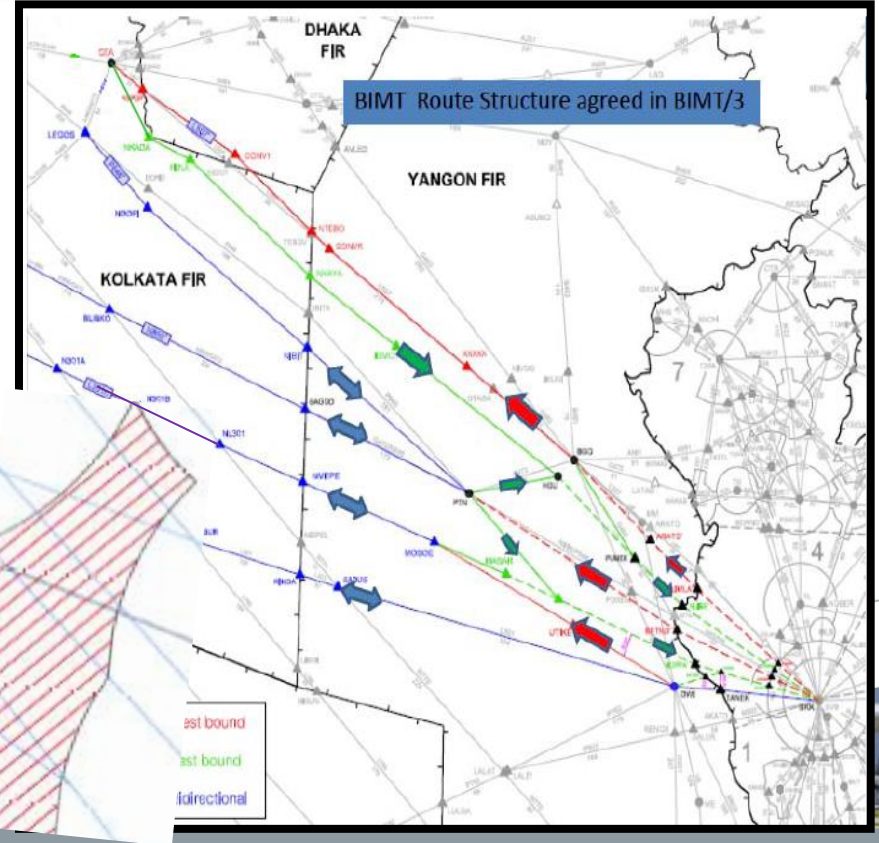
# ATS routes

- These routes were planned as RNP 10 to provide 50NM longitudinal between RNP10 aircraft using VHF/CPDLC



# ATS routes

- These routes were planned as RNP 10 to provide 50NM longitudinal between RNP10 aircraft using VHF/CPDLC
- But all but one are surveilled = RNP 2/RNP 2... 8-20NM lateral (N), 5 NM (ATM)!





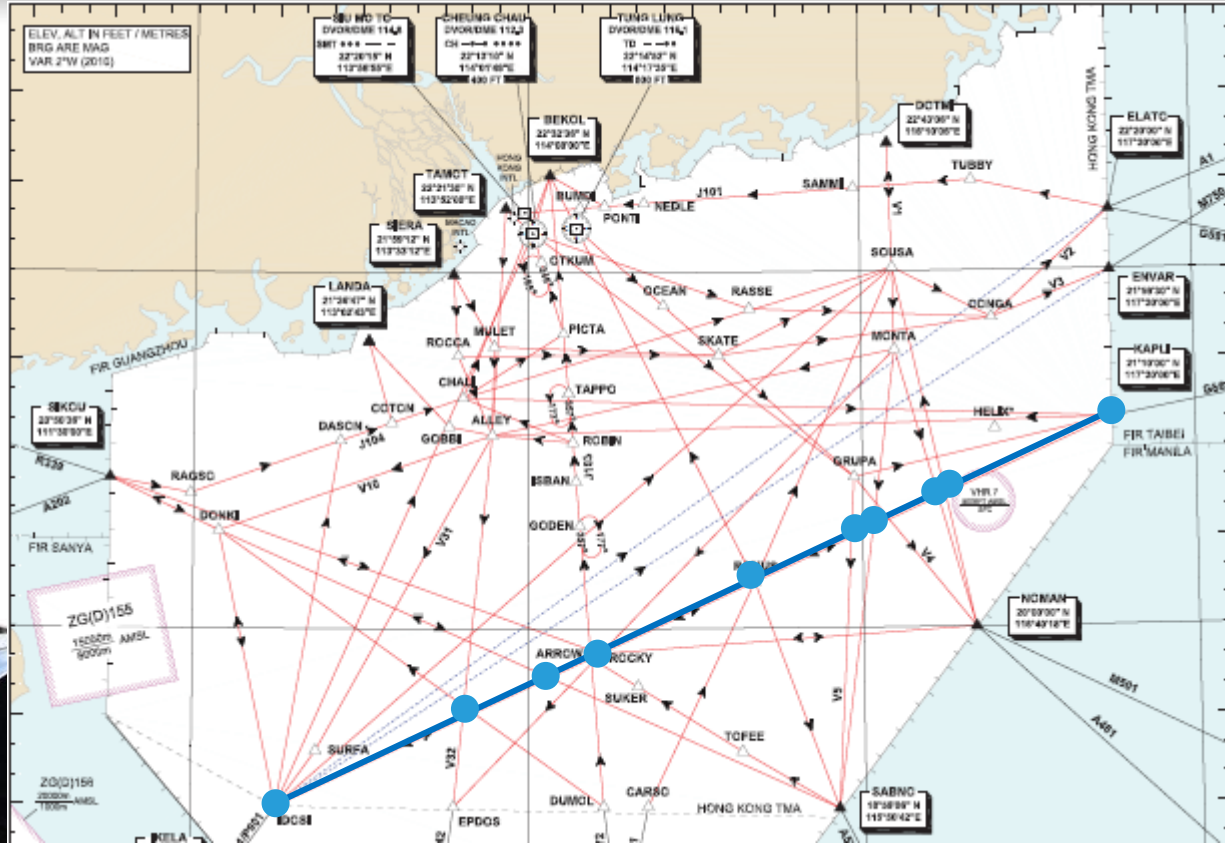
# Complexity

Some administrations worry about the increased complexity of more routes and crossing points using PBN...

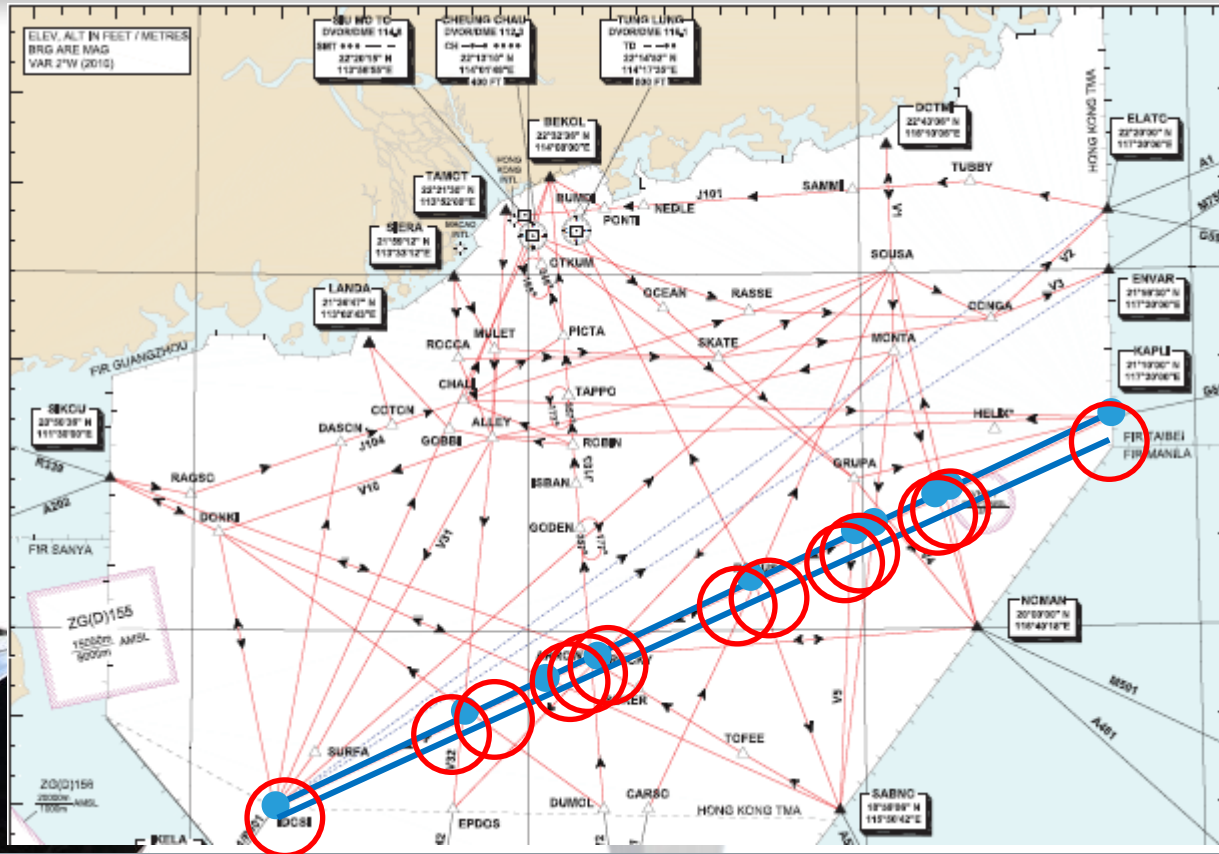




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# Complexity

- Why is an airspace deemed to be more complex when there are more ATS routes and crossing points?
- It isn't in a purely surveillance environment!
- The Aircraft Situation Display (ASD) provides a single conflict identification point, even if the aircraft is being vectored, off track, or there are multiple routes







- Let's look at an example – Cat S airspace, PBN routes





- This is incorrect information to effectively track/vector aircraft situation human error





# Conclusions

- A whole-of-system planning approach is required for PBN
- Many States have been too slow to take advantage of the new specifications or use the wrong specifications so safety and efficiency benefits (fuel and environmental) aren't realised
- Some States are still not understanding fundamental implementation measures and how it changes an operational environment





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