



**The First Meeting of ICAO Asia/Pacific Performance based Navigation  
Implementation Coordination Group (PBNICG/1)**

Beijing, China, 10-12 March 2015

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**Agenda Item 6: Implementations of PBN in Domestic En-route Airspace**

**PBN (RNP 1) DOMESTIC ROUTES**

(Presented by Maldives)

**SUMMARY**

This paper presents information on the successful implementation of PBN (RNP 1)  
Domestic routes

**1. INTRODUCTION**

1.1 On 13<sup>th</sup> November 2014, Maldives has successfully implemented PBN (RNP1)  
Domestic routes

1.2 These parallel routes are aimed at improving safely and efficiently in managing  
domestic IFR traffic, flying between Male International and 6 smaller airports, where there is limited  
or no surveillance coverage.

**2. DISCUSSION**

Concept and Development

2.1 The increasing domestic IFR traffic, associated with new domestic airports, made  
provision of safe, orderly and expeditious flow of air traffic using the conventional separation  
standards a huge burden for air traffic controllers and a heavy fuel penalty for the operators

2.2 As early as 2012 we began discussing the idea of parallel routes based on  
Performance Based Navigation (PBN). We agreed on Basic-RNP 1 (RNP 1).

2.3 RNP 1 was selected due to the following reasons:

- a) Geography of Maldives, stretching from north to south.
- b) Any other navigation specification with a wider lateral spacing requirement, for an  
example RNP 4, would not have served the purpose.
- c) Easier to obtain Operational Approval for the ATR and Dash 8 aircraft in the  
domestic fleet.

*Note: The most basic qualifying system is a stand-alone GNSS receiver (TSO C129(a)) coupled to a CDI or HSI display providing course guidance and cross-track deviation indications.*

- d) When the original design was completed, RNP 2 specification was not published by ICAO.

2.4 Although PBN manual says RNP1 is for terminal airspace (SIDs and STARs), the manual allows use of RNP 1 to design routes which begins or extends beyond 30NM from ARP. We also received expert advice that RNP1 may be used to design domestic PBN routes

2.5 Key points considered in the designing of the routes :

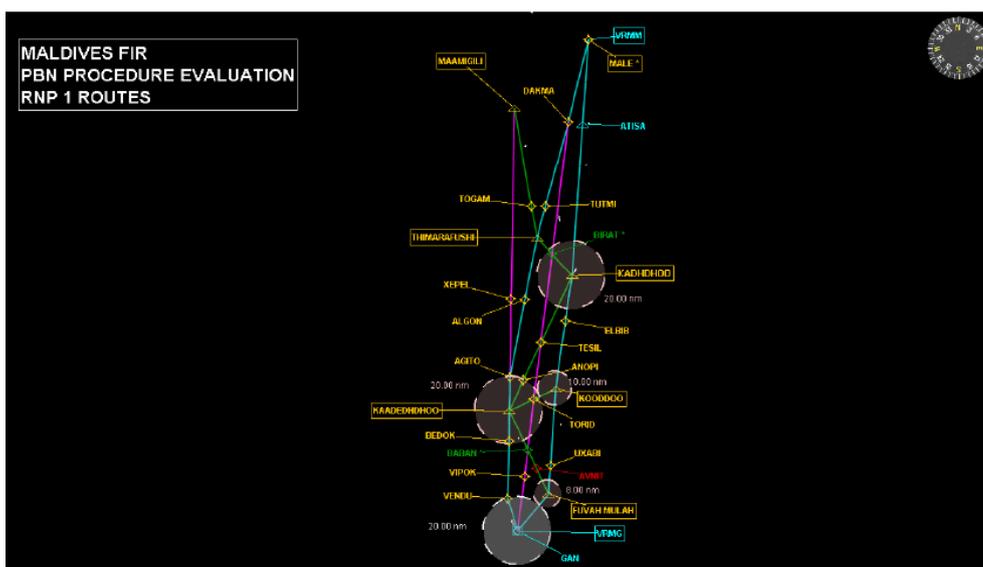
- optimum route;
- optimum cruising level;
- continuous climb operation (CCO) and continuous descend operations (CDO);
- minimum ATC intervention;
- reduced controller and pilot workload

2.6 The minimum lateral separation: 8NM (½ Area Width 3.5 NM between the routes and 1 NM separation buffer)

2.7 Risk assessments were carried out specially to determine the ability to maintain a CDI scaling of +/- 1 NM along routes.

2.8 Validation included both ground, fast-time and flight evaluation.

2.9 Fast-time simulation was carried out with assistance from Airports Authority of India using the Terminal Area Route Generator Evaluation, Traffic Simulation (TARGETS) tool developed by MITRE INC, USA

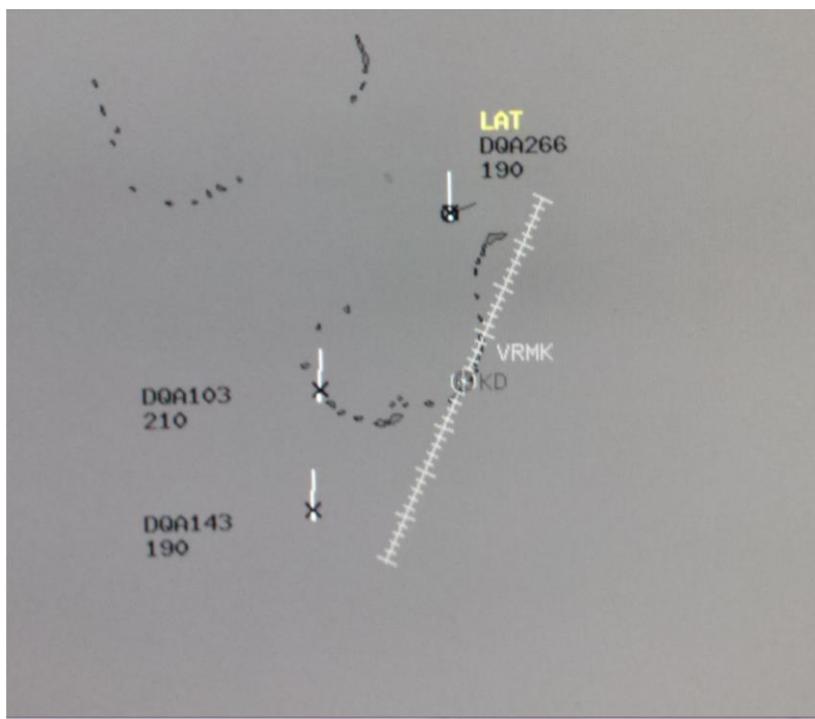


### Benefits

2.10 Although we have not been able to collect any data to determine the actual fuel savings, pilots and controllers have identified the newly implemented PBN (RNP1) Domestic routes as a major breakthrough for safe and efficient operation of domestic IFR traffic.

2.11 The enormous difficulties faced by air traffic controllers in resolving conflict and providing standard separation between IFR aircraft using the conventional methods, such as time-based separation, were effectively removed.

2.12 Now with minimum ATC instruction, aircraft can be flying on laterally separated routes, climbing and descending unrestricted



*Although within the radar coverage aircraft are not vectored*

### **3. ACTION BY THE MEETING**

3.1 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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