



TWELFTH AIR NAVIGATION CONFERENCE

Montréal, 19 to 30 November 2012

Agenda Item 2: Aerodrome Operations – Improving Airport Performance

2.2: Performance-based navigation (PBN) – a practical way to improve airport performance with safety and efficiency

PBN IMPLEMENTATION IN INDIA

(Presented by India)

1. INTRODUCTION

1.1 Necessity for optimization of flight operations amidst steady growth in air traffic, different airspace usage requirements of various airspace users, need to ensure safety, and environmental concerns have highlighted the possibilities offered by PBN implementation. Accuracy, reliability and repeatability of flight paths associated with PBN procedures due to navigation specification and aircraft avionics, are enablers of better airspace management, enhanced access to airports and improved safety. Supplemented by GNSS as navigation sensor during all phases of flight has paved the way for availability of accurate, reliable and seamless position information globally.

1.2 Recognizing the benefits of PBN, India commenced work on development of PBN procedures in 2006 - 2007 with the strategy to achieve quantifiable benefits to stakeholders, terminal capacity enhancement, reduce arrival delay, CDO/CCO within terminal areas and enhanced all-weather access to runways.

2. PBN IMPLEMENTATION IN TERMINAL AIRSPACE

2.1 PBN RNAV-1 SIDs and STARS at eight international airports at Delhi, Mumbai, Kolkata, Chennai, Ahmedabad, Hyderabad, Bangalore, Thiruvananthapuram and Cochin have been implemented. These airports are major traffic centres and during peak traffic times are affected by capacity constraint, communication congestion, bunching and delays. The reduction in track miles achieved through PBN procedures has led to significant fuel savings and reduction in emissions. Structured flow of traffic in the TMA and vertically segregated arrival and departure flow at crossing and merging points have reduced the need for frequent communication between pilot and ATC. It has been possible to obtain 30 per cent reduction in communication during peak times. Reduced track-miles and predictable flight profile due to segregated arrival-departure flows have helped in reducing fuel burn and emissions. Repeatable flight profile and flight path has permitted aircraft to be managed for optimum

efficiency in terms of CDO/CCO and permitted better response from pilots for achieving continuous descent operations.

2.2 Design flexibility offered by the PBN concept through procedure segments connected by a sequence of waypoints defined by WGS-84 geographical coordinates is being fully utilized to plan optimum flight trajectory and profile even in terrain challenged airports where conventional procedures have been restrictive in providing efficient flight profile. The requirement to circumnavigate noise-sensitive areas, danger areas and restricted airspaces has been fulfilled effectively and efficiently through efficient profiles and planning conditional routes through restricted airspaces.

2.3 **CDO/CCO.** To encourage CDO/CCO in non-radar environment, Basic RNP-1 navigation specification is being utilized to segregate ARR/DEP paths to achieve optimization of airspace and segregation of traffic flows. Such procedure development is in progress at Calicut and Coimbatore airports. Mixed equipage traffic i.e. RNAV and non-RNAV limits achievement of full-fledged benefits of PBN procedures in non-surveillance airspace.

3. **PBN IMPLEMENTATION IN ENROUTE AIRSPACE**

3.1 **RNAV-5 Routes.** Seven RNAV-5 routes have been implemented between city pairs, one of them is between Mumbai-Delhi and Delhi-Mumbai which is the seventh busiest ATS route in the world. It has resulted in enhancement of en route capacity and availability of economical flight levels to more number of air traffic. India has planned to implement RNAV-5 routes between major city pairs in the near future and also ready to extend them to neighbouring countries like Bangladesh / Nepal and Pakistan. The fuel savings due to implementation of the seven above-mentioned routes is calculated as 724 ton per annum and reduction in CO₂ emissions of 2 280 ton per annum.

3.2 **IFSET.** Under the initiatives for the reduction of carbon emissions and fuel saving, the Airports Authority of India took various measures and the resultant fuel savings was calculated by using ICAO IFSET. Two officers have been trained in Singapore under the ICAO IFSET training programme to use IFSET for calculation of fuel and CO₂ savings. AAI in coordination with the military authorities reduced the track mileage of a number of international ATS routes by flexible use of military airspace and by optimum design of routes. The resultant fuel savings is calculated by IFSET.

4. **PBN GO-TEAM VISIT TO INDIA**

4.1 The PBN Go-Team visited India from 12 to 15 June 2012. Ten members of the ICAO/IATA PBN Go-Team, including representatives from ICAO, IATA, IFATCA and the industry, conducted a three-day seminar/workshop on the four work areas. Participants from DGCA, AAI, airline operators represented by active pilots, air traffic controllers, performance engineers, operational managers and airspace managers, airspace/procedure design specialists took part in the seminar. Following the seminar, a debriefing meeting was held to summarize the outcomes of the seminar and discussions held during the past three days.

4.2 The PBN Go-Team visit was successful in accomplishing productive interaction with ICAO and IATA experts and other industry subject matter experts in areas such as airspace design to promote CDO/CCO, LNAV, LNAV/VNAV approach procedure, procedure data coding, and operational approval process. The deliberations with the experts also helped in addressing stakeholder concerns in respect of operations approval processes.

5. **PBN GO TEAM RECOMMENDATIONS**

- 5.1 To create a national PBN Implementation support team.
- 5.2 Use IFSET to evaluate effectiveness and fuel savings.
- 5.3 AAI and regulators should consider supporting operators on PBN training and awareness of PBN basics.
- 5.4 Conduct a PBN airspace workshop in 2012.
- 5.5 All the recommendations of PBN Go team have been implemented.

6. **CONCLUSION**

- 6.1 The Conference is invited to note:
 - a) India is willing to support neighbouring countries in developing PBN procedures including RNAV-5 routes from India to other countries; and
 - b) PBN implementation initiatives of India.

— END —