INTERNATIONAL CIVIL AVIATION ORGANIZATION

SEVENTH MEETING OF THE PERFORMANCE BASED NAVIGATION TASK FORCE (PBN/TF/7)

Bangkok, Thailand, 1-3 September 2010

Agenda Item 4: PBN Implementation Issues

PROPOSALS TO FACILITATE PBN IMPLEMENTATION

(Presented by the Republic of Korea)

SUMMARY

This paper provides information on the PBN implementation status and difficulties encountered while proceeding PBN Implementation Project, especially PBN safety assessment issues, of the Republic of Korea. In line with PBN safety assessment, the paper suggests developing PBN safety assessment validation procedure, providing States in the region with PBN safety assessment assistance including experts and providing contracting States with PBN safety assessment guidance material.

1. INTRODUCTION

1.1 The implementation of Performance-based Navigation (PBN) will provide many benefits for the users and air navigation service providers (ANSPs) of airspace. The benefits are improved safety, operational efficiency, capacity, accessibility, predictability, fuel economy and environmental effects in a given airspace.

1.2 Recognizing these benefits, the 36th Session of the ICAO Assembly held in Montreal from 18 to 28 September 2007 adopted Resolution A36-23 urging all States to implement Area Navigation (RNAV) and Required Navigation Performance (RNP) air traffic services (ATS) routes and procedures in accordance with ICAO PBN concept described in the *Performance Based Navigation Manual (Doc 9613).*

1.3 In addition, the resolution calls on States and Planning and Implementation Regional Groups (PIRGs) to develop PBN implementation plan by 2009 to achieve the implementation of RNAV and RNP operations for en route and terminal areas as well as approach procedures with vertical guidance (APV) for all instrument runway ends according to established timelines and intermediate milestones. In line with the Assembly resolution, APANPIRG established the Regional PBN Implementation in 2009.

2. PBN IMPLEMENTATION IN THE REPUBLIC OF KOREA

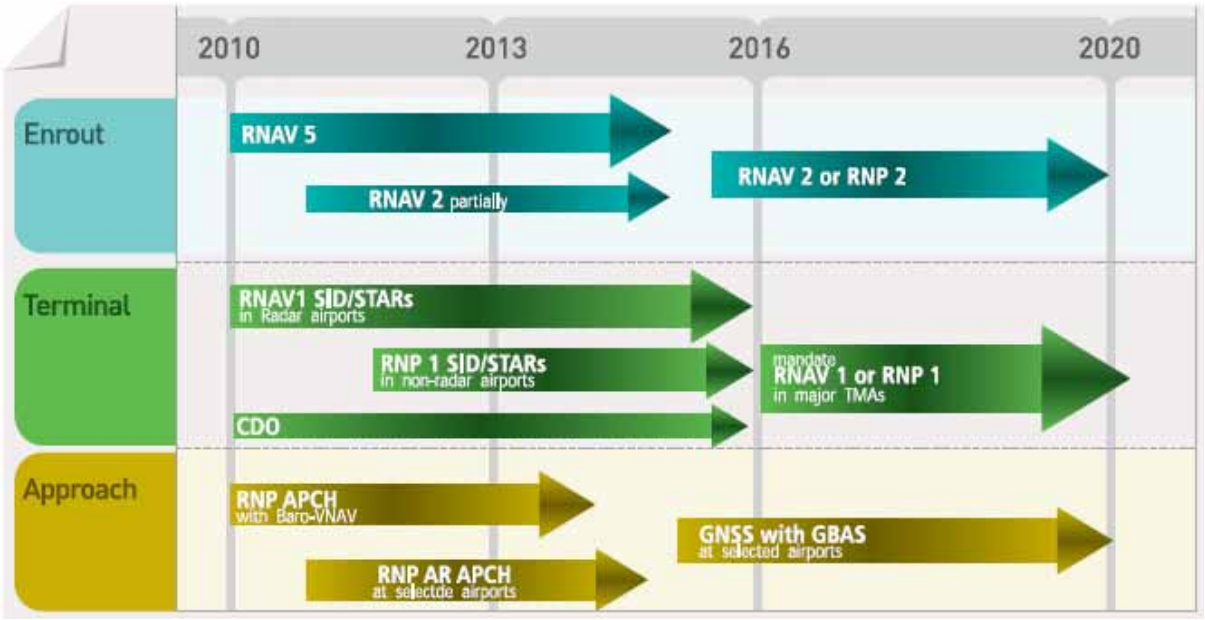
2.1 In December 2009, the Republic of Korea established the PBN Implementation Plan to provide aviation stakeholders with appropriate implementation guidance and to allow them to prepare for PBN implementation properly within Incheon Flight Information Region (FIR) following with ICAO Assembly Resolution A36-23 and the Asia/Pacific Regional PBN Implementation Plan.

2.2 The PBN Implementation Plan of the Republic of Korea comprises 3 steps; Short Term, Medium Term and Long Term.

2.2.1 Short Term (2010~2012): Current RNAV routes will be adjusted to meet ICAO's RNAV 5 specification and RNAV 2 will be introduced on heavily congested routes such as B576 to establish unidirectional parallel routes. In terms of terminal areas, current RNAV Standard Instrument Arrival (STAR) and Standard Instrument Departure (SID) will be switched over to meet RNAV 1 specification which will also be applied to new STARs and SIDs. In addition, APV-Baro VNAV will be introduced to all international airports and the domestic airports with high traffic volume as back-ups for ILS approaches or primary means for non-precision approaches.

2.2.2 Medium Term (2013~2016): Existing VOR Routes will be changed to RNAV 5 or RNAV2 routes and new RNAV 5 or RNAV 2 routes will be established exclusively for transition flights in an effort to diversify traffic. Also, the application of RNAV 1 specification will be completed in international airports and be expanded to major domestic airports. In terms of approaches, the application of APV-Baro will be completed at all airports in Korea and trial operation of GBAS Landing System (GLS) will begin at the selected airports.

2.2.3 Long Term (2017~): All RNAV 5 routes will be switched over to RNAV 2 or RNP 2 and approach procedures using GBAS will be expanded to other airports. In addition, ground NAVAIDs will be decommissioned gradually from 2021. As a result, conventional routes will be replaced with RNAV routes.



2.3 Following the PBN Implementation Plan, the Republic of Korea began work on the PBN Implementation Project. The target in 2010 is to establish trial procedures for en route, terminal and approach. To do this, the Republic of Korea chose two RNAV routes, L512 and Y64, for en route and two airports, Incheon and Gimpo International Airport, for SID, STAR and RNP APCH with Baro-VNAV procedures.

2.4 The reason to begin with trial procedures is to gain operational experience as the Republic of Korea haven't published PBN procedures according to the PBN manual (Doc. 9613) even though it has been operated RNAV routes and procedures since 2001. Therefore, as current RNAV routes and procedures haven't any operational requirements, the PBN Implementation Project has the

plan to promulgate PBN Implementation Plan and operational requirements through Aeronautical Information Circular (AIC) and Aeronautical Information Publication (AIP).

3. CHALLENGES

3.1 As we know, ICAO circulated the amendment proposal of the PANS-ATM (Doc 4444) suggesting more than 7NM (13km) separation between departing and/or arriving aircraft flying the published tracks and approved for either RNAV1, Basic RNP1, RNP APCH and/or RNP AR APCH operations. Even though this proposal is still under consideration by the Air Navigation Commission, more than 7NM separation requirement is big concern in terms of terminal area operations and requires many safety assessment analyses when they are adopted because of the limitation of terminal airspace.

3.2 In addition, we recognized that many States in the Asia and Pacific region neither have the level of technical expertise nor the resources to conduct PBN safety assessment or implementing ongoing monitoring arrangement for either en routes or terminal areas. But RASMAG expressed its opinion that the work program for RASMAG was structured to primarily address vertical and horizontal safety monitoring in international airspaces and it had been too busy to address the data link monitoring requirements that were also under its responsibility. Therefore, RASMAG had little capability or capacity to consider the terminal area safety assessment (refer to APANPIRG/20 report 3.3.49 to 3.3.50).

3.3 However, each State has to establish a lot of PBN procedures including PBN safety assessment to meet the milestones which were set by 36th Session ICAO Assembly (A36-23) and Asia and Pacific Regional PBN Implementation Plan by 2016. It means many States will experience difficulty in implementing PBN because of the lack of expertise and guidance materials. To assist these States, ICAO established Asia and Pacific PBN Task Force and Flight Procedure Program Office but these are not enough to accelerate PBN Implementation.

3.4 The Republic of Korea has been experiencing the same difficulties including PBN safety assessment while proceeding PBN Implementation Project in terminal areas as well as en route areas. As we know, PBN safety assessment and ongoing monitoring responsibility in sovereign airspace are vested in each implementing State.

3.5 Unlike flight procedure design criteria in PANS-OPS (Doc 8168), there is no specific guidance for the PBN safety assessment. Therefore, some States developed their own safety assessment methods. One commonly used method is the safety risk assessment which is described in the Safety Management Manual (Doc 9859). The other method is the collision risk analysis, and Reich Model and Hsu Model are usually used for this method.

3.6 Therefore, the Republic of Korea is considering both methods for the safety assessment. First, the safety risk assessment process will be applied when there are no collision risks between two neighboring procedures. And the collision risk analysis process will applied when two procedures have potential collision risks or ATS Service Provider wants to reduce the distance between two neighboring procedure centerlines. For collision risk analysis, Reich Model will be used for en route procedures because there are previous studies using this model such as longitudinal separation safety assessment in North Atlantic Airspace, RVSM safety assessment and P-RNAV parallel routes safety assessment. Also, the modified Hsu Model will be applied for terminal airspace considering operational and environmental characteristics.

3.7 Even though the Republic of Korea decided the PBN safety assessment methods, there still exist many difficulties in applying for new procedures. The most difficult issue is the reliable and sufficient data collection for analysis, especially in terminal airspace, because of frequent air traffic controller intervention, complex airspace structure including SID and STAR, special local

procedures and so on. Other difficulties are lack of guidance material, no common PBN safety assessment model which is applicable to all procedures, lack of PBN safety assessment experts who can provide assistance both domestically and internationally and so on.

3.8 Considering difficulties mentioned above and current practices that PBN safety assessment procedures based on SMM (Doc 9859) are used by some States, the Republic of Korea suggests that the meeting considers developing PBN safety assessment validation procedure by ICAO to ensure the harmonized application for PBN safety assessment. In addition, it suggests that the meeting considers providing States in the region with PBN safety assessment assistance including the experts in this area. It seems that Asia and Pacific Flight Procedure Program (FPP) has the good position to assist States in the region. Finally, it suggests that the meeting requests ICAO to provide contracting States with PBN safety assessment guidance material to facilitate PBN implementation and to meet the timeline set by ICAO as soon as possible.

4. ACTION BY THE MEETING

4.1 The meeting is invited to

a) Note the PBN implementation status and the challenges of the Republic of Korea; and

b) Discuss the suggestion in paragraph 3.8 to facilitate the PBN implementation in the Region.

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