INTERNATIONAL CIVIL AVIATION ORGANIZATION

REPORT OF THE SEVENTH MEETING OF THE PERFORMANCE BASED NAVIGATION SUB-GROUP

PBN SG/7 Virtual Meeting

(5 – 6 December 2022)

The views expressed in this Report should be taken as those of the PBN Sub-Group and not of the Organization. This Report will, however, be submitted to the MIDANPIRG and any formal action taken will be published in due course as a Supplement to the Report.

Approved by the Meeting
and published by authority of the Secretary General

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PART I – HISTORY OF THE MEETING

1. PLACE AND DURATION

1.1 The Seventh meeting of the Performance Based Navigation Sub-Group (PBN SG/7) was successfully held virtually, 5 – 6 December 2021 from 09:00 to 11:00 UTC, using MS Teams facility.

2. OPENING

2.1 The meeting was chaired by Mr. Ehab Raslan Mohamed, General Manager of Research and Development, NANSC, Egypt, who welcomed the participants and wished them a successful and fruitful meeting.

2.2 Mr. Mohamed Smaoui, Deputy Regional Director, ICAO Middle East Office, welcomed all participants to the PBN SG/7 meeting. Mr. Smaoui provided the meeting with an overview of the subjects that will be addressed during the meeting including PBN planning and implementation issues in the MID Region. Mr. Mohamed Smaoui highlighted that the meeting will be apprised of some recent Global and Regional developments related to PBN and GNSS, including the outcome of the A41 Assembly, the Fifth Edition of PBN Manual Doc 9613, CCO-CDO publication and charting and the new version of the MID Region PBN Implementation Plan. Mr. Smaoui thanked the CCO/CDO AD HOC Working Group and the PBN Implementation Plan AD-HOC Working Group for the efforts they have put in developing templates of CCO-CDO publication and charting and in updating the MID Region PBN Implementation Plan (Doc 007).

2.3 Finally, Mr. Smaoui encouraged the delegates to participate in all the activities and discussions, thanked them for their attendance and wishing them successful and productive meeting.

3. ATTENDANCE

3.1 The meeting was attended by a total of sixty-eight (68) participants from fourteen (14) States (Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Oman, Qatar, Saudi Arabia, Syria, UAE and Yemen) and four (4) International Organizations/Industry (AACO, EUROCONTROL, IATA, REJTECH). The list of participants is at **Attachment A**.

4. OFFICERS AND SECRETARIAT

4.1 The meeting was chaired by Mr. Ehab Raslan Mohamed, General Manager of Research and Development, NANSC, Egypt,

4.2 Mr. Radhouan Aissaoui, Regional Officer, Information Management was the Secretary of the meeting. Mr. Mohamed Smaoui, Deputy Regional Director, supported the meeting.

5. LANGUAGE

5.1 The discussions were conducted in the English language and documentation was issued in English.

6. AGENDA

6.1 The following Agenda was adopted:

Agenda Item 1:	Adoption of the Provisional Agenda
Agenda Item 2:	Follow-up on MIDANPIRG/19 Conclusions and Decisions relevant to PBN
Agenda Item 3:	Global and Regional Developments
Agenda Item 4:	PBN Planning and Implementation in the MID Region
Agenda Item 5:	Working Arrangements and Future Work Programme
Agenda Item 6:	Any other Business

7. CONCLUSIONS AND DECISIONS – DEFINITION

7.1 The MIDANPIRG records its actions in the form of Conclusions and Decisions with the following significance:

a) **Conclusions** deal with matters that, according to the Group's terms of reference, merit directly the attention of States, or on which further action will be initiated by the Secretary in accordance with established procedures; and

b) **Decisions** relate solely to matters dealing with the internal working arrangements of the Group and its Sub-Groups.

8. LIST OF DRAFT CONCLUSIONS AND DRAFT DECISIONS

DRAFT CONCLUSION 7/1:	*WEBINAR ON THE NEW EDITION OF PBN MANUAL – 5TH EDITION*
DRAFT CONCLUSION 7/2:	*PBN AIRSPACE DESIGN WORKSHOP*
DRAFT CONCLUSION 7/3:	*REVISED VERSION OF THE MID REGION PBN IMPLEMENTATION PLAN (DOC 007)*
DRAFT CONCLUSION 7/4:	*PBN CAPACITY-BUILDING AND ASSISTANCE ACTIVITIES*

PART II: REPORT ON AGENDA ITEMS

REPORT ON AGENDA ITEM 1: ADOPTION OF THE PROVISIONAL AGENDA

1.1 The meeting reviewed and adopted the Provisional Agenda as at Para 6 of the History of the Meeting.

REPORT ON AGENDA ITEM 2: FOLLOW-UP ON MIDANPIRG/19 CONCLUSIONS AND DECISIONS RELEVANT TO PBN

2.1 The meeting noted the status of the MIDANPIRG/19 Conclusions and Decisions relevant to PBN and the follow-up actions taken by concerned parties as at **Appendix 2A**.

REPORT ON AGENDA ITEM 3: GLOBAL AND REGIONAL DEVELOPMENTS RELATED TO PBN

GLOBAL DEVELOPMENTS RELATED TO PBN – PBN MANUAL 5TH EDITION

3.1 The subject was addressed in PPT/3 presented by the Secretariat.

3.2 The meeting was apprised of the list of main changes in the PBN Manual Doc 9613 Edition 5, in particular:

- Update to the executive summary to present an overview of the proposed PBN Strategy;
- Inclusion of guidance regarding the judicious use of RF Legs (and in Vol II Part A);
- Clarification of the use of PBN on Free routes and in airspace, rather than just on published ATS routes;
- Clarification of the ability to choose either RNAV or RNP navigation specifications regardless of the availability of suitable surveillance;
- Inclusion of references to material on the conduct of safety case assessments;
- Consideration of reversion from RNP following loss of GNSS;
- Duplicated material removed in Part B – Implementation Guidance removed because duplicated text already found in Doc 9992 – Manual on the use of PBN in Airspace Design, and was therefore redundant in Doc 9613;
- Introduction to PBN Implementation retained, but Processes removed;
- Attachment C on Operational Approval removed since this text more expansively covered in Doc 9997 – PBN Operational Approval Manual, therefore redundant in Doc 9613;
- Recognition of GBAS as a positioning sensor (also in Vol II Parts B and C);
- General text highlighting the need for education and training;
- Clarification of Surveillance requirements (also in Vol II Parts B and C);
- Consistent use of terminology for operational approval, acceptance and authorisation (also in Vol II Parts B and C);
- Addition of RNP AR DP criteria and a complete update of RNP AR APCH criteria in-line with the latest regulatory standards and practices;
- Dropping of scalability requirement and adoption of a fixed RNP 0.3 lateral navigation accuracy in terminal airspace applications, with the exception of the Missed Approach which remains at RNP 1;
- Deletion of Final Approach Segment from A-RNP nav spec ;
- The 4th edition of the PBN Manual also introduced RNP 0.3 as a navigation specification intended primarily for helicopter use. With the 5th edition this is clarified as being solely for the use of helicopters;
- Edition 4, Attachment A to Vol II, Barometric VNAV (Baro-VNAV) is removed, as criteria is outdated;
- New Attachment B to Vol II, containing Temperature Compensation for Barometric VNAV;
- Edition 4 Attachment B to Vol II, Sample Airspace Concepts based on Navigation Specifications now Attachment C;
- New Attachment D to Vol II, containing guidance on the application of Magnetic Variation (MagVar);
- New Attachment E to Vol II, containing Document References for Navigation Specifications;
- Update to Part A Chapter 1, Table II-A-I-I and Notes reflecting applicability of navigation specifications to the relevant flight phases;
- Clarification provided within Specific RNAV and RNP System Functions of the application of Holding Patterns and Parallel offset;
- Update to Part A Chapter 1, Table II-A-1-3 Navigation Specifications and RNP System Functions;

- Part A Chapter 2, On-board performance Monitoring and Alerting concept revised to align with aircraft requirements and remove the current confusion with external signal-in-space requirements;
- Consequential changes to the OBPMA paragraphs in all of the RNP navigation specifications and RNAV navigation specifications changed to be consistent;
- Part A, Chapter 4, recognition of the evolution of GNSS elements including Dual Frequency and Multiple Constellation (DFMC) GNSS;
- Clarification of GNSS monitoring requirements;
- Addition of a new Appendix to Chapter 4 providing guidance on the application of Advanced RNP.

3.3 The meeting noted that the new edition of the PBN manual is due to be released in early 2023.

3.4 Given the marked changes being introduced in the PBN Manual 5th Edition and to provide insights on key changes to the edition 5 of the PBN manual, the meeting agreed to the following Draft Conclusion :

DRAFT CONCLUSION 7/1: WEBINAR ON THE UPDATES TO THE PBN MANUAL – 5TH EDITION

That, ICAO organize a Webinar on the new edition of PBN Manual Doc 9613 (ED5) in 2023.

GLOBAL DEVELOPMENTS RELATED TO PBN - ICAO GROUP UPDATES

3.5 The subject was addressed in PPT/4 presented by the Secretariat.

3.6 The meeting noted that in line with new PBN approach phraseology included in amendment 11 to the PANS-ATM (applicable on 3 November 2022), the Phraseology Working Group of the ATMOPSP has completed the review of Doc 9432 (Manual of Radiotelephony). This new Edition will encompass scenarios about RNP approaches; several RNP types' of finals towards the same runway including RNP (AR) and RNP (VPT). In addition, 'Vectoring to RNP' scenarios have been added. The meeting noted that Edition 5 of Doc 9432 is expected to be released by Q1 2023.

GLOBAL DEVELOPMENTS RELATED TO PBN - A41 UPDATE

3.7 The subject was addressed in WP/5 presented by the Secretariat.

3.8 The meeting was apprised of the outcomes of the 41st Session of the ICAO Assembly held in Montréal; from 27 September to 7 October 2022, particularly Resolutions A41-6 and A41-8 available at https://www.icao.int/Meetings/a41/Documents/Resolutions/a41_res_prov_en.pdf

3.9 The meeting noted that the Assembly, through Resolution A41-6, endorsed the 2023-2025 edition of the Global Aviation Safety Plan (GASP) and the seventh edition of the Global Air Navigation Plan (GANP) as the global strategic directions for safety and the evolution of the air navigation system, respectively.

3.10 The meeting noted also that the progress in implementing PBN and ADS-B leads to an increasingly complex dependence on GNSS for both navigation and surveillance. Europe and many other regions of the world are moving towards a PBN-based navigation environment while reducing procedures based on conventional navigation aids. Similarly, the use of ADS-B and its integration in the wider

surveillance chain is advancing, enabling the realization of associated advanced air traffic control (ATC) capabilities. Furthermore, many surveillance and trajectory management applications are designed to use GNSS timing to synchronize the associated air and ground systems.

3.11 To make it imperative that GNSS RFI is mitigated and that CNS system resilience is strengthened, in particular through improved integration of complementary positioning capabilities, the Assembly resolved through Resolution A41-8 that the Appendices attached to this resolution constitute the consolidated statement of continuing ICAO policies and practices related to CNS/ATM, as these policies exist at the close of the 41st Session of the Assembly.

3.12 The meeting urged States to implement the Assembly Resolutions, in particular Assembly Resolution A41-6 and Assembly Resolution A41-8.

GLOBAL DEVELOPMENTS RELATED TO PBN – ICAO N SIGNIFICANT INTERNATIONAL AVIATION DEVELOPMENTS

3.13 The subject was addressed in IP/3 presented by the Secretariat. This IP provided information concerning ICAO documentation and ICAO activities that could be of interest to the meeting. In particular, the meeting noted the following:

- Adoption of amendment 11 to the PANS-ATM concerning amended phraseologies related to the new PBN chart naming,
- Approval of amendment 10 to the PANS-OPS Volume I and amendment 2 to the PANS-OPS Volume III related to the use of GNSS in conventional routes and procedures, and
- SL 2022/87 in relation to the survey on the moving from magnetic to true North reference system. The meeting invited States to take action on the SL 2022/87.

REGIONAL DEVELOPMENTS RELATED TO PBN – MID FPP UPDATES AND ACTIVITIES

3.14 The subject was addressed in WP/6 presented by the Secretariat.

3.15 The meeting was apprised of the latest developments related to the establishment of the Flight Procedure Programme (MID FPP).

3.16 The meeting re-iterated that the MID FPP is the optimal solution that would support States to develop sustainable capability in the instrument flight procedures (IFP) design, PBN airspace concepts and PBN OPS approval, including regulatory oversight. The MD FPP would also support States to overcome most of the identified challenges, which will foster the PBN implementation, and to meet their commitments under Assembly Resolutions A37- 11 for Performance Based Navigation (PBN) implementation and the regional requirements, and comply with ICAO provisions related to flight procedure design and PBN. The meeting highlighted the participation categories (Active State, User State, Donors). Accordingly, the meeting urged States to join the MID FPP through the signature of the MID FPP ProDoc, if they have not yet done so.

3.17 The meeting noted that the MID FPP SC/1 and 2 meetings were held Virtual, 26 - 27 January 2022 and in Abu Dhabi, UAE, 15 - 16 June 2022, respectively. The Steering Committee elected a Chairperson (Mr. Saqr Al Marashda, SZC, GCAA, UAE); agreed on the Work Plan for the Year 2022 and the funding mechanism to maintain the sustainability of the programme.

3.18 The meeting was apprised of the main activities conducted by the MID FPP during the year 2022, which include the followings:

- Workshops: A Workshop on the Continuous Climb Operations (CCO) / Continuous Descent Operations (CDO) Implementation was successfully held in Abu Dhabi, UAE, 13 - 14 June 2022.
- Training Courses: PANS-OPS Flight Procedure Design Courses Module I (4 weeks) and Module II (3 weeks) held from 18 July to 2 September at the Sheikh Zayed Centre – Abu Dhabi, UAE.
- Projects: A project for analysis, design, and validation of four (4) RNAV1 parallel routes within Kuwait FIR is ongoing.

3.19 The meeting noted the establishment of the MID FPP Pool of experts nominated by States to provide technical support for the implementation of the MID FPP Work Plan; and encouraged States and international organizations to nominate qualified Subject Matter Experts (SMEs) to further support the programme.

3.20 The meeting noted that the MID FPP funding Mechanism was endorsed by the DGCA MID/6 meeting (Abu Dhabi, UAE, 1 – 3 November 2022).

3.21 The meeting encouraged States to join the MID FPP though the signature of the MID FPP ProDoc as active States, and to further support the MID FPP with nomination of Subject Matter Experts (SMEs) to the pool of experts.

REGIONAL DEVELOPMENTS RELATED TO GNSS

3.22 The subject was addressed in WP/7 presented by the Secretariat.

3.23 The meeting recalled that MIDANPIRG/18, through Conclusion 18/39, agreed to conduct Flight Inspection and procedure Validation Symposium in order to support States in improving their capacity to conduct the flight inspection and procedure validation activities in a more effective, efficient, safe and economical manner. The meeting noted that the ICAO MID Office will organize a Radio Navigation Aids symposium (RNAS) jointly with EUR/NAT and ACAO in the 2nd half of 2023. The Symposium will address several subjects, inter-alia, emerging Radio Navigation aids, GNSS/GBAS, GNSS RFI monitoring, Flight inspection using drones,…etc.. The meeting invited States to actively participate in the ICAO Radio Navigation Aids Symposium planned for 2023.

3.24 The meeting recalled that the first edition of the Guidance on GNSS Implementation in the MID Region (MID Doc 011) was endorsed by the MSG/6 meeting in December 2018 and that MIDANPIRG/18, through Conclusion 18/41, endorsed a revised version “edition February 2021”.

3.25 The meeting noted that the MIDANPIRG/18 agreed that the plan should be updated considering the latest global developments and to be in line with the NAV Thread/Elements in the GANP. Consequently, an Ad-Hoc Action Group was established to review and prepare a revised version of the Guidance on GNSS Implementation in the MID Region (MIDANPIRG Decision 18/40). The revised version will be presented to the CNS SG/11 and MIDANPIRG/20.

3.26 The meeting recalled that the ASBU new element “Navigation Minimal Operating Networks” (NAVS B0/4) has been classified as priority 1 in the revised MID Region Air Navigation Strategy (MID Doc 002), which aims to rationalize the conventional Navigational aids network through the increased deployment of the satellite based navigation system.

3.27 The meeting recalled that MIDANPIRG/18 agreed, through Decision 18/42, to establish NAV MON ad-hoc action group to develop a template for Navigation Minimal Operating Networks (NAV MON) plan in line with ICAO SARPs and Regional requirements. The meeting invited States to support the work of the NAV MON Action Group

3.28 The meeting noted that the GNSS interference has been identified as a major safety issue as GNSS is embedded in numerous critical infrastructures and that a substantial number of GNSS interferences were reported across international borders, reaching boundaries out of the MID Region. The majority of GNSS interference incidents were reported in the Ankara FIR (LTAA), Baghdad FIR (ORBB) and their respective borders, which equates to 83.8% of total reports received, followed by Nicosia (LCCC), Beirut (OLBB), Cairo (HECC) and Tehran (OIIX) FIRs.

3.29 The meeting recalled that MIDANPIRG/19 reiterated that States should locate the source of interference and coordinate with relevant parties to resolve the issue of GNSS interferences and through Conclusion 19/4, invited States to report infringements of the ITU radio regulations, describing GNSS RFI effect either in their State or reported by their registered aircraft.

3.30 The meeting urged States to implement GNSS RFI preventive and reactive mitigation strategies as outlined in RSA14.

REPORT ON AGENDA ITEM 4: PBN PLANNING AND IMPLEMENTATION IN THE MID REGION

PBN Route Spacing and CNS Requirements

4.1 The subject was addressed in WP/8 presented by the Secretariat. The Working Paper provided information concerning methodologies used to determine spacing between PBN ATS routes and instrument flight procedures with a focus on RNAV 5 and RNAV 1 to accommodate their strategic de-confliction to achieve the efficiency and safety objectives whilst ensuring a manageable workload for controllers along with Communications and ATS surveillance requirements.

4.2 The meeting recalled the principle described in ICAO PANS-ATM which can be used to determine the appropriate route spacing in the PBN applications:

"5.4.1.2.1.5 RNAV operations where RNP is specified on parallel tracks or ATS routes. Within designated airspace or on designated routes, where RNP is specified, lateral separation between RNAV-equipped aircraft may be obtained by requiring aircraft to be established on the centre lines of parallel tracks or ATS routes spaced at a distance which ensures that the protected airspace of the tracks or ATS routes does not overlap."

4.3 The meeting reiterated that the ½ Airway Width (A/W) of the obstacle clearance area in all RNAV and RNP applications (except RNP AR) is based upon the following: ½ W = XTT *1.5 + BV.

4.4 Based on the above, the meeting noted that the route spacing for :

- RNAV5 parallel routes could be 11.54NM, roughly 12 NM. However, State should undertake the necessary safety assessments outlined in PANS-ATM (Doc 4444). Furthermore, two aspects are of particular importance: spacing between routes in turns and along track distance between leg changes.
- RNAV 1 on parallel tracks or ATS routes could be 10 NM and States should undertake the necessary safety assessments outlined in PANS-ATM (Doc 4444).

4.5 It was recalled that in accordance with provisions of PAN-ATM Doc4444 Chapter 5, 5.11 reduction in separation minima that provided an appropriate safety assessment has shown that an acceptable level of safety will be maintained, and after prior consultation with users, the separation minima may be reduced in the following circumstances:

As determined by the appropriate ATS authority as appropriate:

a) when special electronic or other aids enable the pilot-in-command of an aircraft to determine accurately the aircraft's position and when adequate communication facilities exist for that position to be transmitted without delay to the appropriate air traffic control unit; or

b) when, in association with rapid and reliable communication facilities, information of an aircraft's position, derived from an ATS surveillance system, is available to the appropriate air traffic control unit; or

c) when special electronic or other aids enable the air traffic controller to predict rapidly and accurately the flight paths of aircraft, and adequate facilities exist to verify frequently the actual aircraft positions with the predicted positions; or

d) when RNAV-equipped aircraft operate within the coverage of electronic aids that provide the necessary updates to maintain navigation accuracy.

4.6 The meeting noted the key points to consider to determine spacing between PBN ATS routes:

- It is emphasized that when route spacing values have been derived for use in a Radar surveillance environment using observed performance, such spacing can never be equal to or less than the prescribed radar separation minima applied in the airspace. This is because a lateral deviation could instantly cause a separation infringement. Sufficient time is needed for the controller to detect and correct a deviation and for the pilot to respond correctly.
- Any published table showing route spacing values determined by particular studies must be seen in this light. No published spacing results for continental application (or study supporting these results) can be considered universal norms. Results are valid only for the assumptions and data used, the particular operating environment and airspace and operational concept envisaged. One key assumption is that aircraft being separated on closely spaced routes are within the same ATC sector. It is also stressed that route spacing values supported by extensive data, statistical analysis, mathematical modelling and airspace design do not ensure that the aircraft will adhere to the route to ensure that the route spacing is maintained. Essential to successful flight operations are proper procedure design, the correct coding of procedures in the aircraft databases and validation of the procedure to check flyability.

4.7 The meeting agreed to conduct a workshop, in collaboration with MID FPP, champion States and International Organizations, to provide a thorough understanding of airspace design requirements; focusing on PBN based solutions to ensure an efficient, flexible and dynamic airspace structure that meets Stakeholders requirements in terms of safety, flight efficiency and capacity in a cost-effective manner. The workshop will also be an opportunity to gain insight into lessons learned and/or best practices in the application of PBN in the design of airspace.

4.8 In view of the foregoing, the meeting agreed to the following Draft Conclusion:

DRAFT CONCLUSION 7/2: PBN AIRSPACE DESIGN WORKSHOP

That:

a) ICAO, in collaboration with the MID FPP, organize a PBN Airspace Design Workshop in 2023, to provide necessary knowledge about PBN based solutions for airspace design to ensure an efficient, flexible and dynamic airspace structure that meets Stakeholders requirements in terms of safety, flight efficiency and capacity in a cost-effective manner; and

b) States and International Organizations are strongly encouraged to participate actively in this Workshop.

Continuous Descent Operations/ Continuous Climb Operations (CDO/CCO) Publication and Charting Template

4.9 The subject was addressed in WP/9 presented by the CCO/CDO AD HOC WG.

4.10 The meeting recalled that the Middle East Air Navigation Planning and Implementation Regional Group MIDANPIRG/19 (Riyadh, Saudi Arabia, 14 – 17 February 2022) recognized the need for a harmonized AIP content related to CCO/CDO to ensure that identified good practices are shared and that Flight Crew / Flight Planners know where CCO/CDO-related text may be found in an AIP. Accordingly, the CCO/CDO Ad Hoc Working Group was established through MIDANPIRG DECISION 19/11.

4.11 The CCO/CDO Ad Hoc Working Group is tasked with the development of guidance related to the publication of CCO/CDO information (text and Charts) in the AIP, in coordination with the relevant MIDANPIRG and RASG MID subsidiary bodies.

4.12 The meeting noted that the expert working group developed a harmonised AIP location (ENR1.5 for high level content and AD2.21 / 2.22 for Airport specific content), structure and content, and database coding as per ICAO Doc8168 PANS-OPS, Volume II, Part III, Section 2, and Chapter 5.

4.13 The CCO/CDO AD HOC Working Group recommended that:

- A high level text on the application of CCO/CDO should be included in the ENR1.5 section of the AIP (5 - Holding, Approach and Departure Procedures); and

- Focused CCO/CDO information including specific local information such as phraseology, the timeframe of CCO/CDO availability, the ability to fly without the prescribed altitude or speed restrictions (due to low traffic situation) etc., should be included in the AD2.21 / 2.22 sections of the AIP (Noise Abatement Procedures/Flight procedures) of individual airports.

4.14 The meeting noted also that the Ninth Meeting of the AIM Sub-Group AIM SG/9 held virtually on 20 – 21 September 2022, reviewed and validated the proposed harmonized location, structure and content of CCO / CDO material with minor modifications and through Draft Conclusion 9/4 adopted the proposal for CCO / CDO AIP Publication, Charting and Coding.

4.15 The Meeting reviewed and supported the AIM SG/9 meeting Draft Conclusion 9/4.

The remote continental airspace concept in MID PBN Plan

4.16 The subject was addressed in WP/10 presented by the PBN IP AD-HOC WG.

4.17 The meeting recalled that the Remote continental airspace concept is one of the areas of operation during En-Route phase of flight currently supported by three navigation applications, RNAV 10, RNP 4 and RNP 2. All these navigation applications rely primarily on GNSS to support the navigation element of the airspace concept and may require ATS surveillance for certain applications.

4.18 The meeting recalled also that the Doc 007, MID Region PBN Implementation Plan identifies the navigation specifications RNAV 10 and RNP 4 to be used for Enroute ATS routes within Remote continental airspace.

4.19 The meeting noted that there is no clear definition of remote continental airspace and that for the purpose of PBN Implementation planning in MID Region the Remote Continental Airspace is defined as an airspace where direct controller-pilot VHF voice communication, ATC surveillance and reliable ground-based NAVAIDs are not available.

4.20 It was noted that it is unlikely that the Remote Continental Airspace exists in MID Region. Therefore, the meeting agreed to the proposal put forward by the PBN IP AD-HOC WG to remove the remote continental airspace as an area of operations in MID Region.

MID Region PBN Implementation Plan

4.21 The subject was addressed in WP/11 presented by the PBN IP AD-HOC WG.

4.22 The meeting recalled that the MID Region Performance Based Navigation (PBN) Implementation Plan (MID Doc 007) has been developed to harmonize PBN implementation in the MID Region and to addresses the strategic objectives of PBN based on clearly established operational requirements, avoiding equipage of multiple on-board or ground based equipment, avoidance of multiple airworthiness and operational approvals and explains in detail contents relating to potential navigation applications.

4.23 The meeting reiterated the need to update the MID Region PBN Implementation Plan (Doc007) in order to keep pace with changes in MID Region Air Navigation Strategy (MID Doc 002) and to ensure alignment with the GANP 7th edition.

4.24 The meeting recalled that MIDANPIRG/19 through DECISION 19/12 established the MID region PBN Implementation Plan Ad hoc Working Group (PBN IP Ad-hoc WG) to review the MID Region PBN Implementation Plan (MID Doc 007) and develop an updated version for review by the PBN SG/7 and ATM SG/8 meetings and for subsequent endorsement by the MIDANPIRG/20 meeting, to keep pace with the developments, including the GANP 7th Edition and the MID Region Air Navigation Strategy (MID Doc 002, Edition February 2021).

4.25 The meeting noted that the MID region PBN Implementation Plan Ad hoc Working Group (PBN IP Ad-hoc WG) reviewed and updated the MID Region PBN plan in particular the implementation phases and targets of each PBN navigation specification as follows:

- Short-term (up to Dec 2024)
- Medium Term (2025 - 2030)
- Long Term (2031+)

4.26 The meeting noted also that for reasons of clarity, the new version of the MID region PBN Implementation Plan was consolidated and redundant and obsolete parts were removed. As is the case for Chapter 6 PBN Charting in previous version, which had become obsolete. It was indeed removed and replaced by new chapter National PBN Implementation Strategy & Plan. In order to assist States to achieve the ICAO objectives set out in Resolution 37-11, this chapter provides step-by-step guidance to States on how to establish their own national plan in a standard consistent way in relation to Assembly Resolutions, ICAO SARPs, GANP, GASP, Regional plans and other related documents.

4.27 Whilst it is not possible to provide a tailor made PBN implementation plan, and even less desirable to create a ‘one-size fits all’ plan, what is possible is to provide a generic architecture showing one example of such a PBN Implementation Plan and suggests what such a plan could contain.

4.28 The meeting noted that the Chapter 6 provides a skeleton ‘architecture’ or ‘outline’ which could assist States and ANSPs formulate an ICAO National PBN Implementation Plan.

4.29 The meeting noted that the Eighth Meeting of the MIDANPIRG Air Traffic Management Sub-Group (ATM SG/8) held in Amman, Jordan, 7 – 10 November 2022 reviewed and agreed on the updated version of the MID region PBN Implementation Plan particularly the Enroute phase of flight.

4.30 Based on the above, the meeting agreed to the following Draft Conclusion:

DRAFT CONCLUSION 7/3: REVISED VERSION OF THE MID REGION PBN IMPLEMENTATION PLAN (DOC 007)

That, the revised version of MID Region PBN Implementation Plan (Doc 007) at ***Appendix 4A*** *is endorsed.*

Infrastructure assessments for PBN implementation

4.31 The subject was addressed in WP/12 presented by the Secretariat. This working paper provided information on the methods and processes that should be used to evaluate if a specific navigation infrastructure is suitable to support aircraft flying PBN (RNAV1) application based on infrastructure requirements and corresponding navigation specifications as defined in the Performance Based Navigation Manual, ICAO Doc 9613.

4.32 The meeting reiterated the Air Navigation Service Providers (ANSP) responsibility to provide infrastructure (e.g., navigation aids) that is "sufficient" to support all procedures, including PBN. This generic provision responsibility and the demand for "sufficiency" as documented in the Convention on International Civil Aviation (ICAO Doc 7300/9 Article 28) and ICAO Annex 11, Air Traffic Services (RNP Routes, Attachment B), "…infrastructure must be provided sufficient to support …"

4.33 The meeting recalled that PBN provides procedures that can be flown with a variety of navigation aids and airborne sensors. Each navigation specification stipulates which positioning sensor may be used for a particular navigation application as indicated in the PBN Manual Doc 9613, Volume II table (II-A-1-4).

4.34 The meeting noted that each combination of navigation aid and sensor needs to be assessed to see if the requirements to support a specific procedure are met. Consequently, an ANSP can declare which navigation infrastructures are available to support the navigation specification in a given airspace.

4.35 The meeting noted also that one of the goals of the infrastructure assessment is to provide evidence to the corresponding safety assessment that the navigation service supporting a certain procedure complies with the safety requirements.

4.36 It was highlighted that the DME/DME is the only non-GNSS infrastructure suitable to support aircraft using RNAV 1 procedures and the meeting noted the steps to be followed in order to assess whether DME/DME RNAV infrastructure meets the requirements as per Doc 9613, as follows :

- **Step 1**: Collect Necessary Data: The CNS provider should receive all the necessary information from the procedure design and airspace planning office. This includes all waypoint coordinates, path terminators and any vertical profile restrictions (minimum climb gradients, minimum crossing altitudes, speed categories etc.), offset, direct-to or other operational requirements, as well as the outer boundaries of the secondary protection surfaces.
- **Step 2:** Identify Individual Qualifying DME Facilities: Using a terrain modelling tool, determine which DME facilities are within line of sight to each point of the procedure service volume and are usable by all FMS's (range more than 3 NM & less than 160 NM, elevation angle less than 40 degrees).
- **Step 3**: Establish Supporting DME Pairs: Define sufficient possible combinations of pairs of DMEs at each point within the procedure service volume, based on the list of suitable facilities identified in the previous step.
- **Step 4:** Identify Specific Issues: If only one valid pair of supporting DME exists, both DME facilities are considered critical to the procedure. If a particular DME is common to the list of all supporting DME pairs, that DME is critical as well. A DME is critical when an outage will disable RNAV positioning (using DME/DME only). The infrastructure assessment needs to identify the

number of critical DME facilities that support a procedure.

- **Step 5:** Prepare and Conduct Flight Inspection : Prepare the list of DME facilities to be flight inspected and communicate any findings (such as incomplete coverage of entire procedure volume) to the flight inspection organization, including any specific factors to be considered. Conduct flight inspection to confirm signal in space compliance with ICAO Annex 10, e.g. coverage (availability) and accuracy of individual DME facilities supporting RNAV.
- **Step 6**: Finalize Assessment and Implementation Measures: The CNS provider should assess the flight inspection report to see if the assumptions in the initial assessment have been confirmed or if any unforeseen effects have been discovered and take the appropriate action for remedy. If any DME facilities are identified as being deleterious to the navigation solution, they need to be removed from the list of supporting DMEs and corresponding pairs (if applicable).

4.37 The meeting noted that steps 2, 3, 4 and 6 are best conducted with the support of software tools. More information on the use of tools is contained in para below.

4.38 It was indicated that more guidance for RNAV 1 Infrastructure Assessment is contained Doc EUROCONTROL- -GUID-114 accessible through the link *: https://www.eurocontrol.int/sites/default/files/2021-07/eurocontrol-guidelines-rnav-1-infrastructure-assessment-20.pdf.*

4.39 It was pointed out that appropriate tools should be used to assess navigation infrastructure. While the assessment could be conducted using manual analysis and flight inspection, the use of a software tool is recommended in order to make the assessment more efficient. The software tool should be tailored to allow evaluating the infrastructure in light of the requirements imposed by a specific navigation specification. In general, RNAV assessment tools should include a 3D terrain model with sufficient resolution and accuracy to allow predicting the line of sight visibility of NAVAIDS along a procedure service volume, including an analysis of their respective subtended angles and a variety of other geometric constraints.

4.40 The meeting noted that the VOR/DME assessments for RNAV 5 are simply a matter of generating cumulative coverage estimations, because geometry constrains do not have to be taken into account (such as in DME/DME).

4.41 The meeting noted also that PBN procedures should always allow the use of GNSS and that because GNSS is available on a worldwide basis, infrastructure assessment for GNSS differs significantly from terrestrial navigation aids. Relevant aspects such as safety assessment and GNSS performance assessment are described in the GNSS Manual, ICAO Doc 9849 (2017 edition, especially chapters 7.5 and 7.8.2). In addition to considering constellation performance, the ANSP should assess that the space weather and radio frequency interference environment is satisfactory for the planned procedures, and implement vulnerability mitigation measures, if appropriate (chapter 5 and appendix F of the GNSS Manual). Further guidance on assessing and measuring GNSS interference is contained in ICAO Doc 8071, Testing of Radio Navigation Aids. During outages of GNSS and depending on available NAVAID facilities, ANSPs may find it useful to consider suspending planned routine maintenance activities to ensure the availability of an alternate source of navigation.

4.42 The meeting recalled that the State AIP should clearly indicate whether the navigation application is RNAV 1. The available NAVAID infrastructure should be clearly designated on all appropriate charts (e.g. GNSS, DME/DME or DME/DME/Inertial) and that any DME facilities that are critical to RNAV 1 operations should be identified in the relevant publications.

4.43 The meeting noted that since the RNAV systems conducting DME/DME navigation should only use DME facilities identified in State AIPs, the State should indicate facilities inappropriate for RNAV 1 operations in their AIP and where temporary restrictions occur, the publication of restrictions on the use of a DME facility should be accomplished by use of a NOTAM to identify the need to exclude that specific DME facility.

4.44 In light of the foregoing, the meeting encouraged States that have not yet done so, to conduct a complete assessment of the CNS infrastructure to ensure PBN implementation.

Eurocontrol Software DEMETER Distance measuring equipment tracer

4.45 The subject was addressed in PPT/13 presented by Eurocontrol. This presentation provided information concerning Eurocontrol Distance Measuring Equipment Tracer - DEMETER , a software tool that supports the implementation of performance based navigation (PBN), as well as the optimisation and rationalisation of navigation infrastructure.

4.46 The meeting noted that the tool facilitates collaboration between airspace planners, procedure designers, navaids engineers and flight inspectors. It helps them establish DME/DME positioning as a continuous ground-based back-up solution to the Global Navigation Satellite System (GNSS) for PBN.

4.47 The meeting noted also that DEMETER is designed to assess the performance of DME/DME positioning en-route and in-terminal manoeuvring area (TMA) airspace. It can be used to determine which ground infrastructure enhancements or changes are needed to better support PBN applications, such as RNAV 1 SIDs, STARs and RNAV 5 en-route. This is done according to the EUROCONTROL guidelines on RNAV 1 infrastructure assessment (EUROCONTROL-GUID-0114), developed on the basis of ICAO SARPS (ICAO Annex 10 Vol. I) and the Performance-based Navigation Manual (ICAO Doc. 9613).

4.48 The software tool also supports the assessment of VOR/DME coverage and redundancy for RNAV 5 applications, as well as infrastructure evolution planning (VOR rationalisation, DME/DME optimisation).

4.49 DEMETER Key Features and Interfaces including Main simulation outputs – Area Calculations and Procedure Assessment, Flight Inspection Interface along with Planning Tools for NAVAID Optimization and Other Support Tools were presented to the meeting.

4.50 The meeting noted that the transition of DEMETER to web-based environment started in September 2021 and is planned to be completed by Q1 2023; however, the full testing and validation is required before the service is made available to users.

4.51 It was pointed out that training courses are available from IANS Luxemburg (NAV-DEM, Intro and advanced). They allow users to become familiar with the tool’s many functionalities.

− Navigation infrastructure assessment using DEMETER - Introduction - NAV-DEM-INTRO;
− Navigation infrastructure assessment using DEMETER - Advanced - NAV-DEM-ADV.

4.52 The meeting noted that since DEMETER works globally, non EUROCONTROL's stakeholders and interested parties outside Europe may also request access to it subject to fees.

4.53 The meeting noted that interested States should contact DEMETER@eurocontrol.int for additional information.

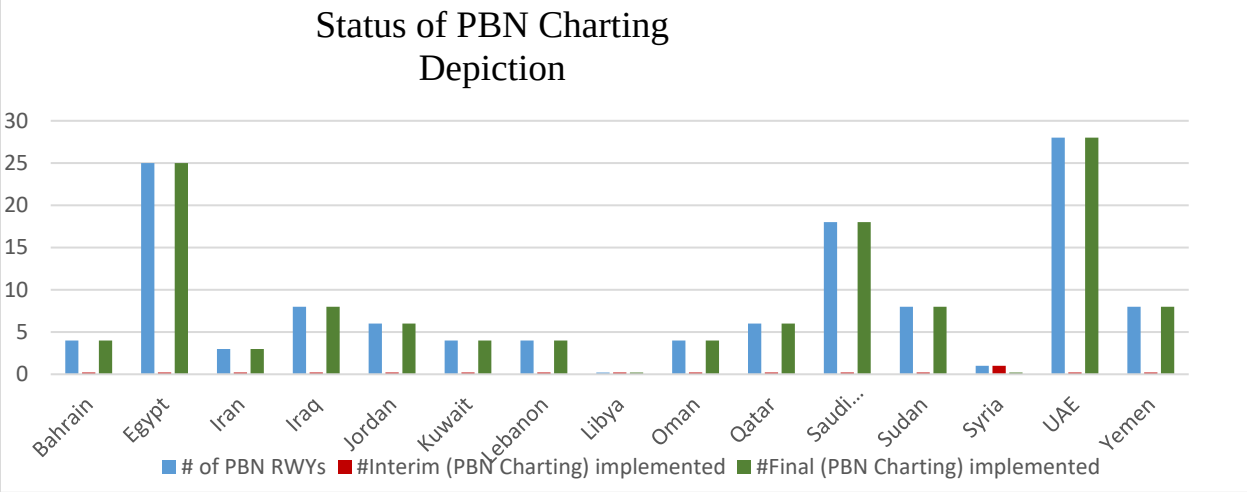
Implementation status of the Regional Transition Plan for RNP APCH Chart Identification from RNAV to RNP

4.54 The subject was addressed in PPT/14 presented by the secretariat. The Secretariat presented the implementation status of the regional transition plan for RNP APCH chart identification from RNAV to RNP in MID Region.

4.55 The meeting recalled the target date to complete the transition as follows:

− Until 30 November 2022, approach charts depicting procedures that meet the RNP APCH navigation specification criteria must include either the term RNP or RNAV (GNSS) in the identification (e.g. RNP RWY 23 or RNAV (GNSS) RWY 23). However, from 1 December 2022, only the term RNP will be permitted.
− Until 30 November 2022, approach charts depicting procedures that meet the RNP AR APCH navigation specification criteria must include either the term RNP (AR) or RNAV (RNP) in the identification (e.g. RNAV (RNP) RWY 23). However, from 1 December 2022, only the term RNP (AR) will be permitted.

4.56 The detailed status of the Transition Plan for RNP APCH Chart Identification from RNAV to RNP in MID region is provided in the chart below.



4.57 The meeting reviewed and updated the status of RNAV to RNP Charting Depiction as indicated in the table below:

State	BHR	EGY	IRN	IRQ	JOR	KWT	LBN	LBY	OMN	QAT	SAU	SDN	SYR	UAE	YEM
# of PBN RWYs	4	25	3	8	6	4	4	0	4	6	18	8	1	28	8
#Interim implemented	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
#Final implemented	4	25	3	8	6	4	4	0	4	6	18	8	0	28	8

4.58 The meeting noted with appreciation the efforts that have been made by MID States for the successful implementation of the MID Transition Plan from RNAV to RNP Charting Depiction reaching 99 per cent of RNP Chart depiction.

4.59 The meeting agreed to include the State not complying with Chart naming Convention (A4 STD 11.6) in the list of Air Navigation Deficiencies.

Implementation status of Resolution A37-11 and APTA THREAD BLOCK 0 & 1 in MID Region

4.60 The subject was addressed in PPT/15 presented by the Secretariat.

4.61 The meeting recalled the key requirement of ICAO Assembly Resolution A37-11, which resolved that States to complete a PBN implementation plan as a matter of urgency to achieve:

a) implementation of approach procedures with vertical guidance (APV) (Baro-VNAV and/or augmented GNSS), including LNAV-only minima, for all instrument runway ends, either as the primary approach or as a back-up for precision approaches by 2016 with intermediate milestones as follows: 30 per cent by 2010, 70 per cent by 2014; and
b) implementation of straight-in LNAV-only procedures, as an exception to a) above, for instrument runways at aerodromes where there is no local altimeter setting available and where there are no aircraft suitably equipped for APV operations with a maximum certificated takeoff mass of 5 700 kg or more.

4.62 The meeting noted that the Percentage of States in MID Region meeting the resolution Targets is 76.6 percent.

4.63 The meeting commended the States' efforts to meet the resolution Targets of 100 percent including Bahrain, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Sudan and UAE and appreciated the progress that had been made by Egypt and Jordan.

4.64 The meeting recalled that the ICAO Assembly Resolution A37-urged States to complete a PBN implementation plan by 2009. To date, Seven out of Fifteen States in the MID Region have submitted plans to the ICAO MID Office.

4.65 The meeting urged States that have not yet done so, to develop and submit PBN implementation plans as soon as possible. States with existing plans should ensure that their plans are robust and are aligned with the Regional plan and ICAO PBN requirements.

4.66 The meeting recalled the priority 1 Elements of APTA Thread along with the associated elements, applicability, performance Indicators, supporting Metrics, and performance Targets as per the revised MID Air Navigation Strategy (MID Doc002) and, reviewed and updated the status of implementation of the APTA THREAD BLOCK 0 & 1 in MID Region as at **Appendix 4B**.

4.67 The meeting noted the status of implementation of the APTA THREAD/Elements as follows:

- The status of implementation of the APTA B0/1 related to PBN Approaches (with basic capabilities) reached 53.3%, which is far behind the regional target of 100% by Dec. 2017.
- The status of implementation of the APTA B0/2 related to PBN SID and STAR procedures (with basic capabilities) reached 53%, which is behind the regional target of 70% by Dec. 2022.
- The status of implementation of the APTA B0/4 and B0/5 reached 65.2% for each element, which is is also far behind the regional target of 100% by Dec. 2021.

- The status of implementation of the APTA B0/7 related to Performance based aerodrome operating minima – Advanced aircraft reached 73.3%, which is above the regional target of 50% by Dec. 2021.

4.68 The meeting urged States behind global and regional targets to expedite implementation of PBN to achieve the global targets of the Assembly Resolution A37-11 and the regional targets of the MID Air Navigation Strategy.

4.69 The meeting recognized that the following challenges, continue to represent the main impediments to the advancement of PBN implementation in the Region:

- PBN Resources: Limited/scarce funding for Regulator/ANSP;
- Lack of training and qualified human resources;
- Lack of airspace and procedure design training;
- Lack of operational approval expertise to obtain proper operational approval and to oversee operators for PBN operations;
- Lack of regulatory expertise to oversee the process leading to procedure publication; and
- Lack of PBN awareness and education to decision makers within States to create the political will to invest.

4.70 The meeting invited States that require support to complete implementation plans and address areas of challenge to inform the ICAO MID Office of their needs in terms of PBN capacity-building and assistance activities.

4.71 Based on the above, the meeting agreed to the following Draft Conclusion:

DRAFT CONCLUSION 7/4: PBN CAPACITY-BUILDING AND ASSISTANCE ACTIVITIES

That, States are encouraged to inform the ICAO MID Office of their needs in terms of PBN capacity-building and required assistance activities, including PBN National Workshops to provide specific guidance related to PBN planning, implementation, including improvement of practices in PBN Design, operational approval and continuous oversight.

States and ANSPs experience in PBN Implementation

4.72 The meeting noted with appreciation the presentations provided by Egypt, Qatar, UAE and Yemen about the Status of PBN implementation, challenges/benefits and plans.

MID Air Navigation Report-2021

4.73 The meeting recalled that the MIDANPIRG/19 meeting, through Conclusion 19/6, urged States to provide the ICAO MID Office, with relevant data necessary for the development of the MID Region Air Navigation Report (2022) (Status of ASBU Implementation), by 1 December 2022. The meeting urged States to provide the ICAO MID Office with required data in a timely manner.

MID eANP Volume III

4.74 The meeting reviewed and updated the MID eANP Volume III (APTA Tables), as at **Appendix 4C**.

REPORT ON AGENDA ITEM 5: WORKING ARRANGEMENTS AND FUTURE WORK PROGRAMME

5.1 The subject was addressed in WP/16, presented by the Secretariat.

5.2 The meeting reviewed the latest version of the PBN SG ToRs **at Appendix 5A** and agreed that they are still current.

5.3 The meeting agreed that the PBN SG/8 meeting be held from 3 to 5 December 2023 back-to-back with the PBN Airspace Design Workshop, 6 – 7 December 2023.

5.4 The meeting noted with appreciation the generous offer received from Qatar to host the PBN SG/8 meeting and PBN Airspace Design Workshop. The exact venue will be communicated with the SG members in due time.

REPORT ON AGENDA ITEM 6: ANY OTHER BUSINESS

OUTCOMES OF THE CCO/CDO WORKSHOP

6.1 The subject was addressed in WP/17 presented by the Secretariat.

6.2 The meeting recalled that MIDANPIRG/19, through Conclusion 19/10, agreed that a Workshop on CCO/CDO implementation be organized in 2022, in collaboration with the MIDFPP, to provide necessary knowledge about the ICAO provisions on the subject and share experience and best practices on CCO/CDO implementation by States/Airspace users.

6.3 The meeting noted that CCO/CDO Implementation Workshop was successfully conducted in Abu Dhabi, UAE during the period 13 – 14 June 2022. The Workshop was generously hosted by GCAA/UAE.

6.4 The meeting noted that the Workshop served as a platform for States, ANSPs, international organizations and industries to share their experiences and lessons learned regarding CCO and CDO implementation.

6.5 The meeting was apprised of the main outcomes of the Workshop, which include:

- Increased awareness on background and implementation guidance for CCO/CDO.
- Gaining insights on the ICAO model processes for implementing CCO/CDO as laid down in Doc. 9931 and Doc 9993 were underlined and noted as an overriding importance.
- Learning and knowledge acquired of the standardization of CCO/CDO procedures for flight safety and the importance to be designed and presented in an unambiguous manner.
- In-depth knowledge of the design of CCO/CDO and airspace changes that may be needed to facilitate a collaborative process involving the ANSP, aircraft operators, airport operators, the aviation regulator, and through appropriate channels, environmental entities, as necessary.
- Acquire a better understanding of the design process as a collaborative effort, thus focused collaboration between ATCOs and Flight Crew when developing new CCO/CDO procedures or operational changes is vital for the implementation’s success and the optimization of the vertical profiles.
- Training and communication to and within stakeholder groups are the foundation of a successful of CCO/CDO implementation.
- Agreement on the harmonized AIP content related to CDO to ensure that identified good practices are shared and that Flight Crews / Flight Planners should always know where CCO/CDO related text may be found in an AIP. A harmonized structure that promotes the sharing of good AIP practices, phraseology, definitions, how CDO is measured etc.
- Need to further develop guidance material to support and expedite the CCO/CDO implementation in MID region.
- The importance of human factors, training and phraseology of ATC staff, highlighted.
- The need for expertise in FMS performance and flight procedure coding conventions to be included on the design team as CCO/CDO procedures will be stored in a navigation database.
- Understanding how important it is to run Simulation of the CCO/CDO procedure during the design phase or prior to flight trials, for controllers and pilots to better understand the issues and limitations that they each face. – Identification of MID FPP support to be provided to facilitate the coordinated implementation of the CCO and the CDO in MID Region.
- Gaining knowledge and experience through hands-on practical exercises (group work), Q&A sessions, scenario challenges, etc.

APPENDICES

APPENDIX 2A

FOLLOW-UP ACTION PLAN ON MIDANPIRG/18 AND 19 CONCLUSIONS & DECISIONS

No.	CONCLUSIONS AND DECISIONS	CONCERNS/ CHALLENGES (RATIONALE)	DELIVERABLE/ TO BE INITIATED BY		TARGET DATE	STATUS/REMARKS
C. 18/22	**ACTION PLAN FOR THE IMPLEMENTATION OF RNAV TO RNP CHART NAMING CONVENTION** That, States, that have not yet done so, be urged to provide the ICAO MID Office with their Action Plan for the implementation of RNAV to RNP Chart naming convention, including the status/plans of implementation by September 2021.	Monitoring and Reporting of RNAV to RNP Chart naming convention implementation and status in the MID Region	State Letter Dashboard of RNAV to RNP Chart naming convention status in the MID Region	ICAO States	Sep. 2021	**Actioned (To be closed)** (File Ref : AN 6/29 – 21/072 dated 19 May 2021)
C. 18/23	**PBN SIDS AND STARS IMPLEMENTATION** That, PBN SIDs and STARs be implemented at all runway ends of international aerodromes listed in the MID Air Navigation Plan as per the agreed targets in the MID Region Air Navigation Strategy (APTA Thread).	Monitoring and Reporting of APTA THREAD /B0/2 Element PBN SID and STAR procedures (with basic capabilities) implementation and status in the MID Region	State Letter APTA THREAD /B0/2 Element PBN SID and STAR procedures (with basic capabilities) status in the MID Region	ICAO States	Sep. 2021	**Actioned (To be closed)** (File Ref : AN 6/28 – 21/076 dated 19 May 2021)

No.	CONCLUSIONS AND DECISIONS	CONCERNS/ CHALLENGES (RATIONALE)	DELIVERABLE/ TO BE INITIATED BY		TARGET DATE	STATUS/REMARKS
C. 19/6	**WEB-BASED MID REGION AIR NAVIGATION REPORT 2022** That, a) States be urged to provide the ICAO MID Office with: i) relevant data necessary for the development of the MID Region Air Navigation Report (2022) (Status of ASBU Implementation), by 1 December 2022; ii) the data necessary for the measurement of the KPIs (01, 02, 13 and 14) for the period June & July 2022, by the 1 October 2022; and b) the MID Air Navigation Report (2022) be presented to the MIDANPIRG/20 for endorsement.	Monitoring and Reporting of ASBU implementation in the MID Region	State Letter Data for WEB-BASED AN Report 2022 WEB-BASED AN Report 2022Air Navigation Report (2022)	ICAO States ICAO	June. 2022 Dec. 2022 Dec. 2022	**Ongoing** (File Ref.: AN 1/7 – 22/116 dated 6 June 2022)
C 19/10	**CONDUCT OF AWORKSHOP ON CCO/CDO IMPLEMENTATION IN 2022** That, a) a Workshop on CCO/CDO implementation be organized in 2022, in collaboration with MID FPP, to provide necessary knowledge about the ICAO provisions on the subject and share experience and best practices on CCO/CDO implementation by States/Airspace users; and b) States and International Organizations are strongly encouraged to participate actively in this Workshop.	Foster the implementation of CCO/CDO in MID Region and share knowledge , experience and best practices on CCO/CDO implementation by States/Airspace users	Workshop	ICAO	2022	**Completed** ICAO MID Workshop on the Continuous Climb Operations (CCO) / Continuous Descent Operations (CDO) Implementation successfully held in Abu Dhabi, UAE, 13 - 14 June 2022
D 19/11	**ESTABLISHMENT OF CCO/CDO AD HOC WORKING GROUP** That, a CCO/CDO Ad Hoc Working Group: a) be established to develop guidance related to the publication of	Support States' ANS to publish	Guidance material related	CCO/CDO Ad Hoc Working Group	2022	**Actioned (To be closed)**

No.	CONCLUSIONS AND DECISIONS	CONCERNS/ CHALLENGES (RATIONALE)	DELIVERABLE/ TO BE INITIATED BY		TARGET DATE	STATUS/REMARKS
	CCO/CDO information (text and Charts) in the AIP, in coordination with the relevant MIDANPIRG and RASG MID subsidiary bodies. b) be composed of: — Chairpersons of the PBN SG*, AIM SG and ATM SG — Mrs. Sheila Brizo, (QCAA Qatar) — Mrs. Lindi-Lee Kirkman (IATA) — Mr. Muhammad Al Juhani (Saudi Arabia) — Secretariat c) present their outcome during the AIM SG/8 and PBN SG/7 meeting. * the rapporteur of the group is the Chairman of the PBN SG.	CCO/CDO information (text and Charts) so text be easily found in the States AIPs	to the publication of CCO/CDO information (text and Charts)			
D 19/12	**ESTABLISHMENT OF THE MID REGION PBN IMPLEMENTATION PLAN AD HOCWORKING GROUP (PBN IP AD-HOCWG)** That, the PBN Implementation Plan Ad Hoc Working Group: a) be established to review the MID Region PBN Implementation Plan (MID Doc 007) and develop a revised version for review by the PBN SG/7 meeting and to the MIDANPIRG/20 meeting for subsequent endorsement, to keep pace with the developments, including the GANP 6th Edition and the MID Region Air Navigation Strategy (MID Doc 002, Edition February 2021); and b) be composed of: − Chairpersons of the PBN SG* and ATM SG − Mr. Saqr Al Marashda (GCAA UAE) − Mr. Hamed Al Zubaidi (GCAA UAE) − Mr. Ahmed Al Shehhi (GCAA UAE) − Mr. Muhammad Al Juhani (Saudi Arabia) − Secretariat * the rapporteur of the group is the Chairman of the PBN SG.	To keep pace with the developments, including the GANP 6th Edition and the MID Region Air Navigation Strategy (MID Doc 002, Edition February 2021);	Updated version of the MID Region PBN Implementation Plan (MID Doc 007)	PBN IP AD-HOCWG	2022	**Actioned (To be closed)**

INTERNATIONAL CIVIL AVIATION ORGANIZATION

MIDDLE EAST AIR NAVIGATION PLANNING AND IMPLEMENTATION REGIONAL GROUP (MIDANPIRG)

MID REGION PERFORMANCE BASED NAVIGATION IMPLEMENTATION PLAN

EDITION MAY, 2023

AMENDMENTS

The MID Region PBN Implementation Plan should be reviewed and updated by the PBN and/or the ATM Sub-Groups and presented to MIDANPIRG for endorsement.
Stakeholders shall submit their proposal for amendment to the Plan to the ICAO MID Regional Office at least three months prior the PBN or the ATM Sub-Groups meetings in order to ensure adequate time for appropriate coordination. The table below provides a means to record all amendments.
An up to date electronic version of the Plan will be available on the ICAO MID Regional Office website.

Amendment Number	Effective Date	Initiated by	Impacted pages	Remarks
1	April 2016	MSG/5		Based on PBN SG/2 outcome
2	December 2018	MSG/6		Based on PBN SG/3, CNS SG/8 and ATM SG/4 meetings
3	**May 2023 2022**	**MIDANPIRG/20**		**Based on PBN SG/7 and ATM SG/8 outcomes**

EXECUTIVE SUMMARY

The MID Region Performance Based Navigation (PBN) Implementation Plan has been developed to harmonize PBN implementation in the MID Region and to addresses the strategic objectives of PBN based on clearly established operational requirements, avoiding equipage of multiple on-board or ground based equipment, avoidance of multiple airworthiness and operational approvals and explains in detail contents relating to potential navigation applications.

The Plan was prepared in accordance with ICAO provisions related to PBN, the Global Air Navigation Plan, Aviation System Block Upgrades (ASBU) methodology, MID Region Air Navigation Plan and the MID Region Air Navigation Strategy. In addition to the Assembly Resolutions and the twelfth Air Navigation Conference (AN-Conf/12) Recommendations related to PBN.

The plan envisages pre- and post-implementation safety assessments and continued availability of conventional air navigation procedures during transition. The plan discusses issues related to implementation which include traffic forecasts, aircraft fleet readiness, adequacy of CNS infrastructure etc. Implementation targets for various categories of airspace for the short term (up to Dec 2024) and for − Medium-to Long-Term (2025-2030+) have been projected in tabular forms to facilitate easy reference.

This Document consolidates, updates and supersedes all previous MID Region PBN Plans.

The parts related to PBN implementation for En-route will be reviewed and updated by the ATM Sub-Group and those related to terminal and approach will be reviewed and updated by the PBN Sub-Group.

Explanation of Terms

The drafting and explanation of this document is based on the understanding of some particular terms and expressions that are described below:

MID Region PBN Implementation Plan - A document offering appropriate guidance for air navigation service providers, airspace operators and users, regulating agencies, and international organizations, on the evolution of navigation, as one of the key systems supporting air traffic management, and which describes the RNAV and RNP navigation applications that should be implemented in the short, medium and long term in the MID Region.

Navigation aid (NAVAID) infrastructure. NAVAID infrastructure refers to space-based and/or ground-based NAVAIDs available to meet the requirements in the navigation specification.

Navigation application. The application of a navigation specification and the supporting NAVAID infrastructure, to routes and procedures, within a defined airspace volume, in accordance with the intended airspace concept.

Note.— The navigation application is one element, along with communications, ATS surveillance and ATM procedures which meet the strategic objectives in a defined airspace concept.

Navigation specification. A set of aircraft and aircrew requirements needed to support Performance-based Navigation operations within a defined airspace. There are two kinds of navigation specification:

RNAV specification. A navigation specification based on area navigation that does not include the requirement for on-board performance monitoring and alerting, designated by the prefix RNAV, e.g. RNAV 5, RNAV 1.

RNP navigation specification. A navigation specification based on area navigation that includes the requirement for on-board performance monitoring and alerting, designated by the prefix RNP, e.g. RNP 4, RNP APCH

Performance-based navigation. Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.

Note.— *Performance requirements are expressed in navigation specifications (RNAV specification, RNP navigation specification) in terms of accuracy, integrity, continuity and functionality needed for the proposed operation in the context of a particular airspace concept.*

REFERENCE DOCUMENTS

The below ICAO Documents provide Guidance related to the PBN implementation:

- Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM) (Doc 4444)
- Procedures for Air Navigation Services — Aircraft Operations, (PANS OPS), Volumes I and II, (Doc 8168)
- Performance-based Navigation (PBN) Manual (Doc 9613)
- Global Navigation Satellite System (GNSS) Manual (Doc 9849)
- Required Navigation Performance Authorization Required (RNP AR) Procedure Design Manual (Doc 9905)
- Continuous Descent Operations (CDO) Manual (Doc 9931)
- Continuous Climb Operations (CCO) Manual (Doc 9993)
- Manual on the Use of Performance-Based Navigation (PBN) in Airspace Design (Doc 9992)
- Quality Assurance Manual for Flight Procedure Design Manual (Doc 9906)
- Performance-based Navigation (PBN) Operational Approval Manual (Doc 9997)
- The Global Air Navigation Plan (GANP) (Doc 9750)
- The European PBN Implementation and Transition Planning Handbook

TABLE OF CONTENTS

ACRONYMS

The acronyms used in this document along with their expansions are given in the following List:

ABAS	Aircraft-Based Augmentation System
AIP	Aeronautical information publication
AIRAC	Aeronautical information regulation and control
AIS	Aeronautical Information System
ANSP	Air navigation service provider
APCH	Approach
APV	Approach Procedures with Vertical Guidance
A-RNP	Advanced RNP
AOC	Air operator certificate
ATC	Air Traffic Control
ASBU	Aviation System Block Upgrades
Baro VNAV	Barometric Vertical Navigation
CCO	Continuous Climb Operations
CDO	Continuous Decent Operations
CNS/ATM	Communication Navigation Surveillance/Air Traffic Management
CPDLC	Controller Pilot Data Link Communications
DME	Distance Measuring Equipment
FIR	Flight Information Region
FMS	Flight Management System
GBAS	Ground-Based Augmentation System
GNSS	Global Navigation Satellite System
GLS	GBAS Landing System
INS	Inertial Navigation System
IRU	Inertial Reference Unit
LNAV/VNAV	Lateral navigation/vertical navigation
LOA	Letter of authorization/letter of acceptance
MEL	Minimum equipment list
MID eANP	MID Region Air Navigation Plan
MIDANPIRG	Middle East Air Navigation Planning and Implementation Regional Group
PANS	Procedures for Air Navigation Services
PBN	Performance Based Navigation
RCP	Required Communication Performance
RNAV	Area Navigation
RNP	Required Navigation Performance
SARP	Standards and Recommended Practices
SBAS	Satellite-Based Augmentation System
SID	Standard Instrument Departure
SOP	Standard operating procedure
STAR	Standard Instrument Arrival
TAWS	Terrain awareness warning system
TMA	Terminal Control Area
VOR	VHF Omni-directional Radio-rangeWGS-84 World Geodetic System — 1984

CHAPTER 1

PERFORMANCE BASED NAVIGATION

1. INTRODUCTION

1.1 The Performance Based Navigation (PBN) concept specifies aircraft RNAV system performance requirements in terms of accuracy, integrity, availability, continuity and functionality needed for the proposed operations in the context of a particular airspace concept, when supported by the appropriate navigation infrastructure. In this context, the PBN concept represents a shift from sensor-based to performance based navigation.

1.2 The main tool for optimizing the airspace structure is the implementation of PBN, which will foster the necessary conditions for the utilization of RNAV and RNP capabilities by a significant portion of airspace users in the MID Region.

1.3 The MID Regional PBN Implementation Plan will serve as guidance for regional projects for the implementation of air navigation infrastructure, as well as for the development of national implementation plans.

1.4 The PBN Manual (Doc 9613) provides guidance on PBN navigation specifications and encompasses two types of approvals: airworthiness, exclusively relating to the approval of aircraft, and operational, dealing with the operational aspects of the operator. PBN approval will be granted to operators that comply with these two types of approval.

1.5 After the implementation of PBN as part of the airspace concept, the total system needs to be monitored to ensure that safety of the system is maintained. A system safety assessment shall be conducted during and after implementation and evidence collected to ensure that the safety of the system is assured.

2. BENEFITS OF PERFORMANCE BASED NAVIGATION

PBN offers a number of advantages over the sensor-specific method of developing airspace and obstacle clearance criteria. For instance, PBN:

a) reduces the need to maintain sensor-specific routes and procedures, and their associated costs. For example, moving a single VOR ground facility can impact dozens of procedures, as VOR can be used on routes, VOR approaches, missed approaches, etc. Adding new sensor-specific procedures will compound this cost, and the rapid growth in available navigation systems would soon make sensor-specific routes and procedures unaffordable;

b) avoids the need for development of sensor-specific operations with each new evolution of navigation systems, which would be cost-prohibitive. The expansion of satellite navigation services is expected to contribute to the continued diversity of RNAV and RNP systems in different aircraft. Some augmentations support PBN operations, and the introduction of new core-constellations and signals will further improve GNSS performance. The use of GNSS/inertial integration is also expanding;

c) allows for more efficient use of airspace (route placement including the use of free routing, fuel efficiency, noise abatement, etc.);

d) clarifies the way in which RNAV and RNP systems are used; and

e) facilitates and harmonizes the operational authorization process for operators by providing a limited set of navigation specifications intended for global use.

3. DRIVERS AND OBJECTIVES OF PBN IMPLEMENTATION

3.1. The PBN Implementation has two main drivers:

- ICAO Resolution 37/11: Urges all States to implement RNAV and RNP air traffic services (ATS) routes and approach procedures in accordance with the ICAO PBN concept laid down in the Performance-based Navigation (PBN) Manual (Doc 9613). This resolution covers all phases of flight, and only specifies the kind of specification for the final approach phase.
- ICAO Doc 9750, the Global Air Navigation Plan (GANP) identifies PBN as the "highest priority" and outlines implementation issues involving PBN planning and implementation as part of the Aviation System Block Upgrades (ASBUs;

3.2. The MID Region PBN Implementation Plan has been developed in line with ICAO Resolution 37/11: adopted by ICAO Assembly in its 37th Session held in September 2010 and has the following strategic objectives:

a) ensure that implementation of the navigation element of the MID CNS/ATM system is based on clearly established operational requirements;

b) avoid unnecessarily imposing the mandate for multiple equipment on board or multiple systems on ground;

c) avoid the need for multiple airworthiness and operational approvals for intra and inter-regional operations; and

d) avoid an eclipsing of ATM operational requirements by commercial interests, generating unnecessary costs to States , and airspace users.

3.3. Furthermore, the Plan is being updated to provide a high-level strategy for the evolution of the navigation applications to be implemented in the MID Region for the short term (up to Dec 2024) and for Medium-to Long-Term (2025-2030+).

3.4. The plan is intended to assist the main stakeholders of the aviation community to plan the future transition and their investment strategies. For example, Operators can use this Regional Plan to derive future equipage and additional navigation capability investment; Air Navigation Service Providers can plan a gradual transition for the evolving ground infrastructure, Regulating Agencies will be able to anticipate and plan for the criteria that will be needed in the future.

4. PLANNING PRINCIPLES

4.1. The implementation of PBN in the MID Region shall be based on the following principles:

a) implementation of PBN navigation specification and granting operational approvals should be in compliance with ICAO provisions;

b) Pre- and post–implementation safety assessments will be conducted in accordance with ICAO provisions to ensure the application and maintenance of the established target level of safety;

c) continued application of conventional air navigation procedures during the transition period, to guarantee the operation by users that are not PBN capable;

d) Airspace users' consultation, dedicated studies and safety cases are required to mitigate the withdrawal of existing ground networks.

e) Strategy for rationalization of conventional radio navigation aids and evolution toward supporting performance-based navigation should be guided by the Guidelines and Principles as at attachment H, Annex 10, Vol I

f) Users/operational requirements should be taken into consideration while planning

for PBN implementation;

g) States should assess the benefit accrued from the implementation of PBN procedures and ATS Routes, and to report the environmental benefits to the ICAO MID Regional Office.

5. PBN OPERATIONAL REQUIREMENTS AND IMPLEMENTATION STRATEGY

5.1. Introduction of PBN should be consistent with the Global Air Navigation Plan. Moreover, PBN Implementation shall be in full compliance with ICAO SARPs and PANS.

En-route

5.2. Considering the traffic characteristic and CNS/ATM capability of the Region, the en-route operations can be classified as oceanic, continental, and local/domestic. In principle, each classification of the en-route operations should adopt, but not be limited to single PBN navigation specification. This implementation strategy should be applied by the States in coordination with airspace users and as coordinated at regional level to ensure harmonization.

5.3. For that MIDANPIRG established the PBN Sub-group to develop a PBN implementation plan for the MID Region and to address related regional PBN implementation issues. Accordingly, States are encouraged to work cooperatively bilaterally, multilaterally and with the PBN Sub-group to ensure regional harmonization of PBN implementation.

5.4. In areas where operational benefits can be achieved and appropriate CNS/ATM capability exists or can be provided for a more accurate navigation specification, States are encouraged to introduce more accurate navigation specification on the basis of coordination with stakeholders and affected neighbouring States.

5.5. Similarly, in circumstances where affected States are agreeable to completing an implementation in advance of the timelines specified in this plan, early implementation is encouraged on the basis of coordination between affected States and airspace users.

Terminal

5.6. Terminal operations have their own characteristics, taking into account the applicable separation minima between aircraft and between aircraft and obstacles. It also involves the diversity of aircraft, including low-performance aircraft flying in the lower airspace and conducting arrival and departure procedures on the same path or close to the paths of high-performance aircraft.

5.7. In this context, the States should develop their own national plans for the implementation of PBN in Terminal Control Areas (TMAs), based on the MID Region PBN Implementation Plan, seeking the harmonization of the application of PBN and avoiding the need for multiple operational approvals for intra- and inter-regional operations, and the applicable aircraft separation criteria.

5.8. Improved management of climb/descent flight profiles, together with the use of PBN, provides safer and more cost-effective operations in terminal areas. PBN procedures contribute to the increased use of CCO/CDO, which improves flight efficiency and reduces fuel consumption, CO2 emissions and noise. MID States are encouraged to implement CCO and CDO, where appropriate, as part of their PBN implementation plans, in line with the provisions of the Continuous Descent Operations (CDO) Manual (Doc 9931) and the Continuous Climb Operations (CCO) Manual (Doc 9993) , and in accordance with the MID Region Air Navigation Strategy (Doc002).

Approach

5.9. ICAO Assembly Resolution 37-11 calls for an ‘implementation of approach procedures with vertical guidance (APV) (Baro-VNAV and/or augmented GNSS), including LNAV-only minima, for all instrument runway ends, either as the primary approach or as a back-up for precision approaches …’,

5.10. It is not foreseen that SBAS or GBAS augmentation systems will be available in the MID Region for the development of approach procedures in the period considered herein.

5.11. Approach procedures with vertical guidance (APV) should be implemented for all Instrument Runway End, with the purpose of increasing safety with stabilized approaches and reducing the possibility of CFIT. Priority will be given to their implementation at international airports and other controlled airports as determined by the competent authority of each State. The navigation specifications to be applied will be RNP APCH and A-RNP, with baro-VNAV for vertical guidance.

5.12. Sates are encouraged to plan for the implementation of RNP AR procedures, which can provide significant operational and safety advantages over other area navigation (RNAV) procedures by incorporating additional navigational accuracy, integrity and functional capabilities to permit operations using reduced obstacle clearance tolerances that enable approach and departure procedures to be implemented in circumstances where other types of approach and departure procedures are not operationally possible or satisfactory. Procedures implemented in accordance with RNP AR Procedure Design Manual (Doc 9905) allow the exploitation of high-quality, managed lateral and vertical navigation (VNAV) capabilities that provide improvements in operational safety and reduced un-stabilized approaches and Controlled Flight Into Terrain (CFIT) risks.

5.13. The design of RNP APCH procedures with RF leg will be encouraged, with a view to shortening approach paths, with the corresponding fuel and CO2 savings.

5.14. ATC workload should be taken into account while developing PBN Approach Procedures. One possible way to accomplish this would be by co-locating the Initial Approach Waypoint (IAW) for PBN with the Initial Approach Fix (IAF) of the conventional approaches. States should phase-out conventional non-precision approach procedures at a certain point when deemed operationally suitable and taking in consideration GNSS integrity requirements.

CHAPTER 2

CNS INFRASTRUCTURE

Within an airspace concept, PBN requirements will be affected by the communications, ATS surveillance and ATM services, the NAVAID infrastructure, and the functional and operational capabilities needed to meet the ATM application. PBN requirements also depend on what reversionary, conventional navigation techniques are available and what degree of redundancy is required to ensure adequate continuity of functions.

States (ANSPs) shall ensure that the navigation, surveillance and communications infrastructure has the capabilities needed to support the intended PBN operation.

1. NAVIGATION INFRASTRUCTURE

1.1. The NAVAID infrastructure refers to ground- or space-based NAVAIDs. Conventional ground-based NAVAIDs include DME and VOR. The PBN concept requires that NAVAID Infrastructure provides position information to the aircraft through an on-board area navigation system. Space-based NAVAIDS include GNSS elements.

1.2. Performance Based Navigation provides procedures that can be flown with a variety of navigation aids and airborne sensors. Each navigation specification stipulates which positioning sensor may be used for a particular navigation application as indicated in the PBN Manual Doc 9613, Volume II table (II-A-1-4).

1.3. As such, each combination of navigation aid and sensor needs to be assessed to see if the requirements to support a specific procedure are met. Consequently, an ANSP can declare which navigation infrastructures are available to support the navigation specification in a given airspace.

1.4. Detailed guidance on the relationship between navigation infrastructure, navigation specifications and their application in a specific airspace are contained in ICAO Doc 9613, Performance Based Navigation Manual.

Global Navigation Satellite System (GNSS)

1.5. PBN procedures should always allow the use of GNSS.

1.6. Because GNSS (and ABAS using RAIM in particular) is available on a worldwide basis, infrastructure assessment for GNSS differs significantly from terrestrial navigation aids. Relevant aspects such as safety assessment and GNSS performance assessment are described in the GNSS Manual, ICAO Doc 9849 (2017 edition, especially chapters 7.5 and 7.8.2). In addition to considering constellation performance, the ANSP should assess that the space weather and radio frequency interference environment is satisfactory for the planned procedures, and implement vulnerability mitigation measures, if appropriate (chapter 5 and appendix F of the GNSS Manual). Further guidance on assessing and measuring GNSS interference is contained in ICAO Doc 8071, Testing of Radio Navigation Aids. During outages of GNSS and depending on available NAVAID facilities, ANSPs may find it useful to consider suspending planned routine maintenance activities to ensure the availability of an alternate source of navigation.

1.7. The processes in the Performance Based Navigation (PBN) Manual are defined with the aim to either identify which navigation specification can be applied in order to serve the operational requirements given by the constraints of a particular airspace environment. This involves lining up a navigation application with the appropriate navigation specification and navigation infrastructure.

1.8. States need to evaluate the navigation infrastructure both in the initial process of

identifying which navigation specification can support the application given the infrastructure, as well as in the final implementation once it has been agreed which specification to use. For each navigation specification, there are specific requirements on the infrastructure. The infrastructure assessment determines if these requirements are met.

1.9. Appropriate tools should be used to assess navigation infrastructure. While the assessment could be conducted using manual analysis and flight inspection, the use of a software tool is recommended in order to make the assessment more efficient. The software tool should be tailored to allow evaluating the infrastructure in light of the requirements imposed by a specific navigation specification. Such a tool could, but does not have to be integrated with procedure design tools.

1.10. In general, RNAV assessment tools should include a 3D terrain model with sufficient resolution and accuracy to allow predicting the line of sight visibility of NAVAIDS along a procedure service volume, including an analysis of their respective subtended angles and a variety of other geometric constraints.

1.11. Closely related to RNAV infrastructure assessment is RNAV instrument flight procedure validation, which looks at flyability and other operational aspects. It differs from RNAV flight inspection, which focuses on signal in space compliance with ICAO Annex 10 only. Guidance on instrument flight procedure validation is contained in ICAO DOC 9906 (Quality Manual, esp. Vol 5). Guidance on ground analysis and flight testing for PBN is discussed in chapter 8 of ICAO DOC 8071 Manual on Testing of Radio Navigation Aids, Volume 1 (2018 edition). Further context on the evolution of conventional navigation aids as a complementary infrastructure to GNSS in support of PBN can be found in ICAO Annex 10, Attachment H.

1.12. Note: Guidance material concerning for RNAV 1 Infrastructure Assessment is contained Doc EUROCONTROL- -GUID-114 accessible through the link : https://www.eurocontrol.int/sites/default/files/2021-07/eurocontrol-guidelines-rnav-1-infrastructure-assessment-20.pdf. .

2. SURVEILLANCE INFRASTRUCTURE

2.1. For RNAV operations, States should ensure that sufficient surveillance coverage is provided to assure the safety of the operations. Because of the on-board performance monitoring and alerting requirements for RNP operations, surveillance coverage may not be required. Details on the surveillance requirements for PBN implementation can be found in the ICAO PBN Manual (Doc 9613) and ICAO PANS-ATM (Doc 4444), and information on the current surveillance infrastructure in the MID can be found in the MID eANP and in the MID Region Surveillance Plan.

3. COMMUNICATION INFRASTRUCTURE

3.1. Implementation of RNAV and RNP routes includes communication requirements. Details on the communication requirements for PBN implementation can be found in ICAO PANS-ATM (Doc 4444), ICAO RCP Manual (Doc 9869), and ICAO Annex 10. Information on the current communication infrastructure in the MID can also be found in MID eANP.

4. PERFORMANCE-BASED COMMUNICATION AND SURVEILLANCE (PBCS)

4.1 The performance-based communication and surveillance (PBCS) concept provides objective operational criteria to evaluate emerging communication and surveillance technologies suited for the evolving needs of ATM functions. Once these criteria are established and accepted, the implementation of a specific ATM function, including its performance in technical and human terms, can be assessed against these operational criteria to determine its feasibility.

4.2 The PBCS concept is aligned with that of PBN. While the PBN concept applies required navigation Performance (RNP) and area navigation (RNAV) specifications to the navigation element,

the PBCS concept applies the required communication performance (RCP) and required surveillance performance (RSP) specifications to communication and surveillance elements, respectively. Each RCP/RSP specification includes criteria attributed to the components of the communication and surveillance systems involved.

4.3 Where beneficial, the RCP, RNP/RNAV and RSP specifications may be applied to the communication, navigation and surveillance elements to ensure the operational system and its components perform in accordance with the specifications.

CHAPTER 3

IMPLEMENTATION OF PBN

1. ATM OPERATIONAL REQUIREMENTS

1.1. The Global ATM Operational Concept (Doc 9854) makes it necessary to adopt an airspace concept able to provide an operational scenario that includes route networks, minimum separation standards, assessment of obstacle clearance, and a CNS infrastructure that satisfies specific strategic objectives, including safety, access, capacity, efficiency, and environment.

1.2. During the planning phase of any implementation of PBN, States should gather inputs from all aviation stakeholders to obtain operational needs and requirements. These needs and requirements should then be used to derive airspace concepts and to select appropriate PBN navigation specification

1.3. In this regard, the following should be taken into consideration:

a) Traffic and cost benefit analyses
b) Necessary updates on automation
c) Operational simulations in different scenarios
d) ATC personnel training
e) Flight plan processing
f) Flight procedure design training to include PBN concepts and ARINC-424 coding standard
g) Enhanced electronic data and processes to ensure appropriate level of AIS data accuracy, integrity and timeliness
h) WGS-84 implementation in accordance with ICAO Annex 15 provisions
i) Uniform classification of adjacent and regional airspaces, where practicable
j) RNAV/RNP applications for SIDs and STARs
k) Coordinated RNAV/RNP routes implementation
l) RNP approach with vertical guidance
m) Establish PBN approval database

1.4. The implementation of PBN additional functionalities/path terminator should be considered while planning/designing new procedures such as:

- the Radius to Fix (RF) for approach;
- Fixed Radius Transition (FRT) for En-route; and

2. AIRSPACE CONCEPT

2.2. The PBN Manual describes the Airspace Concept as a formal way to set out and respond to operational airspace change requirements. As such, the development of the Airspace Concept is a key step in PBN implementation because PBN ATS routes, SIDs/STARs are the backbone of the airspace organisation.

2.3. During the planning phase of any implementation of PBN routes, States should gather inputs from all aviation stakeholders to obtain operational needs and requirements. These needs and requirements should then be used to derive airspace concepts and to select appropriate PBN navigation specification.

3. IMPLEMENTATION ROADMAP:

En-route

Short Term (up to Dec 2024):

Oceanic Airspace
Considering the traffic complexity in oceanic airspace and the need to increase the levels of safety at the transfer points between the FIRs involved, RNP10 (RNAV10) is applied in oceanic airspaces, such as Muscat and Sana'a FIRs over Arabian Sea. This navigation specification and its applications rely primarily on GNSS to support the navigation element of the airspace concept.

Continental en-route
RNAV 5 implementation should be completed by December 2024.

Based on operational requirements, States may choose to implement RNAV 1 routes to enhance efficiency of airspace usages and support closer route spacing, noting that appropriate communication and surveillance coverage is provided. Details of these requirements are provided in the PBN manual (Doc 9613) and PANS-ATM (Doc 4444).

Medium- Term (2025-2030):

Oceanic Airspace
Along with the implementation of RNP10 (RNAV10), migration to RNP4 would be considered for implementation at the identified Airspace to support 30 NM lateral and the 30 NM longitudinal distance-based separation minima in a procedural oceanic airspace. It does not require any ground-based NAVAID infrastructure. GNSS is the primary navigation sensor to support RNP 4, either as a stand-alone navigation system or as part of a multi-sensor system.

Continental en-route
RNAV 5 specifications are applicable to all ATS routes in MID region.
RNAV 1 would be considered for implementation for en-route continental/local domestic operations.

Long Term (2031+): (TBD)

Terminal

Short Term (up to Dec 2024):

RNAV 1 or RNP 1 SIDs and STARs consistent with APTA-B0/2 should be completed at all RWYs ENDs at International Aerodromes.

Improved management of climb/descent flight profiles, together with the use of PBN, provides safer and more cost-effective operations in terminal areas. PBN procedures contribute to the increased use of CCO/CDO, which improves flight efficiency and reduces fuel consumption, CO2 emissions and noise. States should take into account CCO/CDO operations in the design of SIDs/STARs, within the possibilities of each scenario considered. CCO and CDO consistent with APTA B0/4 and APTA B0/5 should be implemented at the defined TMAs, in accordance with the State PBN implementation Plans, the MID Region Air Navigation Strategy and the MID ANP.

Note: CDOs are not necessarily related to the implementation of STARs. Member States may create specific procedures to ensure the implementation of CDOs in airspace with low air traffic volume, without applying STARs.

Medium- Term (2025-2030):

RNAV 1or RNP 1 SIDs and STARs consistent with APTA-B0/2 will be implemented in all TMAs, as appropriate.

CCO and CDO should be implemented at all RWYs ENDs at International Aerodromes. When implemented, CCO and CDO should be consistent with APTA B0/4 and APTA B0/5.

Note: CDOs are not necessarily related to the implementation of STARs. Member States may create specific procedures to ensure the implementation of CDOs in airspace with low air traffic volume, without applying STARs.

Long Term (2031+): (TBD)

Approach

Short Term (up to Dec 2024):

Implementation of PBN Approaches (with basic capabilities) consistent with APTA-B0/1 for all instrument runway ends at the international aerodromes listed in the MID ANP except where approach procedures with vertical guidance (APV) is not feasible. RNP APCH with LNAV minima only should be deployed.

The introduction of PBN Approaches (with advanced capabilities) consistent with APTA-B1/1 would be limited to selected airports, to allow for the introduction of more flexible approaches including the use of RF legs within the Final Approach Segment where operational benefits can be obtained.

Medium- Term (2025-2030):

Implementation of PBN Approaches (with basic capabilities) consistent with APTA-B0/1 for all instrument runway ends except where approach procedures with vertical guidance (APV) is not feasible. RNP APCH with LNAV minima only should be deployed.

Widespread implementation of PBN Approaches (with advanced capabilities) consistent with APTA-B1/1 continue for airports where there are operational benefits.

Long Term (2031+): (TBD)

2.1. Table 3-2 summarizes the implementation targets of each PBN navigation specification in the MID Region:

Table 3-2. SUMMARY TABLE AND IMPLEMENTATION TARGETS

Airspace	Short Term (up to Dec 2024)		Medium- Term (2025-2030)		Long Term (2031+)	
	Navigation Specification Preferred	**Performance Indicators/ Targets**	**Navigation Specification Acceptable**	**Performance Indicators/ Targets**	**Navigation Specification Acceptable**	**Performance Indicators/ Targets**
En-route – Oceanic	RNAV 10 or RNP 4*	70 % by 2024	RNAV 10 RNP 4*	100% by 2030	**TBD**	
En-route – Continental	RNAV 5 RNAV 1	70 % by 2024	RNAV 5 RNAV 1	100% by 2030		
En-route - Local / Domestic	RNAV 5 RNAV 1	70 % by 2024	RNAV 5 RNAV 1	100% by 2030		
TMA – Arrival	RNAV 1 or RNP 1	70% by 2022 and 100% by 2024 for STARs at International Aerodromes	RNAV 1 or RNP 1	100% by 2030 for STARs at all TMAs, as appropriate		
TMA – Departure	RNAV 1 or RNP 1	70% by 2022 100% by 2024 for SIDs at International Aerodromes	RNAV 1 or RNP 1	100% by 2030 SIDs at all TMAs, as appropriate		
Approach	RNP APCH to LNAV/VNAV and LNAV minima only, as required. (PBN Approaches with basic capabilities)	100% by 2022 for all instrument runway ends at the international aerodromes	RNP APCH to LNAV/VNAV and LNAV minima only, as required. (PBN Approaches with basic capabilities) for all instrument runway ends	100% by 2030		
	RNP AR APCH (PBN Approaches with advanced capabilities)	100% by 2024 at selected Airports in MID	Widespread implementation of RNP AR APCH (PBN Approaches with advanced capabilities)	*W/A*		

– *W/A: where applicable/defined Airspace, in accordance with State PBN implementation Plans, the MID Region Air Navigation Strategy and the MID ANP.* – ** would be considered for implementation at the identified Airspace/TMAs* – *When no month is specified means by the end of the year.*	–	–

CHAPTER 4

SAFETY ASSESSMENT AND MONITORING

1. NEED FOR SAFETY ASSESSMENT

4.1. To ensure that the introduction of PBN en-route applications within the MID Region is undertaken in a safe manner and in accordance with relevant ICAO provisions, implementation shall only take place following the conduct of a safety assessment that has demonstrated that an acceptable level of safety will be met. This assessment may also need to demonstrate levels of risk associated with specific PBN en-route implementation. Additionally, ongoing periodic safety reviews shall be undertaken where required in order to establish that operations continue to meet the target levels of safety

2. ROLES AND RESPONSIBILITIES

4.2. To demonstrate that the system is safe, it will be necessary that the implementing agency – a State or group of States - ensures that a safety assessment and, where required, ongoing monitoring of the PBN en-route implementation are undertaken.

4.3. In undertaking a safety assessment to enable en-route implementation of PBN, a State or the implementing agency shall:

a) establish and maintain a registry of PBN approvals;

b) monitor aircraft horizontal-plane navigation performance and the occurrence of large navigation errors and report results;

c) conduct safety and readiness assessments;

d) monitor operator compliance with State approval requirements after PBN implementation; and

e) initiate necessary remedial actions if PBN requirements are not met.

CHAPTER 5
OPERATIONAL APPROVAL

1. OPERATIONAL APPROVAL REQUIREMENTS

5.1. Operational approval is usually the responsibility of the regulatory authority of the State of the Operator for commercial air transport operations and the State of Registry for general Aviation (GA) operations. For certain operations, GA operators may not be required to follow the same authorization model as commercial operators.

5.2. The operational approval assessment must take account of the following:

a) aircraft eligibility and airworthiness compliance;

b) operating procedures for the navigation systems used;

c) control of operating procedures (documented in the OM);

d) flight crew initial training and competency requirements and continuing competency requirements;

e) dispatch training requirements; and

f) control of navigation database procedures. Where a navigation database is required, operators need to have documented procedures for the management of such databases. These procedures will define the sourcing of navigation data from approved suppliers, data validation procedures for navigation databases and the installation of updates to databases into aircraft so that the databases remain current with the AIRAC cycle. (For RNP AR applications, the control of the terrain database used by TAWS must also be addressed.)

Aircraft eligibility

5.3. An aircraft is eligible for a particular PBN application provided there is clear statement in:

a) the Type Certificate (TC); or
b) the Supplement Type Certificate (STC); or
c) the associated documentation — Aircraft Flight manual (AFM) or equivalent document; or
d) a compliance statement from the manufacturer that has been approved by the State of Design and accepted by the State of Registry or the State of the Operator, if different.

5.4. The operator must have a configuration list detailing the pertinent hardware and software components and equipment used for the PBN operation.

5.5. The TC is the approved standard for the production of a specified type/series of aircraft. The aircraft specification for that type/series, as part of the TC, will generally include a navigation standard. The aircraft documentation for that type/series will define the system use, operational limitations, equipment fitted and the maintenance practices and procedures. No changes (modifications) are permitted to an aircraft unless the CAA of the State of Registry either approves such changes through a modification approval process, STC or accepts technical data defining a design change that has been approved by another State.

5.6. For recently manufactured aircraft, where the PBN capability is approved under the TC, there may be a statement in the AFM limitations section identifying the operations for which the aircraft

is approved. There is also usually a statement that the stated approval does not itself constitute an approval for an operator to conduct those operations. Alternate methods of achieving the airworthiness approval of the aircraft for PBN operations is for the aircraft to be modified in accordance with approved data. (e.g. STC, minor modification, etc.)

5.7. One means of modifying an aircraft is the approved Service Bulletin (SB) issued by the aircraft manufacturer. The SB is a document approved by the State of Design to enable changes to the specified aircraft type and the modification then becomes part of the type design of the aircraft. Its applicability will normally be restricted by the airframe serial number. The SB describes the intention of the change and the work to be done to the aircraft. Any deviations from the SB require a design change approval; any deviations not approved will invalidate the SB approval. The State of Registry accepts the application of an SB and changes to the maintenance programme, while the State of the Operator accepts changes to the maintenance programme and approves changes to the MEL, training programmes and Operations specifications. An Original Equipment Manufacturer (OEM) SB may be obtained for current production or out of production aircraft.

5.8. In respect of PBN, in many cases for legacy aircraft, while the aircraft is capable of meeting all the airworthiness requirements, there may be no clear statement in the applicable TC or STC or associated documents (AFM or equivalent document). In such cases, the aircraft manufacturer may elect to issue an SB with appropriate AFM update or instead may publish a compliance statement in the form of a letter, for simple changes, or a detailed aircraft type specific document for more complex changes. The State of Registry may determine that an AFM change is not required if it accepts the OEM documentation. **Table 5-1** lists the possible scenarios facing an operator who wishes to obtain approval for a PBN application, together with the appropriate courses of action.

Table 5-1

Scenario	Aircraft certification status	Actions by operator/owner
1	Aircraft designed and type certificated for PBN application. Documented in AFM, TC or the STC	No action required, aircraft eligible for PBN application
2	Aircraft equipped for PBN application but not certified. No statement in AFM. SB available from the aircraft manufacturer	Obtain SB (and associated amendment pages to the AFM) from the aircraft manufacturer
3	Aircraft equipped for PBN application. No statement in AFM. SB not available. Statement of compliance available from the aircraft manufacturer	Establish whether the statement of compliance is acceptable to the regulatory authority of the State of Registry of the aircraft
4	Aircraft equipped for PBN application. No statement in AFM. SB not available. Statement of compliance from the aircraft manufacturer not available	Develop detailed submission to State of Registry showing how the existing aircraft equipment meets the PBN application requirements
5	Aircraft not equipped for PBN application	Modify aircraft in accordance with the aircraft manufacturer's SB or develop a major modification in conjunction with an approved design organization in order to obtain an approval from the State of Registry (STC).

Operating procedures

5.9. The Standard operating procedure (SOP) must be developed to cover both normal and non-normal (contingency) procedures for the systems used in the PBN operation. The SOP must address:

a) preflight planning requirements including the MEL and, where appropriate, RNP/RAIM prediction;
b) actions to be taken prior to commencing the PBN operation;
c) actions to be taken during the PBN operation; and
d) actions to be taken in the event of a contingency, including the reporting of significant incidents

GA pilots must ensure that they have suitable procedures/checklists covering all these areas

Control of operating procedures

5.10. The SOP must be adequately documented in the OM and checklists

Flight crew and dispatch training

5.11. A flight crew and dispatch training programme for the PBN operation must cover all the tasks associated with the operation and provide sufficient background to ensure a comprehensive understanding of all aspects of the operation. The operator must have adequate records of course completion for flight crew, flight dispatchers and maintenance personnel.

Control of navigation database procedures

5.12. If a navigation database is required, the procedures for maintaining currency, checking for errors and reporting errors to the navigation database supplier must be documented in the maintenance manual by commercial operators

2. DOCUMENTATION OF OPERATIONAL APPROVAL

2.1. Operational approval may be documented as an endorsement of the Air operator certificate (AOC) through:

a) Operations specification, associated with the AOC; or
b) amendment to the OM; or
c) LOA.

2.2. During the validity of the operational approval, the CAA should consider any anomaly reports received from the operator or other interested party. Repeated navigation error occurrences attributed to a specific piece of navigation equipment may result in restrictions on use or cancelation of the approval for use of that equipment. Information that indicates the potential for repeated errors may require modification of an operator’s training programme. Information that attributes multiple errors to a particular pilot or crew may necessitate remedial training and checking or a review of the operational approval.

2.3. The State may determine that a GA aircraft may operate on a PBN route/procedure provided that the operator has ensured that the aircraft has suitably approved equipment (is eligible), the navigation database is valid, the pilot is suitably qualified and current with respect to the equipment, and adequate procedures (checklists) are in place.

3. STATE REGULATORY MATERIAL

3.1. Individual States must develop national regulatory material which addresses the PBN applications relevant to their airspace or relevant to operations conducted in another State by the State's operators or by aircraft registered in that State. The regulations may be categorized by operation, flight phase, area of operation and/or navigation specification. Approvals for commercial operations should require specific authorization.

4. APPROVAL PROCESS

General

3.2. Since each operation may differ significantly in complexity and scope, the project manager and the operational approval team need considerable latitude in taking decisions and making recommendations during the approval process. The ultimate recommendation by the project manager and decision by the DGCA regarding operational approval should be based on the determination of whether or not the applicant:

a) meets the requirements established by the State in its air navigation regulations;
b) is adequately equipped; and
c) is capable of conducting the proposed operation in a safe and efficient manner.

3.3. The complexity of the approval process is based on the inspector's assessment of the applicant's proposed operation. For simple approvals, some steps can be condensed or eliminated. Some applicants may lack a basic understanding of what is required for approval. Other applicants may propose a complex operation, but may be well prepared and knowledgeable. Because of the variety in proposed operations and differences in an applicant's knowledge, the process must be thorough enough and flexible enough to apply to all possibilities.

Phases of the approval process

Step 1 — Pre-application phase

3.4. The operator initiates the approval process by reviewing the requirements; establishing that the aircraft, the operating procedures, the maintenance procedures and the training meet the requirements; and developing a written proposal to the regulator. A number of regulators have published "job aids" to assist the operator in gathering the necessary evidence to support the approval application. At this stage a pre-application meeting with the regulator can also be very beneficial. If the proposed application is complex, the operator may need to obtain advice and assistance from OEMs or other design organizations, training establishments, data providers, etc.

Step 2 — Formal application phase

3.5. The operator submits a formal, written application for approval to the CAA, which appoints a project manager either for the specific approval or generally for PBN approvals.

Step 3 — Document evaluation phase

3.6. The CAA project manager evaluates the formal, written application for approval to determine whether all the requirements are being met. If the proposed application is complex, the project manager may need to obtain advice and assistance from other organizations such as regional agencies or experts in other States.

Step 4 — Demonstration and inspection phase

3.7. During a formal inspection by the project manager (assisted as necessary by a CAA team), the operator demonstrates how the requirements are being met.

Step 5 — Approval phase

3.8. Following a successful formal inspection by the CAA, approval is given through:

a) Operations specification, associated with the AOC; or
b) amendment to the OM; or
c) LOA.

Some PBN applications may not require formal approval for GA operations — this will be determined by the State of Registry.

Note.— The approval procedure described above consists of a simplified process of the certification guidance contained in Part III of the Manual of Procedures for Operations Inspection, Certification and Continued Surveillance *(Doc 8335).*

5. FOREIGN OPERATIONS

5.1. A State undertakes, in accordance with Article 12 to the Convention, to ensure that every aircraft flying over or maneuvering within its territory shall comply with the rules and regulations relating to the flight and maneuver of aircraft there in force. Article 33 to the Convention provides that certificates of airworthiness and certificates of competency and licenses issued, or rendered valid, by the State in which an aircraft is registered, shall be recognized by other States, provided that the requirements under which such certificates or licenses were issued or rendered valid are equal to or above the minimum standards which may be established by ICAO. This requirement for recognition is now extended by Annex 6, Part I and Part III, Section II, such that Contracting States shall recognize as valid an AOC issued by another Contracting State, provided that the requirements under which the certificate was issued are at least equal to the applicable Standards specified in Annex 6, Part I and Part III.

5.2. States should establish procedures to facilitate the application by foreign operators for approval to operate into their territory. States should be careful in their requirements for applications, to request only details relevant to the evaluation of the safety of the operations under consideration and their future surveillance. When evaluating an application by an operator from another State to operate within its territory a State will examine both the safety oversight capabilities and record of the State of the Operator and, if different, the State of Registry, as well as the operational procedures and practices of the operator. This is necessary in order for the State, in the terms of Article 33 to the Convention, to have confidence in the validity of the certificates and licenses associated with the operator, its personnel and aircraft, in the operational capabilities of the operator and in the level of certification and oversight applied to the activities of the operator by the State of the Operator.

5.3. The operator will need to make applications to each State into or over which it is intended to operate. The operator will also need to keep its own CAA, as the authority of the State of the Operator, informed of all applications to operate in other States. Applications should be made direct to the CAAs of the States into which it is intended to operate. In some cases it will be possible to download information and instructions for making an application and the necessary forms from a website maintained by the CAA in question.

5.4. Because functional and performance requirements are defined for each navigation specification, an aircraft approved for an RNP specification is not automatically approved for all RNAV

specifications. Similarly, an aircraft approved for an RNP or RNAV specification having a stringent accuracy requirement (e.g. RNP 0.3 specification) is not automatically approved for a navigation specification having a less stringent accuracy requirement (e.g. RNP 4).

CHAPTER 6

NATIONAL PBN IMPLEMENTATION STRATEGY & PLAN

1. INTRODUCTION

6.1 The ICAO Assembly Resolution 37-11 stressed the need for a National PBN Implementation Plan.

6.2 In order to assist States to achieve the ICAO objectives set out in Resolution 37-11, this chapter provides step-by-step guidance to States on how to establish their own national plan in a standard consistent way in relation to Assembly Resolutions, ICAO SARPs, GANP, GASP, Regional plans and other related documents.

6.3 Whilst it is not possible to provide a tailor made PBN implementation plan, and even less desirable to create a 'one-size fits all' plan, what is possible is to provide a generic architecture showing one example of such a PBN Implementation Plan and suggests what such a plan could contain.

6.4 This chapter provides a skeleton 'architecture' or 'outline' which could assist States and ANSPs formulate an ICAO National PBN Implementation Plan.

2. PLANNING PRINCIPLES

6.5 The following principles should be applied in drawing up the State PBN implementation plan.

Global harmonization: all regulations, navigation requirements, and flight procedures designs should comply with ICAO's PBN Manual, SARPs, PANS, and other international standards

Regional harmonization: there should be no conflict with MID region's PBN implementation plan.

Smooth transition: continued application of conventional air navigation procedures during the transition period, to guarantee availability by users that are not RNAV- and/or RNP-equipped;

CBA: conduct of cost-benefit analyses to justify the implementation of the RNAV and/or RNP concepts in each particular airspace;

Safety Assessment: conduct of pre- and post-implementation safety assessments to ensure the application and maintenance of the established target levels of safety.

Collaborative Consultation: collaborative consultation is critical between the regulatory authority, the service provider, other stakeholders, and the users of the air navigation services.

3. STATES' UPDATE ON PBN IMPLEMENTATION

6.6 States should provide the ICAO MID Regional Office with their updated PBN Implementation Plans on an annual basis (by end of December) in accordance with MSG Conclusion 4/11. The States' National PBN Implementation Plan should be published on the MID Office website as per MSG Conclusion 6/21, to facilitate consultation and planning of airspace users.

4. STATE PBN IMPLEMENTATION STRATEGY

6.7 It is expected that the State (CAA) will develop the policy and PBN Implementation Strategy and the Service Provider will define a deployment plan to deliver the policy goals. The PBN Implementation Plan should be completed in collaborative-partnership approach.

6.8 To ensure the civil aviation authority's (CAA's) plans are complementary to the ANSP and industry plans, they should begin with a shared broad strategic direction. This could start in the form of PBN Implementation Strategy that evolves into a State PBN implementation plan

6.9 A Sample State PBN Implementation Strategy is provided at the PBN Portal through the link https://pbnportal.eu/epbn/main/Implementing-PBN/Implementation-Considerations/Sample-State-PBN-Implementation-Strategy.html

5. NATIONAL PBN IMPLEMENTATION PLAN-CONTENT

The National PBN Implementation Plan should contain the following:

a) Executive Summary

The ANSP may elect to explain why a PBN implementation plan is being developed. It is highly likely that the NSPs will want to highlight why the changes are required and what the expected benefits will be for the airspace users.

b) Drivers for PBN Implementation

Within this section, the ANSP could identify the specific reasons why an airspace change is needed.

c) Analysis of Current Operations

Detailing the current operations would provide the Service Providers with the initial input to the PBN implementation. This detailing of current operations is known as the Reference Scenario is described in Activity 4 of the Manual on the Use of Performance-Based Navigation (PBN) in Airspace Design (Doc 9992). The Reference Scenario includes all existing ATS Routes, SIDs/STARs, airspace volumes, ATC sectorization, air traffic data and as well as all the existing coordination agreements. Description and analysis of the Reference Scenario is a crucial exercise. The Reference Scenario provides a 'baseline' to understand and analyze the current operations, within the national airspace and airports could cover the following elements:

Airspace:

a. Structure
b. Airspace Classification
c. Sectorisation
d. TMA and CTR
e. Route Structure

Aircraft Fleet

f. Fleet Equipage Assessment
g. Categories of Airspace Users
h. Aircraft certification
i. Crew operational approval

Communication Infrastructure

j. Communications coverage and limitations

Navigation Infrastructure

k. Conventional Navigation Aids
l. Precision Approach Landing Aids
m. GNSS status

Surveillance Infrastructure

n. Surveillance coverage and limitations

ATM capabilities (existing and planned)

WGS-84 implementation

d) PBN Operational Requirements & Implementation Strategy

Selection of applicable Navigation Specifications

- Based on National Objectives
- Ensuring Regional Harmonization
- Aligned with ICAO implementation strategies / policies

Realistic Near / Medium / Long term implementation roadmaps for:

- Enroute Operations
    - Key traffic flows and City Pairs Identified
    - Harmonization and interoperability across FIR
- Terminal Operations
    - Specific terminal areas selected for implementation
- Instrument Approaches
    - Designation of airports eligible for RNP APCH and APV
    - Selection of airports requiring RNP AR APCH (based on operational justification

e) Transition Strategies

Considerations for mandate or phased update of procedures or equipage

Infrastructure

- NAVAID phase-out and replacement strategy (VOR / DME / NDB / ILS)
- Requirements for continued application of conventional navigation procedures to accommodate non-RNAV / RNP users
- Provisions for contingency operations

Procedure

- Strategy for mixed-mode operations

- Integration with ATM system

Personnel

- Promotion and training for ATC, Designers and Inspectors

f) Safety Assessment & Monitoring Requirements

Need for a safety assessment

Pre and Post safety assessment in accordance with ICAO provisions

Periodic safety reviews undertaken by the State or group of States where required

Required Metrics

g) Expected Operational Benefits - specific implementations

High-level business case for implementation near / mid long-term)

- END -

MID REGION PBN IMPLEMENTATION STATUS

Legend		
		Not implemented
		Not feasible
		Not applicable
		Data not available
		Implemented

State	Airport	RWY ends	LNAV	LNAV/ VNAV	RNAV SID	RNAV STAR	CDO	CCO	PB-AOM
Bahrain	OBBI	RWY 12R							
		RWY 12L							
		RWY 30R							
		RWY 30L							
Egypt	HEBA	RWY 14R							
		RWY 32L							
		RWY 32							
	HESN	RWY 17							
		RWY 35							
	HECA	RWY 05L							
		RWY 23R							
		RWY 05C							
		RWY 23C							
		RWY 05R							
		RWY 23L							
	HEGN	RWY 16L							
		RWY 34R							
		RWY 16R							
		RWY 34L							

State	Airport	RWY ends	LNAV	LNAV/ VNAV	RNAV SID	RNAV STAR	CDO	CCO	PB-AOM
	HELX	RWY 02							
		RWY 20							
		RWY 02L							
		RWY 20R							
	HEMA	RWY 15							
		RWY 33							
	HESH	RWY 04L							
		RWY 22R							
		RWY 04R							
		RWY 22L							
Iran	OIKB	RWY 03R							
		RWY 21L							
	OIFM	RWY 08L							
		RWY 26R							
		RWY 08R							
		RWY 26L							
	OIMM	RWY 13L							
		RWY 31R							
		RWY 13R							
		RWY 31L							
	OISS	RWY 29L							
		RWY 29R							

State	Airport	RWY ends	LNAV	LNAV/ VNAV	RNAV SID	RNAV STAR	CDO	CCO	PB-AOM
	OITT	RWY 12L							
		RWY 30R							
	OIIE	RWY 11L							
		RWY 29R							
	OIII	RWY 11R							
		RWY 29L							
		RWY 11L							
		RWY 29R							
	OIYY	RWY 13							
		RWY 31							
	OIZH	RWY 17R							
		RWY 35L							
Iraq	ORNI	RWY 28							
		RWY 10							
	ORBI	RWY 15R							
		RWY 33L							
		RWY 15L							
		RWY 33R							
	ORMM	RWY 32							
		RWY 14							
	ORER	RWY 18							
		RWY 36							
	ORSU	RWY 31							
		RWY 13							

State	Airport	RWY ends	LNAV	LNAV/ VNAV	RNAV SID	RNAV STAR	CDO	CCO	PB-AOM
Jordan	OJAM	RWY 06							
		RWY 24							
	OJAI	RWY 08R							
		RWY 26L							
		RWY 08L							
		RWY 26R							
	OJAQ	RWY 01							
		RWY 19							
Kuwait	OKBK	RWY 15R							
		RWY 33L							
		RWY 15L							
		RWY 33R							
Lebanon	OLBA	RWY 03							
		RWY 21							
		RWY 16							
		RWY 17							
Libya	HLLB	RWY 15L							
		RWY 33R							
		RWY 15R							
		RWY 33L							
	HLLS	RWY 13							

State	Airport	RWY ends	LNAV	LNAV/ VNAV	RNAV SID	RNAV STAR	CDO	CCO	PB-AOM
		RWY 31							
	HLLT	RWY 09							
		RWY 27							
Oman	OOMS	RWY 08L							
		RWY 26R							
	OOSA	RWY 07							
		RWY 25							
Qatar	OTBD	RWY 15							
		RWY 33							
	OTHH	RWY 16L							
		RWY 34R							
		RWY 16R							
		RWY 34L							
Saudi Arabia	OEDF	RWY 16L							
		RWY 34R							
		RWY 16R							
		RWY 34L							
	OEJN	RWY 16R							
		RWY 34L							
		RWY 16C							
		RWY 34C							
		RWY 16L							

State	Airport	RWY ends	LNAV	LNAV/ VNAV	RNAV SID	RNAV STAR	CDO	CCO	PB-AOM
		RWY 34R							
	OEMA	RWY 17							
		RWY 35							
		RWY 18							
		RWY 36							
	OERK	RWY 15L							
		RWY 33R							
		RWY 15R							
		RWY 33L							
Sudan	HSOB	RWY 01							
		RWY 19							
	HSSK	RWY 18							
		RWY 36							
	HSNN	RWY 04							
		RWY 22							
	HSPN	RWY 16							
		RWY 34							
Syria	OSAP	RWY 09							
		RWY 27							
	OSDI	RWY 05L							
		RWY 23R							
		RWY 05R							
		RWY 23L							

State	Airport	RWY ends	LNAV	LNAV/ VNAV	RNAV SID	RNAV STAR	CDO	CCO	PB-AOM
	OSLK	RWY 17							
		RWY 35							
UAE	OMAA	RWY 13 R							
		RWY 31 L							
		RWY 13 L							
		RWY 31 R							
	OMAD	RWY 13							
		RWY 31							
	OMAL	RWY 01							
		RWY 19							
	OMDW	RWY 12							
		RWY 30							
		RWY 13							
		RWY 31							
	OMDB	RWY 12L							
		RWY 30R							
		RWY 12R							
		RWY 30L							
	OMFJ	RWY 11							
		RWY 29							
	OMRK	RWY 16							
		RWY 34							
	OMSJ	RWY 12							

State	Airport	RWY ends	LNAV	LNAV/ VNAV	RNAV SID	RNAV STAR	CDO	CCO	PB-AOM
		RWY 30							
Yemen	OYAA	RWY 08							
		RWY 26							
	OYHD	RWY 03							
		RWY 21							
	OYRN	RWY 06							
		RWY 24							
	OYSN	RWY 18							
		RWY 36							
	OYTZ	RWY 01							
		RWY 19							

APTA : Improve arrival and departure operations

TABLE -APTA 3-1

EXPLANATION OF THE TABLE

Column	
1	Name of the State / International Aerodromes' Location Indicator
2	Runway Designator
3, 4, 5	Conventional Approaches (ILS / VOR or NDB)
6, 7, 8, 9	Elements of APTA B0/1 PBN Approaches with basic capabilities (Status of PBN Plan and implementation of LNAV, LNAV/VNAV), where: Y – Yes, implemented N – No, not implemented
10	PBN Runway: where any type of PBN approach is implemented
12, 15	Elements of APTA B0/2 PBN SID and STAR procedures (with basic capabilities) Y – Yes, implemented N – No, not implemented
11, 13	Elements of APTA B0/5 CCO basic (Status of implementation of CCO) per runway end and per aerodrome, where: Y – Yes, implemented N – No, not implemented
14, 16	Elements of APTA B0/4 CDO basic (Status of implementation of CDO) per runway end and per aerodrome, where:

	Y – Yes, implemented
	N – No, not implemented
17	Elements of APTA B0/7 Performance based aerodrome operating minima – Advanced aircraft (Compliance with the requirements for PB AOM) per State, where:
	FC – Fully compliant
	NC – Not compliant
18	Remarks

Int'l AD (Ref. MID ANP) (1)	RWY (2)	Conventional Approaches (3)			APTA (6)				CCO (11)				CDO (14)				PBAOM (17)	Remarks (18)
		Precision (4)		VOR or NDB (5)	PBN PLAN (7)	LNAV (8)	LNAV / VNAV (9)	PBN RWY (10)	RNAV SID (12)		CCO (13)		RNAV STAR (15)		CDO (16)			
		xLS	CAT		Update date				RWY	AD	RWY	AD	RWY	AD	RWY	AD		
BAHRAIN																		
OBBI	12L	ILS	II	VORDME		Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	
	12R			VORDME		Y	Y	Y	N	N	N	N	N	N	N	N		
	30L			VORDME		Y	Y	Y	N	N	N	N	N	N	N	N		
	30R	ILS	II	VORDME		Y	Y	Y	N	N	Y	N	Y	N	Y	N		
Total	4	2		4	Y	4	4	4	0	0	2	1	2	1	2	1	-	

%		50		100	Y	100	100	100	0	0	50	100	50	100	50	100	100	
EGYPT																		
HEBA	14					Y	N	Y	N	Y	N	N	N	N	N	N		
	32	ILS	I			Y	N	Y	Y	N	N	N	N	N	N	N		
HESN	17			VORDME		Y	Y	Y	Y	Y	N	N	Y	Y	N	N		
	35	ILS	I	VORDME		Y	Y	Y	Y	N	N	N	Y	N	N	N		
HECA	05L	ILS	I	VORDME		Y	N	Y	N	N	N	N	N	N	N	N		
	05C	ILS	II	VORDME		Y	N	Y	N	N	N	N	N	N	N	N		
	05R	ILS	II			Y	N	Y	N	N	N	N	N	N	N	N		
	23L	ILS	II	VORDME		Y	N	Y	N	N	N	N	N	N	N	N		
	23C	ILS	II	VORDME		Y	N	Y	N	N	N	N	N	N	N	N		
	23R	ILS	I	VORDME		Y	N	Y	N	N	N	N	N	N	N	N	Y	
HEGN	16L			VORDME		Y	Y	Y	N	Y	N	N	N	Y	N	N		
	16R			VORDME		Y	Y	Y	N	N	N	N	N	N	N	N		
	34L			VORDME		Y	Y	Y	Y	N	N	N	Y	N	N	N		
	34R	ILS	I	VORDME		Y	Y	Y	Y	N	N	N	Y	N	N	N		
HELX	2	ILS	I	VORDME		Y	Y	Y	Y	Y	N	N	Y	Y	N	N		
	20	ILS	I	VORDME		Y	Y	Y	Y	N	N	N	Y	N	N	N		
HEMA	15			VORDME		Y	N	Y	Y	Y	N	N	Y	Y	N	N		
	33			VORDME		Y	N	Y	Y	N	N	N	Y	N	N	N		
HESH	04L	ILS	I	VORDME		Y	Y	Y	Y	Y	N	N	Y	Y	N	N		

	04R			VORDME		Y	Y	Y	Y	N	N	N	Y	N	N	N		
	22L					Y	Y	Y	Y	N	N	N	Y	N	N	N		
	22R					Y	Y	Y	Y	N	N	N	Y	N	N	N		
Total	22	12		17	Y	22	12	22	13	6	0	0	12	5	0	0	-	
%		55		77	Y	100	55	100	59	86	0	0	55	71	0	0	100	
I.R. IRAN																		
OIKB	03L					N	N	N	N	N	N	N	N	N	N	N		
	03R			VORDME / NDB		N	N	N	N	N	N	N	N	N	N	N		
	21L	ILS	I	VORDME / NDB		N	N	N	N	N	N	N	N	N	N	N		
	21R					N	N	N	N	N	N	N	N	N	N	N		
OIFM	08L			VORDME / NDB		N	N	N	N	N	N	N	N	N	N	N		
	08R			VORDME / NDB		N	N	N	N	N	N	N	N	N	N	N	Y	
	26L			VORDME / NDB		N	N	N	N	N	N	N	N	N	N	N		
	26R	ILS	I	VORDME / NDB		N	N	N	N	N	N	N	N	N	N	N		
OIMM	13L			VORDME		N	N	N	N	N	N	N	N	N	N	N		
	13R			VORDME		N	N	N	N	N	N	N	N	N	N	N		

	31L			VORDME / NDB		N	N	N	N	N	N	N	N	N	N	N	
	31R	ILS	I	VORDME / NDB		N	N	N	N	N	N	N	N	N	N	N	
OISS	11L					N	N	N	N	N	N	N	N	N	N	N	
	11R					N	N	N	N	N	N	N	N	N	N	N	
	29L	ILS	I	VORDME / NDB		N	N	N	N	N	N	N	N	N	N	N	
	29R			VORDME / NDB		N	N	N	N	N	N	N	N	N	N	N	
OITT	12L			VORDME / NDB		N	N	N	N	N	N	N	N	N	N	N	
	12R			VORDME / NDB		N	N	N	N	N	N	N	N	N	N	N	
	30L	ILS	I	VORDME / NDB		N	N	N	N	N	N	N	N	N	N	N	
	30R	ILS	I	VORDME / NDB		N	N	N	N	N	N	N	N	N	N	N	
OIIE	11L	ILS	I	VORDME		Y	Y	Y	N	N	N	N	Y	Y	N	N	
	11R			VORDME		N	N	N	N	N	N	N	Y	N	N	N	
	29L					N	N	N	N	N	N	N	Y	N	N	N	
	29R	ILS	II	VORDME		Y	Y	Y	N	N	N	N	Y	Y	N	N	
OIII	11L			VORDME		N	N	N	N	N	N	N	N	N	N	N	

	11R			VORDME		N	N	N	N	N	N	N	N	N	N	N		
	29L	ILS	I	VORDME		Y	Y	Y	N	N	N	N	N	N	N	N		
	29R			VORDME		N	N	N	N	N	N	N	N	N	N	N		
OIZH	17R					Y	Y	Y	N	N	N	N	Y	Y	N	N		
	17L					N	N	N	N	N	N	N	N	N	N	N		
	35L	ILS	I	VORDME		Y	Y	Y	N	N	N	N	Y	N	N	N		
	35R					N	N	N	N	N	N	N	N	N	N	N		
OIYY	13			VORDME		Y	N	Y	N	N	N	N	N	N	N	N		
	31	ILS	I	VORDME		Y	Y	Y	N	N	N	N	N	N	N	N		
Total	34	11		26	Y	7	6	7	0	0	0	0	6	3	0	0	-	
%		32		76	Y	21	18	21	0	0	0	0	18	9	0	0	100	
IRAQ																		
ORBI	15L	ILS	I	VORDME		N	N	N	N	N	N	N	N	N	N	N	N	
	15R					Y	N	Y	N	N	N	N	N	N	N	N		
	33L					Y	N	Y	N	N	N	N	N	N	N	N		
	33R	ILS	I	VORDME		N	N	N	N	N	N	N	N	N	N	N		
ORMM	14			VORDME		N	N	N	N	N	N	N	N	N	N	N		
	32	ILS	I	VORDME		N	N	N	N	N	N	N	N	N	N	N		
ORER	18	ILS	II			Y	N	Y	N	N	N	N	N	N	N	N		
	36	ILS	I			Y	N	Y	N	N	N	N	N	N	N	N		

ORSU	13	ILS	I	VOR		Y	N	Y	N	N	N	N	N	N	N	N		
	31	ILS	I	VOR		Y	N	Y	N	N	N	N	N	N	N	N		
ORNI	10	ILS	I	VOR		Y	Y	Y	Y	Y	N	N	Y	Y	N	N		
	28	ILS	I	VOR		Y	Y	Y	Y	N	N	N	Y	N	N	N		
ORBM	15					N	N	N	N	N	N	N	N	N	N	N		
	33					N	N	N	N	N	N	N	N	N	N	N		
Total	14	9		8	N	8	2	8	2	1	0	0	2	1	0	0	-	
%		64		57		57	14	57	14	17	0	0	14	16.67	0	0	0	
JORDAN																		
OJAI	08L	ILS	I	NDB		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
	08R			NDB		Y	Y	Y	Y	N	N	N	Y	N	N	N		
	26L	ILS	II	VOR		Y	Y	Y	Y	N	N	N	Y	N	N	N		
	26R	ILS	I	VORDME		Y	Y	Y	Y	N	N	N	Y	N	N	N	Y	
OJAQ	1	ILS	I			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
	19	ILS	I			Y	N/A	Y	Y	N	N	N	Y	N	N	N		LNAV/VNAV not feasible
Total	6	5		4	Y	6	6	6	6	2	2	2	6	2	2	2	-	
%		83		67		100	100	100	100	100	33	100	100	100	33	100	100	
KUWAIT																		
OKBK	15L	ILS	II	VORDME		Y	Y	Y	Y	Y	N	N	Y	Y	N	N	N	
	15R	ILS	II	VORDME		Y	Y	Y	Y	N	N	N	Y	N	N	N		

	33L	ILS	II	VORDME		Y	Y	Y	Y	N	N	N	Y	N	N	N		
	33R	ILS	II	VORDME		Y	Y	Y	Y	N	N	N	Y	N	N	N		
Total	4	4		4	Y	4	4	4	4	1	0	0	4	1	0	0	-	
%		100		100		100	100	100	100	100	0	0	100	100	0	0	0	
LEBANON																		
OLBA	3	ILS	I	VORDME		Y	N	Y	N	N	Y	Y	Y	Y	Y	Y		
	16	ILS	I	VORDME		Y	N	Y	N	N	Y	N	Y	N	Y	N		
	17	ILS	I	VORDME / NDB		Y	N	Y	N	N	Y	N	Y	N	Y	N		
	21					Y	N	Y	N	N	Y	N	Y	N	Y	N	Y	
	34	N/A		N/A		N	N	N	N	N	Y	N	N	N	N	N		Not used for landing
	35	N/A		N/A		N	N	N	N	N	Y	N	N	N	N	N		Not used for landing
Total	4	5		5	N	4	0	4	0	0	6	1	4	1	4	1	-	
%		125		125		100	0	100	0	0	150	100	100	100	100	100	100	
LIBYA																		
HLLB	15R			VORDME		N	N	N	N	N	N	N	N	N	N	N		
	15L			VORDME		N	N	N	N	N	N	N	N	N	N	N		
	33R			VORDME		N	N	N	N	N	N	N	N	N	N	N	Y	
	33L	ILS	I	VORDME		N	N	N	N	N	N	N	N	N	N	N		
HLLS	13	ILS	I	VORDME		N	N	N	N	N	N	N	N	N	N	N		

	31			VORDME		N	N	N	N	N	N	N	N	N	N	N		
HLLT	9			VORDME		N	N	N	N	N	N	N	N	N	N	N		
	27	ILS	I	VORDME		N	N	N	N	N	N	N	N	N	N	N		
Total	8	3		8	N	0	0	0	0	0	0	0	0	0	0	0	-	
%		38		100		0	0	0	0	0	0	0	0	0	0	0	100	
OMAN																		
OOMS	08L	ILS	I	VORDME		Y	Y	Y	Y	Y	N	N	Y	Y	N	N		
	26R	ILS	I	VORDME		Y	Y	Y	Y	N	N	N	Y	N	N	N	Y	
OOSA	7	ILS	I	VORDME		Y	Y	Y	Y	Y	N	N	Y	Y	N	N		
	25	ILS	I	VORDME		Y	Y	Y	Y	N	N	N	Y	N	N	N		
Total	4	4		4	Y	4	4	4	4	2	0	0	4	2	0	0	-	
%		100		100		100	100	100	100	100	0	0	100	100	0	0	100	
QATAR																		
OTBD	15	ILS	I	VORDME		Y	N/A	Y	Y	Y	Y	Y	Y	Y	Y	Y		LNAV/VNAV not feasible
	33	ILS	II/III	VORDME/NDB		Y	Y	Y	Y	N	Y	N	Y	N	Y	N	Y	CCO/CDO tactically achieved
OTHH	16L	ILS	I/II/III	VORDME		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		CCO/CDO tactically achieved

	16R	ILS	I/II/III	VORDME		Y	Y	Y	Y	N	Y	N	Y	N	Y	N		CCO/CDO tactically achieved
	34L	ILS	I/II/III	VORDME		Y	Y	Y	Y	N	Y	N	Y	N	Y	N		CCO/CDO tactically achieved
	34R	ILS	I/II/III	VORDME		Y	Y	Y	Y	N	Y	N	Y	N	Y	N		CCO/CDO tactically achieved
Total	6	6		6	Y	6	6	6	6	2	6	2	6	2	6	2	-	
%		100		100		100	100	100	100	100	100	100	100	100	100	100	100	
SAUDI ARABIA																		
OEDF	16L	ILS	I	-		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
	16R	ILS	I	VORDME		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
	34L	ILS	I	VORDME		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
	34R	ILS	I	VORDME		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
OEJN	16L	ILS	I			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
	16C	ILS	I			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
	16R	ILS	I	VORDME		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
	34L	ILS	I	VORDME		NP	NP	N	Y	Y	Y	Y	Y	Y	Y	Y		(NP): Not Published due to operationally unacceptable

																		OCA
	34C	ILS	I	VORDME		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
	34R	ILS	I			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
OEMA	17	ILS	I	VORDME		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
	18			VORDME		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
	35	ILS	I	VORDME		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
	36	ILS	I	VORDME		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
OERK	15L	ILS	I	VORDME		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
	15R	ILS	I	VORDME		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
	33L	ILS	I			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
	33R	ILS	I	VORDME		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Total	18	17		13	Y	18	18	18	18	18	18	18	18	18	18	18		
%		94		72	Jan 2023	100	100	100	100	100	100	100	100	100	100	100	100	
SUDAN																		
HSNN	4					Y	N	Y	Y	Y	N	N	Y	Y	N	N		
	22					Y	N	Y	Y	N	N	N	Y	N	N	N		
HSOB	1					Y	N	Y	Y	Y	N	N	Y	Y	N	N	N	
	19					Y	N	Y	Y	N	N	N	Y	N	N	N		
HSSS	18	ILS	I	VORDME		Y	N	Y	Y	Y	N	N	Y	Y	N	N		
	36	ILS	I	VORDME		Y	N	Y	Y	N	N	N	Y	N	N	N		

HSPN	17			VORDME / NDB		Y	N	Y	Y	Y	N	N	Y	Y	N	N		
	35	ILS	I	VORDME / NDB		Y	N	Y	Y	N	N	N	Y	N	N	N		
Total	8	4		4	Y	8	0	8	8	4	0	0	8	4	0	0	-	
%		50		50		100	0	100	100	100	0	0	100	100	0	0	0	
SYRIA																		
OSAP	9			VORDME		N	N	N	N	N	N	N	N	N	N	N		
	27	ILS	II	VORDME / NDB		N	N	N	N	N	N	N	N	N	N	N		
OSLK	17	ILS	I	VORDME / NDB		N	N	N	N	N	N	N	N	N	N	N		
	35					N	N	N	N	N	N	N	N	N	N	N	N	
OSDI	05L			VOR		N	N	N	N	N	N	N	N	N	N	N		
	05R	ILS	II	VORDME / NDB		N	N	N	N	N	N	N	N	N	N	N		
	23L			VORDME / NDB DME		N	N	N	N	N	N	N	N	N	N	N		
	23R	ILS	II	VORDME		Y	Y	Y	N	N	N	N	N	N	N	N		
Total	8	4		7		1	1	1	0	0	0	0	0	0	0	0	-	
%		50		88		13	13	13	0	0	0	0	0	0	0	0	0	
UNITED ARAB EMIRATES																		
OMAA	13L	ILS	II			AR	AR	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	RNP AR

	13R	ILS	I	VOR		AR	AR	Y	Y	N	Y	N	Y	N	Y	N	RNP AR
	31L	ILS	II/III	VOR		AR	AR	Y	Y	N	Y	N	Y	N	Y	N	RNP AR
	31R	ILS	II			AR	AR	Y	Y	N	Y	N	Y	N	Y	N	RNP AR
OMAD	13			VORDME		Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	
	31	ILS	I	VORDME		Y	N	Y	Y	N	Y	N	Y	N	Y	N	
OMAL	1	ILS	I	VOR		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
	19			VOR		Y	Y	Y	Y	N	Y	N	Y	N	Y	N	
OMDB	12L	ILS	I/II/III			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
	12R	ILS	I/II/III			Y	Y	Y	Y	N	Y	N	Y	N	Y	N	
	30L	ILS	I/II/III			Y	Y	Y	Y	N	Y	N	Y	N	Y	N	
	30R	ILS	I/II/III			Y	Y	Y	Y	N	Y	N	Y	N	Y	N	
OMDW	12	ILS	II/III			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
	30	ILS	II/III			Y	Y	Y	Y	N	Y	N	Y	N	Y	N	
OMFJ	11					N/A	N/A	N/A	Y	Y	Y	Y	N	Y	N	Y	Not used for landing
	29	ILS	I	VOR		Y	Y	Y	Y	N	Y	N	Y	N	Y	N	
OMRK	16			VOR		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
	34	ILS	I	VOR		Y	Y	Y	Y	N	Y	N	Y	N	Y	N	
OMSJ	12	ILS	I			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	RNP AR

	30	ILS	II			Y	Y	Y	Y	N	Y	N	Y	N	Y	N		RNP AR
Total	20	16		9	Y	20	18	20	20	8	20	8	19	8	19	8	-	
%		80		45		100	90	100	100	100	100	100	95	100	95	100	100	
YEMEN																		
OYAA	8	ILS	I	VORDME		N	N	N	N	N	N	N	N	N	N	N	Y	
	26			VORDME		N	N	N	N	N	N	N	N	N	N	N		
OYHD	3			VOR		N	N	N	N	N	N	N	N	Y	N	N		
	21			VOR / NDB		Y	N	Y	N	N	N	N	Y	N	N	N		
OYRN	6					N	N	N	N	N	N	N	N	N	N	N		
	24			VORDME		N	N	N	N	N	N	N	N	N	N	N		
OYSN	18	ILS	I	VORDME/NDB		Y	Y	Y	Y	Y	N		Y	Y	N	N		
	36			VOR		Y	Y	Y	Y	N	N	N	Y	N	N	N		
OYTZ	1					N	N	N	N	N	N	N	N	N	N	N		
	19					N	N	N	N	N	N	N	N	N	N	N		
Total	10	2		7		3	2	3	2	1	0	0	3	2	0	0	-	58
%		20		70		30	20	30	20	20	0	0	30	40	0	0	100	
Results					Plans	LNAV	LNAV/VNAV	PBN RWYs		SID		CCO		STAR		CDO		

Total	168	104		126	13	106	83	115	79	30	49	14	94	35	51	17	10 PBN APV + 101 ILS (111/166)
Percentage (%)		63		76	87	64	50	69	48	45	30	24	57	52	31	24	67% RWY Ends with Vertical guidance
58	Aerodromes																
Note. 6 RNP AR Approach were implemented in UAE (OMAA and OMSJ)																	

APPENDIX 5A

PERFORMANCE BASED NAVIGATION SUB-GROUP (PBN SG)

1. Terms of Reference

1.1 The terms of reference of the PBN Sub-Group are:

a) ensure that the implementation of PBN in the MID Region is coherent and compatible with developments in adjacent regions, and is in line with the Global Air Navigation Plan (GANP), the Aviation System Block Upgrades (ASBU) framework and the MID Region Air Navigation Strategy;

b) monitor the status of implementation of the MID Region PBN-related ASBU threads/elements included in the MID Region Air Navigation Strategy as well as other required PBN supporting infrastructure, identify the associated difficulties and deficiencies and provide progress reports, as required;

c) keep under review the MID Region PBN performance objectives/priorities, develop action plans to achieve the agreed performance targets and propose changes to the MID Region PBN plans/priorities, as appropriate;

d) seek to achieve common understanding and support from all stakeholders involved in or affected by the PBN and GNSS developments/activities in the MID Region;

e) provide a platform for harmonization of developments and deployments of PBN concentrating on PBN for approach and terminal areas;

f) monitor and review the latest developments in the area of PBN and procedure design, provide expert inputs for PBN-related issues; and propose solutions for meeting ATM operational requirements;

g) monitor and review the latest GNSS developments and activities;

h) provide regular progress reports to MIDANPIRG concerning its work programme; and

i) review periodically its Terms of Reference and propose amendments, as necessary.

1.2 In order to meet the Terms of Reference, the PBN Sub-Group shall:

a) provide necessary assistance and guidance to States to ensure harmonization and interoperability in line with the GANP, the MID ANP and ASBU framework;

b) provide necessary inputs to the MID Region Air Navigation Strategy through the monitoring of the agreed Key Performance Indicators related to PBN;

c) identify and review those specific deficiencies and problems that constitute major obstacles to the provision of efficient PBN implementations, and recommend necessary remedial actions;

d) review and support the MID Flight Procedure Programme activities, as required, including coordination of capacity building activities related to training and qualification of the procedure design personnel and all other personnel involved in PBN implementation;

e) monitor the progress of studies, projects, trials and demonstrations by the MID Region States, and other ICAO Regions in PBN and GNSS; and

f) Coordinate with relevant MIDANPIRG and RASG-MID Subsidiary bodies issues with common interests.

2. Composition

2.1 The Sub-Group is composed of:

a) MIDANPIRG Member States;

b) concerned International and Regional Organizations as observers; and

c) other representatives from provider States and Industry may be invited on ad hoc basis, as observers, when required.

3. WORKING ARRANGEMENTS

3.1 The Chairperson, in close co-operation with the Secretary, shall make all necessary arrangements for the most efficient working of the Subgroup. The Subgroup shall at all times conduct its activities in the most efficient manner possible with a minimum of formality and paper work (paperless meetings). Permanent contact shall be maintained between the Chairperson, Secretary and Members of the Subgroup to advance the work. Best advantage should be taken of modern communications facilities, particularly video-conferencing (Virtual Meetings) and e-mails.

3.2 Face-to-face meetings will be conducted when it is necessary to do so.

ATTACHMENT A

Seventh Meeting of the Performance Based Navigation Sub-Group (PBN SG/7)

(Virtual Meeting, 5 – 6 December 2022, 09:00 – 11:00 UTC)

List of Participants

State Org/Industries	Contact	Title
Bahrain	Mr. Ahmed Yousif Al Malki	A/Chief Air Traffic Managment
	Mr. Mohammed Yaqoob Sabt	Air Traffic Controller
Egypt	Mr. Tayseer Mohamed Abdel Kareem	ATS General Manager
	Mr. Ehab Raslan Mohamed	G.M of R&D
	Mr. Ahmed Abdel Wahab ElMarady	Safety Oversight Inspector
	Mr. Mohamed Nabil	ATCO
	Ms. Asmaa Atiya	ATCO
	Mr. Ramy Mansour	GM Quality
	Mr. Amro Bashendy	V.GM of Safety
	Mr. Ahmed Abou Hashem	V. Head of Sector Q&S
Iran	Mr. Mehdi Pahlavani	ATC Flight Procedure Designer
	Mr. Mohsen Saadatpour	Flight Procedure Design Chief
	Mr. Hamid Naghavi	Deputy of Flight Procedure Design
Iraq	Mr. Laith Jabbar Hassan	AIS Inspector
Jordan	Mr. Mohammed Farouq O. Doqa	Acting Manager of Air Navigation Safety and Standards
	Mr. Ali Taleb Emrazzeeq	Chief Amman TACC
	Mr. Marwan Almasri	Air Traffic Control Officer
	Mr. Tamer Ahmad H. Al-Nabulsi	ATC & Chief of ANS Airspace Design
	Mrs. Narman Issat As'ad	Chief of ATM Training Division
	Mr. Ra'ed Ghazawi	
Kuwait	Capt. Yacoub Alnajjar	Flight Operations Inspector
Lebanon	Mr. Bassem Nasser	Chief of AIS
	Mr. Kamal Nasseredine	
Libya	Mr. Hasan Salem	Chief of AIS
Oman	Mr. Sulaiman Nasser Al-Salmi	Act. Chief of Airspace Planning and Management Dept
	Mr. Yousuf Moosa Al-Raisi	ATC Supervisor
Qatar	Mr. Ahmed Al-Eshaq	Air Navigation Director
	Mrs. Pamela Erice	AIM Supervisor
	Mrs. Sheila Brizo	PANS-OPS Specialist
	Mr. Tilak Priyankara	PANS-OPS Specialist
	Mr. Asiri Christo	AIM Officer
	Mr. Antonio Cardoso	ANS Inspector

State Org/Industries	Contact	Title
Saudi Arabia	Mr. Muhammad Al-Juhani	Flight Procedure Manager
	Mr. Imed ben Saad	AFP and AIM Expert
	Mr. Anas Ibrahim Fallatah	Instrument Flight Procedures Chief
	Mr. Nasser Akdemees Alotaibi	Airspace Operation Chief
	Mr. Turki Ahmed Aljudibi	Flight Procedure Design Specialist
Syria	Mr. Hassan Hamoud	ATM Director
	Mr. Tarek Al Jourf	Air Navigation Department
UAE	Mr. Muayyed Al Teneiji	Director Air Traffic Management
	Mr. Saqr Al Marashda	Senior Manager Airspace Management
	Mr. Rovshan Sultanov	Manager Airspace Design & Development
	Mr. Ahmed Saleh Al Shehhi	Acting Senior Manager Airspace
	Mr. Matteo Mollinaro	Airspace and Flight Procedure Specialist
	Mr. Manuel Martin	Senior Specialist Airspace & Procedure Design
Yemen	Mr. Younis Al-Khader	Director General of Air Navigation
	Mr. Mahmood A. Razak	Consultant – D.G. of Air Navigation
	Mr. Abdullah Mohammed Abdullah	Air Navigation CNS Manager
	Mr. Saleem Saleh Saleem	Air Navigation Safety Director
AACO	Mr. Hammam Abou Hatab	Assistant Specialist – Industry Affairs
EUROCONTROL	Mr. Valeriu Vitan	
IATA	Mr. Jehad Faqir	Assistant Director Safety and Flight Operations
	Ms. Zainab Khudhair	Manager Safety & Flight Operations
Raj Technologies	Sumit Khinvasara	Managing Director
	Shreyas Bedekar	Head - Operations
ICAO	Mr. Mohamed Smaoui	A/RD
	Mr. Radhouan Aissaoui	RO/IM
	Mrs. Muna Alnadaf	RO/CNS
	Mr. Ahmad Amireh	RO/ATM/SAR
	Mr. Ahmad Kaveh	RO/ATM
	Mrs. Manal Wissa	Programme Analysis Associate

- END –