INTERNATIONAL CIVIL AVIATION ORGANIZATION

REPORT OF THE FOURTH MEETING OF THE PERFORMANCE BASED NAVIGATION/GLOBAL NAVIGATION SATELLITE SYSTEM TASK FORCE

(PBN/GNSS TF/4)

(Cairo, Egypt, 02 - 04 October 2011)

The views expressed in this Report should be taken as those of the PBN/GNSS Task Force 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 Fourth Meeting of the Performance Based Navigation/Global Navigation Satellite System Task Force (PBN/GNSS TF/4) was held at the ICAO MID Regional Office in Cairo, Egypt, 02 – 04 October 2011.

2. OPENING

2.1 The Meeting was opened by Mr. Mohammed Khonji ICAO Regional Director, Middle East Office. In his opening remarks, Mr. Khonji welcomed all delegates to Cairo, and gave briefing about the traffic growth in the MID Region that is expected to increase at a rate of 8.2 per cent per annum through to the year 2025, while the total aircraft movements to/from and within the Middle East region are estimated to increase at an average annual growth rate of 7.6 per cent. This continuing growth of Traffic in the MID Region places increased demand on airspace capacity and emphasizes the need for the optimum utilization of the available airspace and the Airports.

2.2 Mr. Khonji indicated that the application of PBN techniques is expected to reduce flight delays, maximize airspace utilization and enhance cost effectiveness due to reduction in flight time and would result in improved safety and efficiency of flight operations not to forget the benefits to the environment.

2.3 Furthermore Mr. Khonji highlighted that at the 37th ICAO assembly meeting resolution A36-23 was modified which is now A37-11. The modification basically means that even for those runways that are not served with APV aircraft there has to be at least a GNSS procedure with LNAV only. Finally Mr. Khonji requested the meeting to consider the establishment of MID PBN Support Team and wished the meeting successful deliberation.

3. ATTENDANCE

3.1 The meeting was attended by a total of twenty-six (26) participants from eight (8) States (Bahrain, Egypt, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates) and one (1) International Organization (IATA). The list of participants is at **Attachment A** to the Report.

4. OFFICERS AND SECRETARIAT

4.1 The Chairperson of the meeting was Mr. Mohammed Hassan Al-Asfoor, Senior NAVAIDS Engineer, Civil Aviation Affairs, Bahrain. Mr. Raza Gulam, Regional Officer CNS, and Mr. Saud El Adhoobi, Regional Officer ATM/SAR acted as Secretaries of 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 and election of charipersons
Agenda Item 2:	Review of MIDANPIRG/12 and other meetings Conclusions/ Decisions related to PBN and GNSS
Agenda Item 3:	Recent developments in PBN and GNSS
Agenda Item 4:	Update the Regional PBN Implementation Plan and Guidance Material
Agenda Item 5:	Review State PBN Implementation Plan, Issues and Go Team
Agenda Item 6:	GNSS Specific Issues
Agenda Item 7	Future Work Programme
Agenda Item 8:	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 CONCLUSIONS AND DECISIONS

DRAFT CONCLUSION 4/1 :	*MID REGIONAL PBN IMPLEMENTATION STRATEGY AND PLAN*
DRAFT DECISION 4/2:	*ESTABLISHMENT OF MID PBN SUPPORT TEAM (MPST)*
DRAFT CONCLUSION 4/3:	*PBN IMPLEMENTATION PROGRESS REPORT*
DRAFT CONCLUSION 4/4:	*MID PBN SUPPORT TEAM (MPST)*
DRAFT CONCLUSION 4/5:	*PROTECTION OF GNSS SIGNAL*

DRAFT CONCLUSION 4/6:	*STRATEGY FOR THE IMPLEMENTATION OF GNSS IN THE MID REGION*
DRAFT CONCLUSION 4/7:	*GNSS SURVEY*
DRAFT DECISION 4/8:	*TERMS OF REFERENCE OF THE PBN/GNSS TASK FORCE*

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 paragraph 6 of the history of the meeting.

1.2 The meeting recalled that Mr. Mohammed Hassan Al-Asfoor, Senior NAVAIDS Engineer, Civil Aviation Affairs, Bahrain has been the Chairperson for the PBN/GNSS Task Force since its establishment

1.3 The meeting recalled the provisions of MIDANPIRG Procedural handbook, Fifth Edition – June 2011, Part III, para. 6.1, "*the Chairperson, the First Vice-Chairperson and Second Vice-Chairperson of the Group should assume their functions at the end of the meeting at which they are elected and serve for two cycles unless otherwise re-elected, in which (case) the term would be limited to one additional cycle only"*.

1.4 In light of the above, the representative from Bahrain nominated Mr. Ahmed Mohamed Al Eshaq, Director Air Navigation, from Civil Aviation Authority of Qatar, as the Chairperson of the PBN/GNSS Task Force, the nomination was supported by UAE, Egypt and Jordan. Furthermore, Qatar nominated Eng. Jassim Al-Muhannadi, Superintendent of Navigational Equipment Department Directorate General of Civil Aviation, Kuwait as the task force Vice Chairperson.

PBN/GNSS TF/4
Report on Agenda Item 2

REPORT ON AGENDA ITEM 2: REVIEW OF MIDANPIRG/12 CONCLUSIONS/DECISIONS RELATED TO PBN AND GNSS

2.1 The meeting noted that in order to enhance efficiency and keep track on the follow-up of conclusions and decisions, each MIDANPIRG subsidiary body should review the MIDANPIRG Conclusions/Decisions related to its Terms of Reference (TOR) and decide whether to maintain, remove or replace these Conclusions/Decisions with more up-to-date ones (with new numbers i.e. Conclusion 3/XX).

2.2 The meeting noted that MIDANPIRG decided that those Conclusions/Decisions which are of general nature and whose status of implementation would be "Ongoing" for many years are more suitable for inclusion in Handbooks, Manuals, Guidelines, etc, as appropriate.

2.3 The meeting was provided with an update on the status of MIDANPIRG/12 Conclusions and Decisions related to the PBN/GNSS TF. It also showed the follow-up actions taken by concerned parties.

2.4 With regard to MIDANPIRG/12 Conclusion 12/9: *RNAV 5 IMPLEMENTATION IN THE MID REGION*, mainly for the RNAV 5 Implementation in flight level band FL 160- FL460, the meeting noted that Egypt, Kuwait, Jordan, Oman and UAE had fully implemented the requirements while Bahrain, are ready and waiting for Saudi Arabia who informed the meeting that they are conducting safety studies and would be ready to implement by the end of 2012.

2.5 The meeting noted the status of relevant MIDANPIRG/12 Conclusions and Decisions related to the PBN and GNSS and the follow up actions taken by concerned parties and updated the follow-up as at **Appendix 2A** to the Report on Agenda Item 2.

PBN/GNSS TF/4
Appendix 2A to the Report on Agenda Item 2

MIDANPIRG/12 and other meetings Conclusions and Decisions pertaining to PBN GNSS Task Force for consideration by the PBN/GNSS TF/4 meeting

CONCLUSIONS AND DECISIONS	FOLLOW-UP	TO BE INITIATED BY	DELIVERABLE	TARGET DATE	REMARKS
CONC. 12/2: INCREASING THE EFFICIENCY OF THE MIDANPIRG SUBSIDIARY BODIES That, with a view to maintain the continuity in the activity of the MIDANPIRG subsidiary bodies and increase their efficiency: a) States be invited to nominate for each MIDANPIRG subsidiary body Experts/Specialists as Members of the body concerned to fully contribute to the work of this body; and b) the specialists nominated for membership in a MIDANPIRG subsidiary body, act as focal points within their Civil Aviation Administration for all issues and follow-up activities related to the Work Programme of that body.	Implementation of the Conclusion	ICAO States	State Letter Nomination of Experts/Specialist	January 2011	Ongoing SL Ref.: ME 3/56 - 11/041 dated 7 March 2011 4 States replied
CONC. 12/9: RNAV 5 IMPLEMENTATION IN THE MID REGION That, States that have not yet done so, be urged to: a) update their AIP to change RNP 5 to RNAV 5; and b) take necessary measures to implement RNAV 5 area in the level band FL 160 - FL460 (inclusive).	Implementation of the Conclusion	ICAO States	State Letter update AIP Implement RNAV 5 (FL 160-FL460)	January 2011	Ongoing SL Ref.: AN 6/29 – 10/432 dated 16 December 2010
CONC. 12/47: MID REGION PERFORMANCE METRICS That: a) the following MID Region Metrics be adopted for performance monitoring of the air navigation systems: MID Metric 1: Number of accidents per 1,000 000 departures; MID Metric 2: Percentage of certified international aerodromes;	Monitor performance of ANS using the endorsed metrics	MIDANPIRG & subsidiary bodies	Develop performance targets	2011	Ongoing SL Ref.: AN 7/26.1-11/121 dated 24 May 2011

CONCLUSIONS AND DECISIONS	FOLLOW-UP	TO BE INITIATED BY	DELIVERABLE	TARGET DATE	REMARKS
MID Metric 3: Number of Runway incursions and excursions per year; MID Metric 4: Number of States reporting necessary data to the MIDRMA on regular basis and in a timely manner; MID Metric 5: The overall collision risk in MID RVSM airspace; MID Metric 6: Percentage of air navigation deficiencies priority "U" eliminated; MID Metric 7: Percentage of instrument Runway ends with RNP/RNAV approach procedure; and MID Metric 8: Percentage of en-route PBN routes implemented in accordance with the regional PBN plan. b) the MIDANPIRG subsidiary bodies monitor the Metrics related to their work programmes; develop associated performance targets and provide feed-back to MIDANPIRG.					
CONC. 12/48: DATA COLLECTION FOR MID REGION PERFORMANCE METRICS That, States be invited to: a) incorporate the agreed MID Region Performance Metrics into their National performance monitoring process; b) collect and process relevant data necessary for performance monitoring of the air navigation systems to support the regional Metrics adopted by MIDANPIRG; and c) submit this data to the ICAO MID Regional Office on a regular basis.	Implement the Conclusion	ICAO States	State Letter Include metrics into national performance monitoring Submit data to ICAO	January 2011	Ongoing SL Ref.: AN 7/26.1-11/121 dated 24 May 2011

CONCLUSIONS AND DECISIONS	FOLLOW-UP	TO BE INITIATED BY	DELIVERABLE	TARGET DATE	REMARKS
DEC. 12/49: REVIEW OF THE MID AIR NAVIGATION PLAN (ANP) That, in support to ICAO efforts to improve regional ANPs, the MIDANPIRG subsidiary bodies: a) carry out a complete review of the MID Basic ANP and FASID parts related to their Terms of Reference (TOR) and Work Programme; b) develop revised draft structure and content of the Basic ANP in order to reconcile it with the ATM Operational Concept, the Global Plan provisions and the performance based approach; c) identify the need for and development of those FASID Tables necessary to support the implementation of a performance-based global air navigation systems; and d) report progress to MIDANPIRG/13.	Implement the Decision	ICAO States Users	New structure, format & content of ANP/FASID	2012	Ongoing
CONC. 12/56: STRATEGY FOR THE IMPLEMENTATION OF GNSS IN THE MID REGION That, the Strategy for implementation of GNSS in the MID Region be updated as at **Appendix 5.5N** to the Report on Agenda Item 5.5.	Implement the Conclusion	MIDANPIRG/12	Adopted new Strategy	October 2010	Completed (To be replaced and superseded by Draft Conc. 4/6)
CONC. 12/57: MID REGION PBN IMPLEMENTATION STRATEGY AND PLAN That, the MID Region PBN Implementation Strategy and Plan be updated as at **Appendix 5.5P** to the Report on Agenda Item 5.5.	Implement the Conclusion	MIDANPIRG/12	Approved Strategy	October 2010	Completed (To be replaced and superseded by Draft Conc. 4/1)
CONC. 12/58: PBN IMPLEMENTATION PROGRESS REPORT That, for future reporting on the status of PBN implementation, MID States be urged to:	Implement the Conclusion	States	Progress Report	Every 6 months	Ongoing SL AN 6/28 – 11/026 Dated 16 February 2011

CONCLUSIONS AND DECISIONS	FOLLOW-UP	TO BE INITIATED BY	DELIVERABLE	TARGET DATE	REMARKS
a) use the excel sheet as at **Appendix 5.5Q** to the Report on Agenda Item 5.5 and PBN Implementation Progress Report Template as at **Appendix 5.5R** to the Report on Agenda Item 5.5; and b) submit progress reports to ICAO MID Regional Office every six months or whenever major progress is achieved.					(To be replaced and superseded by Draft Conc. 4/3)
DEC. 12/59: TERMS OF REFERENCE OF THE PBN/GNSS TASK FORCE That, the Terms of Reference and Work Programme of the PBN/GNSS Task Force be updated as at **Appendix 5.5T** to the Report on Agenda Item 5.5.	Implement the Decision	MIDANPIRG	Updated TOR	October 2010	Completed (To be replaced and superseded by Draft Dec. 4/8)
DEC. 12/60: LIST OF TASK FOR PBN/GNSS TASK FORCE That, the list of tasks for the PBN/GNSS Task Force be updated with new task assignments as at **Appendix 5.5U** to the Report on Agenda Item 5.5.	Implement the Decision	MIDANPIRG	PBN/GNSS TF/3 Report	October 2010	Completed
CONC. 12/61: IMPLEMENTATION OF CONTINUOUS DESCENT OPERATIONS That, recognizing the efficiency and environmental benefits of Continuous Descent Operations (CDO), and the need to harmonize these operations in the interest of safety, MID States be encouraged to include implementation of CDO as part of their PBN implementation plans and to implement CDO in accordance with the ICAO CDO Manual Doc 9931.	Follow up development in MID Region/States	States	Progressive introduction of CDO operations in TMAs	2012	Ongoing SL AN 6/28 – 11/026 Dated 16 February 2011
DRAFT CONC. 3/1: MID REGIONAL PBN IMPLEMENTATION STRATEGY AND PLAN That MID Regional PBN Implementation Strategy and Plan be updated as at Appendix 4B to the Report on Agenda Item 4.	Implement the Conclusion	**STATES** CNS/ATM/IC SG/6 MIDANPIRG/13	WP/IP to CNS/ATM/IC SG Approved Strategy	March 2012	(Replaced and superseded by Draft Conc. 4/1)

CONCLUSIONS AND DECISIONS	FOLLOW-UP	TO BE INITIATED BY	DELIVERABLE	TARGET DATE	REMARKS
DRAFT CONC. 3/2: PBN IMPLEMENTATION PROGRESS REPORT That, for future reporting on the status of PBN implementation, MID States be urged to: a) use the excel sheet as at **Appendix 5C** to the Report on the Agenda Item 5 and PBN Implementation Progress Report Template as at **Appendix 5D** to the Report on the Agenda Item; and b) submit progress reports to ICAO MID Regional Office every six months and whenever major progress is achieved starting January 2011.	Implement the Conclusion	States	Progress Report	June 2011	(Replaced and superseded by Draft Conc. 4/3)
DRAFT CONC. 3/3: PROTECTION OF GNSS SIGNAL That, MID States with their names listed in the footnotes 5.362B and 5.362C are urged to take necessary measures to delete their names from these footnote as soon as possible in order to protect the GNSS signal and provide regular reports to ICAO MID Regional Office on action taken.	Implement conclusion and follow-up with the Telcom regulator Authorities	States	Deletion of footnotes Report	June 2011	(To be replaced and superseded by Draft Conc. 4/5)
DRAFT CONC. 3/4: STRATEGY FOR THE IMPLEMENTATION OF GNSS IN THE MID REGION That, the Strategy for implementation of GNSS in the MID Region be updated as at Appendix 7A to the Report on Agenda Item 7	Implement the Conclusion	States MIDANPIRG/13	Adopted new Strategy		(Replaced and superseded by Draft Conc. 4/6)
DRAFT DEC. 3/5: TERMS OF REFERENCE OF THE PBN/GNSS TASK FORCE That, the Terms of Reference and Work Programme of the PBN/GNSS Task Force be updated as at Appendix 8B to the Report on Agenda Item 8.	Implement work programme Implement the Decision	CNS/ATM/IC SG/6 MIDANPIRG/13	 Updated TOR	 Oct 2011	(Replaced and superseded by Draft Dec. 4/8)

REPORT ON AGENDA ITEM 3: RECENT DEVELOPMENT IN PBN AND GNSS

3.1 The meeting recalled that the Workshop on PBN Airspace Planning was successfully held by the Syrian Civil Aviation Authority (SCAA) in Sydnaia (Damascus), from 25 to 28 October 2010 and was attended by a total of forty four (44) participants, including experts from eleven (11) States (Bahrain, Egypt, Iraq, Iran, Jordan, Lebanon, Libya, Qatar, Saudi Arabia, Syria and United Arab Emirates) and (1) one International Organizations (IATA).

3.2 The meeting further recalled that most of the Workshop presentations were conducted by experts from EUROCONTROL and the FAA. The presentations re-introduced the PBN concept that took place during the introduction to Performance Based Navigation (PBN) Seminar, held in Cairo, 12-15 November 2007, which explained the processes for implementation of PBN, the contents and purpose of an Airspace concept.

3.3 The meeting noted that an Airspace Concept Handbook for PBN Implementation which has been developed by EUROCONTROL was introduced. The handbook contains the sixteen (16) activities that formed the basis of the workshop.

3.4 The Eighth Meeting of the ICAO APAC Region Performance Based Navigation Task Force (PBN/TF/8) was held in conjunction with the PBN Workshop and the PBN Implementation Seminar 2011, in India from 09 to 13 May 2011.

3.5 The ICAO APAC Region organized a PBN Workshop that was conducted by Eurocontrol from 9 to 12 May 2011 in parallel with the PBN Implementation Seminar, which was held from 10 to 11 May 2011. The PBN/TF/8 meeting was held from12 to 13 May 2011.

3.6 The meeting noted key global ICAO PBN initiatives and features included the following:

a) Measurement of the PBN implementation performance using an actual implementation database coordinated with Jeppesen, and an ATM Operational Improvement tool;

b) Measurement of actual PBN;

c) Adoption of Assembly Resolution 37-11;

d) Educational activities of the Go Teams, which have been to three States, including UAE in the MID Regions;

e) PBN Airspace planning workshops (including Syria in 2010);

f) ICAO is developing Operational Approval guidance for global application, based to a large degree on the APAC Cooperative Development of Operational Safety and Continuing Airworthiness Programmes (COSCAP) Handbook in cooperation with the Civil Aviation Safety Authority of Australia (CASA);

g) Separation and Airspace Safety Panel (SASP) regarding:

i. variations allowed in true airspeed;
ii. ADS-B and MLAT 3 NM aircraft separations;

iii. applicability of the 2.5 NM radar separation to 20 NM;
iv. availability of GLS approaches;
v. Five Minute Arrival/Departure Procedure amendment;
vi. Advanced Strategic Offset Concept;
vii. 5 NM minima for terminal operations between B-RNP1 aircraft;

h) Instrument Flight Procedures Panel (IFPP) regarding PANS OPS amendments:

i. Definition of GLS (GBAS - Ground-based Augmentation System (Landing System);
ii. General cautions in conventional procedure design;
iii. Quality assurance;
iv. Alignment of RNAV holding criteria with PBN;
v. Use of SBAS equipment for flying APV/Baro-VNAV procedures;
vi. Continuous Descent Operations (CDO, Doc 9931);
vii. RF legs charting to achieve an unambiguous description both for the pilot and for the navigation;
viii. Identification of SBAS service provider;
ix. Definition of the term 'course';
x. Clarification on vertically guided approach requirements;
xi. Continuous Climb Operation (CCO Manual, Final draft Q3, 2012);
xii. Helicopter Manoeuvre Visual segment, LPV criteria, PBN Departure, En-route Criteria and PinS Departure procedures charting;

i) Navigation Systems Panel (NSP) regarding the GNSS Manual ICAO Doc 9849); and
j) Performance Based Navigation Study Group (PBN SG), regarding the:

i. RNP 2 navigation specification;
ii. Application of RF turns outside final approach for all RNP applications;
iii. 'Advanced' RNP navigation specification applicable for en-route, arrival, departure and approach;
iv. RNP 0.3 navigation specification; and
v. RNP AR departures.

3.7 The meeting noted the implications of the new RNP 0.3 and 'Advanced RNP' Navigation Specifications. The 'Advanced RNP' Specification was a means of bringing together appropriate specifications to account for all phases of flight. The RNP 0.3 navigation specification is being designed for helicopter operations although its use by aero planes was not excluded.

3.8 The meeting was apprised that the Air Navigation Commission, at the eighth meeting of its 183rd Session held on 9 March 2010, considered proposals developed by the Navigation Systems Panel (NSP) Working Group of the Whole to amend the Standards and Recommended Practices (SARPs) in Annex 10 — *Aeronautical Telecommunications*, Volume I — *Radio Navigation Aids* concerning the Global Navigation Satellite System (GNSS) Ground-Based Augmentation System (GBAS), which was transmitted to Contracting States and appropriate international organizations for comments under State letter AN 7/1.3.97-10/43. The proposed amendment to Annex 10, Volume I, is envisaged for applicability on 17 November 2011.

3.9 The above proposal was adopted by the council at the third meeting of its 192nd Session on 4 March 2011, under amendment 86 to the *International Standards and Recommended Practices, Aeronautical Telecommunications* (Annex 10 to the Convention on International Civil Aviation)

3.10 The purpose of the proposed amendment is to reflect the initial experience gained with the ongoing technical implementations of GBAS for Category I operations. A number of changes to the GBAS SARPs are proposed, including the following:

a) removal of material on ground-based ranging functions;

b) clarification of the definition of the GBAS digital modulation method;

c) introduction of an optional authentication protocol;

d) clarification of the B-values coding requirements;

e) introduction of forward compatibility requirements;

f) modification of carrier smoothing requirements for airborne equipment;

g) modifications to the guidance material on frequency coordination requirements, link budget, vertical deviations, Type 2 message, and signal quality monitoring; and

h) several minor editorial changes.

3.11 The meeting noted the approval of Amendments 4 and 3 to the fifth edition of the *Procedures for Air Navigation Services — Aircraft Operations,* Volume I — *Flight Procedures* and Volume II — *Construction of Visual and Instrument Flight Procedures* (PANS-OPS, Doc 8168). The nature and scope of the amendments to PANS-OPS, Volume (I) are as follows:

a) introduction of the definition of GBAS landing system (GLS) to align with Volume II;

b) new provisions pertaining to area navigation (RNAV) holding requirements consequential to existing PANS-OPS, Volume II design criteria that seek alignment with the performance-based navigation (PBN) concept. They furthermore remove impracticable requirements, incorporated before the PBN concept materialized, that cannot be coded into the navigation database; and

c) new provisions concerning the use of satellite-based augmentation system (SBAS) approach procedures with vertical guidance (APV)/barometric vertical navigation (baro-VNAV) that are consequential to existing PANS-OPS, Volume II design criteria.

3.12 Furthermore the nature and scope of the amendments to PANS-OPS, Volume (II) are as follows:

a) introduction of the definition GBAS landing system (GLS);

b) a new provision to emphasize that the ILS criteria cannot be used for assessing the effect on safety of penetrations of the Annex 14 — *Aerodromes* obstacle limitation surfaces;

c) modifications to the provisions regarding design criteria to address navigation database coding problems of instrument flight procedures that are published in State aeronautical information publications (AIPs); and

d) refinement of procedure design quality assurance aspects with emphasis on flight validation.

3.13 The meeting noted that it is necessary to publish in the Aeronautical Information Publication a list of any significant differences which will exist on 18 November 2010 between the amended provisions of PANS-OPS, Volumes I and II and the national regulations and practices.

3.14 The meeting was informed that UAE had conducted two workshops (12th July 2010 in Dubai, and 14th July 2010 in Abu Dhabi) for GBAS implementation, where representatives from Airports, ATS, Airlines, and Regulators attended the workshops. The purpose of the workshops was to provide stakeholders with common understanding of GBAS capabilities and implementation program elements. Furthermore, UAE are planning to implement GBAS in Dubai by 2014.

3.15 The meeting urged MID States to provide information on their operational experience with GBAS implementation, including any operational issues or problems identified it was highlighted that the GBAS could be used for the airports that do not have ILS as it will be a cost effective solution in order to gain experience in new technology.

3.16 The meeting was of the view that MID States takes the lead and consider conducting seminar and workshop on PBN implementation, in this regard Jordan suggested that workshop be carried out on PBN procedure design validation and they will consider hosting the workshop, as Jordan hosted several ICAO activities. Furthermore, UAE advised that they became member in ICAO IFPP and SASP, and UAE will be sharing their experience with other MID States and will consider conducting seminars and workshop on PBN in the near future.

3.17 The meeting was informed by Saudi Arabia that ACAC will be conducting workshop on GNSS implementation during October 2011 in Rabat.

REPORT ON AGENDA ITEM 4: UPDATE THE REGIONAL PBN IMPLEMENTATION PLAN AND GUIDANCE MATERIAL

4.1 The meeting recalled ICAO 36th General Assembly Resolution A36-23: *Performance based navigation global goals*, urges Planning and Implementation Regional Groups (PIRGs) and States, inter alia, to complete a States PBN implementation plan by 2009 to achieve specific implementation goals starting with 2010. Accordingly, the first version of the MID Regional PBN Implementation Strategy and Plan were developed in October 2008 and were adopted by MIDANPIRG/11 in February 2009 in order to allow sufficient time for the MID States to complete the development of their States PBN Implementation plans by December 2009. The meeting noted that the above ICAO 36th General Assembly Resolution A36-23 was superseded by Assembly Resolution A37-11.

4.2 The meeting recalled that, RNAV and RNP were implemented in the MID Region before the current PBN Concept, in which there are no provisions for RNP 5. Accordingly MIDANPIRG/11 and subsequent PBN meetings requested that, in order to align with the harmonized PBN terminology, the term RNP 5 needs to be replaced by RNAV 5, and States to take the necessary actions to update their AIPs.

4.3 The meeting further recalled that RNAV 5 cannot be used for oceanic/remote airspace and that in principle RNAV 10 should be used for that particular airspace. It was also recognized that portions of the airspace in the MID Region that were previously classified as remote continental/oceanic now have the required infrastructure capability to support RANV 5. Nevertheless, portions of MID Region airspace remain classified as oceanic and therefore, RNAV 10 would be appropriate as the navigation specification.

4.4 There are several PBN implementation challenges which need to be met in order to progressively implement PBN and achieve the desired benefits. The list of challenges is not limited to the following:

- Airspace concept development
- WGS-84 surveys
- Electronic Terrain and Obstacle Data
- Procedure design
- Ground and Flight Validation
- Operational approval
- Safety assessment
- Awareness and training for pilots and ATC

4.5 The meeting noted that MIDANPIRG/12 urged States, ANSP's, aircraft operators, user communities to continue providing support to States and ICAO PBN Programme, for fulfilling the above and any other challenges for PBN implementation in the MID Region.

4.6 The meeting was updated on ICAO Continuous Descent Operations (CDO) Manual Doc 9931 which is available on ICAONET. The Manual contains guidance material on the airspace design, instrument flight procedures, ATC facilitation and flight techniques necessary to enable Continuous Descent (CD) profiles.

4.7 The meeting noted that CDO is one of several tools available to aircraft operators and ANSPs to increase safety, flight predictability, and airspace capacity, while reducing noise, ATC/Pilot communications, fuel burn and the emission of greenhouse gases. Over the years, different route models have been developed to facilitate CDs and several attempts have been made to strike a balance between the ideal of environmentally friendly procedures and the requirements of a specific airport or airspace.

4.8 The meeting noted that in order to standardize and harmonize the development and implementation of CDO, the airspace and instrument flight procedure design and ATC techniques should all be employed in a cohesive manner. This will facilitate the ability of flight crews to use in-flight techniques to reduce the overall environmental footprint and increase the efficiency of commercial aviation. The implementation guidance in the Manual is intended to support collaboration among the different stakeholders involved in implementing these Continuous Descents.

4.9 In light of the completion of the ICAO CDO Manual which will standardize and harmonize the development and implementations of CD operations, States are encouraged to consult the CDO Manual during their STAR implementations. Recognizing the efficiency, environmental and other benefits of Continuous Descent Operations and the need to harmonize these operations in the interest of safety, the meeting may wish to note that MIDANPIRG/12 agreed to the following Conclusion:

CONCLUSION 12/61: IMPLEMENTATION OF CONTINUOUS DESCENT OPERATIONS

That, recognizing the efficiency and environmental benefits of Continuous Descent Operations (CDO), and the need to harmonize these operations in the interest of safety, MID States be encouraged to include implementation of CDO as part of their PBN implementation plans and to implement CDO in accordance with the ICAO CDO Manual Doc 9931.

4.10 The meeting noted that the above Conclusion is of general nature and should be included in the MID Regional PBN Implementation Strategy and Plan. Accordingly, the meeting revised the MID Regional PBN Implementation Plan and Strategy to include the new requirement as per Assembly Resolution A37/11 and agreed to the following Draft Conclusion:

DRAFT CONCLUSION 4/1: MID REGIONAL PBN IMPLEMENTATION STRATEGY AND PLAN

That, the MID Regional PBN Implementation Strategy and Plan be updated as at ***Appendix 4A*** *to the Report on Agenda Item 4.*

4.11 The meeting noted that the Global PBN Task Force formed Go Team that would assist in developing knowledge and expertise in various States in the Regions. Accordingly, MIDANPIRG/12 meeting encouraged MID States willing to take advantage of the services offered by the GO-Team to communicate with the ICAO MID Regional Office in order to coordinate with ICAO HQ, and facilitate the Go Team visit.

4.12 Based on the above, the meeting noted that UAE had requested Go Team visit which was hosted from 16-20 January 2011, the team was composed of ICAO, IATA, aircraft manufacturers, UAE regulators and services provider were also part of the Go Team.

4.13 The meeting noted that among the Global PBN Task Force activities is the development of guidelines for PBN Operational Approval which will be incorporated in the ICAO PBN Manual Doc 9613 as this has been tasked to a group of industry stakeholders including IATA, manufacturers, airlines, and regulators. In this regard, it was noted that updates will be incorporated into the current version of the PBN manual relating to Operational Approval but the core part will remain in the new manual.

4.14 The meeting agreed with IATA views that prompt action by the Region and by States is required to accelerate PBN planning, development and implementation to a pace of at least achieving closure to the ICAO Resolution implementation targets.

4.15 Based on the above, the meeting was of the view that a comprehensive Regional Support Strategy is required and should include the following objectives;

- Promotion of PBN to decision makers within States to create the political will to invest and devote the necessary resources for PBN implementation
- Establishing a regional working-level team or forum to identify implementation needs and to direct and/or organize the appropriate resources that will deliver PBN solutions to States;
- Formulation of cooperative arrangements to assist States in PBN implementation; and
- Development of additional support mechanisms that create skills and capabilities within States to implement and to sustain PBN operations.

4.16 The meeting agreed for the establishment of MID PBN Support Team (MPST) as it will be considered a step towards fulfilling these objectives The meeting further agreed as well on three areas of work for the MPST (1) promote PBN and convince Stakeholders to support PBN (2) Gap Analysis and States PBN Implementation Plan update/improvement (3) Implementation of PBN. This would require engagement at a working level to coordinate and provide assistance to States in:

- Completion and improvement of PBN implementation plans;
- Conducting safety assessments;
- Collection of required data and practices to maintain data integrity;
- Guidance to establish the regulatory framework, approvals process and other mechanisms necessary for implementation and sustainment of PBN capabilities;
- Providing guidance to States in PBN en-route implementation, airspace route design and harmonization across FIRs;
- Assist in operational approval;
- Promotion of PBN by increasing awareness and education to motivate States to invest and implement;
- Make use of the PBN Go Team Visit to the UAE, and adapt this to provide the support at a greater frequency; and
- Provide guidance and assistance to operators in obtaining operational approval for utilising RNP and other PBN procedures.

4.17 The meeting suggested that UAE be the champion of MPST. Accordingly, UAE agreed to be champion in the MPST for the region since UAE already had the PBN Go Team visit. Furthermore, IATA agreed to support the MPST. It is also required that MID States that are advanced in PBN implementation be encouraged to participate in MPST in order to assist developing MID States.

4.18 Based on the above, the meeting developed draft MPST Terms Of Reference (TOR) as **Appendix 4B** to the Report on Agenda Item 4. Accordingly the meeting agreed to the following Draft Decision:

DRAFT DECISION 4/2: ESTABLISHMENT OF MID PBN SUPPORT TEAM (MPST)

*That, MPST be established with TOR as at **Appendix 4B** to the Report on Agenda Item 4.*

4.19 The meeting recalled that: Bahrain, Egypt and UAE agreed to provide practical examples of the PBN Implementation benefits which will be incorporated in the MID Regional PBN Implementation Strategy and Plan. However, the meeting noted that no practical examples of PBN Implementation benefits were received to be incorporated in the MID Regional PBN Implementation Strategy and Plan. Accordingly the meeting urged MID States to provide the required examples.

4.20 The meeting recalled that CANSO had formed CANSO Middle East ANSP, Airspace Users & Stakeholder Engagement WG (MEAUSE WG), the work of which include PBN, in this regard the meeting agreed that close coordination with these WGs should exists, in order to avoid any duplication of efforts. The meeting agreed that ICAO MID Regional Office coordinate with CANSO, where CANSO can play the role of assisting States in the implementation of PBN.

PBN/GNSS TF/4
Appendix 4A to the Report on Agenda Item 4

MID REGIONAL PERFORMANCE-BASED NAVIGATION IMPLEMENTATION STRATEGY AND PLAN

1. EXECUTIVE SUMMARY

1.1 The MID Regional Performance Based Navigation (PBN) Implementation Strategy and Plan has been produced in line with Resolution A 36/23 adopted by ICAO Assembly in its 36th Session held in September 2007.

1.2 This version of the MID Regional PBN implementation strategy and plan include the modification of assembly resolution A36/23 by the 37th assembly which is now A37-11. The modification of resolution A36/23 by A 37/11 means that even for those runways that are not served with APV aircraft there has to be at least a GNSS procedure with LNAV only. The Regional Plan addresses the strategic objectives of PBN implementation 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.

1.3 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 ground-based CNS infrastructure etc. Implementation targets for various categories of airspace for the short term (2008 – 2012) and for the medium term (2013 – 2016) have been projected in tabular forms to facilitate easy reference. For the long term (2016 and beyond) it has been envisaged that GNSS will be the primary navigation infrastructure. It is also envisaged that precision approach capability using GNSS and its augmentation system will become available in the long term.

2. EXPLANATION OF TERMS

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

2.1.1 **MID Regional PBN Implementation Strategy and 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.

2.1.2 **Performance Based Navigation -** Performance based navigation specifies RNAV and RNP system performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in an airspace.

2.1.3 **Performance requirements -** Performance requirements are defined in terms of accuracy, integrity, continuity, availability and functionality needed for the proposed operation in the context of a particular airspace concept. Performance requirements are identified in navigation specifications which also identify which navigation sensors and equipment may be used to meet the performance requirement.

3. ACRONYMS

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

AACO	Arab Air Carrier Association
ABAS	Aircraft-Based Augmentation System
ACAC	Arab Civil aviation Commission
AIS	Aeronautical Information System
APAC	Asia and Pacific Regions
APCH	Approach
APV	Approach Procedures with Vertical Guidance
ATC	Air Traffic Control
Baro VNAV	Barometric Vertical Navigation
CDO	Continuous Decent Operations
CNS/ATM	Communication Navigation Surveillance/Air Traffic Management
CPDLC	Controller Pilot Data Link Communications
DME	Distance Measuring Equipment
FASID	Facilities and Services Implementation Document
FIR	Flight Information Region
FMS	Flight Management System
GBAS	Ground-Based Augmentation System
GNSS	Global Navigation Satellite System
GLS	GBAS Landing System
IATA	International Air Transport Association
IFALPA	International Federation of Air Line Pilots' Associations
IFATCA	International Federation of Air Traffic Controllers' Associations
IFF	Identification Friend or Foe
INS	Inertial Navigation System
IRU	Inertial Reference Unit
MIDANPIRG	Middle East Air Navigation Planning and Implementation Regional Group
MID RMA	Middle East Regional Monitoring Agency
MLAT	Multilateration
PANS	Procedures for Air Navigation Services
PBN	Performance Based Navigation
PIRG	Planning and Implementation Regional Group
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
STAR	Standard Instrument Arrival
TMA	Terminal Control Area
VOR	VHF Omni-directional Radio-range
WGS	World Geodetic System

4. INTRODUCTION

Need for the roadmap

4.1 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.

4.2 The implementation of RVSM on 27 NOV 2003 in the MID Region brought significant airspace and operational benefits to the Region. However, the realization of new benefits from RVSM have reached a point of diminishing returns. 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.

4.3 In view of the need for detailed navigation planning, it was deemed advisable to prepare a PBN Roadmap to provide proper guidance to air navigation service providers, airspace operators and user, regulating agencies, and international organization, on the evolution of performance base navigation, as one of the key systems supporting air traffic management, which describes the RNAV and RNP navigation applications that should be implemented in the short and medium term in the MID Region.

4.4 Furthermore, the MID PBN roadmap will be the basic material for the development of a boarder MID air navigation strategy, which will serve as guidance for regional projects for the implementation of air navigation infrastructure, such as SBAS, GBAS, GLS etc., as well as for the development of national implementation plans.

4.5 The PBN Manual (Doc 9613) provides guidance on RNAV/RNP 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. RNAV/RNP approval will be granted to operators that comply with these two types of approval.

4.6 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.

Benefits of Performance-Based Navigation

a) Reduces need to maintain sensor- specific routes and procedures, and their associated costs.

b) Avoids need for development of sensor- specific operations with each new evolution of navigation systems; the present requirement of developing procedures with each new introduction is often very costly.

c) Allows more efficient use of airspace (route placement, fuel efficiency, noise abatement).

d) In true harmony with the way in which RNAV systems are used.

e) Facilitates the operational approval process for operators by providing a limited set of navigation specification intended for global use.

f) Improved airport and airspace arrival paths in all weather conditions, and the possibility of meeting critical obstacle clearance and environmental requirements through the application of optimized RNAV or RNP paths.

g) Reduced delays in high-density airspaces and airports through the implementation of additional parallel routes and additional arrival and departure points in terminal areas.

h) For the pilots, the main advantage of using this system is that the navigation function is performed by highly accurate and sophisticated onboard equipment and thus allowing reduction in cockpit workload, with increase in safety.

i) For Air Traffic Controllers, the main advantage of aircraft using a RNAV system is that ATS routes can be straightened as it is not necessary for the routes to pass over locations marked by conventional NAVAIDS.

j) RNAV based arrival and departure routes can complement and even replace radar vectoring, thereby reducing approach and departure controllers' workload.

k) Increase of predictability of the flight path.

Goals and Objectives of PBN Implementation

4.7 The MIDANPIRG/11 meeting required that PBN be implemented in a strategic manner in the MID Region and accordingly established the PBN/GNSS Task Force which, *inter alia*, was required to follow up developments related to PBN and develop an implementation strategy. The 36th Session of ICAO Assembly adopted Resolution A36-23: *Performance based navigation global goals*, which, amongst others, highlighted global and regional harmonization in the implementation of PBN. Accordingly, the MID PBN Implementation Regional Plan has the following strategic objectives:

(a) To ensure that implementation of the navigation element of the MID CNS/ATM system is based on clearly established operational requirement.

(b) To avoid unnecessarily imposing the mandate for multiple equipment on board or multiple systems on ground.

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

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

(e) To explain in detail the contents of the MID air navigation plan and of the MID CNS/ATM plan, describing potential navigation application.

4.8 Furthermore, the MID PBN roadmap will provide a high-level strategy for the evolution of the navigation applications to be implemented in the MID region in the short term (2008-2012), medium term (2013-2016). This strategy is based on the coverage of area navigation (RNAV) and required navigation performance (RNP), which will be applied to aircraft operations involving instrument approaches, standard departure (SID) routes, standard arrival (STAR) routes, and ATS routes in oceanic and continental areas.

4.9 The MID PBN implementation regional plan is developed by MID States together with the international and Regional organizations concerned, and is intended to assist the main stakeholders of the aviation community to plan a gradual transition to the RNAV and RNP concepts. The main stakeholders of the aviation community that benefit from this roadmap are:

- Airspace operators and users
- Air navigation service providers
- Regulating agencies
- International and Regional organizations
- Military Authorities

4.10 The plan is intended to assist the main stakeholders of the aviation community to plan the future transition and their investment strategies. For example, airlines and operators can use this Regional Plan to plan 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.

Planning principles

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

(a) develop strategic objectives and airspace concepts as described in the PBN manual (Doc 9613) to justify the implementation of the RNAV and/or RNP concepts in each particular airspace;

(b) States conduct pre- and post–implementation safety assessments to ensure the application and maintenance of the established target level of safety;

(c) development of airspace concept, applying airspace modelling tools as well as real-time and accelerated simulations, which identify the navigation applications that are compatible with the aforementioned concept; and

(d) continued application of conventional air navigation procedures during the transition period, to guarantee the operation by users that are not RNAV- and/or RNP–equipped.

(e) operational requirement and Stake holder consultation

(f) early implementation is encouraged based on operational requirements and States readiness.

4.12 Planning Documentation: The implementation of PBN in the MID Region will be incorporated into the Regional Supplementary Procedures (Doc 7030) as approved by the ICAO Council. The States' PBN implementation plan will include a concise and detailed schedule of implementation for all phases of flight which will be endorsed through Regional agreement processes and considered by the Council as requirements for incorporation in the Air Navigation Plan (ANP).

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 and be supported by ICAO Global Plan Initiatives.

5.2 In November 2006 the ICAO Council accepted the second amendment to the Global Air Navigation Plan for the CNS/ATM System, which has been renamed the Global Air Navigation Plan (Doc 9750), referred to as the Global Plan. A key part of the Global Plan framework are Global Plan Initiatives (GPIs), which are options for air navigation system improvements that when implemented, result in direct performance enhancements. The GPIs include implementation of performance based navigation (PBN) and navigation system. The introduction of PBN must be supported by an appropriate navigation infrastructure consisting of an appropriate combination of Global Navigation Satellite System (GNSS), self-contained navigation system (inertial navigation system) and conventional ground-based navigation aids.

5.3 It is envisaged that for the short term and medium term implementation of PBN, the establishment of a backup system in case of GNSS failure or the development of contingency procedures will be necessary.

En-route

5.4 Considering the traffic characteristic and CNS/ATM capability of the region, the en-route operation can be classified as Oceanic, Remote continental, Continental, and local/domestic. In principle, each classification of the en-route operations should adopt, but not be limited to single RNAV or RNP navigation specification. This implementation strategy will be applied by the States and international organizations themselves, as coordinated at regional level to ensure harmonization.

5.5 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 the more accurate navigation specification on the basis of coordination with stakeholders and affected neighbouring States.

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 TMAs, based on the MID PBN Regional 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.

Approaches

5.8 During early implementation of PBN, IFR Approaches based on PBN should be designed to accommodate mixed-equipage (PBN and non-PBN) environment. ATC workload should be taken into account while developing approach procedures. One possible way to accomplish this is to co-locate the Initial Approach Waypoint for both PBN and 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, and planning for CDO implementation.

5.9 Recognizing the efficiency and environmental benefits of CDO, and the need to

harmonize these operations in the interest of safety, MID States are encouraged to include implementation of CDO as part of their PBN implementation plans and to implement CDO in accordance with the ICAO CDO Manual Doc 9931.

Implementation Strategy

5.10 In order to address the operational requirements, the following PBN Implementation & Harmonisation Strategy for the ICAO MID Region is formulated as follows:

a) Implementation of any RNAV or RNP application shall be in compliance with ICAO PBN Manual (Doc 9613).

b) Implementation of RNAV5/RNAV1 depending on operational requirements for continental en-route and local/domestic en-route applications at least until 2016.

c) Implementation of RNAV1/Basic-RNP-1 depending on operational requirements for terminal applications at least until 2016.

d) Implementation of RNAV-10 for oceanic/remote continental until at least 2016.

e) The use of RNAV 5 / RNAV 1 specification by RNP specifications (e.g. advanced-RNP-1) for the use in the en-route and terminal airspace to commence by 2016.

f) 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

g) implementation of straight-in LNAV only procedures, as an exception to f) 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 take-off mass of 5 700 kg or more;

h) The use of NDB for approach operations shall be terminated not later than 2012.

i) The operation of CDO to commence 2013;

j) The RNP AR Approaches to commence depending on States operational requirement starting 2012.

6. CURRENT STATUS AND FORECAST

MID Traffic Forecast

6.1 The GEN part of FASID (Part II) provides the information and data of the following traffic forecasts and trends:

- air traffic demand for air navigation systems planning
- Passenger traffic
- Aircraft movements
- Major city-pairs traffic

6.2 The forecast data as well as the figures contained in the FASID document are the results of the regular meetings of, MIDANPIRG Traffic Forecasting Sub-group, which had in last meeting in April 2007. Notably however, in the past two years, air traffic growth trend for the MID Region has signalled a significantly higher aircraft fleet and traffic growth than was previously forecast.

6.3 World scheduled traffic measured in terms of Passenger-kilometers Performed (PKPs) is forecast to increase at a "most likely" average annual rate at 4.6 per cent for the period 2005-2025. International traffic is expected to increase at 5.3 per cent per annum.

6.4 The airlines of the Middle East regions are expected to experience the highest growth in passenger traffic at 5.8 per cent per annum through to the year 2025 compared to the world average of 4.6%.

6.5 World scheduled freight traffic measured in terms of tonne-kilometres performed is forecast to increase at a "most likely" average annual rate of 6.6 per cent for the period 2005-2025. International freight traffic is expected to increase at an average annual growth rate of 6.9 per cent.

6.6 Air freight traffic of the airlines of Middle East region is expected to remain higher than the world average at 7.8 per annum.

6.7 The following major route groups to, from and within the Middle East Region have been identified:

- Between Middle East - Europe
- Between Middle East - Africa
- Between Middle East - Asia/Pacific
- Between Middle East - North America
- Intra Middle East

6.8 Movement forecasts for the major route groups for the 2007-2025 periods are depicted in **Table 1**.

TABLE 1

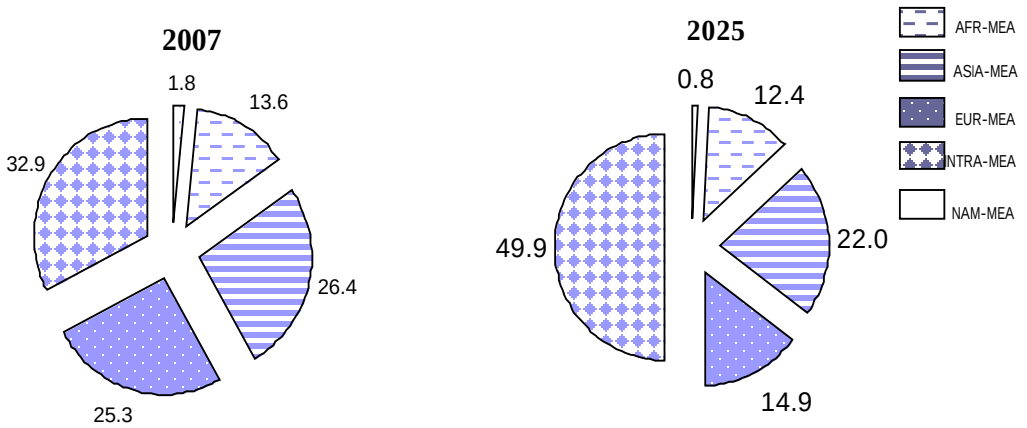
AIRCRAFT MOVEMENTS FORECAST TO THE YEAR 2025

	Actual	Forecast	Average Annual Growths (per cent)
	2007	2025	2007-2025
AFR-MEA	84933	291159	7.1
ASIA-MEA	165364	514979	6.5
EUR-MEA	158346	350380	4.5
INTRA MEA	205769	1170709	10.1
NAM-MEA	11075	18703	3.0
TOTAL	625487	2345929	7.6

6.9 The total aircraft movements to/from and within the Middle East region are estimated to increase from some 625000 in 2007 to around 2346000 in 2025 at an average annual growth rate of 7.6 per cent. The resulting movements' shares for the year 2025 are depicted in **Figure 1**.

FIGURE 1

SHARES OF SELECTED ROUTE GROUPS IN AIRCRAFT MOVEMENTS



Aircraft Fleet Readiness

6.10 IATA had circulated survey and will be compiling the results in report which could be referred to for details

CNS Infrastructure

Navigation infrastructure

Global Navigation Satellite System (GNSS)

6.11 Global Navigation Satellite System (GNSS) is a satellite-based navigation system utilizing satellite signals, such as Global Positioning System (GPS), for providing accurate and reliable position, navigation, and time services to airspace users. In 1996, the International Civil Aviation Organization (ICAO) endorsed the development and use of GNSS as a primary source of future navigation for civil aviation. ICAO noted the increased flight safety, route flexibility and operational efficiencies that could be realized from the move to space-based navigation.

6.12 GNSS supports both RNAV and RNP operations. Through the use of appropriate GNSS augmentations, GNSS navigation provides sufficient accuracy, integrity, availability and continuity to support en-route, terminal area, and approach operations. Approval of RNP operations with appropriate certified avionics provides on-board performance monitoring and alerting capability enhancing the integrity of aircraft navigation.

6.13 GNSS augmentations include Aircraft-Based Augmentation System (ABAS), Satellite-Based Augmentation System (SBAS) and Ground-Based Augmentation System (GBAS).

6.14 Multilateration (MLAT) employs a number of ground stations, which are placed in strategic locations around an airport, its local terminal area or a wider area that covers the larger surrounding airspace. Multilateration requires no additional avionics equipment, as it uses replies from Mode A, C and S transponders, as well as military IFF and ADS-B transponders. MLAT is under consideration by several MID States (Bahrain, Egypt, Oman and UAE).

Other PBN Infrastructure

6.15 Other navigation infrastructure that supports PBN applications includes INS, VOR/DME, DME/DME, and DME/DME/IRU. These navigation infrastructures may satisfy the requirements of RNAV navigation specifications, but not those of RNP.

6.16 INS may be used to support PBN en-route operations with RNAV-10 and RNAV 5 navigation specifications.

6.17 VOR/DME may be used to support PBN en-route and Arrival STAR operations based on RNAV 5 navigation specification.

6.18 Uses of DME/DME and DME/DME/IRU may support PBN en-route and terminal area operations based on RNAV 5, and RNAV 1 navigation specifications. Validation of DME/DME coverage area and appropriate DME/DME geometry should be conducted to identify possible DME/DME gaps, including identification of critical DMEs, and to ensure proper DME/DME service coverage.

Note.- The conventional Navaid infrastructure should be maintained to support non-equipped aircraft during a transition period until at least 2016.

Surveillance Infrastructure

6.19 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 and ICAO PANS-ATM (Doc 4444), and information on the current surveillance infrastructure in the MID can be found in ICAO FASID table.

Communication Infrastructure

6.20 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 ICAO FASID table.

7. IMPLEMENTATION ROADMAP OF PBN

ATM Operational Requirements

7.1 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.

7.2 In this regard, the following programmes will be developed:

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
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

7.3 The above programmes should conform to the performance objectives and regional action plan supporting the regional implementation plan (roadmap).

Short Term (2008-2012)

En-route

7.4 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.

7.5 In this phase, the current application of RNAV 10 is expected to continue for Oceanic and Remote continental routes.

7.6 For Continental routes, the applications of RNAV 5 and RNAV 1 navigation specifications are expected. Before the PBN concept was established , the MID Region adopted the Regional implementation of RNP 5. Under the PBN concept it is now required that RNP 5 will change into RNAV 5. 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).

7.7 **Operational approval**. Operators are required to have operational approval for RNAV 5. Depending on operational requirement RNAV 1 for terminal operations and RNAV 10 for Oceanic/Remote Continental operations.

7.8 Application of RNAV 5 or RNAV 1 for continental en-route will be mandated by the end of 2012.

Terminal

7.9 In selected TMAs, the application of RNAV-1 in a surveillance environment can be supported through the use of GNSS or ground navigation infrastructure, such as DME/DME and DME/DME/IRU. In this phase, mixed operations (equipped and non-equipped) will be permitted.

7.10 In a non- surveillance environment and/or in an environment without adequate ground navigation infrastructure, the SID/STAR application of Basic-RNP 1 is expected in selected TMAs with exclusive application of GNSS.

7.11 **Operational approval**. Operators are required to have operational approval for RNAV 1. In addition, operators are required to have Basic RNP 1 approval when operating in procedural control TMAs.

Note: In order to avoid unnecessary approvals, operators equipped with GNSS

should apply for combined RNAV 1 and Basic RNP 1.

Approach

7.12 The application of RNP APCH procedures is expected to be implemented in the maximum possible number of airports, primarily international airports. To facilitate transitional period, conventional approach procedures and conventional navigation aids should be maintained for non-equipped aircraft.

7.13 States should promote the use of APV operations (Baro-VNAV SBAS) to enhance safety of RNP approaches and accessibility of runways.

7.14 The application of RNP AR APCH procedures should be limited to selected airports, where obvious operational benefits can be obtained due to the existence of significant obstacles.

7.15 **Operational approval requirements**. Operators shall plan to have operational approval for RNP APCH with VNAV operations (Baro-VNAV). Depending on operational need, aircraft shall also meet the RNP AR APCH specification.

SUMMARY TABLE AND IMPLEMENTATION TARGETS

SHORT TERM (2008-2012)		
Airspace	***Navigation Specification Preferred***	***Navigation Specification Acceptable***
En-route – Oceanic	RNAV 10	RNAV 10
En-route - Remote continental	RNAV 5, RNAV 10	RNAV 10
En-route – Continental	RNAV 5, RNAV 1	
En-route - Local / Domestic	RNAV 5, RNAV 1	
TMA – Arrival	RNAV 1 in surveillance environment and with adequate navigation infrastructure. Basic RNP 1 in non-surveillance environment	
TMA – Departure	RNAV 1 in surveillance environment and with adequate navigation infrastructure. Basic RNP 1 in non- surveillance environment	
Approach	RNP APCH with Baro VNAV in all possible airports; RNP AR APCH in airport where there are obvious operational benefits. Implementation of straight-in LNAV only procedures, as an exception	
Implementation Targets ▪ 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% by 2010, and 50 % by 2012; and priority should be given to airports with most significant operational benefits

- RNAV 1 SIDs/STARs for 30% of international airports by 2010 and 50% by 2012 and priority should be given to airports with RNP Approach

Medium Term (2013-2016)

En-route

7.16 Noting the current development of route spacing standards for RNAV 1, in this phase, it is expected that the implementations of all existing RNAV/RNP routes are consistent with PBN standards. However, in order to ensure implementation harmonization, States are urged to implement their RNAV/RNP routes based on a Regional agreements and consistent PBN navigation specifications and separation standards.

7.17 With regard to oceanic remote operations, it is expected that with the additional surveillance capability, the requirement for RNAV 10 will disappear, and be replaced by navigation specifications for continental en-route applications.

7.18 **Operational approval**. Operators are required to have operational approval for RNAV 5 and RNAV 1.

Terminal

7.19 RNAV 1 or Basic RNP 1 will be fully implemented in all TMAs by the end of this term.

7.20 **Operational approval**. Operators are required to have operational approval for RNAV 1/Basic RNP 1 approval.

Note: In order to avoid unnecessary approvals, operators equipped with GNSS should apply for combined RNAV 1 and Basic RNP 1

Approach

7.21 In this phase, full implementation of RNP APCH with Baro VNAV or APV SBAS for all instrument runways is expected. These applications may also serve as a back-up to precision approaches.

7.22 The extended application of RNP AR Approaches should continue for airports where there are operational benefits.

7.23 The introduction of application of landing capability using GNSS is expected to guarantee a smooth transition toward high-performance approach and landing capability.

7.24 **Operational approval requirements**. Operators are required to have operational approval for RNP APCH with VNAV operations (Baro VNAV). Depending on operations, aircraft shall also meet RNP AR specification.

7.25 Application of RNAV 1 or Basic RNP-1 for all terminal areas and APV/Baro VNAV or APV/SBAS for all instrument runway ends, either as the primary approach or as a back-up for precision approaches will be mandated by 2016.

SUMMARY TABLE AND IMPLEMENTATION TARGETS

MEDIUM TERM (2013-2016)		
Airspace	***Navigation Specification (preferred)***	***Navigation Specification (/acceptable)***
En-route – Oceanic	RNAV 10	RNAV 10
En-route - Remote continental	NIL	RNAV 10
En-route – Continental	RNAV 1, RNAV 5	RNAV 1, RNAV 5
En-route - Local / Domestic	RNAV 1 , RNAV 5	RNAV 1, RNAV 5
TMA – (Arrival, Departure)	RNAV1 or RNP 1 application	RNAV 1 or RNP 1 application
Approach	RNP APCH (with Baro VNAV) and APV Expansion of RNP AR APCH where there are operational benefits Introduction of landing capability using GNSS and its augmentations	RNP APCH (with Baro VNAV) and APV Expansion of RNP AR APCH where there are operational benefits Introduction of landing capability using GNSS and its augmentations
Implementation Targets ▪ RNP APCH with Baro VNAV or APV or LNAV in 100% of instrument runways by 2016 ▪ RNAV 1 or RNP 1 SID/STAR for 100% of international airports by 2016 ▪ RNAV 1 or Basic RNP 1 SID/STAR at busy domestic airports where there are operational benefits ▪ Implementation additional RNAV/RNP routes ▪ CDO Implementation will commence in this term		

Long Term (2016 and Beyond)

7.26 In this phase, GNSS is expected to be a primary navigation infrastructure for PBN implementation. States should work co-operatively on a multinational basis to implement GNSS in order to facilitate seamless and inter-operable systems and undertake coordinated Research and Development (R&D) programs on GNSS implementation and operation.

7.27 Moreover, during this phase, States are encouraged to consider segregating traffic according to navigation capability and granting preferred routes to aircraft with better navigation performance.

7.28 Noting the current development of Advanced RNP-1 navigation specification, it is expected that this navigation specification will play an important role in the long term implementation of PBN for enroute and terminal operations.

7.29 With the expectation that precision approach capability using GNSS and its augmentation systems will become available, States are encouraged to explore the use of such capability where there are operational and financial benefits.

7.30 During this term the use of Advanced RNP-1 for terminal and en-route will be mandated by a date to be determined.

7.31 Implementation of CDO in all International Airports is recommended.

8. TRANSITIONAL STRATEGIES

8.1 During the transitional phases of PBN implementation, sufficient ground infrastructure for conventional navigation systems must remain available. Before existing ground infrastructure is considered for removal, users should be consulted and given reasonable transition time to allow them to equip appropriately to attain equivalent PBN-based navigation performance. States should approach removal of existing ground infrastructure with caution to ensure that safety is not compromised, such as by performance of safety assessment, consultation with users through regional air navigation planning process and national consultative forums. Moreover, noting that navigation systems located in a particular State/FIR may be supporting air navigation in airspaces in other States/FIRs States are required to cooperate and coordinate bilaterally, multilaterally and within the framework of Regional agreements, in the phasing out of conventional ground based navigation systems and maintaining the serviceability of required navigation aids for area navigation (e.g. DME).

8.2 States should ensure that harmonized separation standards and procedures are developed and introduced concurrently in all flight information regions to allow for a seamless transition towards PBN.

8.3 States should cooperate on a multinational basis to implement PBN in order to facilitate seamless and inter-operable systems and undertake coordinated R&D programs on PBN implementation and operation.

8.4 States are encouraged to consider segregating traffic according to navigation capability and granting preferred routes to aircraft with better navigation performance, taking due consideration of the need of State/Military aircraft.

8.5 States should encourage operators and other airspace users to equip with PBN avionics. This can be achieved through early introductions of RNP approaches, preferably those with vertical guidance.

8.6 ICAO MID Region Regional Office should provide leadership supporting implementation and transition towards PBN.

8.7 States should have PBN operational approval process.

8.8 Early Implementation of PBN are encouraged.

9. SAFETY ASSESSMENT AND MONITORS

Methodology

Need for Safety Assessment

9.1 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 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.

Roles and Responsibilities

9.2 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. The implementing agency may have the capability to undertake such activities or may seek assistance from the Middle East Regional Monitoring Agency (MID RMA). The latter course of action is preferred as the MID RMA would be in a position to establish the necessary monitoring and data collection activity in an effective manner. Furthermore, the MIDANPIRG/10 meeting in April 2007 adopted the revised terms of reference of the MID RMA, whose scope includes safety monitoring of RNP/RNAV.

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

(a) Establish and maintain a database of PBN approvals;

(b) Monitor aircraft horizontal-plane navigation performance and the occurrence of large navigation errors and report results appropriately to the MID RMA;

(c) Conduct safety and readiness assessments and report results appropriately to the MID RMA;

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

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

9.4 The duties and responsibilities of the MID RMA as well as the agreed principles for its establishment are available from the ICAO MID Regional Office.

10. PERIODIC REVIEW OF IMPLEMENTATION ACTIVITIES

Procedures to Modify the Regional Plan

10.1 Whenever a need is identified for a change to this document, the Request for Change (RFC) Form should be completed and submitted to the ICAO MID Regional Office. The Regional Office will collate RFCs for consideration by the PBN/GNSS Task Force (ATM/SAR/AIS Sub-group of MIDANPIRG).

10.2 When an amendment has been agreed by a meeting of the PBN/GNSS Task Force, a new version of the PBN Regional Plan will be prepared, with the changes marked by an "|" in the margin, and an endnote indicating the relevant RFC, to enable a reader to note the origin of the change. If the change is in a table cell, the outside edges of the table will be highlighted. Final approval for publication of an amendment to the PBN Regional Plan will be the responsibility of MIDANPIRG.

Appendix A – Practical Examples of tangible benefits (living document)

Egypt/ Bahrain / UAE with figures will be provided and inserted here.

Practical examples of tangible benefits derived from the implementation of PBN are:

- Increased airspace safety through the implementation of continuous and stabilized descent procedures using vertical guidance;

- Provision of runway-aligned final approach path which may not be possible from conventional navigation;

- Reduced aircraft flight time due to the implementation of optimal flight paths, with the resulting savings in fuel, noise reduction, and enhanced environmental protection;

- Improved airport and airspace arrival paths in all weather conditions, and the possibility of meeting critical obstacle clearance and environmental requirements through the application of optimized RNAV or RNP paths;

- Implementation of more precise approach, departure, and arrival paths that will reduce dispersion and will foster smoother traffic flows;

- Reduced delays in high-density airspaces and airports through the implementation of additional parallel routes and additional arrival and departure points in terminal areas;

- Reduction of lateral and longitudinal separation between aircraft to accommodate more traffic;
- Decrease ATC and pilot workload by utilizing RNAV/RNP procedures and airborne capability and reduce the needs for ATC-Pilot communications and radar vectoring;

- Increase of predictability of the flight path; and

- Reduction of maintenance and flight inspection costs associated with conventional navigation aids

Appendix B – Reference documentation for developing operational and airworthiness approval regulations/procedures

General Guidelines for Obtaining Airworthiness and Operational Approvals for PBN Navigation Specifications, Version 1.0, International Air Transport Association, August 2008. (URL - http://www2.icao.int/en/pbn/ICAO%20Documentation/ICAO%20Documentation/State%20letter%2007.22%20Guidance%20material%20for%20the%20issuance%20of%20performance%20based%20navigation%20(PBN)%20operational%20approvals.pdf

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PBN/GNSS TF/4
Appendix 4B to the Report on Agenda Item 4

PROPOSED TERMS OF REFERENCE FOR
MID PBN SUPPORT TEAM (MPST)

1. TERMS OF REFERENCE

a) promote PBN and convince Stakeholders to support PBN;

b) gap Analysis and PBN Implementation Plan update/improvement; and

c) implementation of PBN. This would result in the engagement at a working level to coordinate and provide assistance to States.

2. WORK PROGRAMME

a) promotion of PBN by increasing awareness and education to motivate States to invest and implement

b) make use of the PBN Go Team Visit to the UAE, and adapt this to provide the support at a greater frequency

c) Collection of required data and practices to maintain data integrity

d) Conducting safety assessments

e) Completion and improvement of PBN implementation plans

f) Guidance to establish the regulatory framework, approvals process and other mechanisms necessary for implementation and sustainment of PBN capabilities

g) Provide guidance and assistance to operators in obtaining operational approval for utilising RNP and other PBN procedures

h) assist in operational approval

i) Providing guidance to States in PBN en-route implementation, airspace route design and harmonization across FIRs

j) Undertake other functions relevant to implementation of PBN as assigned by the PBN/GNSS TF and report to PBN/GNSS TF

3. COMPOSITION OF THE TASK FORCE

Experts from MID Region States, UAE as champion, IATA support and representative from Industry, International/Regional Organizations may be invited when required.

PBN/GNSS TF/4
Report on Agenda Item 5

REPORT ON AGENDA ITEM 5: UPDATE THE STATES PBN IMPLEMENTATION PLAN

5.1 The meeting recalled the 36th Session of the ICAO Assembly (18-28 September 2007) had endorsed Resolution 36/23 on PBN global goals. The Resolution urged all States to implement Area Navigation (RNAV) and Required Navigation Performance (RNP) Air Traffic Services (ATS) routes and approach procedures in accordance with the ICAO Performance Based Navigation (PBN) concept laid down in the ICAO PBN Manual (Doc 9613). It also resolved that States should complete a PBN implementation plan by 2009 to achieve:

- implementation of RNAV and RNP operations (where required) for en route and terminal areas according to established timelines and intermediate milestones;

- implementation of approach procedures with vertical guidance (APV) (Baro-VNAV and/or augmented Global Navigation Satellite Systems (GNSS)) for all instrument runway ends, either as the primary approach or as a back-up for precision approaches by 2016 with intermediate milestones of 30 per cent by 2010 and 70 per cent by 2014.

5.2 The meeting noted that the Assembly Resolution A36/23 was superseded by the 37th ICAO Assembly (28 September - 8 October 2010) Resolution A37-11, which resolves that, States complete a PBN implementation plan as a matter of urgency to achieve:

- 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

- implementation of straight-in LNAV only procedures, as an exception to the 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 take-off mass of 5 700 kg or more.

5.3 The meeting further noted that the modification of Assembly Resolution A36/23 with A37/11 basically means that aerodromes that do not have any operations of aircraft equipped with APV are exempted to introduce APV procedures. On one side this could be interpreted as a relaxation of the resolution, on the other hand, it is bolstering of Safety, the reason being that it was reported that many States had the excuse of not having APV equipped aircraft to particular aerodromes, not doing anything on improvement of the approach procedures. This means that even when there are GNSS equipped aircraft, they left old (less safe) approach procedures such as NDB and circling as the only option. Now with A37/11, even for those runways that are not served with APV aircraft there has to be at least a GNSS procedure with LNAV only.

5.4 The meeting recalled that the PBN/GNSS Task Force was established in order to foster PBN implementation in the ICAO MID Region. The meeting further recalled that the first version of the MID Regional PBN Implementation Strategy and Plan were developed in October 2008 and were adopted by MIDANPIRG/11 in February 2009 in order to allow sufficient time for the MID States to complete the development of their States National PBN implementation plan by December 2009.

5.5 Furthermore, the meeting was informed that in order to assist States in developing their National PBN Implementation plan a common template with the list of content of the States National PBN implementation plan was developed and made available on the ICAO PBN web site: http://www2.icao.int/en/pbn/Pages/Documentation.aspx which was also endorsed by MIDANPIRG/11 in February 2009.

5.6 The meeting noted that Bahrain, Oman and UAE have implemented RNAV1 routes. Furthermore the following States: Bahrain, Egypt, Jordan, Kuwait, Oman, Qatar , Saudi Arabia, UAE and Yemen had officially submitted their State PBN Implementation Plans some of which are still in draft version. The meeting agreed that States PBN implementation plan and progress reports will be posted on the ICAO PBN website.

5.7 The meeting reviewed the matrix on the status of the MID Region State PBN implementation plan and was of the view that it needs to be revised to include more information on the implementation status at least for the short term. Accordingly, the meeting developed a revised version as at **Appendix 5A** to the Report on the Agenda Item 5.

5.8 The meeting reviewed and updated the list of PBN Implementation focal points, as at **Appendix 5B** to the Report on the Agenda Item 5 and was of the view that focal points should have official emails.

5.9 MIDANPIRG/12 meeting approved the following conclusion 12/58 *PBN IMPLEMENTATION PROGRESS REPORT*, urging all MID States to keep the ICAO MID Regional office updated using the spreadsheet and the progress report, in this regard the meeting received the progress reports from the following States (Bahrain, Egypt, Jordan, Qatar and Saudi Arabia) which were not according to the agreed format. However, UAE provided the updated reports in the agreed format during the meeting as at **Appendix 5C** *to the Report on the Agenda Item 5.*

5.10 Furthermore, the meeting was of the view that the above MIDANPIRG/12 Conclusion 12/58 be amended in para (b) in order that States send their report every six months and whenever major progress is achieved. Accordingly, the meeting agreed to PBN/GNSS TF/3 meeting Draft Conclusion 3/2 with minor correction as follows:

DRAFT CONCLUSION 4/3: PBN IMPLEMENTATION PROGRESS REPORT

That, for future reporting on the status of PBN implementation, MID States be urged to:

*a) use the excel sheet as at **Appendix 5D** to the Report on the Agenda Item 5 and PBN Implementation Progress Report Template as at **Appendix 5E** to the Report on the Agenda Item; and*

b) submit progress reports to ICAO MID Regional Office every six months and whenever major progress is achieved starting January 2012.

5.11 The meeting noted that MIDANPIRG/12 approved the updated performance framework forms (PFF) related to PBN implementation in the MID Region which was reviewed and updated as at **Appendix 5F** to the Report on Agenda Item 5. The meeting urged MID States to develop their States National PFF and send to ICAO MID Regional Office. The meeting noted that all PFF will be reviewed thoroughly during the CNS/ATM/IC SG/6 meeting in January 2012 since this is the Sub-Group responsible for the measurement of the performance metric for the MID Region.

5.12 The meeting further noted that the Global Performance based Navigation Task Force (GPBN TF) was created on 16 December 2008, with the objective to build upon the global and regional structures, which have already been put in place for PBN implementation, and to produce tools and enablers to facilitate and expedite the work.

5.13 It was identified that direct technical assistance to States would be required. In this regard, the Global PBN TF agreed to the formation of "Go Teams" as a key means of providing expertise from a pool of service provider, regulator, and industry subject matter experts to assist States with PBN implementation.

5.14 The meeting noted that a PBN Go Team visit was carried out to UAE, General Civil Aviation Authority from 16 – 20 January 2011, which was conducted by the International Civil Aviation Organization (ICAO)/International Air Transport (IATA) Global Performance Based Navigation Task Force. Where the Go Team performed an assessment on specific working areas and, in agreement with the representatives of UAE aviation community (General Civil Aviation Authority, air navigation service providers, airport authorities, airlines, military and general aviation representatives) and developed a set of recommendations.

5.15 The meeting noted that the objective of the Go Team, in close cooperation with States aviation stakeholders, is to assess the areas identified by the State in the PBN gap analysis and to provide a list of recommendations to further support PBN implementation activities.

5.16 The meeting was informed that in order to accomplish these tasks and better manage the available expertise within the Go Team, a phased approach process would be followed as at **Appendix 5G** to the Report on Agenda Item 5.

5.17 The meeting noted that for preparatory phases of the PBN Go Team process that several conference calls would be conducted in order that States National PBN implementation Plans will be revised and a high level Gap Analysis are to be completed by States PBN POC (Point of Contact). Based on the analyses of the collected data a Statement Of Work (SOW) will be developed and agreed by the State as at **Appendix 5H** to the Report on Agenda Item 5.

5.18 The meeting also noted that there are four main working areas that the PBN Go-Team looks into as follows:

a) assessment of the existing PBN operational approval process;

b) assessment of existing airspace concept aiming to accommodate projected traffic increase and further improve safety, capacity and efficiency;

c) assessment of current approach procedures Implementation and design; and

d) assessment of existing PBN training.

5.19 Based on the above, and under the SOW for the assessment of existing PBN operational approval process the PBN Go Team and States Participants will go through the following:

a) analyze operational approval processes currently in place;

b) assess existing approval processes against Best Practices; and

c) Identify potential gaps and develop a list of recommended actions

5.20 Based on the above, the meeting noted the Go Team Recommended that each ICAO Region develops the Go Team capabilities within the Region. Furthermore, it was recommended that General Civil Aviation Authority (GCAA) be in a position of the PBN Champion in the MID Region in order to be able to assist MID States in the Implementation of PBN as discussed in Agenda item 4 and agreed to the following Draft Conclusion:

DRAFT CONCLUSION 4/4: MID PBN SUPPORT TEAM (MPST)

That,

a) ICAO MID Regional Office provide the leadership;

b) UAE be the champion for the MPST;

c) IATA fully commit and support the MPST; and

d) MID States assign members to MPST and allocate necessary resources.

5.21 The meeting noted that Egypt has requested a Go Team visit. However, it was not possible due to the limitation of resources. Based on the above, the meeting recommended that Egypt consider the support from the MPST.

PBN/GNSS TF/4
Appendix 5A to the Report on Agenda Item 5

STATUS OF MID STATES PBN IMPLEMETATION PLAN

State	**Plan Submission**	**Plan Status**	**Percentage of Implementation Short term (2012)**		**Remark**
			En route %	TMA %	
Bahrain	Submitted		10	40	
Egypt	Submitted	Draft	100	80	need user input
Iran	Not submitted				Only PBN approach and Terminal implementation status received
Iraq	Not submitted				
Jordan	Submitted		100		Restriction on levels
Kuwait	Submitted				
Lebanon	Not submitted				Only PBN approach and Terminal implementation status received
Oman	submitted		100	7	
Qatar	Submitted		10	40	
Saudi Arabia	submitted				
Syria	Submitted	Draft			
UAE	submitted		100	60	
Yemen	Submitted	Draft			

PBN/GNSS TF/4
Appendix 5B to the Report on Agenda Item 5

PBN IMPLEMENTATION FOCAL POINT

STATE	NAME	TITLE	ADDRESS	EMAIL	FAX	TEL	MOBILE
Bahrain	Fareed Abdullah Al Alawi	Head, air Traffic Operations	Civil Aviation Affairs P.O. Box 586	falalawi@caa.gov.bh	+973 17321992	+973 17321158	+97339651596
Bahrain	Saleem Mohamed Hassan	Chief Air Traffic Management	Civil Aviation Affairs P.O. Box 586	saleemmh@caa.gov.bh	+973 17329966	+973 17321117	+97339608860
Egypt	Badr Mohamed Shouman	General Director HCAA	Ministry of Civil Aviation Egyptian Civil Aviation Authority Cairo International Airport Road Cairo - EGYPT	badrshoman@yahoo.com	+202 2268 0627	+202 2265 7849	+20100 601 3603
Iran	Habib Davoudi Dana	Chief of Procedure Design Office	ATM Department Mehrabad International Airport Tehran 13445	h.davoudi@yahoo.com	+982144649269	+982 166025013	
Iran	Mohammad Khodakarami	D.G. of Aeronautical Affairs (in CAO)	Mehrabad International Airport P.O. Box 13445 – 1798	mkhd4444@yahoo.com	+98214464 9269	+982 16603 6241	
Iraq							
Jordan	Nayef Marshoud	Director ATM department	P.O. Box 7547	datm@carc.gov.jo	+962 6 4891266	+962 6 4897729	+962 797498992
Kuwait	Adel Mohammed Al Yagout	Superintendent of Air Navigation Department	Directorate General of Civil Aviation Kuwait International Airport P.O. Box 17 Safat 13001	Q8dgca_danoff@hotmail.com	+965 4346221	+965 4346220	+965 9571755
Lebanon	Walid Alhassanieh	Chief ACC	Air Navigation Department Beirut Rafic Hariri Int'l Airport	hassaniehw @beirutairport.gov.lb	+9611629023 +9611629106	+961 1629026	+961 3509902
Oman	Sabri Said Saud Al-Busaidy	DMS Manager	Directorate General of Meteorology & Air Navigation (DGMAN) Muscat International Airport P.O. Box 1 CPO Seeb	sabri@dgcam.gov.om	+96824518990 +24519 939	+968 24519501	+968 99359415

STATE	NAME	TITLE	ADDRESS	EMAIL	FAX	TEL	MOBILE
Qatar	Ahmed Al-Eshaq	Director Air Navigation	Civil Aviation Authority P.O. Box 3000 Doha – QATAR	ahmed@caa.gov.qa	(974) 465 6554	(974) 462 2300	(974) 555 0440
Qatar	Faisal Alqahtan	Head of AIS	Civil Aviation Authority P.O. Box 73 Doha – QATAR	Faisal.alqahtan@caa.gov.qa	(974)44656554	(974)44656221	(974) 5553 7060
Saudi Arabia	Ali H. Hakami	Navigational Aids Systems Planner	General Authority of Civil Aviation P.O. Box 21444 Jeddah 21444	yaro123@yahoo.com	+966 2 671 7717 Ext 1594	+966 2 671 7717 Ext 1593	+966 59 840 2598
Syria	Al Layth Al Hammoud	Chief of Air Navigation					
UAE	Talal Al Hammadi	Head - Airspace Coordination General Civil Aviation Authority	Sheikh Zayed Air Navigation Centre P.O. Box 66 Abu Dhabi – UAE	thammadi@szc.gcaa.ae	+97125996883	97125996890	+971508180873
Yemen	Ahmed Mohamed Al Kobati	Director Air Navigation Operations	Air Navigation Sector CAMA Airport Road P.O. Box 3473 Sana'a – REPUBLIC OF YEMEN	cama570@yahoo.com	+9671344047	+9671345402	+967 777241375

PBN/GNSS TF/4
Appendix 5C to the Report on Agenda Item 5

PBN IMPLEMENTATION PROGRESS REPORT

State: UNITED ARAB EMIRATE Date: 11 October 2011

Designation of PBN Focal Point

Reference:
MID State Letter Ref AN 6/28 – 149 dated 21 April 2008 and follow up letter Ref AN6/28 – 293 dated 10 August " in order to facilitate necessary follow-up and coordination, to provide a PBN Implementation Focal Point by 21 August 2008 "

Status: Nominated
Focal Point: Talal Al Hammadi, Head - Airspace Coordination, PO Box 666, Abu Dhabi,
thammadi@szc.gcaa.ae
M: +971 50 8180783 | T: +971 2 599 6890 | F: +971 2 599 6836

State PBN Implementation Plan

Reference:
MIDANPIRG Conclusion 11/74 – PBN State implementation Plan
"That, in order to give effect to Assembly Resolution A36-23: Performance based navigation global goals, MID States are urged to complete development of their individual State Implementation plans based on the regional PBN implementation plan by 30 September 2009 so that it may be reviewed by the ATM/SAR/AIS SG as part of the Regional agreement process.

Status: Approved by GCAA, Adopted by NASAC and reviewed by ICAO GNSS TF
Note(s):
The UAE PBN Implementation plan was submitted to ICAO in March 2011 and will be reviewed on an annual basis.

Approach Operations

Reference:
ICAO Assembly Resolution A36-23
"States and planning and implementation regional groups (PIRGs) complete a PBN implementation plan by 2009 to achieve: implementation of approach procedures with vertical guidance (APV) (Baro-VNAV and/or augmented GNSS) for all instrument runway ends, either as the primary approach or as back up for precision approaches by 2016 with intermediate milestones as follows: 30 percent by 2010, 70 percent by 2014."
Status:

Implementation Targets (# of RWY Ends)						Completed (# of RWY Ends)				In Progress (# of RWY Ends)			
Y2010		Y2014		Y2016		LNAV		LNAV/VNAV		LNAV		LNAV/VNAV	
OMAA	13L											OMAA 13L	Y
OMAA	13R											OMAA 13R	Y
OMAA	31L											OMAA 31L	Y
OMAA	31R											OMAA 31R	Y
OMAD	31					OMAD 31	Y					OMAD 31	Y
OMAD	13					OMAD 13	Y					OMAD 13	Y
		OMAL	01										
		OMAL	19										
OMDB	12L					OMDB 12L	Y					OMDB 12L	Y
OMDB	12R					OMDB 12R	Y	OMDB 12R	Y				
OMDB	30L					OMDB 30L	Y	OMDB 30L	Y				
OMDB	30R					OMDB 30R	Y					OMDB 30R	Y
OMDW	12											OMDW 12	Y
OMDW	30											OMDW 30	Y
		OMFJ	11										
		OMFJ	29										
		OMRK	16									OMRK 16	Y
		OMRK	34									OMRK 34	Y
OMSJ	12					OMSJ 12	Y	OMSJ 12	Y				
OMSJ	30					OMSJ 30	Y	OMSJ 30	Y				

Note(s):
OMAA and OMAD are busy with projects to implement RNP-AR procedures – scheduled for implementation in April 2012.
OMRK is busy with a project to implement RNPAPCH-VNAV – scheduled for implementation Q2 2012.

Arrival and Departure Operations

Reference: 1) ICAO Assembly Resolution A36-23

"States and planning and implementation regional groups (PIRGs) complete a PBN implementation plan by 2009 to achieve: implementation of RNAV and RNP operations (where required) for en route and terminal areas according to established timelines and intermediate milestones."

2) MID PBN Regional Implementation Plan and Strategy

"Short-term Implementation Targets: RNP APCH (with Baro-VNAV) in 30% of instrument runways by 2010 and 50% by 2012 and priority should be given to airports with most significant operational benefits RNAV-1 SIDs/STARs for 30% of international airports by 2010 and 50% by 2012 and priority should be given to airports with RNP Approach RNP-5 and B-RNAV which is implemented in MID Region to be redefined as per ICAO PBN terminology by 2009 (MIDANPIRG/11), full implementation of PBN by 2012 for continental en-route.."

- *"Medium-term Implementation Targets: RNP APCH with Baro-VNAV or APV in 100% of instrument runways by 2016. RNAV-1 or RNP-1 SID/STAR for 100% of international airports by 2016 and RNAV-1 or Basic RNP-1 SID/STAR at busy domestic airports where there are operational benefits*

Implementation Targets (# of Int'l Airports)						**Completed** (# of Int'l Airports)		**Design/Review In Progress** (# of Int'l Airports)	
Y2010		**Y2014**		**Y2016**		**STAR**	**SID**	**STAR**	**SID**
OMAA	13L					OMAA 13L	OMAA 13L	OMAA 13L	
OMAA	13R					OMAA 13R	OMAA 13R	OMAA 13R	
OMAA	31L					OMAA 31L	OMAA 31L	OMAA 31L	
OMAA	31R					OMAA 31R	OMAA 31R	OMAA 31R	
OMAD	31							OMAD 31	
OMAD	13							OMAD 13	
				OMAL	01				
				OMAL	19				
OMDB	12L					OMDB 12L	OMDB 12L	OMDB 12L	OMDB 12L
OMDB	12R					OMDB 12R	OMDB 12R	OMDB 12R	OMDB 12R
OMDB	30L					OMDB 30L	OMDB 30L	OMDB 30L	OMDB 30L
OMDB	30R					OMDB 30R	OMDB 30R	OMDB 30R	OMDB 30R
OMDW	12					OMDW 12	OMDW 12		
OMDW	30					OMDW 30	OMDW 30		
		OMFJ	11				OMFJ 11		
		OMFJ	29				OMFJ 29		
				OMRK	16				
				OMRK	34				
OMSJ	12					OMSJ 12	OMSJ 12	OMSJ 12	OMSJ 12
OMSJ	30					OMSJ 30	OMSJ 30	OMSJ 30	OMSJ 30

Note(s):

OMAA and OMAD are busy with projects to implement RNAV-1 STAR procedures – scheduled for implementation in April 2012.

OMDB and OMSJ are busy with projects to implement RNAV-1 SID/STAR procedures - scheduled for implementation Q2 2012).

See the attached spreadsheet for further detail.

UAE PBN APPROACH TERMINAL IMPLEMENTATION STATUS

NO	ICAO REGION	ICAO DESIG	AIRPORT NAME[5]	COUNTRY	INTL (Y/N)[1]	RUNWAY	INST RWY Y/N	RESTRICTIONS IF ANY	APPROACH TYPE[2,7]	APPR EFF DATE[6]	RNAV/RNP SID[3]	SID EFF DATE[6]	RNAV/RNP STAR[4]	STAR EFF DATE[6]	COMMENTS[7]
1	MID	OMAA	Abu Dhabi	UAE	Y	13L	Y		NIL		RNAV-5/1	Jul-09	RNAV-5/1	Jul-09	RNP-AR and RNAV 1 STAR Project in progress
2	MID	OMAA	Abu Dhabi	UAE	Y	13R	Y		NIL		RNAV-5/1	Jul-09	RNAV-5/1	Jul-09	RNP-AR and RNAV 1 STAR Project in progress
3	MID	OMAA	Abu Dhabi	UAE	Y	31L	Y		NIL		RNAV-5/1	Jul-09	RNAV-5/1	Jul-09	RNP-AR and RNAV 1 STAR Project in progress
3	MID	OMAA	Abu Dhabi	UAE	Y	31R	Y		NIL		RNAV-5/1	Jul-09	RNAV-5/1	Jul-09	RNP-AR and RNAV 1 STAR Project in progress
4	MID	OMAD	Al Bateen	UAE	Y	31	Y		RNP APCH	Jun-11	NIL		NIL		RNP-AR and RNAV 1 STAR Project in progress
5	MID	OMAD	Al Bateen	UAE	Y	13	Y		RNP APCH	Jun-11	NIL		NIL		RNP-AR and RNAV 1 STAR Project in progress
6	MID	OMAL	Al Ain	UAE	Y	01	Y		NIL		NIL		NIL		
7	MID	OMAL	Al Ain	UAE	Y	19	Y		NIL		NIL		NIL		
8	MID	OMDB	Dubai	UAE	Y	12L	Y		RNP APCH	Nov-09	RNAV-5	Nov-09	RNAV-5	Nov-09	RNAV 1 SID/STAR Project in progress
9	MID	OMDB	Dubai	UAE	Y	12R	Y		RNP APCH-VNAV	Jun-11	RNAV-5	Nov-09	RNAV-5	Nov-09	RNAV 1 SID/STAR Project in progress
10	MID	OMDB	Dubai	UAE	Y	30L	Y		RNP APCH-VNAV	Jun-11	RNAV-5	Nov-09	RNAV-5	Nov-09	RNAV 1 SID/STAR Project in progress
11	MID	OMDB	Dubai	UAE	Y	30R	Y		RNP APCH	Nov-09	RNAV-5	Nov-09	RNAV-5	Nov-09	RNAV 1 SID/STAR Project in progress
12	MID	OMDW	Dubai World	UAE	Y	12	Y		NIL		RNAV-1	Jun-10	RNAV-1	Jun-10	RNP APCH target AIRAC 93
13	MID	OMDW	Dubai World	UAE	Y	30	Y		NIL		RNAV-1	Jun-10	RNAV-1	Jun-10	RNP APCH target AIRAC 93
14	MID	OMFJ	Fujairah	UAE	Y	11	Y		NIL		RNAV-1	Jul-09	NIL		
15	MID	OMFJ	Fujairah	UAE	Y	29	Y		NIL		RNAV-1	Jul-09	NIL		
16	MID	OMRK	Ras Al Khaimah	UAE	Y	16	Y		NIL		NIL		NIL		RNP APCH Target AIRAC 93
17	MID	OMRK	Ras Al Khaimah	UAE	Y	34	Y		NIL		NIL		NIL		RNP APCH Target AIRAC 93

18	MID	OMSJ	Sharjah	UAE	Y	12	Y		RNP APCH-VNAV	Jun-10	RNAV-5	Nov-09	RNAV-5	Nov-09	RNAV 1 SID/STAR project in progress
19	MID	OMSJ	Sharjah	UAE	Y	30	Y		RNP APCH-VNAV	Jun-10	RNAV-5	Nov-09	RNAV-5	Nov-09	RNAV 1 SID/STAR project in progress

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<STATE> PBN APPROACH and TERMINAL IMPLEMENTATION STATUS

UPDATED: 29/02/2008

NO	ICAO REGION	ICAO DESIG	AIRPORT NAME[5]	COUNTRY	INTL (Y/N)[1]	RUNWAY	INST RWY Y/N	RESTRICTIONS	APPROACH LNAV/VNAV[2]	APPR EFF DATE[6]	RNAV/RNP SID[3]	SID EFF DATE[6]	RNAV/RNP STAR[4]	STAR EFF DATE[6]	COMMENTS
1	MID	OOMS	MUSCAT	OMAN	Y	08	Y		LNAV	May-07	RNAV-1	Dec-10	RNAV-1	Dec-10	
2	MID	OOMS	MUSCAT	OMAN	Y	26	Y		LNAV/VNAV	May-07	RNAV-1	Dec-10	RNAV	May-07	

ABOVE IS ONLY AN EXAMPLE. IT IS NOT MEANT TO SHOW THE ACTUAL IMPLEMENTATION AT THAT AIRPORT

Notes:

1. If the aerodrome is used for international operations, including as an alternate, enter 'Y', if not, enter 'N'
2. If LNAV only, enter LNAV. If LNAV/VNAV only enter LNAV/VNAV. If both enter BOTH. If RNP AR, enter RNP AR.If there is an RNP AR to the same runway that also has an LNAV and/or LNAV/VNAV the enter the RNP AR on a separate line for that runway.
3. If RNAV or RNP SID exists for this runway, note navigation specification, RNAV 1, RNAV 2, or Basic-RNP 1. If not based on a PBN navigation specification, enter RNAV.
4. If RNAV or RNP STAR exists for this aerodrome note navigation specification, RNAV-1, RNAV 2, or Basic-RNP 1. If not based on a PBN navigation specification, enter RNAV.
5. Should list all instrument aerodromes and runway ends in the State, as well as non-instrument runway ends that are used by aircraft in excess of 5700 kg MTOW. Leave blank blocks L-N as appropriate, if PBN or RNAV approaches, SIDs or STARs are not implemented or planned to be implemented yet as part of the State PBN Implementation Plan
6. Enter actual effective date or proposed future effective date as month-year

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PBN IMPLEMENTATION PROGRESS REPORT

State: (Name of State) Date: (DD/MM/YY)

Designation of PBN Focal Point
Reference: MID State Letter Ref AN 6/28 – 149 dated 21 April 2008 and follow up letter Ref AN6/28 – 293 dated 10 August " in order to facilitate necessary follow-up and coordination, to provide a PBN Implementation Focal Point by 21 August 2008 "

Status: (Nominated/ To be Nominated)
Focal Point: (Name, Designation, Mailing Address, Email, Phone, Fax)

State PBN Implementation Plan
Reference: ICAO Assembly Resolution 37/11: Performance-based navigation global goals

Recognizing that not all States have developed a PBN implementation plan by the target date of 2009; *The Assembly: 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);

Status: (Adopted / To be adopted) by (name of a national body) and (Reviewed / To be reviewed) by ICAO *PBN/GNSS* TF

Approach Operations
Reference: ICAO Assembly Resolution A37/11

"*States complete a PBN implementation plan to achieve:* 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 implementation of straight-in LNAV only procedures, as an exception, 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 take-off mass of 5 700 kg or more.

Implementation Targets (# of RWY Ends)			**Completed** (# of RWY Ends)		**On Progress** (# of RWY Ends)	
Y2012	Y2014	Y2016	LNAV	LNAV/VNAV	LNAV	LNAV/VNAV
10			8			

Note(s): (States may include information on recent publications of new PBN approach procedures.)

Arrival and Departure Operations
Reference: ICAO Assembly Resolution A37/11

Implementation Targets (# of Int'l Airports)			**Completed** (# of Int'l Airports)		**On Progress** (# of Int'l Airports)	
Y2012	Y2014	Y2016	Arrival	Departure	Arrival	Departure

Note(s): (States may include information on recent publications with new PBN arrival/departure procedures.)

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Appendix 5F to the Report on Agenda Item 5

MID REGIONAL PERFORMANCE OBJECTIVES
ATM PERFORMANCE OBJECTIVES

OPTIMIZATION OF THE ATS ROUTE STRUCTURE EN-ROUTE AIRSPACE	
Benefits	
Environment	reductions in fuel consumption and CO_2 emission
Safety	Improved safety of ATS routes
Efficiency	• ability of aircraft to conduct flight more closely to preferred trajectories • increase in airspace capacity
KPI	• status of implementation of RNAV 1 in the MID Region • status of implementation of the ATS Routes listed in the MID ATS Route Catalogue • status of implementation of RNAV 5 area in the level band FL160-FL460, in the MID Region • status of Duplicated 5LNCs in the MID Region • status of deficiencies related to non-implementation of ATS Routes • status of implementation of 20NM longitudinal separation
Performance Metrics:	• number of RNAV 1 Routes implemented, in accordance with the MID Basic ANP • number of implemented ATS Routes from the MID ATS Route Catalogue • number of States having implemented RNAV 5 area in the level band FL160-FL460 • number of duplicate 5LNC eliminated • number of eliminated deficiency related to non-implementation of ATS Routes • number of concerned States implementing 20NM longitudinal separation • percentage of CO2 reduction of implemented new routes

Strategy
Short term (2010-2012)
Medium term (2013-2016)

ATM OC COMPONENTS	TASKS	TIMEFRAME START-END	RESPONSIBILITY	STATUS
AOM	***En-route airspace***			
	• develop Airspace Concept based on the MID PBN implementation plan, in order to design and implement a trunk route network, connecting major city pairs in the upper airspace and for transit to/from aerodromes, on the basis of PBN and, in particular, RNAV 5, taking into account interregional harmonization	ongoing	ATM/SAR/AIS SG (ARN TF)	valid
	• develop State PBN implementation plans related to ATS Route development	2008-2012	States	valid
	• monitor user requirements for the establishment of ATS routes in the MID Region	Ongoing	ATM/SAR/AIS SG ARN TF	valid
	• provide status of PBN	2010-2012	States	valid

Strategy ***Short term (2010-2012)*** ***Medium term (2013-2016)***				
ATM OC COMPONENTS	**TASKS**	**TIMEFRAME START-END**	**RESPONSIBILITY**	**STATUS**
	implementation			
	• monitor the implementation of pending ATS Routes and update the MID Basic ANP and the MID ATS Route catalogue	Ongoing	ATM/SAR/AIS SG ARN TF	valid
	• follow–up with States on the implementation of pending ATS Routes and update the list of air navigation deficiencies, accordingly	Ongoing	ATM/SAR/AIS SG ARN TF	valid
	• monitor the implementation of RNAV 5 area in the level band FL160 - FL460 (inclusive)	2008-2012	ATM/SAR/AIS SG ARN TF PBN/GNSS TF	valid
	• monitor the implementation of RNAV 1 routes in the MID Region	Ongoing	ATM/SAR/AIS SG ARN TF	valid
	• implementation of 20NM longitudinal separation between States	2010-2011	Bahrain; Iraq; Jordan; Kuwait; Saudi Arabia; Syria and UAE	Completed
	• monitor the process of allocation of 5LNCs	Ongoing	ICAO	valid
	• elimination/Reduction of the use of duplicate 5LNCs	2010-2011	ICAO States	valid
linkage to GPIs	GPI/5: performance-based navigation, GPI/7: dynamic and flexible ATS route management, GPI/8: collaborative airspace design and management, GPI/20: WGS-84			

OPTIMIZATION OF THE TERMINAL AIRSPACE	
Benefits	
Environment **Safety**	• reductions in fuel consumption and CO_2 emission • enhance safety in terminal air space
Efficiency	• ability of aircraft to conduct flight more closely to preferred trajectories • increase in airspace capacity • facilitate utilization of advanced technologies (e.g., FMS based arrivals) and ATC decision support tools (e.g., metering and sequencing), thereby increasing efficiency
KPI	• status of implementation of PBN routes in terminal airspace • status of implementation of SID and STARS
Proposed Metrics:	• number of States implemented PBN routes in terminal airspace • total Number of PBN routes in MID region terminal airspace • number States implemented SID and STARS • percentage of CO2 reduction of implemented new routes

Strategy
Short term (2010-2012)
Medium term (2013-2016)

ATM OC COMPONENTS	TASKS	TIMEFRAME START-END	RESPONSIBILITY	STATUS
AOM, AO	***In terminal airspace***			
	• develop Airspace Concept taking into consideration the MID PBN implementation plan, in order to design and implement optimized standard instrument departures (SIDs), standard instrument arrivals (STARs), instrument flight procedures, holding, approach and associated procedures (particular RNAV 1, Basic RNP1 and RNP AR)	Ongoing	States	valid
	• include terminal Airspace in the State PBN implementation plans	Ongoing	(ATM/SAR/AIS SG) States, MPST	valid
	• formulate safety plan (assessment and monitoring)	2009-2012	States, MPST	valid
	• support for operational approvals	2012-2013	MPST	valid
	• publish national regulations for aircraft and operators approval using PBN manual as guidance and considering available foreign approval material	2008-2012	States	valid
	• training	2008-2012	States MPST	valid
	• system performance measuring (measurement and monitoring plan)	2009-2012	States, ATM/SAR/AIS SG	valid
	• implement SIDs and STARs	2009-2012	States	valid

Strategy ***Short term (2010-2012)*** ***Medium term (2013-2016)***				
ATM OC COMPONENTS	**TASKS**	**TIMEFRAME START-END**	**RESPONSIBILITY**	**STATUS**
	• monitor implementation progress in accordance with MID PBN implementation roadmap and States implementation plan	2009-2012	States, ATM/SAR/AIS SG, PBN/GNSS TF	valid
Linkage to GPIs	GPI/5: performance-based navigation, GPI/7: dynamic and flexible ATS route management, GPI/8: collaborative airspace design and management, GPI/10: terminal area design and management, GPI/11: RNP and RNAV SIDs and STARs and GPI/12: Functional integration of ground systems with airborne systems.			

IMPLEMENTATION OF RNAV AND RNP APPROACHES	
Benefits	
Environment **Efficiency** **Safety**	• Reduce CO2 emission • reductions in fuel consumption and emissions; • improvements in capacity and efficiency at aerodromes • improvements in safety at aerodromes
KPI	• status of implementation of PBN approaches
Proposed Metrics:	• number of States having implemented PBN approaches • percentage of CO2 reduction of implemented new PBN approaches

Strategy
Short term (2010-2012)
Medium term (2013-2016)

ATM OC COMPONENTS	**TASKS**	**TIMEFRAME START-END**	**RESPONSIBILITY**	**STATUS**
AOM, AO	***At airports***			
	• develop Airspace Concept based on the MID PBN Implementation Plan, in order to design and implement RNP APCH APV in most possible airports; RNP AR APCH at airports where there are obvious operational needs	2009-2012	States	valid
	• formulate safety plan (assessment and monitoring)	2009-2012	States	valid
	• support for operational approvals	2012-2013	MPST	valid
	• publish national regulations for aircraft and operators approval using PBN manual as guidance and considering available foreign approval material	2008-2012	States	valid
	• system performance measuring (measurement and monitoring plan	2009-2012	States, ATM/SAR/AIS SG	valid
	• implement APV procedures	2009-2012	States	valid
	• monitor implementation progress in accordance with MID PBN implementation Plan and States implementation plan	2009-2012	PBN/GNSS TF States, ATM/SAR/AIS SG	valid
Linkage to GPIs	GPI/5: performance-based navigation, GPI/7: dynamic and flexible ATS route management, GPI/8: collaborative airspace design and management, GPI/10: terminal area design and management, GPI/11: RNP and RNAV SIDs and STARs and GPI/12: FMS-based arrival procedures			

PBN/GNSS TF/4
Appendix 5G to the Report on Agenda Item 5

GLOBAL PBN TASK FORCE – GO TEAM HIGH LEVEL PROCESS

PHASE I – SELECTION OF CANDIDATE STATE.

Key actions and considerations:

a) Coordinate with dates and locations of Airspace Design and Operational Approval workshops;
b) Go Team visit should be arranged only after it has been agreed that representatives from the State will participate in at least one of the FAA / Eurocontrol workshops;
c) Authorities to formally request a Go Team visit and list priority work areas; and
d) Details of Go Team visit to be communicated with the State.

PHASE II – DATA COLLECTION.

The following data will be collated and assessed before any visit is agreed:

a) State PBN implementation plan (must have been developed);
b) Assessment of current expertise (high level Gap Analyses). This includes a list of existing capabilities;
c) Review of current PBN implementation;
d) Identification of Airline user requirements; and
e) Teleconference to be conducted with a representative from the State. Interview conducted jointly by IATA and ICAO.

PHASE III – GO-TEAM COORDINATION

The following information will be provided to the Go Team:

a) High level summary of the States PBN capabilities;
b) Priority work areas to be identified to the Go Team members;
c) Go Team members to agree on which States to visit;
d) Work proposal to be presented to each Go-Team organization for their agreement;
e) Hosting State to provide data as required;
f) Hosting State to appoint a Point of Contact; and
g) IATA and ICAO to co-ordinate Go-Team visit.

PHASE IV – GO-TEAM VISIT.

Tasks will be made accordingly the identified priority work areas:

a) Develop a Statement of Work;
b) Establish teams based on specific knowledge areas;
c) IATA and ICAO to conduct a pre-meeting with POC;
d) Hosting State to ensure broad stakeholder participation;
e) Hosting State to provide facilities to support the visit; and
f) Hosting State to invite as deemed appropriate, state representatives from the ICAO Regional PBN Task Force.

PBN/GNSS TF/4
Appendix 5H to the Report on Agenda Item 5

STATEMENT OF WORK (SOW)

ICAO/IATA GLOBAL PBN TASK FORCE

1. Overview

1.1. Introduction

This Statement of Work (SOW) outlines the tasks envisaged for ICAO/IATA Global Task Force (GPBNTF) Go-Team on support of Performance Based Navigation (PBN) implementation to XYZ State for PBN Implementation.

1.2. Scope/Objective

The overall objective of this SOW is for GPBN TF to provide high-level guidance and recommendations to enhance the PBN implementation efforts.

Utilizing best practices and available ICAO provisions, the GBPNTF will assist with the following process:

1) Assessment of the existing PBN operational approval process:
    - Analyze operational approval processes currently in place;
    - Process to recognize PBN operational approval from foreign operators;
    - Assess existing approval processes against Best Practices; and
    - Indentify potential gaps and develop a list of recommended actions.
2) Assessment of existing airspace concept aiming to accommodate projected traffic increase and further improve safety, capacity and efficiency.
    - Assess current fleet;
        - identify existing aircraft area navigation capability; and
        - Identify Airworthiness an Operational Approvals status
    - Assess current traffic characteristics;
        - Assess available movement statistics;
            - Arrivals;
            - Departures;
            - Over flights; and
            - Sectors.
        - Identify bottlenecks and constraints.
    - Review Navigation Aid, Communication and Surveillance infrastructure;
        - Existing Navigation Aid, Communication and Surveillance infrastructure; and
        - Identify potential gaps and develop a list of recommended actions.
    - Air Traffic Management:
        - Assess current ATC SOPs (Data to be provided in advance by State);
        - Analyze existing sectorization (Data to be provided in advance by State);

- Assess current Airspace development processes;
- Assess the interfaces procedures between CTAs (Mainly Airports and ACC);
- Assess SIDs & STARs; and
- Identify potential gaps and develop a list of recommended actions.

- Establishment of optimized climb and descent profiles (CDOs):
  - Analyze current arrival and departure procedures (Data to be provided in advance by State);
  - Identify potential constraints;
  - Identify CDO design options; and
  - Develop a list of recommended actions.

3) Depending on the available time, Assessment of current approach procedures Implementation and design:
   - Assess current procedure development process;
   - Assess airports for traffic conflicts, terrain and obstacles to determine the requirement for RNP implementation and associated benefits; and
   - Identify potential gaps and develop a list of recommended actions.
4) Assessment of existing PBN training:
   - Assess current training;
     - Familiarization training for pilots and air traffic controllers;
     - Airspace planning; and
     - Procedure Design
   - Identify potential gaps and develop a list of recommended actions.

2. ICAO/IATA GPBNTF Responsibilities.

The GPBNTF Go-Team will be composed by a combination of ICAO and IATA representatives with selected subject matter experts from States and Industry partners.

After completion of the visit, the GPBN TF will provide a report containing all the identified process and a list of best practices and provisions to support implementation.

3. States Civil Aviation Authority Responsibilities.

- Provide facilities to support the visit;
- Ensure that all stakeholders involved on the PBN implementation team are represented during the visit;
- Provide access to current processes and available documentation;
- Invite as deemed appropriate, state representatives from the ICAO Regional PBN Task Force; and
- Invite National Airlines representatives.

4. Follow-up activities.

The GPBNTF Go-Team will provide 30 days after the completion of the visit a report with a list of recommendations to enhance States PBN Implementation Plan.

After States PBN Implementation Plan has been updated accordingly, it is expected that a PBN Implementation project plan for the next three years be developed, within six months, including but not limited to the following elements:

- Timeframe;
- Resources;
- Stakeholder Management Plan; and
- Risk Management Plan.

The Global PBN TF Go-Team will be available to analyze States PBN implementation project plan and advise accordingly.

REPORT ON AGENDA ITEM 6: GNSS SPECIFIC ISSUES

6.1 The meeting recalled that the frequency Interference-free operation of Global Navigation Satellite System (GNSS) is essential. The meeting may further wish to note that the frequency band 1 559 - 1 610 MHz, is used for elements of GNSS.

6.2 The meeting was apprised on the International Telecommunication Union (ITU) process, where footnotes Nos. **5.362B** and **5.362C** allowing the operation of the fixed service in some countries on a primary basis until 1 January 2010 and on a secondary basis until 1 January 2015. The above band is allocated, on a worldwide, primary basis, to the Aeronautical Radio Navigation service (ARNS) and to the Radio Navigation-Satellite Service (RNSS).

6.3 The meeting noted that the band already supports operation of two prime elements of GNSS that are the Global Navigation Satellite System (GLONASS) and Global Positioning System (GPS), the standards for which have been adopted into ICAO SARPs. SARPs for other RNSS systems, such as the European Galileo system, are under-development.

6.4 The meeting was apprised of the Studies undertaken in preparation for WRC-2000 indicate that a geographical separation distance exceeding line-of-sight (in the order of 400 km) between aircraft using GNSS and stations of the fixed service is required to ensure safe operation of GNSS.

6.5 The above restriction is very severe which can prohibit the safe use of GNSS over wide areas around any fixed service installation, where a fixed service to be introduced into this band could raise a harmful interference situations leading disruption to GNSS, affecting the safety of aircraft in flight. Thus, the WRC-2000 agreement to terminate all use by the fixed service in this band in 2015 still constitutes a severe and unacceptable constraint on the safe and effective use of GNSS in some areas of the world. It is, therefore, recommended that deletion of these allocations be effective from 2011.

6.6 The meeting agreed that good coordination with the radio frequency regulators and civil aviation experts is essential, where the civil aviation's experts are required to educate the radio regulator on the importance of civil aviation frequency spectrum requirements, and seek their support for aviation spectrum needs at WRC meetings.

6.7 The meeting noted that the following States (*Egypt, Iraq, Israel, Jordan, Qatar, Sudan, Syrian Arab Republic, and Yemen)* have their States names under footnotes 5.362C. Accordingly, the meeting urged these States to delete their names from footnote 5.362C in order to allow interference free GNSS signal and agreed to the following Draft Conclusion that was agreed by PBN/GNSS TF/3 meeting:

DRAFT CONCLUSION 4/5: PROTECTION OF GNSS SIGNAL

That, MID States with their names listed in the footnotes 5.362B and 5.362C are urged to take necessary measures to delete their names from these footnote as soon as possible in order to protect the GNSS signal and provide regular reports to ICAO MID Regional Office on action taken.

6.8 MIDANPIRG/12 meeting was apprised that European Space Agency and GNSS Supervisory Authority already completed their study which was the only study on GNSS (EGNOS extension) in the MID Region. In this regard Saudi Arabia informed the MIDANPIRG/12 meeting on the institutional issues those needs to be tackled which are still under consideration.

6.9 The meeting was informed that Ranging Integrity Monitoring Stations (RIMS) for EGNOS extension has been installed in Egypt (Alexandria fully operational) and in Abu-Simbel under installation, while under feasibility study in Jordan.

6.10 The meeting recalled that IATA does not support Satellite Base Augmentation Systems (SBAS) as IATA users already invested in Aircraft Based Augmentation Systems (ABAS) Avionics.

6.11 The PBN GNSS TF/3 meeting noted that ICAO 37th General Assembly held in Montreal 28 September to 08 October 2010, adopted Resolution A37-11 Performance Based Navigation global goals superseding assembly resolution A36-23.

6.12 Based on the above, the PBN GNSS TF/3 meeting reviewed and updated the Strategy for the implementation of GNSS in the MID Region and agreed to the following Draft Conclusion which is agreed by the meeting:

DRAFT CONCLUSION 4/6: STRATEGY FOR THE IMPLEMENTATION OF GNSS IN THE MID REGION

That, the Strategy for implementation of GNSS in the MID Region be updated as at ***Appendix 6A*** to the Report on Agenda Item 6.

6.13 The meeting noted that the Secretary of the Navigation Systems Panel (NSP) has coordinated the revision of the GNSS Manual (Doc 9849) by sending list of hurdles and requesting additional hurdles from ICAO regions, to ensure that the revised manual meets the goal of supporting GNSS implementation at national level. In this regard the meeting was updated on the revised version of Doc 9849, which has been presented at NSP Working Group of the Whole Meeting in Montreal, (09-18 November 2010) and published.

6.14 The meeting was of the view that GNSS activities need to be enhanced in the MID Region. Accordingly, the meeting encouraged MID States to conduct GNSS studies, workshops and seminars, since GNSS is the only sensor that supports all PBN navigation specification. The meeting developed the survey as at **Appendix 6B** to the Report on Agenda Item 6, to assess the level of GNSS implementation, and agreed to following Draft Conclusion:

DRAFT CONCLUSION 4/7: GNSS SURVEY

That, MID States complete the GNSS survey as at ***Appendix 6B*** *to the Report on Agenda Item 6 and send to ICAO MID Regional Office by 01 September 2012.*

6.15 The meeting noted Oman proposed means of compliance with ICAO Doc 8168 (PANSOPS) to Vertical Path Angles (VPA) approaches is to allow for taking into account hot climate conditions in the design phase of the Instrument Approach Procedure (IAP).

6.16 Furthermore Oman informed the meeting that in practice this can be accomplished by allowing for lowering of the nominal design VPA by taking into consideration higher than standard International Standard Atmosphere (ISA) temperatures.

6.17 Oman proposed the following considerations for Instrument Flight Procedure (IFP) design:

a) All NPA procedures should in principal be based on a nominal VPA of 3.0°.

b) Where daily mean annual temperatures in excess of ISA + 15° are applicable the procedure shall be designed with a nominal VPA of 2.8° or lower.

6.18 The meeting noted that unless temperature compensation is applied in the aircraft, the actual VPA will vary according to the temperature on the day. As a general guideline deviations of 0.2° VPA per 15°C difference from ISA and 4% per 1000’ of altitude for every 10°C deviation from ISA, can be assumed.

6.19 If the VPA is left unadjusted in the design phase for hot climate conditions this can produce operationally undesirable results, example:

a) High probability of unstable approaches because of difficulties in decelerating the aircraft because of higher actual VPAs and associated high descend rates. In certain circumstances (e.g. tailwind conditions) these might even trigger a GWS "sink rate" caution message. The probability of a go-around is increased. The aircraft might need to be configured in the final landing position (including selection of gear down) at a much earlier stage in order to cope with as a result of the high temperature effects.

b) Mismatch with PAPI guidance information because of higher actual VPAs.

6.20 The vertical part of a NPA flight procedure should be executed using the Constant Descent Final Approach (CDFA) flight technique. In FMS equipped aircraft this is accomplished by making use of the VNAV function of the FMC. FMC Navigation Database providers provide for FMC procedures based on AIP data. This data covers published conventional IAPs (VOR/DME, NDB etc.) as well as space based (GNS) IAPs as a minimum (FMC database providers will not go below a published VPA). Flying of conventional NPA procedures s is facilitated by FMC overlay’s of which the vertical (VNAV) part can be compared to flying a Baro-VNAV approach. In hot climate conditions, allowing for lowering of the nominal design VPA shall therefore also be considered for conventional IAPs.

6.21 In order to enhance pilot’s awareness on the effects of high temperatures with regard to flying NPA procedures with vertical guidance inputs based on barometric inputs (Baro-VNAV, FMC overlay etc), consideration should be given to including a VPA table on the approach procedure plates showing the effects of actual VPAs that will occur in systems that do not compensate for temperature at different actual temperatures.

6.22 The same RDH (Reference Datum Height) as for an ILS or MEHT (Minimum Eye Height above Threshold) for the Precision approach path indicator (PAPI) shall be applied for the VPA initiation point (also referred to as runway termination point).

PBN/GNSS TF/4
Appendix 6A to the Report on Agenda Item 6

REVISED STRATEGY FOR THE IMPLEMENTATION OF GNSS IN THE MID REGION

The following is the Strategy for the implementation of GNSS aligned with PBN in the MID Region:

Considering that:

a) Safety is the highest priority.

b) Elements of Global Air Navigation Plan on GNSS and requirements for the GNSS implementation will be incorporated into the CNS part of FASID.

c) GNSS Standards and Recommended Practices (SARPs), PANS and guidance material for GNSS implementation are available.

d) Human, environmental and economic factors will affect the implementation.

e) The availability of avionics, their capabilities and the level of user equipage.

f) The development of GNSS systems including satellite constellations, augmentation systems and improvement in system performance.

g) The airworthiness and operational approvals allowing the current GNSS applied for en-route and non-precision approach phases of flight without the need for augmentation services external to the aircraft.

h) The effects of ionosphere on GNSS and availability of mitigation techniques;

i) The PBN concept and the availability of PBN guidance material

j) The monitoring of the GNSS signal according to ICAO Document 9849 (GNSS Manual) and other related ICAO documents

k) States pay fair cost for GNSS to service providers (according to ICAO provisional policy guidance on GNSS cost allocation

The general strategy for the implementation of GNSS in the MID Region is detailed below:

1) Introduction of GNSS Navigation Capability should be consistent with the Global Air Navigation Plan.

2) Implementation of GNSS and Augmentations should be in full compliance with ICAO Standards and Recommended Practices and PANS.

3) Assessment of the extent to which the GNSS system accessible in the Region can meet the navigational requirements of ATM service providers and aircraft operators in the Region.

4) Introduce the use of GNSS with appropriate augmentation systems, as required, for en-route navigation and Implementation of approach procedures with vertical guidance (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 as per 37th ICAO General Assembly resolutions 37-11 and according to Regional PBN Implementation Plan ~~A 36-23 (APV), 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~~.

5) States, in their planning and introduction of GNSS services, take full advantage of future benefits accrued from using independent core satellite constellations, other GNSS elements and their combinations, and avoid limitations on the use of specific system elements.

6) Facilitate the use of GNSS; as enabler for PBN for en-route, terminal, approach and departure navigation. States should coordinate to ensure that harmonized separation standards and procedures are developed and introduced concurrently in adjacent flight information regions along major traffic flows to allow for a seamless transition to GNSS based navigation.

7) States should to the extent possible work co-operatively on a multinational basis under ICAO MID Office guidance to implement GNSS in order to facilitate seamless and inter-operable systems and undertake coordinated R&D programmes on GNSS implementation and operation.

8) States consider segregating traffic according to navigation capability and granting preferred routes to aircraft that are appropriately equipped for PBN to realize the benefits of such equipage taking due consideration of the need of State aircraft.

9) ICAO and States should undertake education and training programs to provide necessary knowledge in AIM ~~concept~~, PBN, GNSS, Augmentation systems ~~theory~~ and operational application.

10) States establish multidisciplinary GNSS implementation teams, using section 5.2.2 and Appendix C of ICAO Document 9849, GNSS Manual.

11) States, in their planning for implementation of GNSS services, provide effective spectrum management and protection of GNSS frequencies to reduce the possibility of unintentional interference.

12) During transition to GNSS, sufficient ground infrastructure for current navigation systems must remain available. Before existing ground infrastructure is considered for removal, users should be given reasonable transition time to allow them to equip accordingly.

13) States should approach removal of existing ground infrastructure with caution to ensure that safety is not compromised, such as by performance of safety assessment, consultation with users through regional air navigation planning and plan for complete decommissioning of NDBs by 2012.

14) Implement GNSS with augmentation as required for APV where operationally required in accordance with the MID Regional and National PBN Implementation plans.

15) States continue their efforts to implement GNSS applications for en-route, APV and TMA operations. Attention should be accorded to meeting all GNSS implementation requirements, including establishment of GNSS legislation, regulatory framework, and approval procedure.

Notes:

GNSS (and ABAS using RAIM in particular) is available on a worldwide basis, not much needs to be done in terms of infrastructure assessment. Nonetheless, the responsibility for providing services based on GNSS within the airspace of a particular State remains within that State.

A decision on whether or not to develop a status monitoring and NOTAM system for ABAS operations should be made by taking into account the nature of PBN approvals. In many cases ABAS operations are predicated on having a full complement of traditional NAVAIDs available for back-up when ABAS cannot support service.

PBN/GNSS TF/4
Appendix 6B to the Report on Agenda Item 6

GNSS ASSESSMENT SURVEY

The following GNSS survey has been developed by ICAO to assess the Regional (Global) level of GNSS implementation and to determine the role that States would like ICAO to assume

Please return the completed survey to icaomid@cairo.icao.int by 30/Mar 2011

State Name:

Contact Name:

Contact email:

1) Has your State developed a plan to implement GNSS -- ☐Yes ☐No
2) Was the GNSS Manual (Doc 9849) used as a reference when considering the implementation of GNSS ☐Yes ☐No
3) Has the basic GNSS regulation been promulgated in your State -- ☐Yes ☐No
4) a-Has your administration received requests from domestic aircraft operators to provide GNSS-based services -- ☐Yes ☐No

   b-Has your administration received requests from international aircraft operators to provide GNSS-based services -- ☐Yes ☐No
5) What is the level of WGS – 84 survey completion in your State
   a. For Waypoints -- _____%
   b. For Airports -- _____ %
   c. eTOD
6) What percentage of aircraft are equipped with GNSS avionics ____%
7) a- What is the number of runways in your State that meet instrument standards but do not have an instrument approach or _____

   b- What is the number of runways in your State that are only served by a circling procedure

8) In your State, how many PBN approach procedures are promulgated based on
   a. GNSS -- _____
   b. Conventional navigation-aids _____

9) How many ILS systems are equipped with marker beacons only (no DME) for aircraft to perform altitude/distance cross checks? _____

10) Do you allow the use of FMS GPS based computed distance checks? -- ☐Yes ☐No

11) Does your State plan to implement ADS-B -- ☐Yes When _____ ☐No

12) Does your State plan to implement Multirateration -- ☐Yes When _____ ☐No

13) What is the Status of the following systems in your State

   a. ADS-C -- Equipped ☐Yes ☐No Operational ☐Yes ☐No

   b. CPDLC -- Equipped ☐Yes ☐No Operational ☐Yes ☐No

   ……..

14) Does your State have any plans to implement augmentation systems

   a. SBAS -- ☐Yes When _____☐No

   b. GBAS -- ☐Yes When _____☐No

15) What role would your State like ICAO to assume in your GNSS Programme

_____

_____

16) Any comments

_____

_____

REPORT ON AGENDA ITEM 7: FUTURE WORK PROGRAMME

7.1 The meeting recalled that MIDANPIRG/12 held in Amman, Jordan 17-21 October 2010 adopted Decision 12/60 *LIST OF TASKS FOR PBN/GNSS TASK FORCE* which is listing the tasks that needs to be undertaken by the Task Force. Accordingly, the meeting reviewed the list of tasks and was of the view that some task should be reassigned specially after the establishment of the MPST and developed an updated version of the tasks as at **Appendix 7A** to the Report on Agenda Item 7.

7.2 The meeting reviewed and updated the Terms of Reference (TOR) and Work Programme of PBN/GNSS Task Force, taking into consideration the work accomplished during this task force meeting and developments in PBN/GNSS. Accordingly, the meeting agreed to the following Draft Decision:

DRAFT DECISION 4/8: TERMS OF REFERENCE OF THE PBN/GNSS TASK FORCE

That, the Terms of Reference and Work Programme of the PBN/GNSS Task Force be updated as at ***Appendix* 7B** to the Report on Agenda Item 7.

7.3 Taking into consideration the Work Programme of the Task Force, and noting that CNS/ATM/IC SG/6 will be held in January 2012 and MIDANPIRG/13 is tentatively scheduled to be held in April 2012, the meeting agreed that the PBN/GNSS TF/5 meeting be held in the first half of 2013. The venue will be Cairo, unless a State is willing to host the meeting.

PBN/GNSS TF/4
Appendix 7A to the Report on Agenda Item 7

No.	Associated GPI	**Tasks** PBN/GNSS/2	Objective	Deliverables	Target Date	To be delivered by	Supporting Parties	Status
1	GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	Draft Current Status & Forecast: Aircraft fleet readiness status Section of PBN Regional Plan	To facilitate update of the of the Regional Plan	Draft document	PBN/GNSS/4	IATA	States, States	Ongoing JUN 2012
2	GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	Draft Appendix A – Practical Example of tangible benefits Section of PBN Regional Plan	To facilitate the update of the Regional Plan	Draft document	PBN/GNSS/4	MID Office MID PBN support team (MPST)	–	Ongoing JAN 2012
3	GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	Study and assess the Region RNAV and RNP requirements using PBN methodology	To facilitate the update of the Regional Plan	Draft document	PBN/GNSS/4	ARN TF	–	Reassigned
4	GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	Initially focus assistance on States that may require support on development of State PBN implementation plans	To facilitate timely harmonized implementation	Draft provided	PBN/GNSS/4	PBN/GNSS Task Force MPST	States	Done during TF/2 Ongoing
5	GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	Identify priority runways for Approach Procedures with Vertical Guidance (APV) to be implemented based on the ICAO RNP APCH navigation specification (APV/Baro-VNAV)	To facilitate implementation efficiency and early operational benefits	Draft document	PBN/GNSS/4	States	IATA	Ongoing JUN 2012
6	GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	Develop an amendment proposal to the MID Regional Supplementary Procedures concerning the implementation of PBN in the Region	To facilitate harmonized implementation	Doc 7030 amendment proposal	Dec 2010	ARN TF and MID Regional Office	–	~~Ongoing~~ Completed
7	GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	Follow up on the developments in ICAO affecting the Global Plan and PBN in particular, in order to update the Regional plans accordingly	To facilitate planning updates and global harmonization	Information and action items for PBN/GNSS Task Force	Ongoing	MID Regional Office PBN/GNSS TF	-	Ongoing

No.	Associated GPI	**Tasks** PBN/GNSS/2	Objective	Deliverables	Target Date	To be delivered by	Supporting Parties	Status
8	GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	Coordinate with other ICAO Regions as necessary to address implementation interface issues	To facilitate harmonized implementation	Information and action items for PBN/ GNSS Task Force	Ongoing	MID Regional Office PBN/GNSS TF	States	Ongoing
9	GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	Undertake other functions relevant to implementation of PBN as assigned by the ATM/SAR/AIS SG , CNS/ATM/IC SG or MIDANPIRG	To facilitate implementation of PBN	As per assignments	Ongoing	PBN/ GNSS TF	-	Ongoing
10	GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	Report to the CNS/ATM/IC SG and keep ATM/SAR/AIS SG and CNS SG closely briefed	To facilitate efficiency and effectiveness	Task Force reports	Ongoing	PBN/ GNSS TF	–	Ongoing
11	GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	Identify guidance material and training needs/gap	To determine required complementary guidance material	Draft document	PBN/GNSS/4	PBN/ GNSS TF MPST	–	Ongoing
12	GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	Review of Operational Approval Guidance from other Regions for use in the MID Region	To support States' development of harmonized approvals	Draft document	PBN/GNSS/4	IATA		ongoing
13	GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	Assess possibilities of future PBN Seminar	To assist States in their planning and implementation	Working Papers, Information Papers	On-going	PBN/GNSS TF MPST	States UAE , IATA	On going
14	GPI-5	Keep track on the States PBN implementation status	Updated Status of implementation	Status of implementation report	On-going	CNS/ATM/IC SG	States/ IATA DB ON FORUM	On going

No.	Associated GPI	Tasks PBN/GNSS/2	Objective	Deliverables	Target Date	To be delivered by	Supporting Parties	Status
15	GPI-5	Prepare progress report on the PBN implementation plan	Updated Status of implementation	Status of implementation report	On going	PBN/GNSS TF MPST	States /IATA	On going

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PBN/GNSS TF/4
Appendix 7B to the Report on Agenda Item 7

PROPOSED TERMS OF REFERENCE FOR
PBN/GNSS TASK FORCE

1. TERMS OF REFERENCE

a) Carry out specific studies to support the implementation of Performance Based Navigation (PBN) in the MID, in accordance with the ICAO Strategic Objectives and Global Plan;

b) Identify issues/actions arising from the work of ICAO or for consideration by ICAO in order to facilitate regional and global harmonization of existing applications as well as future implementation of Performance Based Navigation operations.

c) Determine and recommend, on the basis of the study, the PBN strategy and Implementation Plan for the MID Region, based on the ICAO PBN Implementation goals as reflected in assembly resolution 37-11.

d) Assist States that may require support in the implementation of PBN, through support teams

e) Monitor the progress of studies, projects, trials and demonstrations by the MID Region States, and other ICAO Regions.

f) Provide a forum for active exchange of information between States related to the implementation of GNSS.

g) Identify deficiencies and constraints that would impede implementation of GNSS, and propose solutions that would facilitate the rectification of such problems.

h) Identify and address, to the extent possible, institutional, financial and legal matters related to the GNSS implementation in the MID Region.

i) Develop a system of post-implementation reviews to ensure the effective and safe introduction of PBN and non-PBN GNSS operation.

2. WORK PROGRAMME

a) Study and assess the Regional RNAV and RNP (PBN) requirements.

b) Initially focus assistance to States that may require support on development of the State PBN implementation plans.

c) Identify priority routes and terminal areas where RNAV and RNP should be implemented.

d) Identify priority runways for Approach Procedures with Vertical Guidance (APV) to be implemented based on the ICAO RNP APCH navigation specification (APV/Baro-VNAV).

e) Develop amendment proposal to the Regional Supplementary Procedures concerning the implementation of PBN in the MID Region.

f) Identify guidance material and training needs.

g) Follow up on the global developments in ICAO in order to update the Regional PBN plans and prepare the necessary proposal for amendment

h) Coordinate with other ICAO Regions as necessary to address implementation interface issues.

i) Undertake other functions relevant to implementation of PBN as assigned by the ATM/SAR/AIS SG or MIDANPIRG.

j) Report to CNS/ATM/IC SG and keep ATM/SAR/AIS SG and CNS SG closely briefed.

k) Monitor and follow-up the studies pertaining to the possible use of GNSS, and different augmentation systems in the MID Region.

l) Review and identify intra and inter regional co-ordination issues related to the implementation of GNSS and where appropriate recommend actions to address those issues.

m) Examine to what extent the GNSS including Augmentation system accessible in the Region can meet the navigational requirements of ATM service providers and aircraft operators in the Region.

n) Identify and co-ordinate GNSS implementation priorities in the MID Region.

o) Provide assistance to MID States in planning and implementation of GNSS, including the development of GNSS procedures.

p) Suggest ways and means for rectifying the problems as they arise related to the implementation of GNSS.

q) Provide necessary knowledge in GNSS operational application.

3. THE TASK FORCE SHALL IN ITS WORK BE GUIDED BY THE FOLLOWING PRINCIPLES

a) Implementation of PBN shall follow the ICAO PBN goals and milestones.

b) Avoid undue equipage of multiple on board equipment and/or ground-based systems.

c) Avoid the need for multiple airworthiness and operational approvals for intra- and inter-regional operations.

d) Continue application of conventional air navigation procedures during the transition period, to guarantee the operations by users that are not RNAV- and/or RNP-equipped.

e) The first regional PBN Implementation Strategy and Plan should address the short term (2008-2012), medium term (2013-2016) and take into account long term global planning issues.

f) Cognizance that the primary objective of ICAO is that of ensuring the safe and efficient performance of the global Air Navigation System, ensure that pre- and post-implementation safety assessments will be conducted to ensure the application and maintenance of the established target levels of safety.

g) Take into account the introduction of new technologies, encourage implementation and development in GNSS.

h) Apply ICAO guidance material and information as may be applicable to the Region to facilitate the implementation of PBN.

4. COMPOSITION OF THE TASK FORCE

STATES

MID Region States

ORGANIZATIONS *(AS OBSERVERS)*

IATA, IFALPA, IFATCA, EUROCONTROL, ACAC, CANSO and additional representative from Industry, International/Regional Organizations may be invited when required.

REPORT ON AGENDA ITEM 8: ANY OTHER BUSINESS

8.1 Bahrain thanked IATA for the active role for the coordination and support between States and IATA user airlines which will enhance safety and efficiency.

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