INTERNATIONAL CIVIL AVIATION ORGANIZATION

THE FIRST MEETING OF THE PERFORMANCE BASED NAVIGATION/GLOBAL NAVIGATION SATELLITE SYSTEM TASK FORCE (PBN/GNSS TF/1)

REPORT OF THE FIRST PBN/GNSS TASK FORCE

(Cairo, from 20 to 23 October 2008)

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

PART I – HISTORY OF THE MEETING

1. PLACE AND DURATION

1.1 The First Meeting of the Performance Based Navigation/Global Navigation Satellite System Task Force (PBN/GNSS TF/1) was held at the ICAO MID Regional Office in Cairo, Egypt from 20 to 23 October 2008.

2. OPENING

2.1 The Meeting was opened by Mr. Jehad Faqir, ICAO Deputy Regional Director, Middle East Office. In his opening remarks, Mr. Faqir welcomed all delegates to Cairo and to the first PBN/GNSS Task Force meeting.

2.2 Mr. Faqir highlighted the volume of work to be carried out by the Task Force and expressed appreciation regarding parties that contributed to the Task List developed by the RVSM/PBN Task Force/1 meeting in March 2008. He further reminded the participants that the Regional PBN Implementation Strategy and Plan had to be completed by this meeting, in order to give time for States to complete their plans by 2009 in accordance with the Resolution A36-23.

2.3 He invited the participants to note that, some of the details making up the States' implementation plans will have the status of Regional requirements, and will as such be incorporated in the MID Air Navigation Plan (ANP). He indicated the necessity for the PBN/GNSS Task Force and the ARN Task Force to work in close coordination to ensure that the route structures developed reflects the PBN Implementation strategy and plan.

2.4 Finally, Mr. Faqir underscored the importance of active participation by members of the Task Force from States and other stakeholders, in order for the Region to successfully meet its obligations in respect of the global implementation of PBN.

3. ATTENDANCE

3.1 The meeting was attended by a total of twenty nine (29) participants from nine (9) States (Afghanistan, Bahrain, Egypt, Iran, Jordan, Qatar, Saudi Arabia, Syria and United Arab Emirates) and four (4) International Organizations (IFALPA, IFATCA, FDC and ACAC). 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. Seboseso Machobane, Regional Officer ATM/SAR was the Secretary of the meeting. He was supported by Mr. Erwin Lassooij, Technical Officer ATM and PBN Programme Manager from ICAO Head Quarters, and Mr. Raza Gulam, Regional Officer CNS. Mr. Jehad Faqir, Deputy Regional Director MID Regional Office also supported the meeting.

5. LANGUAGE

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

6. AGENDA

6.1 The following Agenda was adopted:

Agenda Item 1:	Adoption of the Provisional Agenda
Agenda Item 2:	Election of Chairperson of the Task Force
Agenda Item 3:	Outcome of the RVSM/PBN TF/1 and GNSS TF/7 Meetings
Agenda Item 4:	Recent Developments in PBN and GNSS
Agenda Item 5:	Task List
Agenda Item 6:	Development of the Regional PBN Implementation Plan and Guidance Material
Agenda Item 7:	Development of the State PBN Implementation Plan
Agenda Item 8:	PBN Action Plan
Agenda Item 9:	GNSS Specific Issues
Agenda Item 10:	Future Work Programme/Action Plan
Agenda Item 11:	Date and Venue for the Next Meeting
Agenda Item 12:	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 DECISION 1/1:	*DISSOLUTION OF THE RVSM/PBN AND GNSS TASK FORCES AND ESTABLISHMENT OF THE PBN/GNSS TASK FORCE*
DRAFT CONCLUSION 1/2 :	*PBN IMPLEMENTATION SUPPORT*
DRAFT CONCLUSION 1/3:	*GNSS STUDIES IN MID REGION*
DRAFT CONCLUSION 1/4:	*MID REGION PBN IMPLEMENTATION STRATEGY AND PLAN*
DRAFT CONCLUSION 1/5:	*PBN STATE IMPLEMENTATION PLAN*
DRAFT CONCLUSION 1/6:	*MID REGION PBN IMPLEMENTATION PERFORMANCE OBJECTIVES*
DRAFT CONCLUSION 1/7:	*STRATEGY FOR THE IMPLEMENTATION OF GNSS IN THE MID REGION*

PART II: REPORT ON AGENDA ITEMS

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REPORT ON AGENDA ITEM 1: ADOPTION OF THE PROVISIONAL AGENDA

1.1 The Secretariat presented the meeting with the Provisional Agenda for the PBN/GNSS TF/1 meeting. The Provisional Agenda of the meeting was adopted as indicated in paragraph 6 of the History of the Meeting.

REPORT ON AGENDA ITEM 2: ELECTION OF CHAIRPERSON OF THE TASK FORCE

2.1 In accordance with established procedure within MIDANPIRG, the Representative from Egypt nominated Mr. Mohammed Hassan Al-Asfoor, Senior NAVAIDS Engineer, Civil Aviation Affairs (Bahrain) as Chairperson. Representatives from Iran and Jordan supported the nomination. As such, Mr. Mohammed Hassan Al-Asfoor was elected Chairperson for the MIDANPIRG PBN/GNSS Task Force.

2.2 In accepting the election, Mr. Mohammed Hassan Al-Asfoor thanked the participants for their confidence in him, and assured them that he will do his best to serve the Task Force in order to achieve the MIDANPIRG and Assembly goals with regard to PBN implementation in the MID Region.

PBN/GNSS TF/1
Report on Agenda Item 3

REPORT ON AGENDA ITEM 3: OUTCOME OF THE RVSM/PBN TF/1 AND GNSS TF/7 MEETINGS

3.1 The meeting discussed several issues from the outcome of RVSM/PBN TF/1, GNSS TF/7 and the first MIDANPIRG Steering Group (MSG/1) meetings, in as far they were related to implementation of Performance Based Navigation (PBN). More particularly, the Conclusions/Decisions formulated by these meetings were reviewed and updated by the ATM/SAR/AIS SG/10, CNS SG/2 and MIDNAPIRG/11.

3.2 The meeting recalled, amongst others, the Required Navigation Performance (RNP) and Area Navigation (RNAV) developments that preceded the concept of PBN, the benefits of PBN, as well as the processes followed in the implementation of PBN.

3.3 In particular the meeting recalled that in the PBN concept, there were no provisions for RNP 5, which is implemented in the MID Region, since RNP 5 implementation took place before the PBN Concept was introduced. The meeting noted that accordingly, in order to be aligned with the harmonized PBN terminology, the term RNP 5 needs to be replaced by RNAV 5. Furthermore, that the RNAV specifications do not require on-board performance monitoring and alerting, while RNP specifications do.

3.4 The meeting noted that the MSG/1 meeting, after reviewing the outcome of the ATM/SAR/AIS SG/9, the RVSM/PBN TF/1 and the GNSS TF/7 meetings, agreed to Draft Decision 1/5*: Discontinuation of the RVSM/PBN and GNSS Task Forces and Establishment of the PBN/GNSS Task Force*, to supersede the ATM/SAR/AIS SG/9 Draft Decision 9/10, RVSM/PBN TF/1 Draft Decision 1/1 and GNSS TF/7 Draft Decision 7/4.

3.5 In reviewing further the outcome of the previous meetings relating to PBN, the meeting agreed that issues relating to working arrangements of the PBN/GNSS Task Force should be removed from the Draft Decisions and incorporated in the terms of reference of the Task Force. Accordingly, the meeting agreed to the following Draft Decision to further refine, update and supersede the MSG/1 Draft Decision 1/5:

DRAFT DECISION 1/1: DISSOLUTION OF THE RVSM/PBN AND GNSS TASK FORCES AND ESTABLISHMENT OF THE PBN/GNSS TASK FORCE

That, taking into consideration the status of implementation of RVSM and PBN in the MID Region and the close inter-relationship between the PBN goals and GNSS implementation and with a view to enhance the efficiency of MIDANPIRG, the RVSM/PBN and the GNSS Task Forces are dissolved and the PBN/GNSS Task Force is established with TOR as at ***Appendix 3A*** *to the Report on Agenda Item 3.*

PBN/GNSS TF/1
Appendix 3A to the Report on Agenda Item 3

PROPOSED TERMS OF REFERENCE FOR PBN/GNSS TASK FORCE

1. TERMS OF REFERENCE

a) Carry out specific studies in support of the implementation of Performance Based Navigation (PBN) in the MID, according to the ICAO Strategic Objectives and Global Plan Initiative (GPI) 5 and related GPIs (GPIs 7, 10, 11, 12, 20, 21).

b) Identify other issues/action items 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 36-23.

d) Assist States that may require support in the implementation of PBN.

e) Monitor the progress of updated studies, projects, trials and demonstrations by the MID Region States, and information available from other 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 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 an amendment proposal to the MID Regional Supplementary Procedures concerning the implementation of PBN in the Region.

f) Identify guidance material and training needs.

g) Follow up on the developments in ICAO affecting the Global Plan and PBN in particular, in order to update the Regional plans accordingly.

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) Complete the development of the Regional PBN Implementation Strategy and Plan in 2008.

k) Report to the ATM/SAR/AIS SG and keep the CNS SG closely briefed.

l) Monitor the progress achieved related to the feasibility study pertaining to the possible use of EGNOS as GNSS augmentation system in the MID Region.

m) Monitor the progress of the NAVISAT study.

n) 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.

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

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

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

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

s) 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) Coordinated implementation with other relevant Regional Plans.

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

j) Decide at each meeting, if there are GNSS matters not related to PBN, and arrange to discuss such matters separately from PBN matters, if necessary.

4. COMPOSITION OF THE TASK FORCE

STATES

MID Region States

ORGANIZATIONS *(AS OBSERVERS)*

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

REPORT ON AGENDA ITEM 4: RECENT DEVELOPMENTS IN PBN AND GNSS

4.1 The meeting was presented and provided an update to the meeting on the latest information and events related to Performance Based Navigation since the RVSM/PBN TF/1 meeting held in Amman, Jordan (16-17 March 2008).

4.2 The meeting was informed that PBN Task Forces are now established for every other ICAO region and that the MID region was following good pace.

4.3 The meeting was apprised, among others, on the Flight Procedure Implementation Programme (Flight Procedure Office) concept to address some of the challenges in the implementation of PBN. It was indicated that the FPO concept was getting high acceptance in various regions of the world, and that the preparatory work done in the Asia Pacific Region has served as a valuable example for the other Task Forces as they proceed with their work plans. At the forthcoming Special Africa-Indian Ocean Regional Air Navigation Meeting (AFI/RAN) to be held in Durban, South Africa from 24 to 29 November 2008, the FPO concept will be proposed for the AFI region. The meeting noted furthermore, that the CAR and SAM Regions have envisaged possibilities in developing a regional Flight Procedure Implementation Programme. The meeting agreed that such an implementation programme would be valuable for the MID region.

4.4 The meeting noted that the second of ten planned ICAO/ENAC (École Nationale de L'Aviation Civile) PBN procedure design courses was held for the Cooperative Development Of Operational Safety and Continuing Airworthiness Programme (COSCAP)-South Asia in New Delhi, India in June 2008. Fourteen participants successfully completed the course. The next course, for COSCAP Southeast Asia, will take place in Hong Kong (China) 1-12 December 2008.

4.5 The meeting was informed that seven more procedure design courses were planned worldwide, and that these were dependent on availability of funding. One of the courses is planned for the MID region tentatively in March 2009. To this end, it was indicated that funding for the course was currently being sought. In response, the representative from Jordan indicated that he would be willing to investigate with his management whether hosting in Jordan might be an option. He further indicated that he would have a response to ICAO shortly after the meeting. The meeting also noted the offer from UAE to host the course. However, in light of the forgoing, the offer would be withdrawn.

4.6 The meeting noted the developments and proposed strategies by the EUR PBN/TF/1. It was agreed that these strategies could serve as a basis for the MID strategies. In this way, the desired harmonization would be achieved, thereby benefiting the aviation industry.

4.7 The meeting further noted the good progress of the various ICAO SARPS and guidance material supporting the implementation of PBN, as well as the planned work programme addressing new and revised requirements that especially, would address high density airspace requirements.

4.8 Several PBN implementation challenges were highlighted to the meeting:

- 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

4.9 It was indicated to the meeting that, currently the PBN programme is addressing these matters, as indicated in the above paragraphs (see paragraphs 4.3 to 4.5). However, it was highlighted also, that resources including funding to adequately address all the challenges were lacking. The Secretariat indicated that in order to resolve the problem, support from all Stakeholders (Air navigation service providers (ANSP's), aircraft operators, user communities, etc.) would be required. Accordingly, in order to address the matter the Task Force formulated the following Draft Conclusion:

DRAFT CONCLUSION 1/2 : PBN IMPLEMENTATION SUPPORT

That, in order to address challenges in PBN implementation, stakeholders in the PBN implementation (Air navigation service providers (ANSP's), aircraft operators, user communities, etc.) be encouraged to provide support including resources to the States and ICAO PBN programme.

4.10 As follow-up on MIDANPIRG/10 Conclusion 10/8 the meeting discussed the final outcomes of the ACAC Regional GNSS (ARG) study that had been launched by the Galileo Joint Undertaking entrusted to the European GNSS Supervisory Authority (GSA) and the European Space Agency (ESA).

4.11 The meeting noted that the study was composed of two main tasks: the ARG infrastructure implementation definition (Task 1) and the ARG service implementation definition (Task 2). It addressed all GNSS application domains with a special emphasis on civil aviation. In this activity ESA provided technical support to the European GNSS Supervisory Authority (GSA).

4.12 Based on the study, the meeting noted that the extension of European Geostationary Navigation Overlay Service (EGNOS) over the ARG-3 area (Arabian peninsula and Iraq) is technically feasible through the implementation of a Regional Extension Module (REM) for which duplication with functions and assets already in service in Europe is avoided. The REM concept implies that the ARG-3 area and Europe become “co-producers” of the ARG-3 EGNOS service.

4.13 The study also showed that in order to avoid costly overlaps between ARG-3 States and Europe counter part, as well as implementation delays and difficulties in the certification process, it is recommended that ARG-3 States adopt a regional approach for the institutional framework that can be implemented step-by-step in parallel with the technical development of the infrastructure.

4.14 The meeting was of the view that the cost benefit analysis is of complex nature and not possible without further studies (to validate regional Approach assumptions) that need to be carried out for which means and ways to be explored during the future meetings and to be based on the operational requirements and in close coordination with users and when the users demonstrates a conclusive need. This is in line with the current GNSS strategy, which allows the use of Basic GNSS (GPS augmented with ABAS) from en-route down to non-precision approaches (NPA).

4.15 The meeting agreed that close follow-up and monitoring is to be carried on the implementation of EGNOS in EUR region in order to gain the benefit from operational experience with the EGNOS system and associated aircraft equipment and procedures that would be gained in the EUR region (the primary service area of EGNOS), consequently the meeting agreed to the following Draft Conclusion which will replace and supersede 10/8:

DRAFT CONCLUSION 1/3: GNSS STUDIES IN MID REGION

That,

a) ICAO MID Regional Office Communicate with GSA/ESA to provide more support and detailed studies on EGNOS Extension to the MID region;

b) MID States able to support the cost benefit analysis to provide same to PBN/GNSS TF for the whole region benefits; and

c) MID States and organizations shares experience on GNSS

4.16 The meeting was informed that ACAC are conducting series of GNSS training and workshop programmes, and that the MID States are encouraged to attend these activities in order to realize the associated benefits.

4.17 The meeting noted the MID Region Strategy for the implementation of the Global Plan Initiatives (GPIs) and the near-term projects endorsed by MIDANPIRG/10 Doha,15-19 April 2007, in support of the evolution from a systems-based approach to a performance based approach to planning and implementation of air navigation.

4.18 In this regard, the meeting recalled in particular MIDANPIRG/10 Conclusions 10/13: MID *Region Strategy for the Implementation of the Global Plan Initiatives* and Conclusion 10/14: *Implementation of Work Programme in Support of Strategic performance Objectives*, and that the GNSS Task Force regularly updated the project concerning the implementation of GNSS in the MID Region. The meeting recalled that the strategy had been developed by the CNS/ATM/IC SG/3 for adoption by MIDNAPIRG/10.

4.19 The meeting recognized that to facilitate the realization of a performance based Global ATM system, ICAO has made significant progress in the development of relevant guidance material. The intent of the guidance material is to promote a globally harmonized approach to transition planning and to ensure collaboration in developing air navigation systems and procedures.

4.20 The guidance material includes the Manual on Global Performance of the Air Navigation System (Doc 9883), Global Air Traffic Management Operational Concept (Doc 9854), The Air Traffic Management System Requirements (Doc 9882), and Global Air Navigation Plan (Doc 9750).

4.21 The meeting recalled that ICAO has been developing planning tools to support the Global Air Navigation Plan. To this end, ICAO has developed a common output and management form that has been designated as “Performance Framework Form (PFF), which is applicable to both the Regional and National planning frameworks to facilitate ease of understanding and harmonization at global and Regional levels. The PFF contains the performance objectives for the Region, the benefits to be realized, the tasks to support achievement of the objectives, responsible parties and target dates, performance measurement, as well as the GPIs that support achievement of the objectives. The meeting agreed to further review the material provided by the Secretariat regarding the MID PBN Performance Framework, as discussed under agenda item 8 of this report.

4.22 The meeting received a progress report on NAVISAT Project, where a contract has been signed in September 2008, and the detailed Study has been started which is financed by the Egyptian Government. It consists of a phased approach with decisions points every 6 months.

4.23 The meeting was informed that a workshop will be conducted in October 2008 where all Stakeholders were invited to present their views. It was also indicated that a survey was dispatched to all concerned; the meeting participants were encouraged the reply to the survey.

REPORT ON AGENDA ITEM 5: TASK LIST

5.1 The meeting reviewed the Task List developed by the RVSM/PBN TF/1 in order to develop the MID PBN Implementation strategy and plan. The meeting noted with appreciation that Iran delivered the draft "Introduction" Section of the PBN Regional Plan, that had been assigned to it, by 14 June 2008 (two months ahead of target date). Furthermore, that the MID Regional Office provided the required current status and forecast of the MID Region traffic. The meeting noted however, that these were the only two of the 14 items in the Task List relating to the draft PBN Implementation Regional Plan and the guidance material, that had been delivered as of 12 October 2008.

5.2 The meeting noted nevertheless that, based on the action that had been taken by the Secretariat to draft the PBN regional strategy and implementation plan, most items in the Task List were considered completed or no longer required. Accordingly, the meeting updated the Task List as at **Appendix 5A** to the Report on Agenda Item 5. Furthermore, the meeting noted that some of the items had to be assigned or reassigned to specific parties for delivery. In this respect, the meeting agreed that the Secretariat should follow up with States and concerned International Organizations to inquire on their support on specific items of the Task List.

5.3 The meeting noted that GNSS TF/5 created document "Improvement of Navigation Systems in the MID Region" which was reviewed by GNSS TF/6 and GNSS TF/7, with a view to improve and complete the material in the document in order that the document could be used as guidance for the implementation of improvement to the Navigation infrastructure in the MID region.

5.4 The meeting further noted that GNSS TF/7 developed a task list and assigned the development and review of the various chapters of the documents to the participating States, accordingly ICAO MID Regional Office sent a follow up State letter for which very low response was received and no contribution on the developments were received.

5.5 With the pace of the implementation of the PBN around the world including MID Region, the material in the documents was considered of a preliminary nature and the value added in developing this documents remain questionable, therefore, it was decided that the CNS Sub-Group have a through look at this document and decide if further development is needed or the information contained is sufficient.

5.6 It was highlighted that it is important to update the CNS-3 in MID FASID which was an attachment to this document, Jordan and Afghanistan informed that they have updates on these table and would send the updates to ICAO MID Regional Office to be incorporated in the FASID as per established procedure.

5.7 The meeting encouraged all States to review the FASID table attached in the document and provide the necessary update in 2 weeks in order that all updates are incorporated through one proposal for amendment of the FASID CNS-3 table which will be incorporated in the MID FASID as per established ICAP procedures.

5.8 The meeting further noted that GNSS TF/6 developed "MID Region check list for the introduction of GNSS based operation" at **Appendix 5A** to the Report on Agenda Item 5, the comments received on the list are:

- The legal and operation areas were fully covered;
- In the awareness area, no overall plan was scheduled;
- The safety area was not explicitly covered; and
- The cost-benefit area was partially addressed as there was no provision for cost-benefit analysis and cost allocation model for aviation.

5.9 Based on the above the meeting was of the view that the check list would require further reviewed and update by future meetings.

PBN/GNSS TF/1
Appendix 5A to the Report on Agenda Item 5

TASK LIST

No.	ICAO Strategic Objective	Associated GPI	Tasks PBN/GNSS/2	Objective	Deliverables	Target Date	To be delivered by	Supporting Parties	Status
1	A: Safety D: Efficiency C: Environment	GPI-5, GPI-7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	Draft **Introduction** Section of PBN Regional Plan	To facilitate the development of the Regional Plan	Draft document	15 August 2008	Iran CAO		Complete/ No Long Required
2	A: Safety D: Efficiency C: Environment	GPI-5, GPI-7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	Draft **PBN Operational requirements & Implementation Strategy** Section of PBN Regional Plan – En-route o Oceanic	To facilitate the development of the Regional Plan	Draft document	15 August 2008	UAE GCAA	Yemen, Oman	Complete/ No Long Required
			o Remote Continental					Bahrain	
			o Continental, o Local / Domestic – TMA (Arrival, Departure) – Approach					All States	
3	A: Safety D: Efficiency C: Environment	GPI-5, GPI-7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	Draft **Current Status & Forecast: MID Traffic Forecast** Section of PBN Regional Plan	To facilitate the development of the Regional Plan	Draft document	15 August 2008	MID Regional Office	IATA	Complete/ No Long Required

No.	ICAO Strategic Objective	Associated GPI	Tasks PBN/GNSS/2	Objective	Deliverables	Target Date	To be delivered by	Supporting Parties	Status
4	A: Safety D: Efficiency C: Environment	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 the development of the Regional Plan	Draft document	~~15 August 2008~~ PBN/GNSS/2	IATA (Mr. Ahmad Qinawi)	States, States	Ongoing
~~5~~	~~A: Safety D: Efficiency C: Environment~~	~~GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21~~	~~Draft **Current Status & Forecast: CNS Infrastructure** Section of PBN Regional Plan~~	~~To facilitate the development of the Regional Plan~~	~~Draft document~~	~~15 August 2008~~	~~CARC Jordan (Eng. Samieh Shehin)~~	~~SWG Members, States~~	~~Complete/ No Long Required~~
~~6~~	~~A: Safety D: Efficiency C: Environment~~	~~GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21~~	~~Draft **Implementation Roadmap of Performance Based Navigation** Section of PBN Regional Plan~~	~~To facilitate the development of the Regional Plan~~	~~Draft document~~	~~15 August 2008~~	~~Bahrain~~	~~SWG Members, States~~	~~Complete/ No Long Required~~
~~7~~	~~A: Safety D: Efficiency C: Environment~~	~~GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21~~	~~Draft **Transitional Strategies** Section of PBN Regional Plan~~	~~To facilitate the development of the Regional Plan~~	~~Draft document~~	~~15 August 2008~~	~~ICAO HQ~~	~~-~~	~~Complete/ No Long Required~~
~~8~~	~~A: Safety D: Efficiency C: Environment~~	~~GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21~~	~~Draft **Safety Assessments and Monitors** Section of PBN Regional Plan~~	~~To facilitate the development of the Regional Plan~~	~~Draft document~~	~~15 August 2008~~	~~Israel (Mr. Abraham Shai)~~	~~–~~	~~Complete/ No Long Required~~
~~9~~	~~A: Safety D: Efficiency C: Environment~~	~~GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21~~	~~Draft **Periodic Review of implementation activities** Section of PBN Regional Plan~~	~~To facilitate the development of the Regional Plan~~	~~Draft document~~	~~15 August 2008~~	~~Egypt (NANSC)~~	~~–~~	~~Complete/ No Long Required~~
10	A: Safety D: Efficiency C: Environment	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 development of the Regional Plan	Draft document	~~15 August 2008~~ PBN/GNSS/2	MID Office	–	Ongoing

No.	ICAO Strategic Objective	Associated GPI	Tasks PBN/GNSS/2	Objective	Deliverables	Target Date	To be delivered by	Supporting Parties	Status
11	A: Safety D: Efficiency C: Environment	GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	**Study and assess the Region RNAV and RNP requirements**	To facilitate the development of the Regional Plan	Draft document	~~15 August 2008~~ PBN/GNSS/2	~~UAE GCAA (Mr. B Snowsill)~~	–	Reassign
12	A: Safety D: Efficiency C: Environment	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 ~~document~~ assistance reports	~~15 August 2008~~ PBN/GNSS/2	PBN/GNSS Task Force	States	Ongoing
~~13~~	~~A: Safety D: Efficiency C: Environment~~	~~GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21~~	~~**Identify priority routes and terminal areas where RNAV and RNP should be implemented**~~	~~To facilitate implementation efficiency and early operational benefits~~	~~Draft document~~	~~15 August 2008~~	~~IATA~~	~~States~~	~~Complete/ No Long Required~~
14	A: Safety D: Efficiency C: Environment	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	~~15 August 2008~~ PBN/GNSS/2	States	IATA	Ongoing
15	A: Safety D: Efficiency C: Environment	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	August 2009	MID Regional Office	–	Ongoing
16	A: Safety D: Efficiency C: Environment	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	-	Ongoing

No.	ICAO Strategic Objective	Associated GPI	Tasks PBN/GNSS/2	Objective	Deliverables	Target Date	To be delivered by	Supporting Parties	Status
17	A: Safety D: Efficiency C: Environment	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	–	Ongoing
18	A: Safety D: Efficiency C: Environment	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 or MIDANPIRG**	To facilitate implementation of PBN	As per assignments	Ongoing	PBN/ GNSS Task Force	-	Ongoing
~~19~~	~~A: Safety D: Efficiency C: Environment~~	~~GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21~~	~~**Complete the development of the Regional PBN Implementation Strategy and Plan in 2008**~~	~~To facilitate implementation of PBN in the MID Region~~	~~Draft document~~	~~October 2008~~	~~Task Force~~	~~—~~	~~Complete/ No Long Required~~
20	A: Safety D: Efficiency C: Environment	GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	**Report to the ATM/SAR/AIS SG and keep the CNS SG closely briefed**	To facilitate efficiency and effectiveness	Task Force reports	Ongoing	PBN/GNSS Task Force	–	Ongoing
21	A: Safety D: Efficiency C: Environment	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	~~October 2008~~ PBN/GNSS/2	~~Jordan CARC~~	–	Reassign
22	A: Safety D: Efficiency C: Environment	GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	~~Draft **RNP APCH Operational Approval Guidance**~~ **Review of Operational Approval Guidance from other Regions for use in the MID Region**	To ~~contribute to~~ support States' development of harmonized approvals ~~global implementation guidelines~~	Draft document	~~15 August 2008~~ PBN/GNSS/2	IATA	~~UAE GCAA~~	ongoing

No.	ICAO Strategic Objective	Associated GPI	Tasks PBN/GNSS/2	Objective	Deliverables	Target Date	To be delivered by	Supporting Parties	Status
23	A: Safety D: Efficiency C: Environment	GPI-5, GPI- 7, GPI-10, GPI-11, GPI-12, GPI-20, GPI-21	**Develop PBN Implementation Action Plan**	To facilitate development of the Regional and State PBN Implementation Action Plan	Draft template	PBN/GNSS/2			To be Assigned

Notes:

~~1. RVSM/PBN TF/1 established a Small Working Group (SWG) to address the tasks in the list. The SWG members were Messrs: Fareed Al-Alawi (Bahrain), Mohammad Karimi (Iran), Dawood Al Khandari (Kuwait), Mahmoud Sabrah supported by Eng. Samih Shahin (Jordan), Abdulshakoor Qashqari (Saudi Arabia) Abraham Shai (Israel), Bruce Snowsill (UAE), and Ahmad Qinawi (IATA).~~

~~2. Where the name of a person has not been specifically identified in the "**to be delivered by**," column, the SWG member from the State/Organization that has been named will be responsible for delivery unless the State/Organization names a different person. Where a State did not participant in the meeting and as such not in the SWG, the MID Office will follow up with the State for nomination of focal point for delivery of the Task.~~

REPORT ON AGENDA ITEM 6: DEVELOPMENT OF THE REGIONAL PBN IMPLEMENTATION PLAN AND GUIDANCE MATERIAL

6.1 The meeting was provided with a detailed description of the planning documentation to be discussed. The roles and relations between the following strategic documents and plans were discussed:

- PBN Implementation Regional Strategy
- PBN Implementation Regional Plan (Roadmap)
- PBN Implementation National Plan
- Performance Objectives
- PBN Implementation Regional Action Plan (En-route)
- PBN Implementation National Action Plan (Terminal and approach)

6.2 Amongst others, it was highlighted that the goal of the strategies is to provide stakeholders (airspace operators and users, air navigation service providers, regulating agencies, international organizations) guidance and directions in developing their investment strategies during the transition to PBN, and to facilitate coordination and harmonization of implementation. The goal of the plans is to provide a systematic description of the tasks that are required for the implementation, and to provide an implementation schedule.

6.3 The meeting recalled that in accordance with its terms of reference, the PBN/GNSS Task Force is required to complete development of the Regional PBN Implementation Strategy and Plan in 2008, in order to allow sufficient time for the MID States to complete development national implementation plans by 2009.

6.4 The meeting also recalled that the RVSM/PBN TF/1, noting the amount of work to develop the Regional Strategy and Plan for implementation of PBN in MID in 2008, had developed a Task List comprising 22 items and assigned to its members, the various tasks most of which were requested to be delivered by 15 August 2008.

6.5 Recalling its discussion with regard to the Task List under agenda item 5, and the action that had been taken by the Secretariat to prepare the draft PBN Implementation Regional Plan for further development by the meeting, which was done. Moreover, the meeting considered that in order to provide clarity with regard to the planning documentation, while the strategy is also reflected in the Roadmap (the implementation plan), the high level strategy should be adopted as a separate document, thereby elucidating its level and role in relation to the more detailed implementation plan. The meeting noted that a similar course of action was also followed by the EUR Region.

6.6 As a result, the Secretariat developed the MID Region PBN Strategy and implementation plan for consideration by the meeting. The meeting deliberated in detail on the required navigation specifications for applications in the three phases of flight (En-route, terminal and Approach). One of the issues that arose was related to the change of RNP 5 terminology to PBN terminology (RNAV 5). It was agreed that the change should be included in the Strategy for adoption by MIDANPIRG/11.

6.7 The need for inclusion of RNAV10 as an Oceanic/remote airspace navigation application was challenged, as RNAV 5 was already implemented. A technical response was provided, and the meeting accordingly recalled that RNAV 5 cannot be used for Oceanic/remote airspace and that in principle RNAV 10 should be used for that particular airspace. However, it was indicated that presently some of the airspaces that had previously been classified as remote continental/oceanic, now has the required surveillance capability to support RNAV 5. Nevertheless there is other airspace in the MID region that still could be classified as Oceanic and therefore RNAV 10 would be appropriate as the navigation specification, at least for the short term.

6.8 After thoroughly examining the various navigation applications for the various phases of flight and planning terms (short, medium and long term), the meeting agreed to both the PBN Strategy and Implementation Plan as indicated in **Appendix A** and **Appendix B** respectively, and accordingly the following Draft Conclusion was formulated:

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

*That, in order to provide direction to the Stakeholders in their strategic planning during the transition to full implementation of PBN, the Draft Middle East Regional Strategy for Implementation of PBN is adopted as at **Appendix 6A** to the Report on Agenda Item 6. The Draft PBN Implementation Regional Plan is adopted as at **Appendix 6B** to the Report on Agenda Item 6.*

6.9 In the context of the above, the meeting was apprised on PBN related development in the Emirates Flight Information Region (FIR). The meeting noted that the UAE is planning to open in December 2008 of the segment of ATS route A419 to the south of Dubai through military airspace, which had not been possible for many years. It was explained that the achievement had been made possible by, *inter alia*, the cooperation of the military and the availability of RNAV 1 PBN specification. The meeting noted the benefits of the achievement, which include the route length reductions of up to 75 nautical miles, related cost savings, and the reductions in CO_2 emissions.

PBN/GNSS TF/1
Appendix 6A to the Report on Agenda Item 6

MID REGION PBN STRATEGY

1. INTRODUCTION

1.1 This document provides the high level strategy that is further detailed in the regional implementation plan (roadmap). 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.

1.2 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.

2. EN-ROUTE OPERATIONS

2.1 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.

2.2 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.

3. TERMINAL OPERATIONS

3.1 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.

3.2 In this context, the States should develop their own national plans for the implementation of PBN in TMAs, based on the MID PBN Regional 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.

4. INSTRUMENT APPROACHES

4.1 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 non-precision approach procedures at a certain point when deemed operational suitable and taking in consideration GNSS integrity requirements.

5. IMPLEMENTATION STRATEGY

5.1 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 RNAV 5/RNAV 1 depending on operation requirements for continental en-route and local/domestic en-route applications at least until 2016.

Note: All current RNP 5 applications shall be redefined as RNAV 5 or, depending on operational needs, as RNAV 1.

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

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

e) Replacement 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) The target date for the completion of implementation for the Approach procedures with vertical guidance (APV) (APV/Baro-VNAV and/or APV/SBAS) for all instrument runway ends is 2016: The development of new conventional non-precision approach procedures should be discouraged. Existing conventional non-precision approach procedures should be phased out not later than 2016, pending readiness of stand-alone GNSS.

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

Note: Although SBAS APV-I and II is currently not referenced in ICAO Doc9613, in accordance with the general Assembly resolution (A36-23) it is included in this Strategy as part of APV.

PBN/GNSS TF/1
Appendix 6B to the Report on Agenda Item 6

DRAFT MID PERFORMANCE-BASED NAVIGATION REGIONAL PLAN

1. EXECUTIVE SUMMARY

1.1 This Middle East PBN Implementation Regional Plan has been produced in line with Resolution A 36/23 adopted by ICAO Assembly in its 36th Session held in September 2007. 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.

1.2 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 (2011 – 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 **Middle East PBN Implementation Plan -** A document offering appropriate guidance for air navigation service providers, airspace operators and users, regulating agencies, and international organizations, on the evolution of navigation, as one of the key systems supporting air traffic management, and which describes the RNAV and RNP navigation applications that should be implemented in the short, medium and long term in the MID Region.

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
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
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
GRAS	Ground-based Regional Augmentation System
IATA	International Air Transport Association
IFALPA	International Federation of Air Line Pilots' Associations
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
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 performance based navigation (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, 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 cock-pit 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/10 meeting required that PBN be implemented in a strategic manner in the MID Region and accordingly established the RVSM/PBN 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 the MID States together with the international organizations concerned (AACO, ACAC, IATA, IFALPA, IFATCA), 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 organizations

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.

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. he 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 incorporated 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 neighboring 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 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 non-precision approach procedures at a certain point when deemed operational suitable and taking in consideration GNSS integrity requirements.

Implementation Strategy

5.9 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 RNAV 5/RNAV 1 depending on operation requirements for continental en-route and local/domestic en-route applications at least until 2016.

Note: All current RNP 5 applications shall be redefined as RNAV 5 or RNAV 1 depending on operational needs.

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

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

e) Replacement 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) The target date for the completion of implementation for the Approach procedures with vertical guidance (APV) (APV/Baro-VNAV and/or APV/SBAS) for all instrument runway ends is 2016: The development of new conventional non-precision approach procedures should be discouraged. Existing conventional non-precision approach procedures should be phased not later than 2016, pending readiness of stand-alone GNSS.

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

Note: Although SBAS APV-I and II is currently not referenced in ICAO Doc9613, in accordance with the general Assembly resolution (A36-23) it is included in this Strategy as part of APV.

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 May 2006. 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

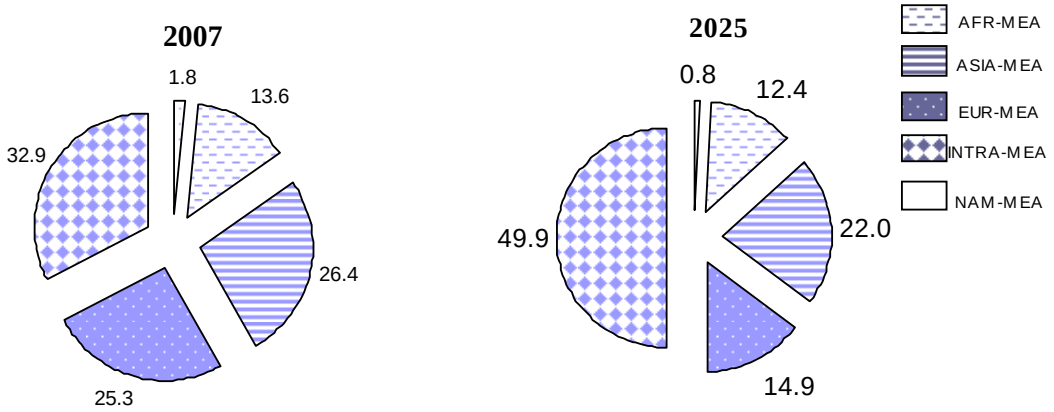
AIRCRAFT MOVEMENTS FORECAST TO THE YEAR 2025

	Actual 2007	Forecast 2025	Average Annual (per cent) 2007-2025	Growths
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 …..

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), Ground-Based Augmentation System (GBAS), and Ground-based Regional Augmentation System (GRAS).

Other PBN Infrastructure

6.14 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.

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

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

6.17 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

6.18 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

6.19 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 tables.

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

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,.

Terminal

7.8 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.

7.9 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.

7.10 **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

7.11 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.

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

7.13 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.

7.14 **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.

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

SUMMARY TABLE AND IMPLEMENTATION TARGETS

SHORT TERM (2008-2012)	
Airspace	***Navigation Specification***
En-route – Oceanic	RNAV 10
En-route - Remote continental	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 most possible airports; RNP AR APCH in airport where there are obvious operational benefits.
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 (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

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

Terminal

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

7.21 **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

7.22 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.

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

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

7.25 **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.

7.26 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/acceptable)***
En-route – Oceanic	Nil
En-route - Remote continental	Nil
En-route – Continental	RNAV 1, RNAV 5
En-route - Local / Domestic	RNAV 1 , RNAV 5
TMA – (Arrival, Departure)	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
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 ▪ RNAV 1 or Basic RNP 1 SID/STAR at busy domestic airports where there are operational benefits ▪ Implementation additional RNAV/RNP routes	

Long Term (2016 and Beyond)

7.27 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.

7.28 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.

7.29 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.

7.30 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.

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

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.

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 (to be developed) 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)

(To be Developed)

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

(To be Developed)

REPORT ON AGENDA ITEM 7: DEVELOPMENT OF THE STATE PBN IMPLEMENTATION PLAN

7.1 The meeting recalled outcome of the 36th Session of the Assembly with regard to the implementation of PBN. In particular, the meeting noted that the Assembly, *inter alia*, had recalled that States are ultimately responsible for the safe and efficient operation of their national airspace systems including the provision for safe instrument flight procedures and safety oversight of their service providers and operators.

7.2 The Assembly also agreed that there should be a globally harmonized and coordinated transition to PBN, noting that in addition to the safety benefits, it was a key enabler towards a performance-based global air traffic management (ATM) system. Furthermore, the Assembly indicated that, there was a need to monitor the progress of PBN implementation in States and Regions.

7.3 Based on, inter alia, the above, the Assembly adopted Resolution A36-23: *Performance based navigation global goals*, which, amongst others, urges States to ensure that all RNAV and RNP operations and procedures are in accordance with the PBN concept. Moreover, the Resolution requests the Planning and Implementation Regional Groups (PIRG) to include in their work programme the review of status of implementation of PBN by States according to the defined implementation plans and report to ICAO any deficiencies that may occur.

7.4 The meeting noted that among other guidance material, a template for State PBN implementation plan had been provided on the ICAO PBN web site: http://www2.icao.int/en/pbn/Pages/Documentation.aspx . After the review discussions on the material provided on the website as well the list of contents template provided by the Secretariat, the Secretariat was tasked to align the template for the use of the MID Region and the regional implementation plan. The meeting discussed the modified template and indicated that an item for the Strategic objectives and Airspace concept should be added. The agreed template is attached as **Appendix 7A** to the Report on Agenda Item 7.

7.5 The meeting agreed that 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 into the Air Navigation Plan (ANP).

7.6 Based on the above, the meeting formulated the following Draft Conclusion:

DRAFT CONCLUSION 1/5: 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.

PBN/GNSS TF/1
Appendix 7A to the Report on Agenda Item 7

PROPOSED LIST OF CONTENTS FOR THE STATE PBN IMPLEMENTATION PLAN

- Background
  - Future Demands on Aviation
  - Operational Efficiency
  - Environmental Issues
- Strategic objective and Airspace concepts
- Performance Based Navigation
  - PBN
  - Current Status of PBN
- Benefits of PBN and Global Harmonization (Safety, Efficiency, Environment)
- Challenges
  - Transition to the PBN System
  - Increasing Demands
  - Efficient Operations
  - Environmental Impact
- Implementation Strategy
  - Short Term (Now until end of 2012)
    - En-route
    - Departures and Arrivals
    - Approaches
    - NAVAID Infrastructure
      - Ground based
      - Space based
  - Medium Term (2013 until end of 2016)
    - En-route
    - Departures and Arrivals
    - Approaches
    - NAVAID Infrastructure
      - Ground based
      - Space based
  - Long Term (2016 and beyond)
    - En-route
    - Departures and Arrivals
    - Approaches
    - NAVAID Infrastructure
      - Ground based
      - Space based
- Implementation Schedule
  - En-route
  - Departures and Arrivals
  - Approaches

REPORT ON AGENDA ITEM 8: PBN ACTION PLAN

8.1 The PBN action plan provides a systematic plan of all tasks that need to be undertaken to achieve PBN implementation according to the PBN strategy and Implementation plan. The action plan is divided into three sub-plans, one for en-route, one for terminal and one for approach implementation. The action plan is furthermore supported by the PBN performance objectives which provide the benefits and the high level tasks.

8.2 The meeting first discussed the Performance Framework Forms (PFF), which were introduced under agenda item 4, and the development of performance objectives. It was explained to the meeting that the objectives are part of the ICAO planning tool to achieve a performance based global air traffic management (ATM) system through the implementation of air navigation systems and procedures in a progressive, cost-effective and cooperative manner. It is recognized that the regional planning and implementation process is the principal engine of ICAO's planning framework. It is here that the top-down approach comprising global guidance and regional harmonization measures converge with the bottom-up approach constituted by national planning by States.

8.3 Along with further descriptions of the PFF, the Secretariat presented discussion material regarding the need for development of MID ATM performance objectives, including draft initial performance objectives for the MID Region in respect of PBN.

8.4 In this regard, the meeting took into consideration the outcome of the MSG/1 meeting in July 2008, where it was agreed that the CNS/ATM IC SG/4 meeting should work further on the MID Region strategy for the implementation of GPIs and present the same to MIDANPIRG/11 for its consideration and adoption. The meeting also recalled, in this regard, that the Assembly Resolution A36-23 established global goals for the implementation of performance based navigation (PBN).

8.5 The meeting agreed in principle with the draft performance objectives but was of the view that the dates should be filled out to get a clearer opinion about the objectives. As a consequence, the Secretariat prepared a draft performance objective sheet for en-route implementation, which was reviewed by the meeting and agreed to as at **Appendix 8A** to the Report on Agenda Item 8). In addition, the meeting agreed that the Secretariat would draft other performance objectives as well using the PFF, and submit the same to the next PBN/GNSS TF meeting for approval. Moreover, the Task Force agreed that the format of the PBN performance objective be presented to the CNS/ATM/IC SG/4 through the ATM/SAR/AIS SG/10, for inclusion into the review/revision of the MID Region GPI implementation strategy.

8.6 Based on the above, the meeting formulated the following Draft Conclusion:

DRAFT CONCLUSION 1/6: MID REGION PBN IMPLEMENTATION PERFORMANCE OBJECTIVES

*That, in order to provide direction to the planning for implementation of PBN in the MID Region in accordance with ICAO planning framework, the MID performance objectives will be developed in accordance with the format in **Appendix 8A** to the Report on Agenda Item 8.*

8.7 With the background of the performance objectives, the meeting continued discussion on the PBN action plan. It was recalled that in order to further facilitate implementation, the Task Force should adopt a PBN Action Plan for implementing the PBN strategy and implementation plan. Furthermore, in order to avoid duplication where possible, the Task Force reviewed the Action Plan at **Appendix 8B** to the Report on Agenda Item 8, which has been developed by the ICAO CAR/SAM Region and considered for the same purposes by the APAC Region. The meeting agreed to the contents thereof and that it would be necessary to be further developed with the support of States. The Secretariat would follow up with States to obtain a finalized draft of the action plan for review by PBN/GNSS TF/2.

PBN/GNSS TF/1
Appendix 8A to the Report on Agenda Item 8

PERFORMANCE FRAMEWORK FORM
EXPLANATORY NOTES

1. Performance framework form: This form is an output and management form which is applicable to both regional and national planning and includes references to the Global Plan. Other formats may be appropriate but should contain as a minimum the elements described below

2. Performance objective: Regional /national performance objectives should be developed using a performance based approach that best reflects the necessary activities needed to support regional/national ATM systems. During their life cycle, performance objectives may change depending on the ATM system's evolution; therefore, throughout the implementation process, these should be coordinated with and be available to all interested parties within the ATM Community. The establishment of collaborative decision making processes ensures that all stakeholders are involved in and concur with the requirements, tasks and timelines.

3. Regional performance objective: Regional performance objectives are the improvements required to the air navigation system in support of the global performance objectives, and are related to the operating environments and priorities applicable at the regional level.

4. National performance objective: National performance objectives are the improvements required to the air navigation system in support of the regional performance objectives, and are related to the operating environments and priorities applicable at the State level.

5. Benefits: The regional/national performance objectives should meet the expectations of the ATM community as described in the operational concept and should lead to benefits for stakeholders and be achieved through operational and technical activities aligned with each performance objective.

6. Strategy: ATM evolution requires a clearly defined progressive strategy including tasks and activities which best represent the national and regional planning processes in accordance with the global planning framework. The goal is to achieve a harmonized implementation process evolving toward a seamless global ATM system. For this reason, it is necessary to develop short (1 to 5 years) and medium term (6 to 10 years) work programmes, focusing on improvements to the system indicating a clear work commitment for the parties involved.

7. ATM operational concept components: Each strategy or set of tasks should be linked with associated components of the ATM operational concept. The designators for ATM components are as follows:

- AOM – Airspace organization and management
- DCB – Demand and capacity management
- AO – Aerodrome operations
- TS – Traffic synchronization
- CM – Conflict management
- AUO – Airspace user operations
- ATM SDM – ATM service delivery management

8. Tasks: The regional/national work programmes, using these PFF templates, should define tasks in order to achieve the said performance objective and at the same time maintain a direct relation with ATM system components. The following principles should be considered when developing work programme:

- The work should be organized using project management techniques and performance-based objectives in alignment with the strategic objectives of ICAO.

- All tasks involved in meeting the performance objectives should be developed using strategies, concepts, action plans and roadmaps which can be shared among parties with the fundamental objective of achieving seamlessness through interoperability and harmonization.

- The planning of tasks should include optimizing human resources as well as encouraging dynamic use of electronic communication between parties such as the Internet, videoconferences, teleconferences, e-mail, telephone and facsimile. Additionally, resources should be efficiently used, avoiding any duplication or unnecessary work.

- The work process and methods should ensure that performance objectives can be measured against timelines and the national and regional progress achieved can be easily reported to PIRGs and ICAO Headquarters respectively.

9. Timeframe: Indicates start and end time period of that particular task(s).

10. Responsibility: Indicates the organization/entity/person accountable for the execution or management of the related tasks.

11. Status: The status is mainly focused on monitoring the progress of the implementation of that task(s) as it progresses toward the completion date.

12. Linkage to global plan initiatives (GPIs): The 23 GPIs, as described in the Global Plan, provide a global strategic framework for planning for air navigation systems and are designed to contribute to achieving the regional/national performance objectives. Each performance objective should be mapped to the corresponding GPIs. The goal is to ensure that the evolutionary work process at the State and regional levels will be integrated into the global planning framework.

PBN IMPLEMENTATION
DRAFT PERFORMANCE OBJECTIVES
(PERFORMANCE FRAMEWORK FORM)

REGIONAL PERFORMANCE OBJECTIVE **OPTIMIZATION OF THE ATS ROUTE STRUCTURE EN-ROUTE AIRSPACE**				
Benefits				
Environment **Efficiency**	▪ reductions in fuel consumption; ▪ 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.			
Short-term Strategy(2008-2012)				
TASK	**DESCRIPTION**	**START-END**	**RESPONSIBILITY**	**STATUS**
AOM	***En-route airspace***			
	Develop regional strategic plan	2008-2009	MIDANPIRG/11 (PBN /GNSS TF)	PBN/GNSS TF/1 agreed on Draft for presentation at ATM/SAR/AIS SG/10
	Develop regional implementation roadmap	2008-2009	MIDANPIRG /11 (PBN /GNSS TF)	PBN/GNSS TF/1 agreed on Draft for presentation at ATM/SAR/AIS SG/10
	Develop regional action plan	2009-2010	MIDANPIRG /12 (PBN /GNSS TF)	Need identified by PBN/GNSS TF/1. Small WG to be formed to draft action plan.
	Develop Airspace Concept based in MID PBN Roadmap, 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	2009-2010	ATM/SAR/AIS (ARN TF)	ARN TF/2 to start work
	Develop State PBN implementation plans	2008-2009	MIDANPIRG/12 (ATM/SAR/AIS, States	States preparing plans
	Standards and Procedures	2010	States	Ongoing
	Formulate safety plan	2009	ATM/SAR/AIS SG (MID RMA)	MID RMA to start work
	Establish collaborative decision making (CDM) process	2008-2010	MIDANPIRG/12 (ATM/SAR/AIS SG, CNS SG)	
	Publish national regulations for aircraft and operators approval using PBN manual as guidance material	2008-2010	States	Review and adapt available foreign approval guidance material

	Training	2008-2010	States	Identify training needs and develop corresponding guidelines
	System performance measurement	2010-2012	ATM/SAR/AIS (ARN TF)	ARN TF/2 to start work
	Implement the designed ATS route network	2009-2012	MIDANPIRG/12 (ATM/SAR/AIS) STATES	
	monitor implementation progress in accordance with MID PBN implementation roadmap and State implementation plan	2008-2012	MIDANPIRG/12 (ATM/SAR/AIS SG, CNS SG)	
References	GPI/5: performance-based navigation, GPI/7: dynamic and flexible ATS route management, GPI/8: collaborative airspace design and management, GPI/20: WGS-84			

REGIONAL PERFORMANCE OBJECTIVE OPTIMIZATION OF THE ATS ROUTE STRUCTURE IN TERMINAL AIRSPACE				
Benefits				
Environment Efficiency	▪ reductions in fuel consumption; ▪ 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.			
Strategy				
TASK	**DESCRIPTION**	**START-END**	**RESPONSIBILITY**	**STATUS**
AOM	***In terminal airspace***			
	Develop regional Implementation plan			
	Develop regional action plan			
	Develop State PBN implementation plan			
	Develop Airspace Concept based on MID PBN Roadmap, in order to design and implement optimized standard instrument departures (SIDs), standard instrument arrivals (STARs), instrument flight procedures, holding, approach and associated procedures, on the basis of PBN and, in particular RNAV 1 and Basic-RNP 1			
	Develop performance measurement plan			
	Formulate safety plan			
	Establish collaborative decision making (CDM) process			
	Publish national regulations for aircraft and operators approval using PBN manual as guidance material			
	Identify training needs and develop corresponding guidelines			
	Develop a regional work programme for implementation of SIDs and STARs			
	Formulate system performance monitoring plan			
	Implement SIDs and STARs			
	Monitor implementation progress in accordance with MID PBN implementation roadmap and State implementation plan			
References	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.			

REGIONAL PERFORMANCE OBJECTIVE IMPLEMENTATION OF VERTICALLY GUIDED RNP APPROACHES				
Benefits				
Efficiency **Safety**	▪ Improvements in capacity and efficiency at aerodromes. ▪ Improvements in safety at aerodromes.			
Strategy **(2008-2016)**				
TASK	**DESCRIPTION**	**START-END**	**RESPONSIBILITY**	**STATUS**
	Develop regional Implementation plan			
	Develop regional action plan			
	Develop State PBN implementation plan	**2008-2016**		
	Develop Airspace Concept based in MID PBN Implementation Plan, in order to design and implement RNP APCH with Baro-VNAV in accordance with Assembly Resolution A36-23, and RNP AR APCH where beneficial.			
	Develop performance measurement plan			
	Formulate safety plan			
	Establish collaborative decision making (CDM) process			
	Publish national regulations for aircraft and operators approval using PBN manual as guidance material			
	Identify training needs and develop corresponding guidelines			
	Formulate system performance monitoring plan			
	Implement APV procedures			
	Monitor implementation progress			
References	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 IMPLEMENTATION REGIONAL ACTION PLAN

PBN en-route Action Plan

PBN en-route Action Plan GPI 1, 4, 5, 7, 8, 10, 11, 12, 16, 21,23			
	Start	**End**	**Remarks**
1 AIRSPACE CONCEPT			
1.1 Establish and prioritize Strategic Objectives (Safety, Capacity, Environment, etc)			
1.2 Collect air traffic data to understand airspace traffic flows in a particular airspace.			
1.3 Analyse navigation capability of the fleet			
1.4 Analyse communication, ground navigation (VOR, DME) and surveillance for navigation specification and reversionary mode compliance.			
1.5 Optimise the airspace structure, by reorganising the network or implementing new routes based on the strategic objective of the airspace concept. Consider Airspace Modelling, ATC simulations (fast time and/or real time), Live Trials, etc.			
2 DEVELOP PERFORMANCE MEASUREMENT PLAN			
2.1 Prepare Performance Measurement Plan, including gas emission, safety, efficiency, etc.			
2.2 Conduct Performance Measurement Plan			
3 AIRSPACE SAFETY ASSESSMENT			
3.1 Determine which methodology shall be used to evaluate airspace safety and ATS routes spacing, depending on the navigation specification. Consider Airspace Modelling, ATC simulations (fast time and/or real time), Live Trials, etc.			
3.2 Prepare a data collection programme for airspace safety assessment			

PBN en-route Action Plan GPI 1, 4, 5, 7, 8, 10, 11, 12, 16, 21,23			
	Start	**End**	**Remarks**
3.3 Prepare preliminary airspace safety assessment			
3.4 Prepare final airspace safety assessment			
4 ESTABLISH COLLABORATION DECISION MAKING (CDM) PROCESS			
4.1 Coordinate planning and implementation needs with Air Navigation Service Providers, Regulators, Users, aircraft operators and military authorities			
4.2 Establish implementation date			
4.3 Establish the documentation format of CAR/SAM RNAV/RNP Website			
4.4 Report planning and implementation progress to the corresponding Regional Office			
5 ATC AUTOMATED SYSTEMS			
5.1 Evaluate the PBN implementation in the ATC Automated Systems, considering the Amendment 1 to the PANS/ATM (FPLSG).			
5.2 Implement the necessary changes in the ATC Automated Systems			
6 AIRCRAFT AND OPERATORS APPROVAL			
6.1 Be aware of the national implementation programme and of the required navigation specifications			
6.2 Analyse aircraft approval requirements, aircrew and operator approval requirements for the navigation specifications to be implemented, as contained in the ICAO PBN Manual			
6.3 Publish the national regulations to implement the required ICAO navigation specifications			

PBN en-route Action Plan GPI 1, 4, 5, 7, 8, 10, 11, 12, 16, 21,23				
		Start	**End**	**Remarks**
6.4	Approval of aircraft and operators for each type of procedure and navigation specification			
6.5	Establish and keep updated a record of approved aircraft and operators			
6.6	Verify operations with a continuing monitoring programme			
7	**STANDARDS AND PROCEDURES**			
7.1	Evaluate regulations for GNSS use, and if such were the case, proceed to its publication.			
7.2	Finalize implementation of WGS-84			
7.3	Develop and publish AIC notifying PBN implementation planning			
7.4	Publish AIP Supplement including applicable standards and procedures			
7.5	Review Procedural Manuals of the ATS units involved			
7.6	Update Letters of Agreement between ATS units			
7.7	Develop amendment to the regional documentation, if necessary			
7.8	Provide procedures to accommodate non-approved RNAV/RNP aircraft, when applicable			
7.9	Identify transition areas and procedures, if necessary			
7.10	Conduct ATC simulations to identify the workload/operational factors, if necessary, and report the simulations activities to the ATM Committee			
8	**TRAINING**			
8.1	Develop a training programme and documentation for operators (pilots, dispatchers and maintenance)			
8.2	Develop training programme and documentation for Air Traffic Controllers and AIS Operators			

PBN en-route Action Plan GPI 1, 4, 5, 7, 8, 10, 11, 12, 16, 21,23			
	Start	**End**	**Remarks**
8.3 Develop training programme to regulators (aviation safety inspectors)			
8.4 Conduct training programmes			
8.5 Hold seminars oriented to operators, indicating the plans and the operational and financial benefits expected			
9 DECISION FOR IMPLEMENTATION			
9.1 Evaluate operational documentation availability (ATS, OPS/AIR)			
9.2 Evaluate the percentage of approved aircraft and operations (mixed equipage concerns)			
9.3 Review safety assessment results			
10 SYSTEM PERFORMANCE MONITORING			
10.1 Develop post-implementation en-route operations monitoring programme			
10.2 Execute post-implementation en-route operations monitoring programme			
Pre operational implementation date			
Definitive implementation date			

PBN TMA Action Plan

PBN TMA Action Plan GPI 5, 7, 8, 10, 11, 12			
	Start	**End**	**Remarks**
1 AIRSPACE CONCEPT			
1.1 Establish and prioritize Strategic Objectives (Safety, Capacity, Environment, etc)			
1.2 Collect air traffic data to understand airspace traffic flows in the TMA.			
1.3 Analyse aircraft fleet navigation capacity operating in the TMA			
1.4 Analyse communication, ground navigation (VOR, DME) and surveillance for navigation specification and reversionary mode compliance			
1.5 Optimise the airspace structure, by implementing new SID and STARS, based on the strategic objective of the airspace concept. Consider Airspace Modelling, ATC simulations (fast time and/or real time), Live Trials, etc.			
2. DEVELOP PERFORMANCE MEASUREMENT PLAN			
2.1 Prepare Performance Measurement Plan, including gas emission, safety, efficiency, etc.			
2.2 Conduct Performance Measurement Plan			
3 AIRSPACE SAFETY ASSESSMENT			
3.1 Determine which methodology shall be used to evaluate airspace safety and routes spacing, depending on the navigation specification. Consider Airspace Modelling, ATC simulations (fast time and/or real time), Live Trials, etc.			
3.2 Prepare a data collection programme for airspace safety assessment			
3.3 Prepare preliminary airspace safety assessment			

PBN TMA Action Plan GPI 5, 7, 8, 10, 11, 12			
	Start	**End**	**Remarks**
3.4 Prepare final airspace safety assessment			
4 ESTABLISH COLLABORATION DECISION MAKING (CDM) PROCESS			
4.1 Coordinate planning and implementation needs with Air Navigation Service Providers, Regulators, Users, aircraft operators and military authorities			
4.2 Establish implementation date			
4.3 Establish the documentation format of CAR/SAM RNAV/RNP Website			
4.4 Report planning and implementation progress to the corresponding Regional Office			
5 ATC AUTOMATED SYSTEMS			
5.1 Evaluate the PBN implementation in the ATC Automated Systems, considering the Amendment 1 to the PANS/ATM (FPLSG).			
5.2 Implement the necessary changes in the ATC Automated Systems			
6 AIRCRAFT AND OPERATOR APPROVAL			
6.1 Be aware of the national implementation programme and of the required navigation specifications			
6.2 Analyse aircraft approval requirements, aircrew and operator approval requirements for the navigation specifications to be implemented, as contained in the ICAO PBN Manual			
6.3 Publish the national regulations to implement the required ICAO navigation specifications			
6.4 Approval of aircraft and operators for each type of procedure and navigation specification			

PBN TMA Action Plan GPI 5, 7, 8, 10, 11, 12			
	Start	**End**	**Remarks**
6.5 Establish and keep updated a record of approved aircraft and operators			
6.6 Verify operations with a continuing monitoring programme			
7 STANDARDS AND PROCEDURES			
7.1 Evaluate regulations for GNSS use, and if such were the case, proceed to its publication.			
7.2 Develop and publish AIC notifying PBN implementation planning			
7.3 Publish AIP Supplement including applicable standards and procedures			
7.4 Review Procedural Manuals of the ATS units involved			
7.5 SID and/or STAR Ground Validation and Flight Inspection/Flight Validation			
7.6 Data Base Validation Requirements/Procedures			
7.5 Update Letters of Agreement between ATS units			
7.6 Provide procedures to accommodate non-approved RNAV/RNP aircraft, when applicable			
7.7 Conduct ATC simulations to identify the workload/operational factors, if necessary.			
8 TRAINING			
8.1 Develop a training programme and documentation for operators (pilots, dispatchers and maintenance)			
8.2 Develop training programme and documentation for Air Traffic Controllers and AIS Operators			

PBN TMA Action Plan GPI 5, 7, 8, 10, 11, 12			
	Start	**End**	**Remarks**
8.3 Develop training programme to regulators (aviation safety inspectors)			
8.4 Conduct training programmes			
8.5 Hold seminars oriented to operators, indicating the plans and the operational and financial benefits expected			
9 DECISION FOR IMPLEMENTATION			
9.1 Evaluate operational documentation availability (ATS, OPS/AIR)			
9.2 Evaluate the percentage of approved aircraft and operations (mixed equipage concerns)			
9.3 Review safety assessment results			
10 SYSTEM PERFORMANCE MONITORING			
10.1 Develop post-implementation TMA operations monitoring programme			
10.2 Execute post-implementation TMA operations monitoring programme			
Pre operational implementation date			
Definitive implementation date			

PBN Approach Action Plan

PBN APP Action Plan GPI 1, 12, 16, 21, 23			
	Start	**End**	**Remarks**
1 AIRSPACE CONCEPT			
1.1 Establish and prioritize Strategic Objectives (Safety, Capacity, Environment, etc)			
1.2 Analyse aircraft fleet navigation capacity operating in the Airport			
1.3 Analyse communication, ground navigation (VOR, DME) and surveillance for navigation specification and reversionary mode compliance			
1.4 Design Instrument Approach Procedure (RNP APCH/APV Baro-VNAV or RNP AR), based on the strategic objective of the airspace concept. Consider Airspace Modelling, ATC simulations (fast time and/or real time), Live Trials, etc.			
2 DEVELOP PERFORMANCE MEASUREMENT PLAN			
2.1 Prepare Performance Measurement Plan, including gas emission, safety, efficiency, etc.			
2.2 Conduct Performance Measurement Plan			
3 PROCEDURE SAFETY ASSESSMENT			
3.1 Determine which methodology shall be used to evaluate procedure safety, depending on the navigation specification. Consider Airspace Modelling, ATC simulations (fast time and/or real time), Live Trials, etc.			
3.2 Prepare a data collection programme for airspace safety assessment			
3.3 Prepare preliminary procedure (s) safety assessment			

PBN APP Action Plan GPI 1, 12, 16, 21, 23			
	Start	**End**	**Remarks**
3.4 Prepare final procedure (s) safety assessment			
4 ESTABLISH COLLABORATION DECISION MAKING (CDM) PROCESS			
4.1 Coordinate planning and implementation needs with Air Navigation Service Providers, Regulators, Users, aircraft operators and military authorities			
4.2 Establish implementation date			
4.3 Establish the documentation format of CAR/SAM RNAV/RNP Website			
4.4 Report planning and implementation progress to the corresponding Regional Office			
5 ATC AUTOMATED SYSTEMS			
5.1 Evaluate the PBN implementation in the ATC Automated Systems, considering the Amendment 1 to the PANS/ATM (FPLSG).			
5.2 Implement the necessary changes in the ATC Automated Systems			
6 AIRCRAFT AND OPERATOR APPROVAL			
6.1 Be aware of the national implementation programme and of the required navigation specifications			
6.2 Analyse aircraft approval requirements, aircrew and operator approval requirements for the navigation specifications to be implemented, as contained in the ICAO PBN Manual			
6.3 Publish the national regulations to implement the required ICAO navigation specifications			
6.4 Approval of aircraft and operators for each type of procedure and navigation specification			

PBN APP Action Plan GPI 1, 12, 16, 21, 23			
	Start	**End**	**Remarks**
6.5 Establish and keep updated a record of approved aircraft and operators			
6.6 Verify operations with a continuing monitoring programme			
7 STANDARDS AND PROCEDURES			
7.1 Evaluate regulations for GNSS use, and if such were the case, proceed to its publication.			
7.2 Develop and publish AIC notifying PBN implementation planning			
7.3 Publish AIP Supplement including applicable standards and procedures			
7.4 Review Procedural Manuals of the ATS units involved			
7.5 Update Letters of Agreement between ATS units, if necessary			
7.6 Provide procedures to accommodate non-approved RNAV/RNP aircraft, when applicable			
7.7 Conduct ATC simulations to identify the workload/operational factors, if necessary.			
8 TRAINING			
8.1 Develop a training programme and documentation for operators (pilots, dispatchers and maintenance)			
8.2 Develop training programme and documentation for Air Traffic Controllers and AIS Operators			

PBN APP Action Plan GPI 1, 12, 16, 21, 23			
	Start	**End**	**Remarks**
8.3 Develop training programme to regulators (aviation safety inspectors)			
8.4 Conduct training programmes			
8.5 Hold seminars oriented to operators, indicating the plans and the operational and financial benefits expected			
9 DECISION FOR IMPLEMENTATION			
9.1 Evaluate operational documentation availability (ATS, OPS/AIR)			
9.2 Evaluate the percentage of approved aircraft and operations (mixed equipage concerns)			
9.3 Review safety assessment results			
10 SYSTEM PERFORMANCE MONITORING			
10.1 Develop post-implementation APP operations monitoring programme			
10.2 Execute post-implementation APP operations monitoring programme			
Pre operational implementation date			
Definitive implementation date			

REPORT ON AGENDA ITEM 9: GNSS SPECIFIC ISSUES

9.1 The meeting noted that MIDANPIRG/10 adopted the revised Strategy for the implementation of GNSS in the MID Region under Conclusion 10/9.

9.2 The meeting further noted that GNSS TF/6 and GNSS TF/7 had revised the Strategy for the implementation of GNSS in the MID Region and integrated the PBN implementation requirement to the Strategy.

9.3 The meeting was informed that MSG/1 was also of view 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.

9.4 The meeting was further informed GNSS TF/6 had developed Draft Conclusion on the GNSS cost allocation policy, which is of general nature and was of the view to incorporate it in the Strategy for the implementation of GNSS in the MID Region.

9.5 Since this is was the first meeting in which both operational and technical experts met together a through review was considered to the Strategy in order get the benefit from the available technology, and encourage the GNSS implementation, the meeting developed the revised Strategy for the implementation of GNSS in the MID Region as at **Appendix 9A** to the Report on Agenda Item 9, and agreed to the following Draft Conclusion:

DRAFT CONCLUSION 1/7: STRATEGY FOR THE IMPLEMENTATION OF GNSS IN THE MID REGION

*That, the Revised Strategy for implementation of GNSS in the MID Region is adopted as at **Appendix 9A** to the Report on Agenda Item9.*

9.6 The meeting noted IFALPA delegate concern and requests for assurance that different GNSS systems will not be considered as sole mean of navigation until they are internationally approved reliable.

PBN/GNSS TF/1
Appendix 9A to the Report on Agenda Item 9

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).

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 A 36-23 (APV) (Baro -VNAV and or augmented GNSS) 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 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 2015.

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.

REPORT ON AGENDA ITEM 10: FUTURE WORK PROGRAMME/ACTION PLAN

10.1 With context of its work programme and outcome of its discussions, and in accordance with the ICAO Business Plan and the requirements for performance monitoring, the Task Force developed a draft follow-up action plan on the results (Draft Conclusions/Decisions) of the meeting, as at **Appendix A** to the Report on Agenda Item 10.

PBN/GNSS TF/1
Appendix 10A to the Report on Agenda Item 10

DRAFT FOLLOW-UP ACTION PLAN

CONC/DEC NO. --- STRATEGIC OBJECTIVE	TITLE OF CONCLUSION/DECISION	TEXT OF CONCLUSION/DECISION	FOLLOW-UP ACTION	TO BE INITIATED BY	DELIVERABLE	TARGET DATE
Draft Dec. 1/1	Dissolution of the RVSM/PBN and GNSS Task Forces and Establishment of the PBN/GNSS Task Force	That, taking into consideration the status of implementation of RVSM and PBN in the MID Region and the close inter-relationship between the PBN goals and GNSS implementation and with a view to enhance the efficiency of MIDANPIRG, the RVSM/PBN and the GNSS Task Forces are dissolved and the PBN/GNSS Task Force is established with TOR as at **Appendix 3A** to the Report on Agenda Item 3.	Follow up on PBN implementation	ICAO, States	PBN/GNSS TF reports	Ongoing
Draft Conc. 1/2	PBN implementation support	That, in order to address challenges in PBN implementation, stakeholders in the PBN implementation (Air navigation service providers (ANSP's), aircraft operators, user communities, etc.) be encouraged to provide support including resources to the States and ICAO PBN programme.	Follow up on the Conclusion	States and concerned international organizations	State Letter Support to the States and ICAO PBN programme	Dec 2008 Ongoing

Draft Conc. 1/3	GNSS Studies in MID Region	That, a) ICAO MID Regional Office Communicate with GSA/ESA to provide more support and detailed studies on EGNOS Extension to the MID region; b) MID States able to support the cost benefit analysis to provide same to PBN/GNSS TF for the whole region benefits; and c) MID States and organizations shares experience on GNSS	Follow-up State Letter Support to CB Sharing Exp.	ICAO MID States Lead by Saudi Arabia MID States	State Letter CBA Report WP/IP	December 2008 2009 Ongoing
Draft Conc. 1/4	MID Region PBN Implementation Strategy and Plan	That, in order to provide direction to the Stakeholders in their strategic planning during the transition to full implementation of PBN, the Draft Middle East Regional Strategy for Implementation of PBN is adopted as at **Appendix 6A** to the Report on Agenda Item 6. The Draft PBN Implementation Regional Plan is adopted as at **Appendix 6B** to the Report on Agenda Item 6.	Follow up on adoption of conclusion	ICAO, PBN/GNSS TF	MIDANPIRG/11 report	February 2009

Draft Conc. 1/5	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.	Follow up development of plan	PBN/GNSS TF, ICAO	States implementation plan Incorporation of PBN requirements into ANP	2009 2009
Draft Conc. 1/6	MID Region PBN Implementation Performance Objectives	That, in order to provide direction to the planning for implementation of PBM in the MID Region in accordance with ICAO planning framework, the MID performance objectives will be developed in accordance with the format in **Appendix 8A** to the Report on Agenda Item 8.	Follow up on conclusion	PBN/GNSS TF, ICAO	Report of PBN/GNSS TF2	2009
Draft Conc. 1/7	Strategy for the Implementation of GNSS in the MID Region	That, the Revised Strategy for implementation of GNSS in the MID Region is adopted as at **Appendix 9A** to the Report on Agenda Item 9.	Implement Strategy	MID States	Feed back from States Report of PBN/GNSS TF/2	2009

REPORT ON AGENDA ITEM 11: DATE AND VENUE FOR THE NEXT MEETING

11.1 The meeting recalled that, in accordance with the MIDANPIRG Procedural Handbook, the Task Force is expected to decide on the dates and venue of its next meeting. In discussing this subject, the meeting recalled that it noted due to the operational relationship of the EUR and MID Regions, it would beneficial to follow developments in the EUR closely, among others, in order to achieve the desired harmonization of implementation of PBN.

11.2 In light of the above, the meeting agreed on convening the PBN/GNSS TF/2 meeting in April 2009 immediately after the EUR Region PBN/TF meeting. The meeting recognized however, that the dates of the meeting will have to be coordinated with other activities of the MID Regional Office. The tentative agenda of the next meeting was also agreed as at **Appendix A** to the Report on Agenda Item 11.

11.3 The meeting agreed that the venue of the meeting will be Cairo, unless a State proposed to host. In this regard the meeting also agreed that States interested to host should indicate so within the next 30 days (by 21 November 2008) in order to allow all parties sufficient time to plan for the meeting.

PBN/GNSS TF/1
Appendix 11A to the Report on Agenda Item 11

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

(PBN/GNSS TF/2)

PROVISIONAL AGENDA

STRATEGIC OBJECTIVES	AGENDA ITEM #	SUBJECTS
D	1	Adoption of the Provisional Agenda
A and D	2	Review of PBN/GNSS TF/1, ATM/SAR/AIS SG/10 and MIDANPIRG/11 Conclusions/Decisions Related to PBN Implementation and GNSS
A and D	3	Recent Developments in PBN and GNSS
A and D	4	Task List
A and D	5	Development of the Regional PBN Implementation Plan and Guidance Material
A and D	6	Development of the State PBN Implementation Plan
D	7	PBN Action plan
A and D	8	GNSS Specific issues
D	9	Future Work Programme / Action Plan
D	10	Date and venue for the next meeting
	11	Any other business

REPORT ON AGENDA ITEM 12: ANY OTHER BUSINESS

12.1 In the ending session of the meeting, on behalf of the other members of the Task Force, participants from Bahrain, Egypt, Jordan, Saudi Arabia, and ACAC thanked the MID Regional Office for organizing the meeting, the Secretariat for support and guidance of the meeting, particularly in light of the many new aspects related to the transition to a performance based ATM, and PBN itself, as well as other participants for role. The participants called for more guidance from ICAO, and indicated the need for training and workshops, in order to keep implementation on track. The seminars and workshops provided by ACAC were noted.

12.2 In adjourning the meeting, the Chairperson recalled the intensive activities of the past days three and half days of the meeting, and noted with appreciation the hard work by the meeting to arrive at concrete outcomes.

12.3 In his closing remarks, Mr. Jehad Faqir, Deputy Regional Director thanked all participants once again for their active participation, which had resulted in the milestone outcomes: the PBN Implementation Regional Strategy and Implementation Regional Plan. He noted however, that there was still a long way to go and urged participants to increase their participation.

12.4 Mr. Faqir echoed the appreciation of the meeting regarding the opening by the UAE, of ATS route A419 through a military airspace, and noted this is an exemplary show of benefits of PBN.

ATTACHMENT A

PBN/GNSS TF/1
Attachment A to the Report

NAME	TITLE & ADDRESS
STATES	
AFGHANISTAN Eng. Raz Mohammad Alami	Technical & Operational Deputy Minister Ministry of Transport and Civil Aviation Ansari Watt Kabul - AFGHANISTAN Fax: 873 762 523 846 Tel: 93 20 210 1031 Mobile: 93 799 360 360 Email: alami_mot@yahoo.com
Mr. Hammayon	Air Traffic Control Director Kabul International Airport Ministry of Transport and Civil Aviation Ansari Watt Kabul - AFGHANISTAN Fax: 873 762 523 846 Tel: 93 20 210 1031 Mobile: 93 798 446 652
BAHRAIN Mr. Mohammed Hassan Al-Asfoor	Senior Navaids Engineer Bahrain International Airport Civil Aviation Affairs P.O. Box 586 KINGDOM OF BAHRAIN Fax: 973 173 219 92 Tel: 973 173 210 35 Mobile: 973 396 910 35 Email: malasfoor@caa.gov.bh
Mr. Saleem Mohamed Hassan	Chief Air Traffic Management Civil Aviation Affairs P.O. Box 586 KINGDOM OF BAHRAIN Fax: 973 173 219 92 Tel: 973 173 211 17 Mobile: 973 396 088 60 Email: saleemmh@caa.gov.bh

NAME	TITLE & ADDRESS
EGYPT	
Mr. Ahmed Essam M. Maher	Air Traffic Services G. Manager Ministry of Civil Aviation Civil Aviation Authority Cairo – EGYPT Fax: 202 226 785 37/35 Tel: 202 226 883 72 Ext. 1409 Mobile: 010 528 5255 Email: ahmedessam88@yahoo.com
Mr. Mahmoud Metwaly Mohamed	Manager of Research and Development Ministry of Civil Aviation Complex Cairo Airport Road Cairo-EGYPT Fax: 202 226 878 49 Tel: 202 226 507 43 Mobile: 012 753 9921 Email: M3A55@hotmail.com
Mr. Micheal Youssef Finan	Air Traffic Controller Senior ATS Inspector Egyptian Civil Aviation Authority Cairo Airport Road Cairo - EGYPT Fax: 202 226 785 37 Tel: 202 226 785 37 Mobile: 2010 109 6295
Dr. Mohsen El Agaty	Director General of Research and Development National Air Navigation Services Company Cairo Navigation Center Cairo International Airport Road Cairo - EGYPT Fax: 202 228 710 56 Tel: 202 226 507 43/202 226 710 56 Mobile: 2010 162 3922 Email: mohsen.elagaty@nansceg.org Mohsen_elagaty@yahoo.com
Mr. Hammad Mohamed Medany	Air Traffic Controller National Air Navigation Services Company Cairo Navigation Center Cairo International Airport Road Cairo - EGYPT Tel: 202 226 773 47 Mobile: 2010 601 3714 Email: medany54@hotmail.com

NAME	TITLE & ADDRESS
Mr. Salama Ramadan Radwan	ACC Safety National Air Navigation Services Company Cairo Navigation Center Cairo International Airport Road Cairo - EGYPT Fax: 202 226 806 27 Tel: 202 226 878 883 Mobile: 2 010 258 1261 Email: salama-ramadan@hotmail.com
ISLAMIC REPUBLIC OF IRAN Mr. Habib Davoudi Dana	Chief of Procedure Design Office ATM Department Mehrabad International Airport Tehran 13445 Tehran - ISLAMIC REPUBLIC OF IRAN Fax: 98 21 446 492 69 Tel: 98 21 660 250 13 Mobile: 98 912 390 8197 Email: h.davoudi@yahoo.com
JORDAN Mr. Inad Al-Shaham	Area Control Center Supervisor Civil Aviation Regulatory Commission P.O. Box 7547 Amman - JORDAN Fax: 962 6 489 1708 Tel: 962 6 445 1672 Mobile: 079 511 5471
Eng. Samih Mahmoud Shahin	Director of ANS Planning and Studies ANS Unit Civil Aviation Regulatory Commission P.O. Box 7547 Amman - JORDAN Fax: 962-6 489 1708 Tel: 962-6 489 1708 Mobile: 962-6 777 167 300 Email: dplanans@carc.gov.jo

NAME	TITLE & ADDRESS
QATAR Mr. Ahmed Mohamed Al Eshaq	Director Air Navigation Civil Aviation Authority P.O.Box 3000 Doha – QATAR Fax: 974 465 6554 Tel: 974 462 2300 Mobile: 974 555 0440 Email: ahmed@caa.gov.qa
SAUDI ARABIA Mr. Abdulaziz Al Mohammad	ATC (Operation and Planning) General Authority of Civil Aviation P.O.Box 100824 - Jeddah 21311 KINGDOM OF SAUDI ARABIA Fax: 00966 26405000 Ext 1417 Tel: 00966 26405000 Ext . 5559/5568 Mobile: 00966 50 552 2447 Email: meshary001@yahoo.com
Mr. Abdul Hameed Khatir Yahia	NAVAIDS Engineering Branch Systems Engineering Division General Authority of Civil Aviation P.O.Box 15441 - Jeddah 21444 KINGDOM OF SAUDI ARABIA Fax: 00966 2 671 9041 Tel: 00966 2 671 7717 Mobile: 00966 50 836 0244 Email: k_yahia@yahoo.com
Mr.Khaled Al-Motrafi	Manager NAVAIDS Engineering Branch General Authority of Civil Aviation P.O.Box 15441 - Jeddah 21444 KINGDOM OF SAUDI ARABIA Fax: 00966 2 671 9041 Tel: 00966 2 671 7717 Ext. 291 Email: kalmotrafi@hotmail.com

NAME	TITLE & ADDRESS
SYRIA	
Mr. Ahmad Masbout	ATC Controller Head of ATC Deputy Lattakia International Airport General Organization of Civil Aviation 1, Al Najmed Square P.O.Box 6257 Damascus - SYRIA Fax: 963-41 Tel: 963-41 803 809 Mobile: 099 983 1627
Mr. Mouhamed Omar Ahmed	Chief of Air Traffic Controller/International Aleppo International Airport General Organization of Civil Aviation 1, Al Najmed Square P.O.Box 6257 Aleppo - SYRIA Fax: 963-21 421 1212 Tel: 963-21 933 914 247 Mobile: 963-93 391 4247
Mr. Ossama Nofal	AIS Officer/Air Transport Damascus International Airport Syrian Civil Aviation Authority 1, Al Najmeh Square P.O.Box 6257 Damascus - SYRIA Fax: 963-11 331 5547/540 0168 Tel: 963-11 646 0472 Mobile: 00963 955 118 515
Mr. Usama Safi	Head ATC Department Damascus International Airport Syrian Civil Aviation Authority 1, Al Najmeh Square P.O.Box 6257 Damascus - SYRIA Fax: 963-11 540 0312 Tel: 963-11 540 0312 Mobile: 00963 944 672 817 Email: ousafi@mail.sy

NAME	TITLE & ADDRESS
UNITED ARAB EMIRATES	
Mr. Bruce Snowsill	Senior Manager AIM SERCO – IAL Limited Dubai International Airport P.O.Box 1897 Dubai UAE Dubai--UNITED ARAB EMIRATES Fax: 971 0 4 224 5359 Tel: 971 0 4 216 7207 Mobile: 971 0 50 621 4085 Email: bruce.snowsill@dubaiairnav.gov.ae
Mr. Khalid Al Arif	Director Standards & Regulations UAE Dubai Civil Aviation Authority P.O.Box 2525 Dubai – UNITED ARAB EMIRATES Fax: 971 4 220 0808 Tel: 971 4 216 2010/216 2049 Mobile: 971 50 452 0990 Email: Khalidalarif@dca.gov.ae
Mr. Riis Johansen	ANS Advisor UAE General Civil Aviation Authority P.O.Box 6558 Dubai – UNITED ARAB EMIRATES Fax: 971 2 665 6548 Tel: 971 2 405 4502 Mobile: 971 50 617 5319 Email: rjohansen@gcaa.ae
Mr. Abdulla Al Hashimi	Air Traffic Control Officer UAE General Civil Aviation Authority P.O.Box 6558 UNITED ARAB EMIRATES Tel: 971 240 542 89 Mobile: 971 50 441 2060 Email: alhashimi@gcaa.ae

NAME	TITLE & ADDRESS
ORGANIZATIONS	
IFALPA Capt. Mohamed Kheir Hassoun	Executive Vice President, Africa & Middle/East Kontary, Clemenceau St., Al Khorafi Bldg, 2022 -6403 Beirut - LEBANON Fax: 961-1 623 875 Tel: 961-1 378 778 Mobile: 961-3 385 555 Email: hassounm@mea.com.lb
IFATCA Mr. Ayman Mahmoud Hassan	ATC- IFATCA Representative Cairo International Airport Cairo-EGYPT Fax: 202 226 806 27 Tel: 202 226 579 54 Mobile: 010 601 3751 Email: aamh9999@yahoo.com
FRANCE DEVELOPMENT CONSEIL **(on behalf of GSA and ESA) - FDC** Mr. Bruno Roussel	Head of Navigation Department FDC 10, Cours Louis Lumiere 94300 Vincennes France Fax: 33 0 1 53 66 11 00 Tel: 33 0 1 53 66 11 11 Mobile: 33 6 7973 5618 Email: bruno.roussel@fdc.fr
ACAC Mr. Mohamed El Kady	Air Navigation Expert Souissi Rabat, Morocco P.O.Box 5025 MOROCCO Fax: 00 212 37 65 81 54 Tel: 00 212 37 65 83 23 Mobile: 212 0 49 46 24 28 Email: melkady@acac.org.ma

- END -