INTERNATIONAL CIVIL AVIATION ORGANIZATION

Third Meeting of the APIRG Communications, Navigation and Surveillance Sub-Group (Nairobi, 26-30 April 2010)

Agenda Item 6: Review of GNSS and PBN Implementation Task Forces Meeting

(Presented by the Secretariat)

SUMMARY
This working paper reviews the report of GNSS and PBN Implementation Task Force meetings 1. The Action by the meeting is at **paragraph 3.**
REFERENCE: The report of GNSS implementation TF/ & PBN Task Force meeting /1 Report of ATS/AIS/SAR/SG/10

1. INTRODUCTION

1.1 At the first meeting of AFI PBN Task Force, the meeting proposed the merger with AFI GNSS Implementation Task Force. ATS/AIS/SAR/SG/10 also endorsed the merger of the two Task Forces in order to avoid duplication of Tasks. The two Task Forces had their first joint meeting on 8-10 September 2009.

2. DISCUSSION

2.1 Upon a request from GNSS Implementation Task Force/8 Meeting, EASA was to represent the Cost Benefit Analysis taking into consideration the traffic date from all / more AFI States. EASA presented the new COB for comments from Task Force members. The final COB will be presented to CNS/SG/3 then to APIRG/17.

2.2 The meeting finalized Appendix H of Doc 003 AFI GNSS strategy as attached to this working paper as **Appendix A**.

2.3 A**ppendix B** is attached to this working paper as the draft terms of reference and work program for the Joint task forces.

3. ACTION TO BE TAKEN BY THE MEETING

3.1 The meeting is invited to :

- take note of the developments in the AFI GNSS strategy;
- comment on the Joint Terms of Reference and work program for the combined Task Forces; and
- comment on the Draft GNSS Strategy.

APPENDIX A

PROPOSALS FOR AMENDMENTS TO AFI CNS/ATM IMPLEMENTATION PLAN (DOC. 003) (APPENDIX H) (UPDATED VERSION)

Concept of the GNSS Strategy for the AFI Region

1. Introduction

1.1 The purpose of the AFI GNSS strategy is to define an evolution path for replacement of ground-based navigation aids, i.e. VOR/DME/ILS/NDB, ensuring that operational and other concerns such as positive cost-benefit are fully taken into account.

1.2 The AFI GNSS strategy assumes availability of a GNSS meeting of the specified parameters at every phase of deployment. It does not analyze GNSS systems configuration per se nor the advantages and disadvantages of various deployment strategies.

2. General Considerations

2.1 By necessity, satellite-based and ground-based navigation systems will co-exist for a period of time. Considering that the operation of a dual system is detrimental to a positive cost-benefit, users and providers will co-operate with the view of reducing the duration of the transition period as much as possible, having due regard for the following principles:

- The level of safety will not be downgraded during the transition;
- GNSS-based service must, before the end of the transition period, fully meet the required parameters of accuracy, availability, integrity and continuity for all phases of flight;
- During the transition, gradually evolving levels of functionality will be available;
- Operational advantage shall be taken in to consideration the available and capabilities at every step of deployment;
- Methods of application will take into account full consideration of safety considerations of any functional limitations;
- Users must be given sufficient advance notice to re-equip before ground-based systems are decommissioned.

3. Evolving functionality

3.1 Phase I (Short term), up to 2012: ***Additional ranging and health information on GPS constellation provided via GEO satellites***

- **This phase will allow the use of GNSS as a primary-means of navigation for en-route, and for NPA; and as a supplemental-means navigation system for TMA. Existing ground infrastructure remains intact.**

Table 1: Summary of AFI GNSS Strategy for 2008-2012		
Airspace	**Navigation Specifications**	**Navigation Specifications where operationally required**
	Basic GNSS	
En-Route Oceanic	RNAV-10	RNP-4
En-Route Remote Continental	RNAV-10	RNP-4
En-Route Continental	RNAV-5	RNAV-1
TMA Arrival/Departure	RNAV-1 in a surveillance environment Basic RNP-1 in non-surveillance environment	
	Basic GNSS	
Approach	RNP APCH with Baro-VNAV or RNP AR APCH if required	

3.2 Phase II (Medium term) -2013 - 2016:

- This phase will allow for:

a) <u>En-route phase</u>: sufficient capability to meet en-route navigation requirements everywhere in the AFI Region. GNSS will continue to be used as principal en-route navigation. The same principle will be characterized by a clearly planned transition for the use of GNSS as the sole means for en-route navigation. Navigational aids will accordingly be progressively withdrawn in consultation with the Users.

b) <u>Terminal areas</u>: sufficient capability to meet TMA navigation requirements everywhere in the AFI region. GNSS is approved as sole-means for TMAs, taking into account technical and legal developments, and institutional aspects.

c) Terminal area VOR/DME/NDB, and Locators not associated with ILS, will be progressively withdrawn in consultation with users during Phase II.

d) <u>Approach and landing phase:</u> sufficient capability for APV1 in the whole AFI Region. ILS will continue to be provided at aerodromes[1].

Note 1: Where the requirements for approach and landing can be met by APV 1, the withdrawal of ILS CAT I should be considered.

- During Phase II, the implementation of Long- term GNSS will be developed**.**

Table 2: Summary of AFI GNSS Strategy for 2013-2016		
Airspace	**Navigation Specifications**	**Navigation Specifications where operationally required**
	Basic GNSS	
En-Route Oceanic	RNAV-10	RNP-4
En-Route Remote Continental	RNAV-10	RNP-4
En-Route Continental	RNAV-2, RNAV-5	RNAV-1
TMA Arrival/Departure	Expand RNAV-1, or RNP-1 application Mandate RNAV-1 OR RNP-1 in high density TMAs	
	ABAS or SBAS (SBAS will be included in ICAO PBN concept)	
Approach	Expand RNP APCH with (Baro-VNAV0 and APV (ABAS or SBAS) Expand RNP AR APCH where there are operational benefits	
Approach Precision	Cat I (SBAS, GBAS) and CAT II /III (GBAS)	

3.3 Phase III (Long term) 2017 onwards**:** It is assumed that more constellations of navigation satellites will be available to support GNSS as the sole-means of navigation from en-route to CAT I operations. CAT I by SBAS or GBAS will be available in those locations where analysis of historical MET data or traffic characteristics justifies the requirement. Other requirements will be met by ground-based augmentation system (GBAS).

- During Phase III, ILS CAT I will be withdrawn in consultation with users.

- Where CAT II/III ILS requirements have been confirmed, these facilities will remain unless technical evolution then demonstrates that the requirement can be supported by GBAS or SBAS.

Table 3: Summary of AFI GNSS Strategy for 2017 – and beyond		
Airspace	**Navigation Specifications**	**Navigation Specifications where operationally required**
	Basic GNSS	
En-Route Oceanic	RNAV-10	RNP-4
En-Route Remote	RNAV-10	RNP-4

Table 3: Summary of AFI GNSS Strategy for 2017 – and beyond		
Airspace	**Navigation Specifications**	**Navigation Specifications where operationally required**
Continental		
En-Route Continental	RNAV-5	RNAV-1
TMA Arrival/Departure	RNAV-1 in a surveillance environment Basic RNP-1 in non-surveillance environnent	
	ABAS, SBAS, GBAS (SBAS and GBAS will be included in ICAO PBN concept)	
Approach	RNP APCH with (Baro-VNA) RNP AR APCH if required	
Approach Precision	CAT I (SBAS) CAT I/II/III/(GBAS) as required	

4. The strategy will be reviewed periodically. In particular, it will be reviewed and updated at the beginning of each planning phase to ensure continuance relevance in support of the global ATM operational concept, taking into account technological evolution and developments in the field of GNSS.

5. It will be reviewed, and the relevant technological and evolutional issues will be taken into consideration.

Appendix B

PROPOSED TERMS OF REFERENCE FOR COMBINED APIRG 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 AFI Region, 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 studies, the PBN strategy and Implementation Plan for the AFI 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.

2. Work Programme

Activity/Task	**Assigned person/organ**	**Target date**
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). e) Develop an amendment proposal to the AFI 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 APIRG. j) Develop and update (as necessary) the Regional PBN Implementation Strategy and Plan. k) Develop the PBN performance objectives and related action plans for en-route, terminal and approach phases of flight; and; l) Report to APIRG through its ATM and CNS Sub-groups.		

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 interregional 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.

4. Composition of the Task Force:

States

AFI States and States having territories in the AFI Region

(meeting to decide on a concise list, preferably not exceeding 15)

Note:
States are requested to included in their delegations: PBN experts, GNSS (CNS) experts, as well as officials experts involved in the PBN approval process of aircraft operators.

Organizations
ASECNA, IATA, IFALPA, IFATCA and ESA. Additional representative from International/Regional Organizations may be invited when required.
