



International Civil Aviation Organization
Southern and Central African Office

**First Meeting of the APIRG Performance Based Navigation/Global Navigation Satellite System Task Force (PBN/GNSS TF/1)
(Nairobi, Kenya, 12 - 14 October 2010)**

Agenda Item 5: AFI GNSS Implementation Strategy

REVIEW OF AFI GNSS IMPLEMENTATION

(Presented by the Secretariat)

SUMMARY
This working paper provides the framework for GNSS introduction in the AFI Region and reviews the status of implementation according to the AFI GNSS Strategy.
Action by the meeting is at Paragraph 3.
REFERENCES
<ul style="list-style-type: none">• AFI Air Navigation Plan (Doc 7474)• AFI/7 Report (Doc 9702)• APIRG/16 Report• SP AFI/08 Report (Doc 9930)
This Working Paper is related to Strategic Objectives: A and D

1. INTRODUCTION/BACKGROUND

1.1 The Seventh Africa-Indian Ocean Regional Air Navigation Meeting (AFI/7) (Abuja, Nigeria, 12-23 May 1997) agreed that the future navigation plan for the region would be based on the global navigation satellite system (GNSS) which is expected to evolve from the two existing systems, i.e. the global positioning system (GPS) and the global orbiting navigation satellite system (GLONASS). AFI/7 adopted the following recommendation and conclusion:

Recommendation 10/5: Global navigation satellite system implementation in the Africa-Indian Ocean Region

That States in the Africa-Indian Ocean Region:

- a) *Implement WGS-84 by 1 January 1998 in accordance with ICAO Annex 15;*
- b) *Make maximum use possible of the guidance and information contained in ICAO Circular 267 – Guidelines for the introduction and operational use of the Global Navigation Satellite System (GNSS) and other relevant GNSS-related documents;*
- c) *Review, as a matter of urgency, operational requirements for en-route, approach, landing and*

departure operations which could be met by GNSS-based applications and make them available to APIRG;

- d) Develop GNSS-based ATS procedures;*
- e) Develop, if not yet done, AIC on the use of supplementary/primary GNSS taking into account, as appropriate, the model AIC included in the report on Agenda Item 12;*
- f) Address and plan matters related to human resources with special emphasis on the formation, training and retraining of technical personnel involved in GNSS implementation and operation; and*
- g) Give proper consideration to the concept of “Multinational ICAO AFI Air Navigation Facility/Service” addressed in the report on Agenda Item 14.*

Conclusion 10/6: GNSS implementation – Africa Indian Ocean Region Strategy

That APIRG,

- a) Finalize, as a matter of urgency, the strategy for the implementation of GNSS in the Africa-Indian Ocean Region, including ground and satellite-based augmentations systems (EGNOS, WAAS), taking due account of developments in adjacent regions;*
- b) Undertake proper liaison with certified GNSS service providers;*
- c) Give further consideration to the concept of “Multinational ICAO AFI Air Navigation Facility/Service” in the report on Agenda Item 14;*
- d) Identify and address as appropriate, possible sources of funding to facilitate GNSS implementation in the Africa-Indian Ocean Region;*
- e) Identify and address, to the extent possible, institutional and legal matters related to the GNSS implementation in the region; and*
- f) Monitor cost benefit analyses related to GNSS implementation scenarios.*

1.2 As a follow up to AFI/7 Conclusion 10/6, the Twelfth Meeting of APIRG (APIRG/12, Tunis, Tunisia, 25-29 June 1999) adopted a three-phased strategy for the introduction of GNSS in the Africa-Indian Ocean, which defines an evolution path for replacement of conventional ground-based navigation aids, ensuring that operational and other concerns such as positive cost-benefit are fully taken into account. It 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. The AFI GNSS strategy is updated from time to time by APIRG to reflect developments related to GNSS, as discussed in *WP/6 of this meeting*.

2. DISCUSSION

Implementation of WGS-84

2.1 AFI/7 Meeting had identified the implementation of WGS-84 as a sine qua non condition for the safe and efficient use of GNSS, particularly in support of approach and landing operations. However, surveys conducted within the region show that the implementation of WGS-84 has not yet been completed properly in many States. For this reason, a performance framework form (PFF) for WGS-84 and electronic terrain data as part of AIM performance objectives.

Implementation of Phase I of the AFI GNSS Strategy (up to 2012)

2.2 Phase I of the strategy allows the use of basic GNSS (GNSS augmented with ABAS) from en-route down to non-precision approaches (NPA); and as a supplemental-means navigation system for TMA. Existing ground infrastructure remains intact. APIRG/16 Meeting (Rubavu, Rwanda, 25-29 November 2007), after noting that it had not been completed properly and uniformly throughout the Region recommended a prolongation of this phase which has now been expanded up to 2012, in consistency with Phase I (Short-term) of the Regional Performance-based navigation (PBN) Roadmap.

2.3 APIRG/16 Meeting recognized that en-route use of basic GNSS was not yet approved in a majority of AFI States, and NPA procedures and/or related regulatory texts had not yet been published. It also noted that the requirement for the recording of GNSS parameters was not met by the States that have approved GNSS-based procedures. The following Conclusions and Decision were adopted accordingly:

Conclusion 16/21: Implementation of GNSS en-route and non-precision approach operations

That AFI States continue their efforts to implement GNSS applications for en-route and non-precision approach operations as part of Phase I of AFI GNSS Strategy. In so doing, particular attention should be accorded to meeting all GNSS implementation requirements, including establishment of GNSS legislation, regulatory framework, and approval and monitoring procedures.

Conclusion 16/22: Recording of GNSS parameters

That AFI States that approve GNSS-based operations ensure that GNSS data relevant to those operations are recorded as recommended in ICAO Annex 10, Volume I, Chapter 2, Para. 2.4.3. Particularly, for GNSS core systems, the following monitored items should be recorded for all satellites in view:

- a) observed satellite carrier-to-noise density;*
- b) observed satellite raw pseudo-range code and carrier phase measurements;*
- c) broadcast satellite navigation messages, for all satellites in view; and*
- d) relevant recording receiver status information.*

Conclusion 16/23: Aeronautical information related to GNSS

That when implementing GNSS-based operations, AFI States ensure that the relevant aeronautical information is provided to the users as appropriate.

2.4 The meeting may wish to discuss the extent to which the above conclusions have been/are being implemented by States and air navigation service providers.

Implementation of Phase II of the AFI GNSS Strategy

Phase II (Medium term, 2013 – 2016) of the strategy which is also aligned with Phase II of the PBN Roadmap for the Region, is expected to allow for:

- a) 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

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navigation. Navigational aids will accordingly not be replaced, subject to consultation with the users.

- b) 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) capability for approach with vertical guidance (APV-I) in the whole AFI Region. ILS will continue to be provided at aerodromes.

2.5 The planning for the implementation of Phase II of the AFI GNSS strategy is still under discussion (*WP/6 refers*).

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the information provided in this working paper; and
- b) reiterate the need for AFI States which have **not** done so to:
 - 1) complete the implementation of WGS-84 coordinates;
 - 2) ensure that all the prerequisites are met when implementing GNSS applications for en-route and non-precision approach (NPA) operations in accordance with the current Phase 1 of AFI GNSS Strategy, and in support of PBN operational requirements.
- c) request ICAO to pursue its efforts aimed at assisting States experiencing implementation challenges.

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