

APPENDIX A

INITIAL CONCEPT OF THE GNSS STRATEGY FOR THE AFI REGION (Rev. 1)**Introduction**

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.

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

General Considerations

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 of the available capabilities at every step of deployment.
- Methods of application will take into full consideration safety considerations of any functional limitations;
- Users must be given sufficient advance notice to re-equip before ground-based systems are decommissioned.

Evolving functionality*

Phase I (Short term), up to 2004 2003: *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.

Phase I-A (up to 2003)

- An AFI GNSS test bed will be implemented to validate the objectives and differential correction algorithms of ~~Phase II and Phase III~~ **of the operational EGNOS system to be implemented during Phase I.**

Phase I-B (up to 2004): This phase will be achieved by the deployment of a network of RIM stations through the AFI Region.

- **To prepare EGNOS implementation, numerous activities must be carried out: final system definition, specifications development, cost/benefit analysis (CBA) and funding, preparation of the institutional and operational framework and programmatic issues will be carried out.**
- **This phase will end with EGNOS validation in the AFI Region.**

*Dates are indicative

Phase II (Medium term) 2005-2011 2003-2008: *APV-I NPV-I, 20m vertical accuracy, will be available everywhere in the AFI Region*

1. This phase will allow for:
 - En-route phase: sufficient capability to meet en-route navigation requirements everywhere in the AFI Region; GNSS is approved as a sole-means system for en-route navigation, taking into account technical and legal developments, and institutional aspects. En-route navigation aids will be progressively withdrawn accordingly in consultation with users.
 - Terminal areas: 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.
 - Terminal area VOR/DME/NDB, and Locators not associated with ILS, will be progressively withdrawn in consultation with users during Phase II.
 - Approach and landing phase: sufficient capability for APV-1 non-precision approach and landing in the whole AFI Region.
 - ILS will continue to be provided at aerodromes¹.

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

2. During Phase II, ~~the implementation of Long term GNSS will be developed.~~ a satellite-based augmentation system (SBAS) ground infrastructure will be put in place in the AFI Region; en-route navigation aids will be progressively withdrawn. VOR/DME and ILS will continue to be provided in terminal areas and at aerodromes.

Phase III (Long term) 2008 2012 onwards: It is also assumed that at least two constellations of navigation satellites will be available. *Sole-means navigation services from en-route to CAT I operations. CAT I by SBAS or GBAS CAT I 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).* ~~This will require the deployment of additional RIMS in the AFI.~~

- a) During Phase III, ILS CAT I will be withdrawn **in consultation with users.**
- b) 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 GNSS.**
- c) ~~The plan of withdrawal of ILS should ensure availability of an ILS at least within 500 NM. This reduced back-up network of ILS will remain in place as long as necessary and until sufficient level of confidence has been built on GNSS as sole-means navigation system for CAT I approach and landing operations.~~
3. ~~Terminal area VOR/DME will also be progressively withdrawn during Phase III in a co-ordinated ILS/VOR/DME withdrawal plan, catering for the alternate availability of the two sets of facilities at different locations.~~

Institutional issues

- a) Phases II and III of the AFI GNSS strategy will require the deployment of AFI specific GNSS components. In order to minimize costs associated with the deployment and operation of these components, AFI should seek cooperation agreements with systems providers in adjacent regions with a view to the joint use of GNSS components where feasible and cost-effective.

- b) Meanwhile the modalities of installation and cost-recovery of multinational facilities, essentially RIMS, in some AFI States, must be addressed without delay so that deployment can be initiated as soon as technically possible.

4. Synopsis of the AFI GNSS strategy

AFI GNSS Strategy SBAS-APV-1				
	Phase I		Phase II	Phase III
Time scale	2000 - 2004		2005 - 2011	2012 - 2017
Certification	Supplemental	Primary	Sole-means from en route to APV-1	Sole means from en route to CAT I
Oceanic/En route		GPS	GNSS-1 GPS with EGNOS	Long term GNSS GNSS-2
Continental/En route		GPS	GNSS-1 GPS with EGNOS	Long term GNSS GNSS-2
Terminal	GPS		GNSS-1 GPS with EGNOS	Long term GNSS GNSS-2
Approach and landing	(GPS/Baro) NPA		APV-1 SBAS CAT I GBAS	SBAS CAT I CAT I GBAS CAT II/III GBAS
