INTERNATIONAL CIVIL AVIATION ORGANIZATION

Fourth Meeting of the APIRG Communications, Navigation and Surveillance Sub-group (Dakar, Senegal, 25-29 July 2011)

Agenda Item 6: Aeronautical Radionavigation (AFS)

AFI SBAS Cost Benefit Analysis – Terms of reference

(Presented by the Secretariat)

SUMMARY
This paper presents the terms of reference of an independent cost-benefit benefit analysis for an AFI SBAS, as a follow up to APIRG Conclusions 17/28 and 17/29, for consideration by the CNS/SG.
Action by the meeting is at paragraph 3.
References : APIRG/17, Report Note: Reference can be downloaded from **www.icao.int**
Related ICAO Strategic Objective A: Safety and C: Environmental Protection and Sustainable Development of Air Transport.

1. Introduction

1.1 APIRG/17 reviewed a revised AFI GNSS Strategy as drafted by CNS/SG/3. After noting the lack of consensus between stakeholders on available cost-benefit analysis, APIRG/17 identified the need for a cost-benefit analysis to be conducted by independent experts, based on objective assumptions. The following conclusions were formulated:

CONCLUSION 17/28: NEED FOR A HIGH LEVEL MEETING ON AFI GNSS STRATEGY

That, in order to assist AFI States in making an informed decision on the regional strategy for the introduction of GNSS applications, AFCAC organize as a matter of urgency a high level meeting in coordination with ICAO, ASECNA, IATA, AFRAA and other relevant stakeholders.

CONCLUSION 17/29: NEED FOR AN INDEPENDENT COST-BENEFIT ANALYSIS

That, considering the lack of consensus between stakeholders on available cost-benefit analyses related to SBAS implementation in the AFI Region, a cost benefit analysis based on objective assumptions should be performed by independent experts, and submitted to the high level meeting to be organized by AFCAC on AFI GNSS strategy, for consideration.

2. Discussion

2.1 Appendix to working paper contains the terms of reference developed by the Secretariat in coordination with AFCAC, for the conduct of an AFI SBAS cost-benefit analysis to be conducted by AFCAC.

3. Conclusion

3.1 The meeting is invited to:

1) review the terms of reference established for the conduct of an independent AFI SBAS cost-benefit analysis as presented in Appendix to this working paper;

2) provide comments as required.

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Appendix

IMPLEMENTATION OF GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) SATELLITE-BASED AUGMENTATION SYSTEM (SBAS) IN AFRICA-INDIAN OCEAN (AFI) REGION THROUGH THE EXTENSION OF THE EUROPEAN GEOSTATIONARY NAVIGATION OVERLAY SYSTEM (EGNOS)

COST-BENEFIT ANALYSIS

TERMS OF REFERENCE

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) and recommended its implementation by States, based on a regional strategy to be developed by the AFI Planning and Implementation Regional Group (APIRG).

1.2 As a follow-up to AF/7 recommendation, the Twelfth Meeting of APIRG (APIRG/12, Tunis, Tunisia, 25-29 June 1999) developed a three-phased strategy for the introduction of GNSS in the Africa-Indian Ocean Region, which defines an evolutionary path for replacement of conventional ground-based navigational aids, ensuring that operational and other concerns such as positive cost-benefit are fully taken into account. It assumes availability of a GNSS meeting the specified parameters at every phase of deployment. The AFI GNSS strategy is updated from time to time by APIRG to reflect developments related to GNSS.

1.3 The strategy for the introduction of GNSS for aviation use includes augmented GNSS to support specific air navigation operations, including satellite-based augmentation systems (such as EGNOS).

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

1.4 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 its implementation 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 AFI Regional Performance-based navigation (PBN) Plan.

Phase II of the AFI GNSS Strategy (2013 – 2016)

1.5 Phase II (Medium term, 2013 – 2016) of the strategy which is also aligned with Phase II of the PBN Regional Plan, 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 a principal en-route navigational aid. 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 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 the sole-means for TMAs, taking into account technical and legal developments, and institutional aspects.

c) Capability for approach with vertical guidance (APVI) in the whole AFI Region.

NEED FOR THE PROJECT

1.6 The Seventeenth Meeting of APIRG (APIRG/17) which was held in Ouagadougou, Burkina Faso from 2 to 6 August 2010, reviewed a proposed updated AFI Strategy developed by the Communications, Navigation and Surveillance (CNS) Subgroup, and was informed by AFCAC that the provision of SBAS over the AFI Region was being considered in the frame work of Africa-European Union strategic partnership, and that the implementation plan would be discussed at an African – European Union Summit scheduled in November 2010.

1.7 APIRG/17 specifically agreed on the need to organize a high-level meeting on AFI GNSS Strategy under the aegis of AFCAC, in close coordination with ICAO and other relevant stakeholders (Conclusion 17//28). Considering that all available cost-benefits analyses (CBAs) related to SBAS implementation in the AFI Region had been carried out by the system vendor, as well as IATA position on SBAS and the lack of consensus between stakeholders on these cost-benefit analyses, APIRG/17 also recommended an independent cost benefit analysis based on realistic and objective assumptions (Conclusion 17/29).

SCOPE OF THE PROJECT

Identification of benefits and costs

1.8 A project such as SBAS implementation in the ICAO AFI Region requires a methodology that reflects the related public and industry benefits and costs. The cost-benefit analysis (CBA) of the project should identify the investment option that best conforms to the economic goal of maximizing net societal benefits. This obviously goes well beyond a financial evaluation that focuses on the project's financial accounts and cash flows. While the financial evaluation would look at the financial cash flows and required user charges associated with the investment, the CBA should consider the benefits to and costs for all parties concerned.

System configuration (SBAS)

1.9 The various AFI SBAS implementation options should be listed and each option described with a clear identification of the system components and their functionalities.

Fleet evolution

1.10 The CBA should determine the current fleet operating in the AFI Region, including all aircraft registered in AFI States and those that are not registered in AFI States but utilize AFI airspace, which are engaged in domestic, regional and international operations, the current status of aircraft equipage with respect to SBAS. Operators' plans to increase their fleets and to acquire SBAS receivers should also be investigated.

Traffic data and forecast

1.11 As recommended by APIRG, the analyses should use AFI Traffic Forecast Group data as updated from time to time. ICAO Doc 9879 contains AFI Regional Traffic Forecasts for 2004–2020 (ICAO Doc 9879).

Airspace users

1.12 The costs and benefits should include those that will accrue to air carriers from fuel savings and to passengers from time savings. The following should be considered, among other relevant issues:

1. Situation with and without project (impact)

a) Current situation

b) Situation if SBAS were implemented

2. Technical and operational aspects

a) Demand assessment in time (Historical data and forecasts.)

3. Investment

a) Costs: Avionics equipment, supplies, planning, maintenance, pilot training, user charges.

b) Benefits foreseen with SBAS: economy during flight hours, expenses avoided other benefits.

Air navigation service providers (ANSPs)

1.13 There are also potential productivity gains for the provider of the air navigation services which must be taken into consideration. The following should be considered, among other relevant issues:

1. Situation with and without project (Impact)

a) Current situation.

b) Situation if SBAS were implemented.

2. Technical and operational aspects

a) Demand assessment in time (Historical data and forecasts).

b) Implementation phases of the project and time required for each phase (study, coordination, quotation of equipment, obtaining of resources, acquisition, procedure development, personnel training, acquisition, facilities, installation, operation, trials, as applicable).

c) Time required for the system operation.

d) Requirements of the system in the short/mid and long terms.

3. Investment

a) Value of acquisition of equipment, with breakdown of each one of the system components.

b) Useful life of each component

c) Value of intangible assets of the project (software, data entry information to feed the system), feasibility studies, technical-operational training, and trials.

d) Physical valued infrastructure (if available)

e) Other investments

4. Annual expenses

a) Professional, technical and administrative personnel required.

b) Operations expenses, including maintenance

Safety benefits

1.14 The measurement of safety benefits requires an analysis of the safety risks, which are a composite measure of the probability and the severity of an adverse occurrence. The CBA should take into consideration the consequences of such occurrences determined by a risk analysis and attribute a specific monetary value to them. Where the project cannot be justified by consideration of the non-safety benefits, it may still be necessary to consider whether the project will lead to an improvement in the level of safety.

Social benefits

1.15 Considering the wider social effects, the analyses should take into account the negative effects like increased traffic and noise experienced by individuals living or working in the vicinity of some airports.

Environmental benefits

1.16 The impact on the environment is an important factor in many large transportation projects. Whether considered as a cost or as a negative benefit (environmental effects are often unintended and typically negative), these effects are difficult to measure in a precise way. Nevertheless, it is important that they be identified and carefully evaluated. Extensive research has been carried out in the quantification of environmental effects/impact.

Outcome of the project

1.17 Once all of the benefits and costs have been identified and forecast, in order to determine if the project is cost-beneficial, or to assess which option yields the greatest net benefits, the net cash stream of benefits and costs is discounted to today's value to produce a single net present value (NPV), i.e. the discounted value of benefits from the investment less the discounted value of expected costs. A positive NPV indicates that the investment is worthwhile. The preferred option, from an economic perspective, should be the one with the highest NPV.

1.18 Benefits and costs do not necessarily follow the same distribution of cash flows arising from a financial evaluation. In addition, benefits accruing to aviation users may be insufficient to cover the total cost of the project.

DURATION OF THE PROJECT

1.19 The CBA project is expected to be completed and delivered to the African Commission for Civil Aviation (AFAC) within two (2) months, including briefing sessions with AFCAC and ICAO Regional Offices, data collection from, and discussions with the SBAS provider, selected air navigation service providers, domestic/regional/international airspace users, international organizations (ASECNA, AFRAA, IATA, IFALPA, IFATCA), and other relevant stakeholders to be identified. Aircraft manufacturers (such as Airbus and Boeing) may also be contacted as necessary to get accurate information SBAS avionics and related trends.

DOCUMENTATION

1.20 The CBA project should refer to the following guidance material. Additional documentation could be obtained on request via the ICAO Regional Offices.

- Eleventh Air Navigation Conference. Montréal, 22 September – 3 October 2003. Report (ICAO Doc 9828)
- Global Navigation Satellite System (GNSS) Manual (ICAO Doc 9849)
- Manual on Air Navigation Services Economics (ICAO Doc 9161)
- Economics of Satellite-Based Air Navigation Services (ICAO Circular 257)
- Global Air Navigation Plan (ICAO Doc 9750)
- Seventh Africa-Indian Ocean Regional Air Navigation Meeting (AFI/7) Report (ICAO Doc 9702)
- Special Africa-Indian Ocean Regional Air Navigation Meeting (SP AFI/08) Report (ICAO Doc 9930)
- AFI Planning and Implementation Regional Group (APIRG) and its Communications, Navigation and Surveillance Sub-group Meeting Reports
- Africa-Indian Ocean Regional Traffic Forecasts 2004–2020 (ICAO Doc 9879)

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