



International Civil Aviation Organization

**Third Meeting of APIRG Communications, Navigation and
Surveillance Sub-Group (CNS/SG/3)
(Nairobi, Kenya 26 – 30 April 2010)**

Agenda Item 3: Review and follow up of Recommendations, Conclusions and Decisions applicable to the CNS Sub-Group

Agenda Item 6: Aeronautical Radio Navigation Service (ARNS)

COST-BENEFIT ANALYSES RELATED TO AN AFI SBAS

(Presented by the International Air Transport Association)

SUMMARY

This paper provides IATA's feedback on the draft Cost-Benefit Analysis presented by an SBAS provider to the First Joint Meeting of the APIRG PBN and GNSS Task Forces (Nairobi, Kenya 8-10 September 2009).

References:

- ICAO Global Air Navigation Plan (Doc 9750)
- APIRG/16 Report.
- Report of the First Joint Meeting of the APIRG Performance Based Navigation and Global Navigation Satellite System Implementation Task Forces.

1. INTRODUCTION

- 1.1. In 2005, IATA indicated to APIRG/15 its position concerning the implementation of a satellite-based augmentation system (SBAS) in the AFI region, known as the Interregional SBAS over AFI (ISA).
- 1.2. In 2007, APIRG/16 noted the action taken by the Air Navigation Commission on APIRG/15 Report, and recommended that the ISA should be delayed until further cost-benefit analysis (CBA) in coordination with users demonstrates a conclusive need.
- 1.3. This working paper shares IATA's comments on the Draft CBA presented to the First Joint Meeting of the APIRG PBN and GNSS Task Forces (Nairobi, Kenya 8-10 September 2009) by an SBAS provider.

2. DISCUSSION

Consensus between Air Navigation Service Providers (ANSPs) and Users

- 2.1. **Appendix** to this paper provides the planning flow chart recommended in ICAO Global Air Navigation Plan (Doc 9750) for CNS/ATM systems. It shows the importance of performing

12/02/10

cost-benefit and sensitivity analyses, evaluating acceptance by, and developing consensus with users prior to proceeding with implementation tasks.

- 2.2. As a matter of fact, the consensus accordingly called for by APIRG/16 has not yet been reached between users and AFI ANSPs, based on cost-benefit analyses developed by the latter.

Feedback from users (PBN/GNSS/I/TF/1 WP/10, Para 1.11.1)

- 2.3. There is no business case demonstrating tangible operational benefits for airlines in support of SBAS. In fact, SBAS is the only GNSS augmentation system that airlines are not willing to pay for cost recovery.
- 2.4. If the extension of EGNOS was ever to become a mandate, the cost for operators to retrofit their fleets would be significant, in addition to ground infrastructure cost recovery, which operators cannot afford.

Update of numbers of previous CBA - African fleet and flight statistics (PBN/GNSS/I/TF/1 WP/10, Para 1.9.2)

- 2.5. Fleet assumptions: The on-going ICAO/IATA survey on aircraft equipage is expected to provide reliable data concerning airlines plans.
- 2.6. Flight statistics: The CBA should be based on more current and commonly agreed traffic data/forecasts such as the Regional Traffic Forecast for 2004–2020 contained in ICAO Doc 9879.

System Configuration (PBN/GNSS/I/TF/1 WP/10, Para 1.11.2)

- 2.7. It is not clear as to how the qualitative assessment of the “Intermediate SBAS” has been included in the CBA. Furthermore, it does not indicate whether it applies to:
- full implementation of ISA (with 27 - 32 RIMS), or
 - ISA with a reduced infrastructure (with 4 - 5 RIMS), for which very little information is currently available on costs and benefits.
- 2.8. APIRG/16 noted that introducing the ISA with a reduced infrastructure would enhance en-route/NPA performance but would not enable APV. The related benefits would be significantly smaller compared to a full infrastructure, and would still be conditional on the level of aircraft equipage with SBAS receivers.

CBA timeframe (PBN/GNSS/I/TF/1 WP/10, Para 1.9.1)

- 2.9. If approved by APIRG in 2010 full implementation of the ISA infrastructure would normally not be achieved until 2016, and this should be reflected in AFI GNSS Strategy. This is consistent with the description of Navigation Systems (GPI-21) Strategy in ICAO Global Air Navigation Plan, which provides that “*Near-term applications of GNSS are intended to enable the early introduction of satellite-based area navigation without any infrastructure investment, using the core satellite constellations and integrated multisensory airborne systems*”.

12/02/10

- 2.10. Subsequently, APV with Baro-VNAV appears to be the only available option to implement ICAO Assembly Resolution A36-23 calling for APV (Baro-VNAV and/or augmented GNSS) for all instrument runway ends by 2016 - and not 100% of APV/SBAS.
- 2.11. The CBA timeframe of 30 years should be adjusted based on realistic fleet assumptions and ANSP charging scheme.

Operational benefits (PBN/GNSS/I/TF/1 WP/10, Section 1, Para 1.9.3 and Section 2, Paras 2.1.1 through 2.3.3)

Technical Report on AFI Test Bed in Central, Eastern and Southern Africa

- 2.12. AFI GNSS Implementation Task Force, Conclusion 4/4 requested ESA, in cooperation with ASECNA, ATNS South Africa and Kenya to provide a consolidated Final Report on AFI GNSS Test Bed, covering Zone A, Zone B and Zone C. The First Joint Meeting of the APIRG PBN and GNSS Task Forces noted that the ICAO Secretariat had received three (3) reports from ESA which were not technical reports.
- 2.13. The still expected consolidated Technical Report is meant to validate AFI GNSS system performance and support an informed GNSS Strategy for the Region.

Reduction of Controlled flight into terrain (CFIT)

- 2.14. IATA's analysis of 95 accidents involving AOC holders from 24 States for 2001/2008 shows that CFIT's contribution to AFI accidents has been fading over the years; whereas runway excursion has become a prominent contributing factor.
- 2.15. APV provides vertical guidance for pilots to reduce the risk of Controlled Flight into Terrain (CFIT). Due to the reduced risk of APV operation as compared to Non-Precision Approaches, the 36th Session of the ICAO Assembly adopted Resolution A36-23 urging all States to implement APV procedures to all runway ends serving aircraft with a maximum take-off mass of 5700 kg or more.
- 2.16. CFIT reduction is not inherent to a particular infrastructure. It applies to any APV procedure, including in the Base Case environment.

Enhancement of Automatic Dependent Surveillance (ADS-B)

- 2.17. SBAS has no specific *advantage* in this area *over the current situation* since ADS-B services have not been implemented in the AFI Region.

Reduction of Delays, diversions and cancellations (DDCs)

- 2.18. DDCs due to weather conditions or traffic congestion are negligible in the AFI Region. No specific benefit can reasonably be attributable to a potential SBAS service area as compared to the current situation – which is the base case scenario.

Impact on Decision Height (DH)

- 2.19. SBAS can provide vertical guidance down to 250-foot decision height. Under favorable specific conditions¹, it can provide vertical guidance to a 200-foot decision height for Category I precision approach. In this case, there is a 50-foot improvement over RNP with Baro-VNAV. However SBAS is not a solution for a 100-foot decision height or for auto-land. Moreover, the vast majority of airports that service air transport operators (and alternates) offer standard ILS operations. Therefore, SBAS is not an airline requirement but GBAS remains a requirement for the future implementation of GNSS Category II and III precision approach.

¹ The case of the United States Wide Area Augmentation System (WAAS).

12/02/10

Phasing out of conventional navigational aids (VORs and NDBs)

- 2.20. Since some AFI ANSPs have plans for new VOR facilities based on a 10/15-year life cycle², the assumption of 10 years to complete the process should be revisited.

ANSP Charging Scheme

- 2.21. The CBA does not provide accurate information on the levels of air navigation users' charges to be applicable beyond 2015.

Costs related to Flight Procedures

- 2.22. The costs for procedure development and validation as well as controller training program should be added to procedure costs for ANSPs.
- 2.23. The costs for FMS maintenance and pilot training program should be added to procedure costs for aircraft operators.

Costs related to Infrastructure Maintenance

- 2.24. The assumption of a flat level for infrastructure maintenance costs over a period of 30 years should be further documented. One would expect such maintenance costs to vary along a "bathtub curve".

3. ACTION BY THE MEETING

- 3.1. The meeting is invited to:
- a) Reiterate the need for a consolidated Technical Report on the AFI GNSS Test Bed to support validation of AFI GNSS system performance as well as an informed Navigation Infrastructure Strategy for the Region;
 - b) Review IATA's feedback on the Draft SBAS CBA submitted to the previous Joint Meeting of APIRG PBN and GNSS Implementation Task Forces, as provided in this working paper; and
 - c) Request AFI ANSPs to develop CBAs for CNS/ATM systems in order to facilitate collaborative-decision making (CDM) in consultation with airlines as recommended by ICAO.

- END -

² E.g. ASECNA 2009/2013 Investment Plan for its 17 AFI member States.

Appendix

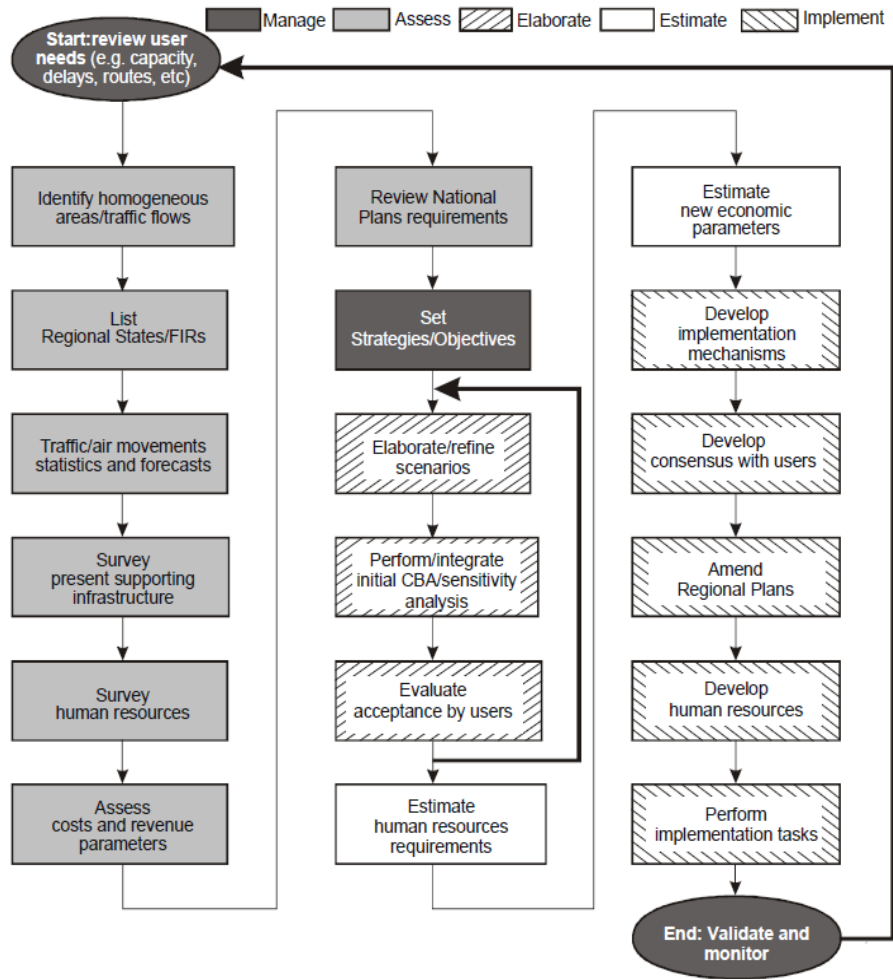


Figure 1-1. Planning flow chart