



Agenda Item 2: Global and inter-regional activities

2.1 Inter-regional and intra-regional CNS/ATM activities and coordination

**REVIEW OF THE RESULTS OF GBAS
IMPLEMENTATION STUDIES AND TRIALS IN CHILE**

(Presented by Chile)

SUMMARY

This working paper presents the decision to implement a *Ground-Based Augmentation System, GBAS*, in order to find a solution to terminal area navigation using precision procedures.

1. Introduction

1.1 Considering the final results of Project RLA/00/09 and its impact on the implementation of GNSS augmentation systems in the CAR/SAM Regions, it may be concluded that trials conducted to provide a (mathematical) model to infer the delay caused by the ionosphere and the troposphere have confirmed that an SBAS system cannot be used for precision approaches in the Southern Hemisphere, at least at a reasonable cost, and that, based on the decision model for Availability, only *non-precision* approaches can be obtained.

1.2 The RCC/5 of project RLA /03/902 Project (SACCSA) concluded that the SBAS augmentation solution was tentatively viable, considering the results obtained (based on defined and developed models); and that, consequently, a third phase had to be defined in order to give continuity to the work started, so that it could be completed and demonstrations conducted to confirm the technical and financial viability of the SACCSA Project.

1.3 The Directorate General of Aeronautics of Chile signed a Memorandum of Cooperation with the FAA in May 1998, establishing the terms and conditions for FAA collaboration in the development of the Global Navigation Satellite System (GNSS).

1.4 The Directorate General of Aeronautics of Chile signed a Memorandum of Cooperation with the FFA at FIDAE 2008, establishing the terms and conditions for sharing information about policies and procedures for LAAS and ADS-B development.

1.5 Chile joined the GGBAS at the seventh meeting of the GBAS Task Force, held in Rio de Janeiro, Brazil, and participated with the DECEA of Brazil, learning about the steps taken and advances made by Brazil in implementing a system.

1.6 The Directorate General of Aeronautics of Chile signed an agreement recently with the U.S. Trade Development Agency (USTDA), an entity subordinate to the U.S. Department of Commerce, to conduct a study to determine the feasibility of implementing GBAS systems at the A.M.B. airport and other airports of the country.

2. Need for a Ground-Based Augmentation System (GBAS)

2.1 Although the main airport of the country, Comodoro Arturo Merino Benítez, in Santiago, has two parallel runways, it has limitations for accommodating simultaneous approaches, mainly because of the missed approach protection areas in runway 17R. These limitations are a serious obstacle to the growth of aeronautical activity which, judging by the behaviour of demand, will reach a point of saturation by 2018 as to the maximum number of operations it will be capable of handling per hour. The special characteristics of a GBAS system would make it possible to develop procedures for operating both runways simultaneously, thus increasing airport capacity considerably and moving its point of saturation ahead by several decades. It would also make it possible to increase the availability of air operations when poor visibility due to fog restricts the use of the airport.

2.2 In addition to the situation in the main airport of the country, it is felt that GBAS systems could be implemented in a second stage in another 5 airports and 6 aerodromes where conditions are favourable for the use of this type of technology or where traditional radio aid procedures are simply not acceptable.

Advantages of establishing a Ground-Based Augmentation System (GBAS)

- A single GBAS station could support multiple runways.
- Flight inspection and maintenance requirements are far fewer in a GBAS system as compared to ILS.
- The signal is more stable and there is less interference with preceding aircraft and/or vehicles in sensitive areas, thus reducing the scalloping effect.
- GBAS serves as support in the approach, landing, and departure phases and in the surface movements within the coverage area.
- GBAS provides augmented GNSS information and transmits that information to aircraft every second, providing accuracy and the necessary integrity for the precision of the established procedures.
- GBAS is an aid to approach that protects vertical descents in the procedure.
- It allows for the design of curved (TAP) procedures, whether for missed approach, SIDs or STARs.
- It makes it possible to provide ground guidance for taxiing in low visibility conditions.

- The precision measured in test flights reveals very good accuracy in the vertical path, equivalent to ± 2 metres at the landing point and ± 4.5 metres 20 NM of landing.
- It expands airport capability by making simultaneous precision procedures in all runways possible.
- It makes it possible to design, publish and operate CAT I and, in the future, CAT II and III precision approaches for all the runways of an airport and others nearby, up to 23 NM.
- It makes it possible to design SIDs, STARs and missed procedures with the same precision (RNP 0.03) throughout the entire terminal area, up to 23 NM.

3. Implementation programme

2008 / 2009 - The GBAS implementation study will be completed.

2009 / 2010 - A GBAS system will be acquired for installation at the Santiago AMB airport.

2009 / 2012 - Pilot and ATC training will be complemented.

Instrument procedures will be developed.

Test flights will be conducted for subsequent certification of instrument procedures and their publication for the case of the A.M.B. airport.

2012 - The GBAS will be declared operational.

2012 to 2020 - Implementation in the rest of the country.

4. Conclusion

4.1 The Directorate General of Aeronautics of Chile plans to implement a GBAS system in 2012 at the Santiago Comodoro Arturo Merino Benitez airport and to complete this implementation subsequently in other Chilean airports and aerodromes.

4.2 In order to consolidate this objective, it is mandatory to have ionosphere studies and for these to be favourable and reliable so as to be able to use the procedures as the primary means of approach; to this end, the DGAC and the USTDA will carry out the required feasibility studies through a consulting firm.

5. Suggested action

The Meeting is invited to:

5.1 Take note of this working paper

5.2 Analyse GBAS-based precision approaches as a feasible solution.

5.3 Share the experiences CAR/SAM States may have with this type of solution for air navigation in terminal areas.