SESAR Solution Regulatory Overview

Precision approaches using GBAS CAT II/III based on GPS L1

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Abstract

This document contains an overview of the SESAR Solution "Precision approaches using GBAS CAT II/III based on GPS L1" documented recommendations from regulatory, standardisation, oversight and certification perspectives resulting from the cooperation between the SESAR Joint Undertaking and the EASA and National Authorities.

Authoring & Approval

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1 Introduction

The purpose of this document is to provide an overview of the SESAR Solution “Precision approaches using GBAS CAT II/III based on GPS L1” documented recommendations from regulatory, standardisation, oversight and certification perspectives resulting from the cooperation between the SESAR Joint Undertaking and the EASA and National Authorities.

The document presents the recommendations issued by the National Authorities and EASA, for an acceptable deployment of the concepts contained in the SESAR Solution. These recommendations must be taken into consideration by the entities in charge of deployment of the correspondent SESAR Solution.

2 General recommendations

In general terms, it must be underlined that:

1) When deploying a SESAR Solution, the compliance with all applicable regulatory requirements must be ensured by the different concerned entities;

2) In particular, it must be ensured that the appropriate safety argument for the concerned change to the ATM functional system is performed in accordance with EC regulation 1035/2011 (under revision; EASA opinion 03-2014) confirming validity of assumptions of the SESAR solution, addressing local specific risks and mitigation providing evidence that residual risks are acceptable.

3) The present SESAR Solution does not constitute in itself an acceptable Means of Compliance with the previously mentioned regulatory requirements. Means of Compliance are subject to their acceptance by the Authorities involved in each concrete local implementation.

4) A verification of the existing standardisation and regulatory frameworks has to be done before the date of local deployment to identify possible major changes to the ones applicable for the SESAR Solution.

3 Specific recommendations

3.1 On the Regulatory Framework

In general, the GBAS Cat II/III concept is not in contradiction with existing requirements. However, the lack of clear split between the ground and airborne elements in the performance demonstration may challenge the application of the current rules as they are written today.

This is the reason that it has been concluded that dedicated regulatory material might be necessary in order to ensure that this lack of clear split is properly managed.

It is important to highlight that the approval flows between airborne and ground domain are different (EASA for airborne, NSAs for ANSPs and NAAs for aircraft and aerodrome operators). Then, the proposal should ensure the consistency of the overall demonstration process, while maintaining the current approval/certification flows.

Additionally, on this regard, a centralised assessment of the ground technical systems could also contribute to this goal.

1. **EASA Rule-making task (RMT.0680)**

On the Rule-making plan EASA foreseen to start rule-making task (RMT.0680) on Ground Based Argumentation System (GBAS)

The objective of this task is the development of the requirements for the use of GBAS-augmented Global Satellite Navigation Systems (GNSS) in precision approach and landing guidance. The rule making activity will concentrate, initially, on GAST-D.

Augmentation Systems (Satellite-based (SBAS) as well as Ground-based (GBAS) for precision approach) are proposed to increase the accessibility to airports, as an alternative to ILS or where ILS is not a viable or economical solution.

The rule-making task has started in 2015 and will end in 2017. Planned NPA (Notices of proposed amendments) are foreseen in 2016 Q4.

2. **EASA rule-making tasks where GBAS elements will be considered**

<u>EASA RMT.0379 - All weather operations</u>

Objective: Review and update of the All-Weather Operations (AWO) rules as regards:

- Approach classification;
- Use and crediting of vision systems;
- GBAS CATII/III approach operations;
- Pilot training; and

- International harmonisation.

The particular RMT has started in 2015 and will end in 2019.

RMT.0519 (MDM.078) - Maintaining CS-ACNS

Objective: Development and update of aircraft certification specifications in support of ATM operations. The specific purpose of this task is to introduce the necessary requirements for the following:

- global PBN operations;
- Ground-Based Augmentation System (GBAS) CAT II/III landing systems;
- Data link operations to address the ATN B1 and B2 and FANS integration including, D-TAXI, D-ATIS; and
- Mode S and ADS-B out implementation.

The RMT task started in 2013 and will end in 2017.

3.2 On the Standardisation Framework

The introduction of the GBAS Cat II/III technology would require specific regulatory and standardisation activities, some of them already on-going. Despite that it would require a more detailed analysis, the following areas have been identified:

- Development of MOPS for airborne and ground equipment. These standardisation activities are already on-going at RTCA (airborne) and at EUROCAE (ground). The lack of MASPS may lead to some mismatches between both standards, with potential impact on interoperability.

- Development of AMC/GM. The potential areas are driven by the dependency between the airborne and ground regarding the split of responsibilities and demonstration of the performances. In other GBAS concepts (GBAS Cat I), the clear split of responsibilities allows the establishment of a separation between the ground and airborne demonstrations. However, due to the GBAS Cat II/III impacts (introduced dependencies and mixing of responsibilities), such separation implies the potential need of development of AMC/GM in order to ensure that the ground and airborne demonstrations are performed under the same assumptions/conditions. The areas potentially impacted would be at least:

    - Aerodrome aspects: consideration about antenna siting requirements, new operational elements described in SESAR documents (e.g., Landing Clearance Line) and/or relationship with A-SMGCS.

    - Cat III demonstration requirements, specially related to the GBAS noise model.

    - Ground equipment, to ensure a uniform deployment consistent with the GBAS noise model.

- Additionally, the introduction of GBAS for Cat II/III operations would require some adaptations in existing rules:
    - Part-SPA, Subpart LVO, to include GBAS CAT II/III in all aspects (in particular procedures, training, safety assessments including proof that ground and airborne equipment functions well).
    - Air OPS would also require changes to the implementing rules in order to make it more general to describe the performance required for the approach category but without explicit reference to a specific landing system.
    - Aircrew Regulation, to update the Appendices for LVO checking, which are all linked to ILS and would need to be extended.
    - Operational aspects (Part-SPA and SERA) regarding the additional decision points and new phraseology identified by SESAR.
- Regulation maintenance activities:
    - Update of the SES and EASA relevant regulations to align with the updated ICAO Annex 10, once published.
    - Update of the CS-AWO and ETSO specification to consider the corresponding new/updated industrial standards (RTCA DO-253 and EUROCAE ED-114).
- Additionally, despite that the deployment is performed locally, it would be suitable to develop specific regulatory material (AMC/GM) in order to ensure uniform deployment across the European Union, reducing the interoperability and safety risks. This may cover following aspects:
    - Centralised ground equipment approval (similar to the ETSOA process on the airborne side)
    - GM on the installation aspects (e.g., number of Reference Receivers, antenna location and siting considerations).

3.3 On the Regulatory Oversight and Certification Activities

For GBAS applications, above all in CAT II/III, the quantification of the risks is difficult, as GPS signal is a common failure mode. Strong mitigation measures in case of failure or corruption of the basic signal will be requested by Authorities for approval. Due to the local use of GBAS applications, the criteria to accept/reject those mitigation measures may significantly vary from one Authority to another. Harmonization of criteria would facilitate a seamless implementation of the solutions.

An excessive degree of flexibility in the apportionment of the regulatory requirements for GBAS operations between the aircraft and the ground stations could end in customised certification criteria leading to confusing trade-offs and thus to safety issues. Minimum set of requirements for each stakeholder are needed.

The incentive for the implementation of GBAS based solutions in each airport relies very much on the result of the local business case. The decision-makers should evaluate the capacity benefits vs. investment.

The recommendation is to have a significantly distinct phraseology between ILS and GBAS in order to avoid misunderstandings.

The local circumstances should be considered:

- On Safety domain
  - Separation infringements
  - Runway incursions
  - Go-arounds

- Human Performance
  - Workload
  - Situational awareness
  - HMI usability
  - ATCO acceptability of procedures

EASA opinion 03-2014 describe that for any change notified in accordance with ATM/ANS.OR.A.045(a)(1), the air traffic services provider shall:

(1) ensure that a safety assessment is carried out covering the scope of the change, which is:
(i) the equipment, procedural and human elements being changed;
(ii) interfaces and interactions between the elements being changed and the remainder of the functional system;
(iii) interfaces and interactions between the elements being changed and the context in which it is intended to operate;
(iv) the life cycle of the change from definition to operations including transition into service; and
(v) planned degraded modes; and

(2) provide assurance, with sufficient confidence, via a complete, documented and valid argument that the safety criteria identified via the application of ATS.OR.210 are valid, will be satisfied and will remain satisfied.

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