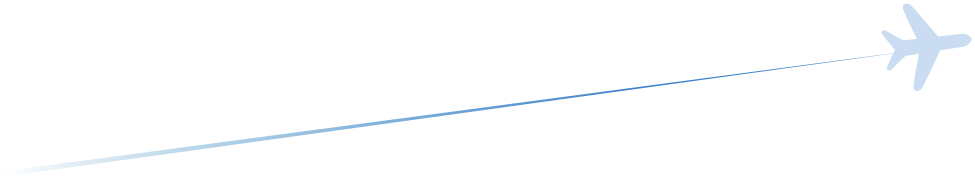

SESAR 2020 VLD - AAL2 Contextual note

Deliverable ID:	**2.1**
Dissemination Level:	**CO**
Project Acronym:	**AAL2**
Grant:	**783112**
Call:	**H2020-SESAR-2016-2]**
Topic:	**SESAR-VLD1-06-2016**
Consortium Coordinator:	**HON**
Edition date:	**8th Oct 2020**
Edition:	**00.00.01**
Template Edition:	**02.00.01**

Founding Members

EUROPEAN UNION EUROCONTROL

SESAR JOINT UNDERTAKING

Authoring & Approval

Authors of the document

Name/Beneficiary	Position/Title	Date
Martin Walczysko	WP leader	14th Sept 2020
Pavel Ptacek	Project contributor	14th Sept 2020

Reviewers internal to the project

Name/Beneficiary	Position/Title	Date
Jiri Ilcik	Consortium Coordinator	25th Sept 2020

Approved for submission to the SJU By - Representatives of beneficiaries involved in the project

Name/Beneficiary	Position/Title	Date

Rejected By - Representatives of beneficiaries involved in the project

Name/Beneficiary	Position/Title	Date

Document History

Edition	Date	Status	Author	Justification
00.00.01	14th Sept	Final version	HON	No additional comments

Copyright Statement

AAL2

AUGMENTED APPROACHES TO LAND 2

This [insert type of result] is part of a project that has received funding from the SESAR Joint Undertaking under grant agreement No 783112 under European Union's Horizon 2020 research and innovation programme.

Abstract

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1 Purpose

This contextual note introduces a SESAR Solution focusing on GLS CAT II operations using GBAS GAST-C.

2 Improvements in Air Traffic Management (ATM)

Flying GLS CAT II on GAST C equipment improves resilience in low visibility conditions. In current ILS operations there is a need to protect the ILS critical and sensitive areas which result in restricted ground movements and extra spacing margins between aircraft in order to accommodate the longer runway engage time. This allows reducing the runway occupancy times in low visibility conditions resulting in reduced spacing between arrival aircraft. The amount of runway throughput gained depends on wake turbulence separation and any other additional spacing needs.

While with regular ILS operations one ground station per runway is needed, one GBAS ground station can be used for multiple runways operations

The solution is based on the existing single frequency GPS L1 (1575.42 MHz), GBAS GAST-C and SBAS messages. The aircraft needs to be equipped for GAST-C but does not need to be equipped for SBAS. SBAS messages are used by the ground in order to monitor the integrity of the GAST-C service.

Solution 55, “Precision approaches using GBAS CAT II/III”, addressed CAT II/III operation based on GAST-D. This solution addresses CAT II operations, including CAT II Autoland, based on GAST-C ground and airborne equipment.

Unlike for GAST-D, in the standard GAST-C the integrity requirements associated with detection of anomalous ionospheric conditions that could induce an erroneous GBAS position outside the Protection Levels (therefore undetected by the system) are not monitored on board; instead, with the enhanced GAST-C ground station, they are monitored on the ground, and when the GBAS position is properly bounded CAT II operations can be performed; this is referred to as GAST-C Service Level B. When the integrity levels are not fulfilled (e.g. severe anomalous ionospheric conditions), protection levels are inflated, and only CAT I operations are supported; this is referred to as GAST-C Service Level A.

From the ATC perspective, the CAT II operations based on GAST-C Service Level B are the same as CAT II operations based on GAST-D, except that an approach category indication (GLS CAT I/II) is needed. Application of aircraft separation/latest point of landing clearance will be the same to what was delivered by Solution #55, and like for GAST-D, ATC clearance for GAST-C GLS LVC doesn’t contain approach category. Like for GAST-D availability, GAST-C GBAS availability levels will be broadcast in the ATIS, and the ATIS has not yet been updated after a Service Level change, controllers will pass the information directly to pilots over R/T. For GAST-C, ATC is the only source for the pilots to get information of Service Level degradation, while for GAST-D, there is also an on-board monitoring function, which is geared to monitoring integrity to CAT III requirements (but is used also for CAT II).

From the flight crew perspective, CAT II operations based on GAST-C are the same as CAT II operations based on GAST-D; with GAST-C there is no possibility for on-board service level degradation alert like it can happen in GAST-D, so in GAST-C information on service level degradation will always come from ATC. GAST-C service level degradation is triggered sufficiently in advance so as to not impact the safety of an approach that is currently in progress, i.e. when the service level is degraded from B (CAT II) to A (CAT I), an already initiated approach can continue as CAT II, but all newly initiated approaches must be CAT I.

Compliance matrix to Solution 55 OSED REQ is provided in AAL2 DEMR.

The AAL2 demonstration included a particular case of RNP to GLS procedures with RF turn to the IF, but GBAS CAT II based on GAST-C can support all the RNP to GLS procedures described in solution 9, “Enhanced terminal operations with automatic RNP transition to ILS/GLS”, including the RF turn to final approach, because all the solution 9 RNP to GLS procedures require only the less restrictive GAST-C Service Level A.

The GLS CAT II operation using GBAS GAST-C described in AAL2 DEMR should enable:
- Automatic Approach and Landing down to Cat II for Mainline Aircraft
- Automatic Approach and Landing down to Cat II minima for Business and Regional Aircraft
- DH ≥ 100 & 300 m < RVR < 550m
- GBAS GAST C/CAT I equipment is sufficient.

3 Operational Improvement Steps (OIs) & Enablers

New OI step to be created to reflect GLS CAT II operation using GBAS GAST-C airborne and ground equipment.

Operational improvement should provide Improved Low Visibility operation using GBAS GAST-C on GPS L1. It should increase runway capacity in poor weather conditions as the glide path and azimuth signals will face hardly any interference from previous landing aircraft or other obstacles.

MOPS for GBAS receiver **(BTNAV-0307) of A/C 56a enabler** and **CTE-N07** – in navigation system aspects limited to GBAS GAST-C (GPS L1) ground station with functionality described in AAL2 DEMR, and necessary standards and specification (e.g. **BTNAV-0306** - MOPS for GBAS Cat I Ground Sub-System (ED-114A), **STD-024** - DO-253D MOPS on GBAS Receiver) for GLS CAT II are needed.

Technology enhancements on GBAS ground station and airborne validation allows to improve low visibility operation using GBAS GAST-C on GPS L1 down to GLS CAT II minimum with GBAS GAST-C. Therefore, the solution is similar to some extent to SESAR Solution #55, but it targets GLS CAT II not CAT III approach and doesn't require airborne and ground GBAS GAST-D. The main benefit is similar for operations down to GLS CAT II, i.e. the increased runway capacity in poor weather conditions as the glide path and azimuth signals will face hardly any interference from previous landing aircraft or other obstacles. More sustained accuracy in aircraft guidance on final approach.

4 Background and validation process

During planning and execution, the AAL2 WP2 worked on the demonstration of GBAS technology operational making the use of SESAR Operational Solution #55 covering GBAS CAT II/III. As the scope of the demonstration was not exactly matching this solution and built on new enhanced capabilities not available in current Solution definition including work done before and outside SESAR project and achievements of the AAL2 project as well, the new solution was proposed.

As the AAL2 project was by its scope and work performed a demonstration project focusing on VLD objectives. Project delivered safety assessment for GBAS Ground Station service enhancement with EGNOS, airborne and airline safety assessment, modified CONOPS for GLS CAT II for the airport under AAL2 demonstration, pilot feasibility and flight accuracy demonstration, and view on cost efficiency aspects.

5 Results and performance achievements

Refer to dedicated sections of the SESAR AAL2 DEMR.

6 Recommendations and Additional activities

Refer to dedicated sections of the SESAR AAL2 DEMR.

7 Actors impacted by the SESAR Solution

Aerodrome operators, Air operators, ANSP including ATC. Refer to dedicated sections of the SESAR AAL2 DEMR.

8 Impact on Aircraft System

GAST C airborne equipment is needed. Refer to dedicated sections of the SESAR AAL2 DEMR.

9 Regulatory Framework Considerations

Refer to dedicated sections of the SESAR AAL2 DEMR.

10 Standardization Framework Considerations

Refer to dedicated sections of the SESAR AAL2 DEMR.

11 Solution Data pack

No data pack as the definition is not part of SESAR program.