

Contextual note – SESAR Solution description form for deployment planning

Purpose:

This contextual note introduces a SESAR Solution (for which maturity has been assessed as sufficient to support a decision for industrialization) with a summary of the results stemming from R&D activities contributing to deliver it. It provides to any interested reader (external and internal to the SESAR programme) an introduction to the SESAR Solution in terms of scope, main operational and performance benefits, relevant system impacts as well as additional activities to be conducted during the industrialization phase or as part of deployment. This contextual note complements the technical data pack comprising the SESAR deliverables required for further industrialization/deployment.

Improvements in Air Traffic Management (ATM)

Trajectory management is a key cornerstone of the ATM system. The better the trajectory prediction is, the better the whole ATM system will be. Nowadays there are multiple trajectory predictions held and maintained by air and ground actors. They take into account different parameters (e.g. aircraft model, route/restrictions, operating preferences & weather forecast) leading to inconsistencies and different accuracy levels depending on flight phases. These inconsistencies lead to an inefficient ATM system as a whole.

“Extended projected profile (EPP) availability on ground” technological solution is a first step towards a full ground-air trajectory synchronization required for the implementation of the targeted Trajectory based operations. It allows the provision to the ground systems of the aircraft view on the planned route and applicable restrictions known to the airborne system, together with the corresponding optimal planned trajectory computed on-board and speed preferences. This information is automatically downlinked from the airborne Flight Management System via ADS-C data link to the ground ATC unit which has subscribed to the needed service contract (e.g. Extended Projected Profile & Speed Schedule Profile contracts) and made available to the controllers.

The solution¹ also introduces initial ground system automation tools based on the comparison between the ground and the air planned routes, and showing 2D discrepancy indicators to the controllers, so that the differences are highlighted and can be corrected.

Operational Improvement Steps (OIs) & Enablers

This technological solution covers the following enablers (Applicable Integrated Roadmap Dataset is DS16):

¹ It enables other SESAR solution focusing on the synchronisation of the airborne and ground trajectory such as SESAR Solution #6 - Controlled Time of Arrival (CTA) in Medium density / medium complexity environment

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Extended projected profile (EPP) availability on ground

- A/C 37a: Downlink of trajectory data according to contract terms
- ER APP ATC 119: Enhance Air/Ground Data Communication for Step 1
- ER APP ATC 149a²: Air-Ground Datalink Exchange to Support i4D - Extended Projected Profile (EPP)

Background and validation process

The “Extended projected profile (EPP) availability on ground” solution has been technically validated through a set of exercises encompassing:

- Real Time Simulations performed in Arlanda and Maastricht environment where the access to the display capability of EPP information was introduced in the ATCO HMI; and
- Flight Trials performed in Maastricht airspace during which controllers could access and monitor the consistency of the ground computed trajectory with the one received from the aircraft.

Additionally, the Large Scale Demonstration project PEGASE (Providing Effective Ground & Air data Sharing via EPP) confirmed the maturity of the Datalink technology, establishing ADS-C contracts with more than 50 production A320 aircrafts equipped with test prototypes developed by HONEYWELL and THALES which flew between Hamburg to Toulouse in 2015 and 2016. This enabled the analysis of the downlinked information by several ground partners.

The performed validation activities allowed the increase in maturity of all technical enablers covered by the solution up TRL6.

Results and performance achievements

This solution technically validated the following:

- Adaptation to ATN B2 initial standard
- ADS-C contracts establishment
- Automated downlinking of ADS-C reports following the ADS-C contract
- Initial presentation of the downlinked trajectory on the CHMI
- Computation and presentation of 2D discrepancy indicators

This solution is a technological solution.

² A change request is required to correct the link to appropriate Functional Block (i.e. CHMI and TP&M, in addition to existing AGDS).

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Release 5 SESAR Solution ID #115
Extended projected profile (EPP) availability on ground

For SESAR technological solutions a full safety and performance assessment has not been performed, but the reviewing panel considered that the validation activities performed in SESAR give sufficient confidence that it can safely be implemented in operations and will deliver benefits.

In particular, the reviewing panel considers that this solution has a positive impact on the human performance domain, delivering safety improvements by increasing ATCO situational awareness.

An additional performance benefit could be expected in ATCO productivity on sectors where there is frequent event of discrepancy between air and ground trajectory.

Recommendations and Additional activities

This SESAR technological solution has reached TRL6 maturity level. It has been demonstrated that implementation of the required Enhanced Datalink Services (e.g. ATN B2) to support Air-Ground exchanges are feasible but further validation activities are needed to secure convergence between latest version of the standard and the prototypes implementations.

The solution is considered as a first step and a key technological building block on which several operational improvements are expected and yet to be matured:

- Enhancement of controller support tools (Conflict Detection and Resolution, Situation awareness Tools ...)
- Enhancement of ETFMS Flight Data with EPP data

Local safety and performance assessment (e.g. security and human performance) have to be performed during the industrialisation of the deployment phase.

Actors impacted by the SESAR Solution

Airspace Users and Air Traffic Controllers.

Impact on Aircraft System

In order to provide EPP on ground, the aircraft must be upgraded with avionics systems implementing EPP functionalities. The avionics systems impacted by the EPP functionality are:

- Flight Management System (FMS),
- Airborne Air Traffic Service Unit (ATSU).

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Impact on Ground Systems

Ground systems have to be updated to implement the Enhanced Datalink Services ATN B2 standard to support Air-Ground exchanges in order to receive EPP data.

Ground systems have to be updated to allow the display of EPP data and potential discrepancy in CHMI.

Regulatory Framework Considerations

Refer to Regulatory Overview for this Solution

Standardization Framework Considerations

The standardisation documents to be applied by the airborne part for EPP functionality are:

- ED-228A Safety and Performance Requirements Standard for Baseline 2 ATS Data Communications – Revision A,
- ED-229A Interoperability Requirements Standard for Baseline 2 ATS Data Communications – Revision A.

Considerations of Regulatory Oversight and Certification Activities

NONE

Solution Data pack

The Data pack for this Solution includes the following documents:

- Functional Requirements Document³:

³ Please note that these specifications were compliant with the definition of prototypes used in SESAR 1 and, as a consequence, compliant with intermediate version H of standardisation documents (now called ED-228/ED-229). However, a synthesis of the major differences between this version H and the official release has been provided in D58 document.

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- 09.01-D57 Aircraft & System Performance and Functional requirements
- Interface Requirements Specifications:
 - 09.01-D58 Interface requirements between the aircraft and the ATC systems
- Technical Specifications:
 - 10.02.01-D88 Updated Step 1ATC TM System Requirements - Cycle 3
- Technical Specifications:
 - 10.07.01-D76 D10.7.1 - AGDL System Requirements - Final TS

Intellectual Property Rights (foreground)

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