

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.

Enhanced Tactical Conflict Detection & Resolution (CD&R) services and conformance monitoring tools for En-Route

The SESAR Solution “Enhanced tactical conflict detection & resolution (CD&R) services and conformance monitoring tools for en-route” consists of innovative approaches to provide enhanced CD&R services to the En-Route Controllers. The SESAR solution consists of two separation provision services:

- An enhanced Monitoring Conformance Service (MONA) for both tactical and planning controllers with:
 - A new alert to take into account lateral deviation
 - The addition of the rate change monitoring in climbing and descending phase to minimize false alerts

The innovation and enhancements consists in the new alerts and monitoring that the service offers to the En-Route controllers, compared to the existing MONAs.

- A CD/R Service fully dedicated and designed for the tactical controller (Tactical Controller Tool or in short TCT) with :
 - A conflict detection service down to Flight Level 100, based on effective clearances
 - A specific ergonomics and use developed for the Tactical Controller, but also available and usable for the Planning Controller

The existing TCTs (FASTI baseline) are basically an adaptation of an MTCD for the Tactical Controller. Therefore they do not match fully with the Tactical Controller’s needs. The existing MONAs (FASTI baseline) do not cover all adherence deviations and present false alarms. All these issues minimize the benefits of the services and the confidence of the En-Route controllers toward those services.



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The development of a dedicated TCT and the enhancement of the MONA functionalities proposed within the solution aim at increasing the confidence of the En-Route Controllers and providing a much more efficient service.

Operational Improvement Steps (OIs) & Enablers

Below is the list of OIs addressed in the scope of the SESAR solution #27.

- CM-0205: Advanced Conflict Detection and Resolution in En Route. (fully covered by solution #27)
 - ER_ATC_157: ATC System Support for Medium-Term Conflict Detection and Resolution in En-route Airspace
 - PRO-046b: ATC Procedures for Using Advanced System Assistance to Medium Term Conflict Detection and Resolution
- CM-0207-A: Advanced Automated Ground Based Flight Conformance Monitoring in En Route (fully covered by solution #27)
 - ER_ATC_91: ATC System Support for Advanced Conformance Monitoring in En-route Airspace

Applicable Integrated Roadmap Dataset is DS15.

A set of CRs is in preparation to update the ATM Master plan in way that CM-0205 (DS 15) is split in order to keep only TCT aspects. This implies as well the creation of two specific enablers for TCT aspects. These changes should be implemented as part of DS17.

Pre-Requisites for SESAR solution #27 are:

- Predecessor OIs & enablers:
 - CM-0203 : Automated Flight Conformance Monitoring
 - CTE-S01a
 - CTE-S03
 - CTE-S03a
 - CTE-S04
 - CTE-S04a
 - CTE-S04b
 - ER_APP_ATC_130
 - CM-0202 : Automated Assistance to ATC Planning for Preventing Conflicts in En Route Airspace
 - ER_APP_ATC_129

Background and validation process



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The SESAR Solution #27 has been validated through a series of exercises including seven Real Time Simulations to achieve V2 and three Real Time Simulations to achieve V3, focusing on various environments (UIR, FIR) and the several services: CD/R TC service (TCT), conformance monitoring (MONA). A high level summary of each validation is presented hereafter:

- Real Time Simulations to achieve V2:
 1. Assessment of the acceptability of CD/R aid services for both TC and PC on a simulated UIR environment (one large sector, no inter-sector coordination) with 12 ATCOs participating. Assessment of the operability of the CD/R service for the TC (TCT), with and without the conformance monitoring service (MONA) in an environment with many evolutive flights (FIR/TMA interface), in medium to high traffic. 4 sectors were played during 3 days with
 2. Assessment of the CD/R aid services to both PC and TC with MONA in a FIR/UIR interface environment with some proportion of evolutive flights. 2 control positions were played with 4ATCOs. 2 scenarios were tested : TC aid (TCT) with MONA and TC and PC aid together (TCT & MTCD)
 3. Validation of enhanced CD/R aid service to PC & TC (MTCD & TCT) in a fixed route environment in a generic sector, from medium to high traffic. MTCD tested in this exercise used a mixed agenda : conflicts detected were automatically displayed on the agenda, on which the ATCO is able to add elements, create new one or suppressed some.
 4. Validation of CD/R Aid service to TC (TCT), notably what-else probing function and Flight Path Monitoring, in an environment with many evolutive flights (FIR/TMA interface). This activity was the first step of a more advanced activity (n°8)
 5. Gather Initial Feedback on the operational and technical acceptability of the PC aid service (Interim Risk Module with 2 types of risks and what-if probe level associated) to replace standard MTCD by using level bands instead of the planned vertical profile, in the UK South-West UIR/FIR environment (including interface with London TMA). 2ATCOs participated to the RTS during 3 days. This activity was the first step of a more advanced activity (n°9)

- Real Time Simulations to achieve V3:
 8. Assessment of the operability of the CD/R aid service for the TC (TCT) and associated MONA in an environment with a high percentage of vertical movements (FIR/TMA interface – Bremen sectors including several TMA interface with Hamburg, Bremen and Hannover). Validation was performed on an industrial platform using iTEC system.
 9. Validation of the MONA Service in a free route environment in low to medium traffic, on an industrial platform using Coflight system.



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Results and performance achievements

The overall validation exercises have demonstrated the following (to be completed in Final Version):

- The new CD/R service dedicated to the TC (TCT) has been proven efficient in lower airspace with a high percentage of vertical flights.
- The enhanced conformance monitoring service (MONA) has been proven useful and adapted to lower airspace with many evolutive flights and even deemed strongly needed in a Free Routing Environment, where it is hard to spot if a turn is due to a user preferred planned route or to an unexpected manoeuvre

The overall validation exercises have yielded the following benefits:

- For all the TCT validation results obtained, the overall conclusion is that in most areas the impacts expected in the BIMs, i.e. a reduction, increase or no change, is supported by the validation results (Capacity and Safety increase, no impact on Flight Efficiency).
- The new TCT service is compatible with the ATM systems and support controllers to provide a better service to airspace users while maintaining safety.
- The new TCT service contributes to increase controllers’ productivity and reduce workload.
- None of the results regarding TCT were in the opposite direction to that expected in the BIMs.
- MONA Service is very useful especially with the new monitoring features (rate and heading), in fixed route environment, and even more in Free Route environment.

Recommendations and Additional activities

The following recommendations are to be considered while moving to the industrialization phase:

- Develop coordination activities within CD/R services, especially through IOP, to improve the way the tools are operating.
- Improve the trajectory prediction, which is the most impacting element regarding CD/R services operability and efficiency. This could include the improvement of the accuracy of the prediction and the anticipation of the conflicts earlier through other services and ATFCM roles to reduce tactical clearances and ensure a better adherence to planned trajectory. In addition, improvements of the trajectory prediction should be investigated by the use of downlinked aircraft data, e.g. use of ADS-C EPP data.



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- Evaluate further CD/R service’s needs, benefits and operability in all types of environment, with for example a higher complexity of traffic.
- Investigate enhanced MTCD solutions, which haven’t been successfully addressed in V3 in this SESAR Solution

Actors impacted by the SESAR Solution

En-Route Controllers – both planner and tactical – are directly impacted by the SESAR Solution #27.

Impact on Aircraft System

There is no identified impact on Aircraft System within the SESAR Solution #27.

Impact on Ground Systems

The SESAR Solution #27 is assumed to be applicable with a ground system consistent with a FASTI baseline environment.

Regulatory Framework Considerations

There is no specific topic in the field of the regulatory framework to be considered within the SESAR Solution #27, beyond the applicable regulations currently existing.

Standardization Framework Considerations

There is no specific topic in the field of the standardization framework to be considered within the SESAR Solution #27, beyond the applicable standards currently existing.

Considerations of Regulatory Oversight and Certification Activities

There is no specific topic in the field of the regulatory oversight and certification activities to be considered within the SESAR Solution #27, beyond the applicable regulatory oversight and certification activities currently existing.



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Solution Data pack

The Data pack for this Solution includes the following documents:

- SPR - 04.07.02-D23 Edition 00.04.00 (25.10.2016). The document contains the safety and performance requirements for TCT. It includes notably the security and human performances assessment reports;
- SAR - 04.07.02-D61 Edition 00.03.00 (25.10.2016). The document contains the safety assessment report linked with TCT;
- OSED - 04.07.02-D28 Edition 00.01.01 (25.10.2016). The document provides contextual information and operational requirements for solution #27;
- TS: 10.04.01-D78 00.02.00 (14.10.2016). This document refines the functional analysis of the TCT operational concept
- TS: 10.04.02-D44 00.04.00 (10/11/2016). This document refines the functional analysis of the “MONA” operational concept.
- TS: 10.02.01-D88 00.02.00 (29.09.2016) This document contains the Step 1 ATC technical requirements for Trajectory Management

Intellectual Property Rights (foreground)

The foreground is owned by the SJU.

