

Release 5 SESAR Solution #32

Free Route through the use of Direct Routing for flights both in cruise and vertically evolving for cross ACC/FIR borders and in high complexity

Contextual note – SESAR Solution description form for deployment planning

Purpose:

This contextual note introduces SESAR Solution #32 (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)

The SESAR Solution #32 relates to **“Free Route through the use of Direct Routing for flights both in cruise and vertically evolving for cross ACC/FIR borders and in high complexity environments”**.

This SESAR Solution is an extension of the baseline concept of published En-Route DCTs (Directs) for seamless operations in En-Route Direct Routing environment or Airspace defined at a large geographical scale. Direct routing options form an extension of the current ATS route network and offer routing options in addition to those provided by means of ATS routes.

Direct routing options extending the ATS route network might be constituted by some large geographical scale Direct Routings structured along major traffic flows with connectivity ensured along the segments (so-called Long Range Direct Routings) and/or by many shorter Direct Routings that can be freely combined by AUs to optimise their planned trajectories. Long Range Direct Routings means that there is a FAB-wide cross-border dimension in most of them. Intermediate waypoints are allowed and can be used for instance to join/leave Long Range Direct Routings or to design Direct Routings avoiding ARES.

This SESAR Solution focuses on the operational needs for Airspace Users and ATS units to support safe and efficient Direct Routing operations for cross ACC/FIR borders in high complexity environments; it has to be considered with the full operation of A-FUA (SESAR Solution#31). It documents for:

- Airspace Users: Adapted operational procedures to plan and conduct Direct Routing operations across ACC/FIR borders and in high complexity environments.
- Air Traffic Controllers: Adapted operational procedures and support tools to provide safe and efficient Air Traffic Services across ACC/FIR borders and in high complexity environments.

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Operational Improvement Steps (OIs) & Enablers

Note: Reference Data Set is DS16¹

This SESAR Solution scope is supported by the following Master Plan:

- Operational Improvement Step in En-Route high complexity environments (traffic complexity scope higher than 6).
 - *AOM-0500: Direct Routing for flights both in cruise and vertically evolving for cross ACC/FIR borders and in high complexity environments*
- Enabler
 - *ER APP ATC 75²: Enhance FDP for Direct Route and Free Route Operations*

The SESAR Solution covers the scope of this OI Step.

Background and validation process

The SESAR Solution #32 has been validated through a series of V2 and V3 validation. In addition, demonstration activities have also been conducted through SESAR Demo projects and Large Scale Demonstrations.

The following validation activities contributed to the maturity of this SESAR Solution:

- User Preferred Routing inside Maastricht Airspace: this Real Time Simulation aimed at validating the feasibility of the UPR concept using DCT routes between entry and exit points. Low traffic conditions were primarily investigated with a mixture of night / near-night/ weekend and H24 traffic samples. It also looked into the use of the DCT routes in a cross border environment and crossing active AMC-manageable airspace.
- Integrated validations took place at V2 and V3 level in order to focus on ATC tools, and Ground-Ground Interoperability (G-G IOP) in a Direct Routing environment.
- Some Demonstration projects and Large Scale Demonstrations aimed at demonstrating various implementations of published direct segments (e.g. long range, cross border, high density). FRAMAK, WE-FREE and FREE Solutions are 3 demonstration projects that addressed this SESAR Solution and confirmed its maturity at early V4.

¹ CRs have been identified to adapt the definition of OI steps and enablers to the scope of SESAR Solution #32 (they will be implemented in DS17).

² As a predecessor, ER APP ATC 129 (Upgrade FDP and provide Controller Tools to provide assistance to ATC Planning for Preventing Conflicts in En Route Airspace) has to be considered implemented as part of the baseline.

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Results and performance achievements

The results from the various exercises have demonstrated that Direct Routing operations at large geographical scale in high complexity environment:

- Allow more flexible Flight Planning thanks to more flight planning options offered to Airspace Users, which should positively affect predictability of flights.
- Improve operational Efficiency for Airspace Users in term of fuel burn, distance flown, and flight time. Quantitative results depend directly on the direct routing network design.
- Improve environment sustainability (reduced fuel burnt and emissions).

Provided that the Direct Routings are designed so as to induce manageable level of complexity (e.g. limited number of Direct Routings inducing conflicts at sector/ATSU boundaries or creating potential conflict geometries difficult to manage), the validation results also demonstrated that:

- Safety levels and airspace capacity are not degraded
- ATCOs' workload remains acceptable and no significant changes in current working methods are required.

Recommendations and Additional activities

In the scope of the Free Route OFA activities:

- No additional Cost estimation and CBA have been undertaken beyond the ones supporting the PCP IR 716/2014.
It is likely that there will be some costs for ANSP related to FDPS update to support Direct Routing operations, together with costs related to Airspace redesign and ATCOs training which costs will have to be evaluated before implementation considering local environment specificities.
- No Security assessment has been performed. It is recommended to perform security assessment of the operational use of ATC support tools in Direct Routing environment prior to the deployment phase considering local environment characteristics.

Besides, it is highly recommended prior to operational deployment to pay attention to the design of Direct Routings in order not to adversely affect the controller workload or induce hazardous situations.

Note that Direct Routing implementation includes a number of design options that can result in different variants that should be compared with fixed route reference scenarios and between each other. This in order to determine the best possible scenario allowing safe and efficient operations.

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It is also recommended to complete the validation of the two operational requirements still "in progress" (related to DRA Airspace status management by AUs³) during the pre-operational phase in the local environment where a DRA is expected to be published.

SESAR Solution #32 is an extension of the baseline concept of published En-Route DCTs. No specific transition phase is required in addition to the standard training of ATCOs set in place for any change in Airspace design.

Actors impacted by the SESAR Solution

Airspace Users and En-Route Air Traffic Controllers – both planner and tactical – are directly impacted by the SESAR Solution #32.

Impact on Aircraft System

No Aircraft Systems capabilities are impacted by this SESAR Solution.

Impact on Ground Systems

Flight Data Processing system on the ground shall be able to process all necessary information associated to Direct Route (e.g. include all points of interest for the ATCO, also some points of neighbouring area). To ease cross-border operations ground systems shall allow for coordination based on dynamic, LAT-LON-determined Coordination Points (instead of published ACT COPs).

Regulatory Framework Considerations

This SESAR Solution is contributing to the Pilot Common Project (PCP) Implementing Rule PCP (IR 716/2014) through the 3rd ATM Functionality/ Sub-functionality: AF#3-2 related to Free Route.

Standardization Framework Considerations

There is no specific topic in the field of the standardization framework to be considered within the SESAR Solution #32, 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 #32, beyond the applicable regulatory oversight and certification activities currently existing.

³ see REQ-04.07.02-SPR-DRFP.0101 and REQ-04.07.02-SPR-DRFP.0108 in SPR (D63)



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Solution Data pack

The Data pack for this SESAR Solution includes the following document:

- P04.07.02-D63 (Free Route Step 1 SPR);
- P10.02.01-D88 (ATC Trajectory Management Requirements).

Intellectual Property Rights (foreground)

The foreground of this SESAR Solution and documents in the Solution Data pack is owned by the SJU.

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