

SESAR Solution

PRNAV in a Complex TMA

Contextual note

Purpose:

This contextual note is a vehicle to summarize the results stemming from Release delivery activities. It provides a summary of the SESAR Solution in terms of results of the Validation exercises and achievements as well as additional activities to be conducted before or as part of deployment.

This contextual note is part of a package prepared for each SESAR Solution for which exercise results are conclusive and sufficient to support a decision for industrialisation. It complements a technical data pack comprising available deliverables required for further industrialization.

In addition, adequate consideration of the recommendations on the regulatory and standardisation frameworks and the regulatory and certification activities is required. These recommendations are detailed in the 'SESAR Solution Regulatory Overview – P-RNAV in Complex TMA' included in the technical data pack.

Improvement in ATM Operations

Precision Area Navigation (P-RNAV) technology is a mechanism that will help reduce today's radar vectoring activities by air traffic controllers. Enhanced precision allows improved predictability and hence safe capacity optimization.

This SESAR Solution permits to:

- Improve the design and organisation of the Terminal Manoeuvring Area (TMA);
- Enhance the terminal airspace through the use of P-RNAV technologies (curved and segmented P-RNAV approaches);
- Manage and mitigate aircraft noise at and around airports.

Operational Improvements – OI Steps and OI coverage

- **AOM-0404** - Optimised Route Network using Advanced RNP - Partially
- AOM-0601 - Terminal Airspace Organisation Adapted through Use of Best Practice - Partially
- **AOM-0603** - Enhanced Terminal Airspace for RNP-based Operations with vertical guidance - Partially
- AOM-0602-C - Enhanced terminal operations with automatic RNP transition to XLS/LPV - Partially

Background and validation process

The **purpose** of this exercise consisted in assessing improved procedures and guidelines for implementing P-RNAV in complex TMAs.

The SESAR Solution has been validated through EXE-05.07.04-VP-142 on P-RNAV in Complex TMA.

The validation activities were conducted through Real Time Simulations of P-RNAV implementation in Madrid Terminal Area (TMA). The exercise demonstrated the operational feasibility of P-RNAV, of Continuous Descent Approaches (CDA) and Continuous Climb Departures (CCD) in high traffic density scenarios.

Results and performance achievements

The validation exercise demonstrated that the implementation of this concept leads to:

- A reduction of delays due to airborne holding, resulting in better **predictability**, fuel savings and lower environmental impact, thanks to upgraded procedures;
- A substantial increase in **capacity**; for the LEMDREN sector above Madrid, which is representative of many high traffic density TMA situations encountered elsewhere in Europe, the technology led to a doubling of aircraft movements: the calculated capacity was increased from 48 aircraft movements to 50 + 47 movements, as the concept enabled the independent operation of two parallel runways;
- An increase of the maximum capacity of P-RNAV Arrivals, Transitions, Standard Instrument Departures (SID) & Standard Terminal Arrival Routes (STAR) by integration of P-RNAV & conventional routes in high traffic density TMAs, compared with the usual mode of operations in the majority of TMA sectors;
- **Environmental benefits** through reductions in Fuel burn and Emissions, through limited airborne holding periods and associated delays as well as the demonstrated feasibility of smooth, low fuel consumption CDAs and CCDs thanks to P-RNAV; and
- A reconfiguration of air traffic controller teams, allowed by the upgraded P-RNAV procedures and guidelines, which effectively decreased the controllers' work load by between 47% and 57% despite the substantial capacity increases.

Additional activities

Mixed equipage issue to be further assessed.

Actors involved

Actors involved in operations of the SESAR Solution are:

- Air Traffic Controller
- Planning Controller

- En-Route Planning Controller
- TMA Planning Controller
- Executive Controller
 - En-Route Executive Controller
 - TMA Executive Controller
- ATS Supervisor
- Sequence Manager (Approach Coordinator)
- Traffic Complexity Manager
- Flight Crew, Pilot

Impact on A/C system

Airspace Users will need to update Standard Operating Procedures.

Aircraft operators will need to update Minimum Equipment Lists.

Although most aircraft are P-RNAV compliant, non-compliant aircraft would need to be updated to enable them to operate in the new environment.

Some FMS may have insufficient memory for the increased number of waypoints.

Impact on ground systems

The Controller mode of operation is expected to change. These procedures have been designed with the goal of replacing open loop vectors in Approach for Arrivals (source: OSED).

Trajectories will need to be displayed on the controller's screen.

Conflict detection systems and safety nets will need to be modified and/or re-configured.

Consideration of Regulatory Framework

There is no specific topic in the field of the regulatory framework to be considered in deployment, beyond the applicable regulations currently existing.

Consideration of Standardisation Framework

Current existing standardisation frameworks, both at European and ICAO levels, are compatible with the implementation of this SESAR Solution.

Consideration of Regulatory Oversight and Certification Activities

Due consideration should be given to local adaptations of air navigation charts and ATCO and flight crew training procedures.

At present there are no European regulatory obligations to obtain formal approval prior to executing a visual approach and/or a contact approach. Specific requirements may be derived from the national rules of individual Member States, which should be taken into account.



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