

SESAR Solution

Time Based Separation

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 – Time based Separation' included in the technical data pack.

Improvement in ATM Operations

The Time-Based Separation (TBS) for Arrivals concept was developed as a solution to permanently provide arrival capacity resilience to headwind conditions on final approach. With Distance-Based Separation (DBS) procedures based on wake-turbulence categories and radar spacing, the achieved arrival capacity is impacted as stronger headwind conditions on final approach increase the time taken to fly the distance-based separations. This leads to landing rate losses.

Changing the separation rules on final approaches from Distance Based Separation to Time Based Separation implies that the final Approach and Tower Controllers are able to deliver time based separation constraints to the aircraft. This is achieved with the support of dedicated tools, providing "separation indicators" displayed on the extended runway centre-line of the Approach Radar and Tower Runway displays. The controller separation/spacing procedures need also to be changed, to take into account the use of these separation indicators in supporting the arrival delivery on final approach.

Operational Improvements – OI Steps

AO-0303 Time Based Separation for Final Approach - full concept

OI definition : The application of time-based wake turbulence radar separation rules on final approach (TBS) provides consistent time spacing between arriving aircraft in order to maintain runway approach capacity independently of any headwind component. The final approach controller and the Tower runway controller are to be provided with the necessary TBS tool support to enable consistent and accurate delivery to the TBS rules on final approach. The minimum radar separation and runway related spacing constraints will be required to be respected when applying the TBS rules.

Background and validation process

Two exercises validated the TBS SESAR solution: EXE-06.08.01-VP-302 conducted in February/March 2012 and EXE-06.01.08-VP-303 which took place in July 2012. The exercises validated the TBS tool and procedures for London Heathrow, including training in the concept and tool, using a real-time ATC simulator.

The purpose of the exercises consisted in assessing the delivery of TBS minima to aircraft by approach controllers in all wind conditions using the TBS tool support in terms of safety, human performance, arrival runway capacity, predictability of operations and environmental performance of aircraft in the hold and on final approach.

Results and performance achievements

The main findings from the activity showed that the TBS concept is viable as simulated for the Heathrow Approach and could deliver significant benefits in terms of higher aircraft landing rates in stronger wind conditions along with reduced holding and approach times and stack entry to touchdown times. The concept shows positive benefits for fuel efficiency, predictability and safety, in particular:

- Aircraft landing rates were consistently increased, for the traffic samples and wind conditions simulated: up to 5 additional aircraft per hour were landed, with an average of 2 additional aircraft per hour;
- Holding times and Stack Entry to Touchdown times were also reduced with a mean reduction in holding times of 0.9 minutes, and a mean reduction in Stack Entry to Touchdown times of 1.4 minutes. There were no statistically significant differences between the Clearance to Land margins (of 15 seconds or less), Go-arounds, Wake Vortex Advisories or Expedited Runway Vacation Requests issued between DBS and TBS;
- Separation accuracy for Wake pairs shows a clear and statistically significant improvement with TBS, though for Non-Wake pairs the accuracy was the same as DBS;
- The percentage of under-separated events (<0.5 Nm under Wake / 2.5 Nm) was almost half with TBS compared to DBS showing that, with the TBS indicators, controllers were able to provide improved separation overall;
- There was no difference in controller workloads with TBS compared with DBS; and
- Situational Awareness for the Final controller was slightly reduced with TBS, though this reduction was not statistically significant. The reduction was evident through a change of focus onto the TBS indicators and away from the flight strips resulting in less awareness of aircraft types, wake vortex categories and the relative position of the lead aircraft.

Additional activities

The SESAR validation activities have identified future possible validation objectives for the follow-on maturity steps. As these future validation objectives are mainly dependent on the local operating environment they couldn't be addressed as R&D. These could include the provision of the Glideslope Wind Conditions Service, the provision of the Arrival Sequence Order Service, the electronic provision of the final approach separation and runway spacing constraints and the scenario spacing requirements, including the departure gap requirements for interlaced mode operations, and the impact of these on the responsibilities of the Approach and Tower Supervisors and ATCOs. The

Safety Assessment Results have also identified a number of safety mitigation functions that require further consideration in the industrialisation phase.

Actors involved

Actors involved in operations of the SESAR solution and the use of services required to implement TBS:

- Flight Crew
- TMA Sector Controllers
- Approach Supervisor
- Intermediate Approach Controllers & Intermediate Support Controllers
- Final Approach Controller
- Tower Supervisor
- Tower Runway Controller
- TMA System Operating Authority
- Tower System Operating Authority

Impact on A/C system

Not Applicable

Impact on ground systems

Enablers impacted:

- System / ER-APP-ATC-xxx (TBS indicators)
- Procedural / PRO-66b (ATC procedures for using TBS on approaches)
- Human / HUM-AO-0303

Additional Enablers proposed:

- Approach arrival sequence service
- Glideslope wind conditions service

Consideration of Regulatory Framework

Due consideration should be paid to introducing in the regulatory framework changes in the rules for the separation from Distance Based to Time Based on final approach..

Consideration of Standardisation Framework

In the field of the standardisation framework, the availability of adequate level of standardisation is key to ensure stable means of compliance for elements that will have high safety significance in the day to day operation.

Common functional requirements for the tools used by ATC to provide TBS are under development and will be used for standardisation purpose.

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 in deployment, beyond the applicable existing ones.

Intellectual property rights (foreground)

The foreground is owned by the SJU.