

# Contextual note – PJ.02-01-01 “Optimised Runway Delivery on Final Approach” (V3) Description Form for Deployment Planning

## 1. Purpose

This contextual note describes SESAR solution PJ.02-01-01 “Optimised Runway Delivery on Final Approach” with a summary of the results stemming from R&D activities contributing to deliver it. It provides (to both those external and internal to the SESAR programme) an overview of PJ.02-01-01 in terms of scope, main operational and performance benefits, relevant system impacts and recommends additional activities that should be conducted during the industrialisation phase or as part of deployment.

This contextual note complements the solution Data Pack comprising the SESAR deliverables required for industrialisation and deployment.

## 2. Improvements in Air Traffic Management (ATM)

Solution PJ.02-01-01 “Optimised Runway Delivery on Final Approach” enables safe, consistent and efficient delivery of the required separation or spacing between arrival pairs on final approach to the runway landing threshold. It is supported by the Optimised Runway Delivery (ORD) tool. The ORD tool can be used to support the application of Distance Based and Time Based wake separation rules e.g. ICAO, RECAT-EU, PWS-A and WDS-A wake separation schemes, and aims at consistently and efficiently managing the spacing compression that occurs on short final from the lead aircraft crossing the deceleration fix.

The solution can be deployed in different operational environments either independently or as an enabler of other SESAR solutions (and OI steps) developed and validated in SESAR that aim at increasing runway throughput.

Based on the validations performed in Wave 1, the solution can be considered an optional or required operational support tool for other SESAR solutions depending on the complexity of the targeted operational environment. In case of SESAR solutions where the use of the ORD tool is optional, particular attention must be paid when assessing traffic demand, expected benefits and scalability of the proposed solutions. The CBA supporting the different SESAR solutions will support this analysis.

The solution targets capacity constrained runways during high intensity runway operations and applies to very large, large and possibly medium airports.

Note that solution PJ.02-01-01 is an ATM solution even if the SPR-INTEROP/OSED is not always explicit about this.

### Relevant Operational Environments

OEs	Sub Operating Environments	Definition
Airport (capacity constrained)	Very Large Airport	Airports with more than 250k movements per year
	Large Airport	Airports with more or equal than 150k and less or equal than 250k movements per year
	Medium Airport	Airports with more or equal than 40k and less than 150k movements per year

Note: The investment on this solution may be only justified only in large and very large airports.

### 3. Operational Improvement Steps (OIs) & Enablers

Applicable OI Step:

**AO-0328** — Optimised Runway Delivery on Final Approach.

Required enablers:

**AERODROME-ATC-68** – ATC System to support Optimised Runway Delivery on Final Approach;

**APP ATC 120** – ATC System to support Optimised Runway Delivery on Final Approach;

**STD-093** – EUROCONTROL Guidelines for Optimised Runway Delivery;

**APP ATC 99** – ATC System to use Real-Time Meteo Information Received From Met Systems<sup>1</sup>;

Optional enablers:

**A/C-47** – On-board management of meteorological data from on-board sensors for sharing and use by MET service providers

**AERODROME-ATC-55** – Airport ATC tool for Aircraft ROT categorisation;

**AERODROME-ATC-17** - Airport ATC tool to Support Time-Based Separation in Final Approach;

**APP ATC 169** – Approach ATC tool for Aircraft ROT categorisation (compute + display);

**APP ATC 156** - ATC System to Support Time-Based Separation in Final Approach;

**SWIM-APS-07a** - Stakeholder systems consumption of Meteorological Information services for Step 1.

Applicable Integrated Roadmap Dataset is DS20.

### 4. Background and Validation Process

Significant validation and development work was performed on Pairwise separation and TBS throughout SESAR 1:

- **SESAR1 P06.08.01:** Flexible and Dynamic Use of Wake Turbulence Separations.

Solution PJ.02-01-01 built on this work and performed both real-time and fast-time simulation activities:

- **RTS1:** Validation to assess Weather Dependent Separations on the arrival approach (WDS-A) with Optimised Runway Delivery (ORD) tool in a dual approach environment with segregated runway operations;
- **RTS2:** Validation to assess Static Pairwise Separations on the arrival approach (S-PWS-A) with Optimised Runway Delivery (ORD) tool under segregated runway operations;

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<sup>1</sup> Enabler developed under the scope of solution PJ.02-01-05 (AO-0310).

- **RTS3a:** Validation to assess Static Pairwise Separations on the arrival approach (S-PWS-A) with Optimised Runway Delivery (ORD) tool plus Static Pairwise Separations for departures (S-PWS-D) with Optimised Separation Delivery (OSD) tool under mixed runway operations;
- **RTS3b:** Validation to assess ICAO Time Based Separation (TBS) with Optimised Runway Delivery (ORD) tool in a PBN approach environment with segregated runway operations.
- **RTS4a:** Validation to assess Static Pairwise Separations on the arrival approach (S-PWS-A) with Optimised Runway Delivery (ORD) tool plus Static Pairwise Separations for departures (S-PWS-D) with Optimised Separation Delivery (OSD) tool under mixed mode runway operations;
- **RTS4b:** Validation to assess Static Pairwise Separations on the arrival approach (S-PWS-A) with Optimised Separation Delivery (OSD) tool plus Static Pairwise Separations for departures (S-PWS-D) with Optimised Separation Delivery (OSD) tool in a dual approach environment with CSPR under segregated and partially segregated runway operations;
- **FTS9:** Fast time simulations of ORD, S-PWS and WDS concepts for different airports to support the CBA.

## 5. Results and Performance Achievements

The results show that the use of the Optimised Runway Delivery tool to support separations and spacing delivery (either time or distance based) is operationally feasible and acceptable in both segregated and mixed mode runway operations in a high complexity TMA and large airport environment in low wind and strong wind conditions.

The solution can be used in the mixed mode single runway operations to support the delivery of large gap spacings in the arrival flow to allow for several departures in a peak departure traffic flow.

Furthermore, it was shown that the tool could be used on the final approach in a PBN approach environment with no negative impact on the approach and / or final approach controllers' work.

Overall the accuracy of separation delivery was found to improve with the ORD tool. The controllers reported that the ORD tool was necessary for TBS procedures to be applied accurately and consistently. Runway throughput capacity gains can be achieved compared to current operations with no support tool.

There is a positive impact on resilience, as the capacity loss was found to be smaller with TBS and the ORD tool under strong headwind and crosswind conditions. Also the number of go-arounds stays the same or is reduced up to 1%, in adverse headwind condition; depending on the current wake vortex separation scheme applied at the airport.

The workload of the Final Approach and runway tower controllers was not negatively impacted with the ORD tool compared to current operations in mixed mode runway operations. No changes in competence requirements were identified

Changes to tasks, procedures and working methods when working with TBS and the ORD tool in mixed mode procedures were clear, acceptable and usable for the ATCOs. However, controllers did express concern that while working with the ORD tool, a controller might become less aware about the aircraft distances on the final approach and consequently have a lower level of situational awareness. Although not a problem when the ORD was available, this could be an issue if the ORD was not available such as in degraded modes of operations i.e. tool not operative.

## 6. Recommendations and Additional activities

The following recommendations should be taken into consideration during the industrialisation and deployment phases.

- The reliability of the ORD must be improved and assured prior to implementation;

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- The ORD would need to be further tuned for the local approach and tower environment e.g. smaller buffers in the tool to ensure runway throughput is optimised (the buffers required to optimise capacity whilst maintaining safety would have been determined in the local safety assessment). The industrialised version of the ORD tool will need to be developed using a methodology appropriate to the software assurance level required in the local deployment environment;
- Issues related to potential loss of controllers situational awareness need to be investigated further in industrialization and deployment phases. Training is considered essential to prevent any skill decay and ensure controllers were fully familiar and at ease with any contingency procedures developed relating to the ORD tool;
- The ORD tool requires a stricter more rigid speed control profile on the final approach. An information campaign should be conducted with airlines to ensure pilots adhere to the controllers speed instructions.

Future development of the ORD tool could include:

- The integration of ORD tool within the CWP;
- The integration of the ORD with the AMAN / DMAN;

## 7. Actors Impacted by the SESAR Solution

The following actors are impacted by the solution PJ.02-01-01:

- Air Traffic Controllers;
- Flight Crew;
- ANSPs;
- Airlines /airspace Users;
- Airport Operators;
- Regulatory Authorities.

## 8. Impact on Aircraft System

No impact on aircraft system.

## 9. Impact on Ground Systems

ORD tool has to be integrated in CWP and current TBS system (if present). The solution is based on existing MET capabilities and information to measure or forecast the wind on the final approach path along the section applicable for calculating separations and spacing indicators.

The TS/IRS and the SPR-INTEROP/OSED refer to a new MET service (METForWTS service) that has been developed by solution PJ.18-04b. This service has achieved TRL2 in Wave 1 and it may be an option for this solution if further developed and validated in future R&D activities.

## 10. Regulatory Framework Considerations

EC 2017/373 IR for Change Management and Assessment is applicable. It requires the development of a Local Safety Case.

## 11. Standardisation Framework Considerations

STD-93 "EUROCONTROL Guidelines for Optimised Runway Delivery "

## 12. Solution Data pack

Solution PJ.02-01-01 is covered by PJ.02-01 Data Pack that includes the following documents:

- D1.1.01 – PJ02-01 OSED-SPR-INTEROP (Final) Parts I 00.01.02, II, IV and V – 01.02.01 (31/01/2020);
- D1.1.02 – PJ02-01 TS/IRS (Final) – 00.03.04 (06/03/2020)<sup>2</sup>;
- D1.1.04 – PJ02-01 VALR (Final) – 00.01.01 (31/01/2020);
- D1.1.05 – PJ02-01 CBA – 00.01.01 (31/01/2020)<sup>3</sup>.

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<sup>2</sup> The final version of the TS/IRS MS Word document still contains many requirements that are "in progress" status while they have been actually validated. The status of these requirements is properly updated and documented in the SE-DMF that represents the reference for the list of validated requirements.

<sup>3</sup> Note that PJ.02-01-01 can be independently deployed even if the CBA does not consider the solution and a standalone one explicitly.