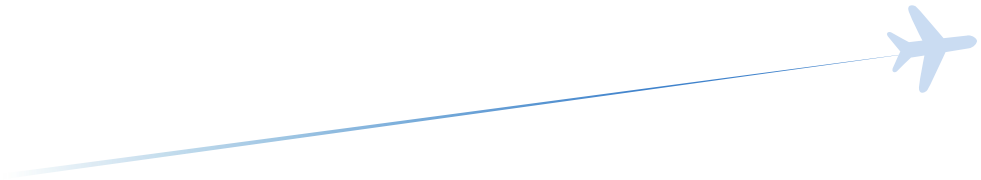

SESAR Solution 02-01 TS/IRS for V3

Deliverable ID:	**D1.1.02**
Dissemination Level:	**PU**
Project Acronym:	**PJ02 EARTH**
Grant:	**731781**
Call:	**H2020-SESAR-2015-2**
Topic:	**INCREASED RUNWAY AND AIRPORT THROUGHPUT**
Consortium Coordinator:	**EUROCONTROL**
Edition Date:	**06th March 2020**
Edition:	**00.03.04**
Template Edition:	**02.00.02**

Founding Members

EUROPEAN UNION EUROCONTROL

SESAR JOINT UNDERTAKING

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Document History

Edition	Date	Status	Author	Justification
00.00.05	01/11/2017	DRAFT	THALES AIR SYS	2nd draft
00.01.00	26/04/2019	DRAFT	THALES AIR SYS	5th draft
00.02.00	31/07/2019	INTERIM	INDRA	Interim submission (7th draft)
00.03.00	15/11/2019	FINAL	THALES AIR SYS	Document submitted to SJU for approval
00.03.01	28/01/2020	FINAL	THALES AIR SYS	Document updated following SJU assessment
00.03.02	18/02/2020	FINAL	THALES AIR SYS	Document updated following SJU assessment
00.03.03	18/02/2020	FINAL	THALES AIR SYS	Further Thales updates following SJU assessment

00.03.04	06/03/2020	FINAL	INDRA	Further Indra updates following SJU assessment

PJ02 EARTH

INCREASED RUNWAY AND AIRPORT THROUGHPUT

This final TS/IRS document is part of a project that has received funding from the SESAR Joint Undertaking under grant agreement No 731781 under European Union's Horizon 2020 research and innovation programme

Abstract

This document collects and describes the Technical System Requirements (functional and non-functional) which shall guide the development and implementation of addressing the wake turbulence separation optimization concept. These System Requirements are derived from the Operational Requirements collected by the specification of previous R&D projects and studies, and from SESAR project PJ02-01 Wake turbulence separation optimization.

This document details Technical and Interface specifications related to the four following concepts:

- Arrivals Concepts Solutions
- Departures Concepts Solutions
- Wake Risk Monitoring Concept Solution
- Wake Decay Enhancing Concept Solution

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1 Executive summary

This document lists and details the Technical System Requirements (functional and non-functional) that shall guide the development and implementation of prototypes involved in PJ02-01 Validation exercises. This document addresses Interface Requirements as well.

In line with the SPR/INTEROP-OSED [39], functional and non-functional are addressing four concepts.

Arrivals Concepts Solutions

The arrivals concepts solutions consist of Wake Turbulence Separations for Arrivals based on Static Aircraft Characteristics (PWS-A), Optimised Runway Delivery on Final Approach (ORD) and Weather-Dependent Reductions of Wake Turbulence Separations for Final Approach (WDS-A).

ORD is the ATC support tool to enable consistent and efficient delivery of the required separation or spacing between arrival pairs on final approach to the runway landing threshold through providing Target Distance Indicators (TDIs) to the controllers.

PWS-A is the efficient aircraft type pairwise wake separation rules for final approach consisting of both the 96 x 96 aircraft type based pairwise wake separation minima and the twenty wake category (20-CAT) based wake separation minima for arrival pairs involving other aircraft types.

WDS-A is the conditional reduction or suspension of wake separation minima on final approach, applicable under pre-defined wind conditions, so as to enable runway throughput increase compared to the applicable standard weather independent wake separation minima. This is on the basis that under the pre-defined wind conditions the wake turbulence generated by the lead aircraft is either wind transported out of the path of the follower aircraft on final approach, or has decayed sufficiently to be acceptable to be encountered by the follower aircraft.

The wake separation minima on final approach are defined as both distance-based minima and time-based minima, and so may be applied as either distance-based minima or time-based minima.

Revising the wake separation minima aims to increase arrival runway capacity, efficiency, predictability and resilience while maintaining or increasing safety.

Departures Concepts Solutions

The departures concepts solutions consist of Wake Turbulence Separations for Departure based on Static Aircraft Characteristics (PWS-D), Optimised Separation Delivery for Departure (OSD) and Weather-Dependent Reductions of Wake Turbulence Separation for Departure (WDS-D).

OSD is the ATC support tool to enable consistent and efficient delivery of the required separation or spacing between departure pairs on the initial departure path.

PWS-D is the efficient aircraft type pairwise wake separation rules for departure operations currently consist of the time-based seven wake category (7-CAT) based wake separation minima, or the distance-based 96 x 96 aircraft type based pairwise wake separation minima in conjunction with the twenty wake category (20-CAT) based wake separation minima for departure pairs involving other aircraft types.

Planned for SESAR 2020 Wave 2 is an activity to develop the aircraft type pairwise time-based wake separation minima for departures and the refined wake category time-based wake separation minima. This is subject to having sufficient departure aircraft data for carrying out the wake risk analysis for the supporting safety case. In SESAR 2020 Wave 1 draft aircraft type pairwise time-based wake separation minima and refined wake category time-based wake separation minima were established and employed in the validation exercises in order to support assessment of the Human Performance, Safety and Performance validation objectives.

WDS-D is the conditional reduction or suspension of the wake separation minima for departure operations, applicable under pre-defined wind conditions so as to enable a runway throughput increase compared to the applicable standard weather independent wake separation minima. This is on the basis that under the pre-defined wind conditions the wake turbulence generated by the lead aircraft is either crosswind transported out of the path of the follower aircraft on the initial departure path, or has decayed sufficiently to be acceptable to be encountered by the follower aircraft on the initial departure path.

The wake separation minima on the initial departure path are defined as both distance-based minima and time-based minima, and so may be applied as either distance-based minima or time-based minima.

OSD, PWS-D and WDS-D will increase departure runway capacity, and improve the efficiency, predictability and resilience of departure operations, while maintaining safety.

The main development and validation needs remains the specification and approval of the wake separation rules with particular focus on the safety assurance evidence, the development and validation of the controller tool support with particular focus on the human performance and safety assurance evidence, and the development and validation of the business case with particular focus on the benefits evidence.

Wake Risk Monitoring Concept Solution

This wake risk monitoring concept and solution that has been developed and validated is an improved detection and monitoring of wake turbulence encounters occurring in day-to-day operation.

The detection and monitoring are an automated and objective means to identify wake turbulence encounters in daily operations in the post execution phase, based on the analysis of recorded operational data available from on-board the aircraft, and additional traffic information from ADS-B Out messages. This analysis can be complemented by additional ground-based direct measurements of wake vortices during the approach or departure phases.

This tool provides objective and statistically meaningful information about the frequency of occurrence of wake turbulence encounters, both within the operating method proposed by this SESAR Solution PJ02-01 as well as under pre-SESAR operating methods. It furthermore allows to identify severe wake turbulence encounters (those which are expected to lead e.g. to an associated Reportable Occurrence) as well as non-severe wake encounters which normally cause no disruption of the normal flight. This new capability will facilitate in-service safety monitoring of the wake turbulence encounter risk of the deployed new wake turbulence separation optimisation regulations.

Wake Decay Enhancing Concept Solution

The highest risk of encountering wake vortices prevails during final approach in ground proximity, where the vortices cannot descend below the glide path but tend to rebound because of the interaction with the ground surface. This is aggravated by the fact that the possibilities of the pilot to recover from a vortex encounter are limited by the low flight altitude. A method has been developed and demonstrated at an international airport that accelerates wake vortex decay in that critical height range. The installation of so-called plate lines beyond the runway tails improve safety by reducing the number of wake vortex encounters and increase the efficiency of wake vortex advisory systems.

The individual plates are aligned parallel to the runway direction and are 9m long and 4.5m high. A plate line consists of 8 plates with a separation of 20m. The plate line is displaced by at least 300m from the threshold. While descending the vortices interact with the plates generating disturbances that propagate in and against flight direction. These disturbances reduce the lifetime of the longest lived and potentially most hazardous wake vortices by at least 20%.

A technical design of the plate lines has been elaborated that is compatible with airport requirements (e.g. stability, frangibility) and approval of authorities for the installation of the plate line has been obtained. A measurement campaign has been conducted at Vienna airport employing several LiDARs for wake vortex measurements supplemented by a suite of advanced meteorological sensors to determine the atmospheric conditions and especially the wind conditions which have a major impact on the wake vortex decay and wake displacements which have been measured with high accuracy.

The measurement data has been analysed to quantify the acceleration of the decay of the wake vortices close to the ground. The measurement data will also be used to estimate the corresponding flight safety benefits and capacity gains to be achieved by different arrival concept solutions in SESAR 2020 Wake 2 VLD3. Finally, comprehensive documentation has been elaborated to form the basis for the preparation of regulations to be endorsed by competent authorities.

2 Introduction

2.1 Purpose of the document

This TS/IRS document [1]provides the requirements specification of the PJ02-01 Solution addressing Wake vortices separation reduction, covering functional, non-functional and interface requirements related to SESAR Solution PJ02-01. This document focuses on specifying the functional description and the logical interfaces with other functional blocks

2.2 Scope

This TS/IRS covers functional, non-functional and interface requirements related to SESAR Solution PJ02-01.

The listed requirements shall comply with the operational requirements listed in the SPR-INTEROP/OSED [39].

2.3 Intended readership

The intended readership is the SESAR Solution PJ02-01 project members, the other solutions in SESAR Project PJ02 Increased Runway and Airport Throughput, the related solutions in SESAR Project PJ01 Enhanced Arrivals and Departures, the related solutions in SESAR Project PJ04 Total Airport Management, the related solutions in SESAR Project PJ09 Advanced Demand & Capacity Balancing, the related transversal SESAR Projects PJ19 and PJ22, and all impacted and interested stakeholders.

2.4 Background

For this solution, the baseline from which this document has been written partly consists of SESAR 1 Technical Specification documents

- SESAR 1, 12.02.02-D56

2.5 Structure of the document

The document is organised as described hereafter

Section 1 gives a brief summary of this Technical Specification document

Section 2 gives an introduction to how the document is organised

[1] The opinions expressed herein reflect the authors view only. Under no circumstances shall the SESAR Joint Undertaking be responsible for any use that may be made of the information contained herein.

Section 3 describes the links between Functional blocks, Enablers and Roles coming from the EATMA models
Section 4 describes the Functional Architecture and lists the Technical Requirements

Section 5 lists the options
Section 6 explains the assumptions for the technical feasibility of the solution

Section 7 lists the Applicable documents and the references

Appendix C describes how Optimised separation delivery in mixed mode operations are specified

2.6 Glossary of terms

Term	Definition	Source of the definition
DBS	Refers to applying wake separations on final approach which are based on distances. This is how wake separations are applied in the majority of current operations.	OFA 01.03.01 Enhanced Runway Throughput Consolidated Final Step 1 OSED [38]
In-trail aircraft pair	Refers to consecutive aircraft pairs that are landing on the same runway.	OFA 01.03.01 Enhanced Runway Throughput Consolidated Final Step 1 OSED [38]
Not-in-trail aircraft pair	Refers to consecutive aircraft pairs that are landing on different parallel runways.	OFA 01.03.01 Enhanced Runway Throughput Consolidated Final Step 1 OSED [38]
ORD	Refers to the Optimised Runway Delivery concept which intends to provide additional tool support to show the Controller the required spacing on the approach to take into account the effect of compression primarily caused by aircraft decelerating to land.	OFA 01.03.01 Enhanced Runway Throughput Consolidated Final Step 1 OSED [38]
S-PWS	A wake separation concept where wake separations are optimised by defining them between aircraft type pairs rather than between wake categories.	OFA 01.03.01 Enhanced Runway Throughput Consolidated Final Step 1 OSED [38]
TBS	Refers to the generic TBS concept that was developed in SESAR 1 Project P06.08.01 which included tool support to	OFA 01.03.01 Enhanced Runway Throughput

	show the Controller the required separation.	Consolidated Final Step 1 OSED [38]
WDS (arrivals)	There are two versions: WDS (total wind) and WDS (crosswind). WDS (total wind) aims to allow reduced Wake Turbulence (WT) separations based on the argument that WT is more rapidly decayed as the wind magnitude increases. WDS (crosswind) aims to allow the reduction of WT separations based on the argument that WT is transported out of the path of follower aircraft.	OFA 01.03.01 Enhanced Runway Throughput Consolidated Final Step 1 OSED [38]
WDS (departures)	A concept that allows the reduction of wake separations between departures when the wind is above a certain threshold based on the argument that WT is more rapidly decayed as the wind magnitude increases. Note that within SESAR 2020 there are two main versions: WDS (total wind) and WDS (crosswind). WDS (total wind) aims to allow reduced Wake Turbulence (WT) separations based on the argument that WT is more rapidly decayed as the wind magnitude increases. WDS (crosswind) aims to allow the reduction of WT separations based on the argument that WT is transported out of the path of follower aircraft. Also note that a third version of differentiated rotation positions and climb profiles is under consideration in SESAR 2020.	OFA 01.03.01 Enhanced Runway Throughput Consolidated Final Step 1 OSED [38]

Table 1 : Glossary

2.7 Acronyms and Terminology

Acronym	Definition
3-CAT	Three Wake Category
6-CAT	Six Wake Category
7-CAT	Seven Wake Category
14-CAT	Fourteen Wake Category
20-CAT	Twenty Wake Category (Fourteen Wake Category with Six Wake Category)
A-CDM	Airport Collaborative Decision Making
A-SMGCS	Advanced Surface Movement Guidance and Control System
ACC	Area Control Centre
ADI	Average Departure Interval
ADS-B	Automatic Dependent Surveillance Broadcast
AFTN	Aeronautical Fixed Telecommunication Network
AIP	Aeronautical Information Publication
AO	Aircraft Operations
AOCC	Aircraft Operations Control Centre
AoR	Area of Responsibility
AMAN	Arrival Manager (System)
APOC	Airport Operations Centre
AROT or aROT	Arrival Runway Occupancy Time
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
ATFCM	Air Traffic Flow and Capacity Management
ATIS	Automatic Terminal Information Service
ATM	Air Traffic Management
ATS	Air Traffic Service
ATSA	Air Traffic Services Assistant
CAP	Capacity
CAT	Category (for aircraft classification for wake)
CAT <n>	Category of ILS System (CAT I, CAT II, CAT III)

Acronym	Definition
CBA	Cost Benefit Assessment
CDM	Collaborative Decision Making
CNS	Communication Navigation and Surveillance
CONOPS	Concept of Operations
CR	Change Request
CREDOS	Crosswind-Reduced Separation for Departure Operations
CTOT	Calculated Take Off Time
CWP	Controller Working Position
D-ATIS	Digital Automatic Terminal Information Service
DBS	Distance Based Separation
DC	Data Collection
DER	Departure End of the Runway
DF	Deceleration Fix (for landing stabilisation)
DLR	Deutsches Zentrum für Luft- und Raumfahrt
DMAN	Departure Manager (System)
DME	Distance Measuring Equipment
EASA	European Aviation Safety Agency
EATMA	European ATM Architecture
E-ATMS	European Air Traffic Management System
EC 6FP	European Commission 6th Framework Programme
EFPS	Electronic Flight Progress Strip
EU	European Union
EXE	Exercise
FAF	Final Approach Fix
FAP	Final Approach Point
FOC	Flight Operations Centre
FPL	Flight Plan
ft	feet
FTD	Final Target Distance

Acronym	Definition
FTS	Fast Time Simulation
GH	Ground Handlers
GMC	Ground Movement Controller
GMP	Ground Movement Planner
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GWCS	Glideslope Wind Conditions Service
HEAVY	ICAO Heavy Wake Category
HMI	Human Machine Interface
HPAR	Human Performance Assessment Report
Hz	Hertz
IAF	Initial Approach Fix
ICAO	International Civil Aviation Organisation
IAS	Indicated Air Speed
ILS	Instrument Landing System
INTEROP	Interoperability Requirements
ITD	Initial Target Distance
kg	kilograms
KPA	Key Performance Area
kt or kts	knots
LiDAR	Light Detection and Ranging
LIGHT	ICAO Light Wake Category
LT	Live Trial
m	metres
m/s	metres per second
MDI	Minimum Departure Interval
MEDIUM	IACO Medium Wake Category
MET	Meteorological
MHz	Megahertz (1,000,000 Hz)

Acronym	Definition
MLS	Microwave Landing System
MRS	Minimum Radar Separation
MTOM	Maximum Take Off Mass
MTOW	Maximum Take Off Weight
N/A	Not applicable
NDB	Non Directional Beacon
NM	Nautical Mile (1852m)
NMF	Network Management Function
NPR	Noise Preferential Route
OFA	Operational Focus Area
OI	Operational Improvement
OM	Outer Marker (final approach)
OPAR	Operational Performance Assessment Report
ORD	Optimised Runway Delivery (arrivals)
OSD	Optimised Separation Delivery (departures)
OSED	Operational Service and Environment Definition
PANS	Procedures for Air Navigation Services
PAR	Performance Assessment Report
PCP	Pilot Common Project
PFS	Paper Flight Strip
PIRM	Programme Information Reference Model
PJ	Project
PSR	Primary Surveillance Radar
PWS	Pair Wise Separation
PWS-A	Pair Wise Separation for Arrivals
PWS-D	Pair Wise Separation for Departures
QoS	Quality of Service
R&D	Research & Development
R/C	Radio Communications

Acronym	Definition
RBT	Reference Business Trajectory
RECAT	Re-categorisation (wake scheme)
RECAT-EU	RECAT Europe
RECAT-EU-PWS	RECAT Europe Pair Wise Separation
REQ	Requirement
RMT	Reference Mission Trajectory
ROT	Runway Occupancy Time
RSVA	Reduced Separation in the Vicinity of the Aerodrome
RT (or R/T)	Radio Telephone or Radiotelephony
RTS	Real-Time Simulation
s	seconds
S-PWS	Static Pair Wise Separation
S-PWS-A	Static Pair Wise Separation for Arrivals
SAC	Safety Criteria
SAR	Safety Assessment Report
SBT	Shared Business Trajectory
SecAR	Security Assessment Report
SESAR	Single European Sky ATM Research Programme
SESAR 1	SESAR from 2010 to 2016
SESAR 2020	SESAR from 2016 (to 2020)
SID	Standard Instrument Departure
SJU	SESAR Joint Undertaking
SMT	Shared Mission Trajectory
SPR	Safety and Performance Requirements
SSR	Secondary Surveillance Radar
STAR	Standard Terminal Arrival Route
SWIM	System Wide Information Model
TAS	True Air Speed
TB	Time Based

Acronym	Definition
TBA	To be added
TBD	To be determined
TBS	Time Based Separation
TBS-A	Time Based Separation for Arrivals
TDI	Target Distance Indicator
TIS-B	Traffic Information Services - Broadcast
TOBT	Target Off Blocks Time
TMA	Terminal Manoeuvring Area
TS	Technical Specification
TSAT	Target Start-up Approval Time
TT	Target Time
TTOT	Target Take-Off Time
UTC	Universal Coordinated Time
V APP	Approach Speed
VCR	Visual Control Room
VOR	VHF Omnidirectional Range
V_R	Rotation Speed (for Take Off)
WDS	Weather Dependent Separation
WDS-A	Weather Dependent Separation for Arrivals
WDS-D	Weather Dependent Separation for Departures
WT	Wake Turbulence
WTE	Wake Turbulence Encounter
WVE	Wake Vortex Encounter

Table 2 : Acronyms

3 SESAR Solution Impacts on Architecture

3.1 Target Solution Architecture

The following tables are extracted from MEGA modelling activities that were conducted for the concepts addressed by this Solution. The following OIs are covered:

- AO-0328: Optimised Runway Delivery on Final Approach;
- AO-0306: Wake Turbulence Separations (for Arrivals) based on Static Aircraft Characteristics;
- AO-0310: Weather-Dependent Reductions of Wake Turbulence Separations for Final Approach;
- AO-0329: Optimised Separation Delivery for Departure.
- AO-0323: Wake Turbulence Separations (for Departures) based on Static Aircraft Characteristics;
- AO-0304: Weather-Dependent Reductions of Wake Turbulence Separations for Departures;
- AO-0327: Reduction of Wake Turbulence Risk through Wake Risk Monitoring;
- AO-0325: Reduction of Wake Turbulence Risk considering Acceleration of Wake Vortex Decay in Ground Proximity;

3.1.1 SESAR Solution(s) Overview

PJ.02-01: Wake Turbulence Separation Optimization

PJ02-01 Solution aims to optimise wake turbulence separation minima for arrivals and departures to enhance airport runway throughput. It focuses on development of:
- wake turbulence separations based on static aircraft characteristics and weather dependent reductions;
- separation delivery support tools for ATCOs;
- wake risk monitoring function;
- wake decay enhancing devices.

OI Step		OI description	Open CR
AO-0304		Weather-Dependent Reductions of Wake Turbulence Separations for Departures	CR 03427 Update AO-0304 (PJ.02-01)
	EN code	EN description	Open CR
	A/C-47	On-board management of meteorological data from on-board sensors for sharing and integration by ATM and ATM-MET systems	
	A/C-48a	Air broadcast of aircraft position/vector (ADS-B OUT) compliant with DO260B	

	SWIM-APS-07a	Stakeholder systems consumption of G/G Meteorological Information services	
	AERODROME-ATC-60	Airport ATC system to monitor wake turbulence risk using ground-based LIDAR/Radar	CR 02027 Unset AERODROME-ATC-60 V3 date (PJ02-01)
	AERODROME-ATC-19	Runway Usage Management sub-system capable of processing initial departure path wind conditions information	CR 03241 Update AERODROME-ATC-19 links to EATMA (AO-0304 - PJ02-01)
	APP ATC 99	ATC System to use Real-Time Meteo Information Received From Met Systems	CR 03424 Update APP ATC 99 (PJ.02-01)
AO-0306		Wake Turbulence Separations (for Arrivals) based on Static Aircraft Characteristics	CR 03430 Update AO-0306 (PJ.02-01)
	EN code	EN description	Open CR
	AIRPORT-08	Decay Enhancing Devices	
	APP ATC 118	ATC System to support static pair-wise wake separation (S-PWS) on approach	CR 02022 Update APP ATC 118 (AO-0306 - PJ02-01)
	AERODROME-ATC-60	Airport ATC system to monitor wake turbulence risk using ground-based LIDAR/Radar	CR 02027 Unset AERODROME-ATC-60 V3 date (PJ02-01)
	AERODROME-ATC-42a	Airport ATC tool to support static pair-wise wake separation (S-PWS) in final approach	CR 03242 Update AERODROME-ATC-42a (PJ02-01)
	REG-0523	Regulatory provisions (AMC) for static pair-wise wake separation minima (S-PWS)	CR 03520 Update REG-0523 (PJ02-01)
AO-0310		Weather-Dependent Reductions of Wake Turbulence Separations for Final Approach	CR 03431 Update AO-0310 (PJ02-01)
	EN code	EN description	Open CR
	A/C-47	On-board management of meteorological data from on-board sensors for sharing and integration by ATM and ATM-MET systems	
	AIRPORT-08	Decay Enhancing Devices	

	APP ATC 74	ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach	
	REG-0522	Regulatory provisions for weather-dependent separation minima (WDS)	Upd EN publication date Link OI to EN
	SWIM-APS-07a	Stakeholder systems consumption of G/G Meteorological Information services	
	AERODROME-ATC-60	Airport ATC system to monitor wake turbulence risk using ground-based LIDAR/Radar	CR 02027 Unset AERODROME-ATC-60 V3 date (PJ02-01)
	APP ATC 99	ATC System to use Real-Time Meteo Information Received From Met Systems	CR 03424 Update APP ATC 99 (PJ.02-01)
AO-0323		Wake Turbulence Separations (for Departures) based on Static Aircraft Characteristics	CR 03477 Update AO-0323 (PJ02-01)
	EN code	EN description	Open CR
	AERODROME-ATC-60	Airport ATC system to monitor wake turbulence risk using ground-based LIDAR/Radar	CR 02027 Unset AERODROME-ATC-60 V3 date (PJ02-01)
	AERODROME-ATC-42b	Airport ATC tool to support static pair-wise wake separation (S-PWS) for departure operations	CR 03519 Create AERODROME-ATC-42b (PJ02-01)
	REG-0523	Regulatory provisions (AMC) for static pair-wise wake separation minima (S-PWS)	CR 03520 Update REG-0523 (PJ02-01)
AO-0325		Reduction of Wake Turbulence Risk considering Acceleration of Wake Vortex Decay in Ground Proximity	CR 01984 Update AO-0325 (PJ02-01)
	EN code	EN description	Open CR
	AIRPORT-08	Decay Enhancing Devices	
AO-0327		Reduction of Wake Turbulence Risk through Wake Risk Monitoring	CR 01985 Update AO-0327 (PJ02-01)
	EN code	EN description	Open CR

	A/C-48a	Air broadcast of aircraft position/vector (ADS-B OUT) compliant with DO260B	
	A/C-30c	On-board Detection of Wake Turbulence Encounters	CR 02026 Update A/C-30c links to EATMA (PJ02-01)
	A/C-48b	Air broadcast of aircraft data (ADS-B OUT) compliant with new DO260C standard	CR 03670 for Update A/C-48b description
AO-0328		Optimised Runway Delivery on Final Approach	CR 03432 Update AO-0328 (PJ02-01)
	EN code	EN description	Open CR
	A/C-47	On-board management of meteorological data from on-board sensors for sharing and integration by ATM and ATM-MET systems	
	AERODROME-ATC-17	Airport ATC tool to Support Time-Based Separation in Final Approach	
	APP ATC 156	ATC System to Support Time-Based Separation in Final Approach	
	SWIM-APS-07a	Stakeholder systems consumption of G/G Meteorological Information services	
	AERODROME-ATC-68	ATC System to support Optimised Runway Delivery on Final Approach	CR 02028 Update AERODROME-ATC-68 (AO-0328 - PJ02-01)
	APP ATC 120	ATC System to support Optimised Runway Delivery on Final Approach	CR 02029 Update APP ATC 120 (AO-0328 - PJ02-01)
	AERODROME-ATC-55	Aerodrome ATC System to support Optimised Runway Delivery on Final Approach based on Aircraft ROT categorisation	CR 03413 Update AERODROME-ATC-55 (PJ02-01-PJ02-08)
	APP ATC 99	ATC System to use Real-Time Meteo Information Received From Met Systems	CR 03424 Update APP ATC 99 (PJ.02-01)
	APP ATC 169	Approach ATC System to support Optimised Runway Delivery on Approach based on Aircraft ROT categorisation	CR 03506 Create APP ATC 169 (AO-0337 - PJ02-08)
	STD-093	EUROCONTROL Guidelines for Optimised Runway Delivery	CR 03525 Create STD-093 (PJ02-01)

AO-0329		Optimised Separation Delivery for Departure	CR 03433 Update AO-0329 (PJ02-01)
	EN code	EN description	Open CR
	A/C-37a	Downlink of trajectory data according to contract terms (ADS-C) compliant to ATN baseline 2 (FANS 3/C)	
	A/C-47	On-board management of meteorological data from on-board sensors for sharing and integration by ATM and ATM-MET systems	
	APP ATC 99	ATC System to use Real-Time Meteo Information Received From Met Systems	CR 03424 Upd EN with enabling EN
	SWIM-APS-07a	Stakeholder systems consumption of G/G Meteorological Information services	
	AERODROME-ATC-69	ATC system to support optimised departure separation	CR 03243 Update AERODROME-ATC-69 (AO-0329 - PJ02-01)
	AERODROME-ATC-55	Aerodrome ATC System to support Optimised Runway Delivery on Final Approach based on Aircraft ROT categorisation	CR 03413 Update AERODROME-ATC-55 (PJ02-01-PJ02-08)
	AERODROME-ATC-93	Aerodrome ATC system to support optimised runway separation delivery in mixed mode operations	CR 03436 Update AERODROME-ATC-93 (AO-0329 - PJ02-01)

Table 3 : SESAR Solution Overview

3.1.1.1 Focus on Arrivals concept

SESAR Solution ID and Title	Functional Blocks/Role impacted by the SESAR Solution (from EATMA)	Enabler ID (from EATMA)	Enabler Title (from EATMA)	Enabler coverage
PJ02-01: Wake turbulence	Aerodrome Weather Information Management	**STD-066**	**Standard related to weather-dependent separation minima (WDS)**	•

		APP ATC 99	**ATC System to use real time meteo information received from met systems**	• Fully
		METEO-03	**Provision and monitoring of real-time airport weather information, Step 1**	•
		METEO-04b	**Generate and provide MET information services relevant for Airport and final approach related operations, Step 1**	•
	Runway and Taxiway Usage Management	**AERODROME-ATC-17**	Airport ATC tool to support time based separation in final approach	• **Fully**
		AERODROME-ATC-68	**ATC system to support optimized runway delivery on final approach**	• **Fully**

Table 4: SESAR Solution PJ02-01 Scope and related Functional Blocks/roles & Enablers for Arrivals

The applicable roles and responsibilities for the arrivals concepts solutions include:

- Tower ATC Roles
    - Tower ATC Supervisor
    - Tower Runway Controller
- Approach ATC Roles
    - Approach Supervisor
    - Final Approach Controller
    - Intermediate Approach Controller
- Flight Crew Roles
    - Flight Crew
- System Roles
    - Operation Technicians / System Engineers

These roles and the specific/additional role responsibilities are detailed below.

Role	Current Responsibility	Specific/additional role
Tower ATC Supervisor	Has overall responsibility for the planning of the tower operation. Monitors operations. Decides on arrival rates. Decides on staffing and manning of CWPs in accordance with expected traffic demand. Proposes runway configuration. Gives permission for maintenance, etc.	Is aware of the wind conditions, and for determining and deciding on the application (if required) of the arrivals concept (TBS-A, PWS-A, WDS-A) in consultation with the Approach Supervisor. Responsible for ensuring the duty runways-in-use information, and the separation policy information, and planned changes to these, is available, set up, and maintained consistently in the arrival Separation Delivery tool support for Tower ATC. Responsible for ensuring runway conditions, and planned and forecast changes to the runway conditions, are reflected in the separation policy information.
Tower Runway Controller	The Tower Runway Controller is responsible for the provision of air traffic services to aircraft within the control zone, or otherwise operating in the vicinity of controlled aerodromes (unless transferred to Approach Control/ACC, or to the Tower Ground Controller), by issuing clearances, instructions and permission to aircraft, vehicles and persons as required for the safe and efficient flow of traffic.	Uses the Separation Delivery tool to monitor that separation / spacing remain consistent as aircraft descend on final approach, so as to enable timely intervention action to be taken when there is separation infringement. Monitors runway occupancy, and runway conditions, and ensures separation policy is consistently maintained to support the runway conditions, and changes to the runway conditions. Receives, from different sources, and disseminates to the flight deck, critical WT and weather information, when needed.
Approach Supervisor	Plans and monitors operation in the TMA.	Is aware of the wind conditions, and for deciding and agreeing to the application (if required) of the applicable arrivals concept (TBS-A, PWS-A, WDS-A), in consultation with the Tower Supervisor. Responsible for ensuring the duty runways-in-use information, and the separation policy information, and planned changes to these, is available, set up, and maintained consistently in the arrival Separation Delivery tool support for Approach ATC. Responsible for ensuring that flight crew are informed of the application of the applicable arrivals concept (TBS-A, PWS-A, WDS-A), for example, through D-ATIS.

Role	Current Responsibility	Specific/additional role
Final / Intermediate Approach Controller	Are in charge of safe and efficient processing of arrivals to the runway.	Responsible for ensuring that the arrival aircraft information used by the Separation Delivery tool to calculate the TDIs is correct. This includes the arrival sequence order intent, and the flight specific aircraft information such as the aircraft type, the landing speed intent, and in the case of parallel active duty runways-in-use, the landing runway intent of each aircraft. Uses the Separation Delivery tool to ensure final approach separations are set up consistently and efficiently. Uses the Separation Delivery tool to monitor that separations remain consistent as aircraft descend on final approach, so as to enable timely intervention action to be taken when there is separation infringement.
Flight Crew	The Flight Crew remains ultimately responsible for the safe and orderly operation of the flight.	Is aware of the applicable arrivals concept (TBS-A, PWS-A, WDS-A) in operation and the impact on the distance separation set up on final approach. Is informed of when the applicable arrivals concept (TBS-A, PWS-A, WDS-A) is being employed on final approach, for example, through D-ATIS. Reports critical weather and WT information to ATC.
Operation Technicians / System Engineers	Monitors the health of the systems used to provide air traffic control services and restore them in case of failure.	Monitors the health and when necessary, restores the Separation Delivery Tool support, and the associated support tools and system services, such as the glideslope wind conditions service.

Table 5 : Roles and responsibilities for the Arrival concept

3.1.1.2 Focus on Departure concepts

The main FBs impacted by this SESAR Solution are the Departure Separation Management, Operational Supervision Aerodrome ATC and Controller Human Machine Interaction Management Aerodrome ATC.

SESAR Solution ID and Title	Functional Blocks/Role impacted by the SESAR Solution (from EATMA)	Enabler ID (from EATMA)	Enabler Title (from EATMA)	Enabler coverage

PJ02-01: Wake turbulence separation optimization	Departure Separation Management	**AERODROME-ATC-19**	**Runway Usage Management sub-system capable of processing initial departure path wind conditions information**	• Fully
	Controller Human Machine Interaction Management Aerodrome ATC			
	Operational Supervision Aerodrome ATC			
	Departure Separation Management	**AERODROME-ATC-42a**	**Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information**	• Fully
	Departure Separation Management	**AERODROME-ATC-69**	**ATC system to support optimised departure separation**	• Fully
	Controller Human Machine Interaction Management Aerodrome ATC			

Table 6: SESAR Solution PJ02-01 Scope and related Functional Blocks/roles & Enablers for Departures

Mainly, the roles impacted on this solution are the Tower controllers (Tower Runway Controller and Airport Tower Supervisor) and the Flight Crew:

- **Airport Tower Supervisor**: Responsible for ensuring the duty runways-in-use information, and the separation policy information, and planned changes to these, is available, set up, and maintained consistently in the Separation Delivery ATC tool support for Tower ATC (e.g. A-CDM System & DMAN System).

  Responsible for ensuring runway conditions, and planned and forecast changes to the runway conditions, are reflected in the separation policy information.

  Is aware of the wind conditions, and for determining and deciding on the application (if required) of the departures separations solutions concepts (PWS-D, WDS-D) in consultation with the TMA Supervisor or TMA Planner Controller, and the TMA Departure Radar Controller.

  Responsible for ensuring that flight crew are informed of the application of WDS (departures), for example, through D-ATIS.

- **Tower Runway Controller**: Responsible for employing the efficient departure wake separations for enabling the safe and efficient flow of departure traffic.

Uses the Separation Delivery ATC tool support to determine and provide for the safe and efficient flow of departure traffic.

Informs departure aircraft when the WDS (departure) concept is being employed.

Monitors safe separations and the efficient spacing and sequence for departures when using the reduction of WT separations.

Receives, from different sources, and disseminates to the flight deck, critical WT and weather information, when needed.

- **Flight Crew**: Is aware of the applicable concept (PWS-D, WDS-D) in operation and the impact on the time separation and/or distance separation minima set up on climb out on the initial departure path.

  Is informed of when the applicable concept (PWS-D, WDS-D) is being employed on climb-out on the initial departure path, for example, through D-ATIS.

  Reports critical weather and WT information to ATC.

3.1.1.3 Focus on Wake Decay Enhancing

The highest risk of encountering wake vortices prevails during final approach in ground proximity, where the vortices cannot descend below the glide path but tend to rebound because of the interaction with the ground surface. This is aggravated by the fact that the possibilities of the pilot to recover from a vortex encounter are limited by the low flight altitude. In SESAR a method is developed and demonstrated at Vienna International Airport that accelerates wake vortex decay in that critical height range. The installation of so-called plate lines beyond the runway tails may improve safety by reducing the number of wake vortex encounters and increase the efficiency of wake vortex advisory systems as developed within arrival concept solutions. Flight experiments with the DLR research aircraft HALO (Gulfstream G550) at special airport Oberpfaffenhofen demonstrated that the lifetime of the longest lived and thus potentially most hazardous vortex could be reduced by one third.

The individual plates are aligned parallel to the runway direction and are 9 m long and 4.5 m high. A plate line consists of 8 plates with a separation of 20 m. Two plate lines were installed at the tail of runway 16 of Vienna airport. The first plate line was displaced by 400 m from the threshold situated behind the localizer. A second plate line was installed at a distance of 340 m from the first series of plates. The principle of operation of the plates is as follows: while descending the vortices interact with the plates generating secondary vortices that propagate in and against flight direction and accelerate wake vortex decay by interacting with the primary wake vortices.

A measurement campaign was conducted at Vienna airport starting 6 May 2019 and ending in November 2019. The instrumentation comprises three LiDARs for wake vortex measurements supplemented by a suite of advanced meteorological sensors to determine the atmospheric conditions. The analysed measurement data suggests that the plate lines reduce the lifetime of long-lived vortices in a ±50 m safety corridor along the final approach on average by about 30%. A detailed description of the results can be found in Appendix J of the VALR. Capacity gains to be achieved by different arrival concept solutions will be assessed in VLD3.

In PJ02-01 a technical design of the plates that is compatible with airport requirements was elaborated with which approval of authorities for the installation of the plate line was obtained. The considered criteria comprise stability against wake vortices and wind, obstacle clearance, frangibility, interference with the localizer, and visibility of the warning lights. For a permanent installation of the plates a design has been elaborated consisting of aluminium lattice masts grounded with prefab concrete foundations and covered with truck tarpaulin. The masts are compatible with ICAO frangibility requirements and don't perturb the localizer signal. For stability calculations three different sources of maximum wind speeds have been considered: wind forces of wake vortices generated by different aircraft types in ground proximity, the 16 year gust maximum measured at the corresponding runway and the calculation specifications of DIN 1055-4.

Airport Vienna opted, however, to first develop a temporary plate line design that can easily be removed after the measurement campaign. The installation of persistent plates is only foreseen after the safety gains of the plates have been quantified. The temporary plates are folded down out of measurement times. Thus the plates must not withstand strong winds and can be secured on the ground when they are not needed. A safety assessment has been conducted by the EASA Safety- & Compliance Management of Vienna Int. Airport and the Austrian ministry (BMVIT) has approved the installation of the plate lines at runway 16 of Vienna airport.

3.1.1.4 Deviations with respect to the SESAR Solution(s) definition

A CR has been raised in order to amend the textual description of the solution according to the latest status of the S2020 work through CR 03504.

Current description:

> PJ02-01 Solution aims to optimize wake turbulence separation minima for arrivals and departures to enhance airport runway throughput. It focuses on development of:
>
> - wake separations reductions based on weather and static aircraft characteristics;
>
> - separation delivery support tool for ATCOs;
>
> - wake risk monitoring function (ground and airborne);
>
> - wake vortex decay enhancing devices.

Proposed description:

> PJ02-01 Solution aims to optimise wake turbulence separation minima for arrivals and departures to enhance airport runway throughput. It focuses on development of:
>
> - wake turbulence separations based on static aircraft characteristics and weather dependent reductions;
>
> - separation delivery support tools for ATCOs;
>
> - wake risk monitoring function (airborne);
>
> - wake decay enhancing devices.

Besides, there have been some changes regarding to the PJ.02-01 Enablers.

Enabler	Opt/Req	Deviation
APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems	Required	METEO-03 and METEO-04b are set as "enabling" enablers for APP ATC 99. V3 date updated from 8/31/2019 to new 3/3/2020.
PJ.02-01_Wake Turbulence Separation Optimization	Required	
AIRPORT-08_Decay Enhancing Devices	Optional	V3 date updated from 8/31/2019 to new 3/3/2020.
APP ATC 118_ATC System to support static pair-wise wake separation (S-PWS) on approach	Required	Enabler title changed from "*ATC System to Support Pairwise Separation in Specific Conditions based on static parameters*" to "*ATC System to support static pair-wise wake separation (S-PWS) on approach*".
APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach	Required	V4 Updated
METEO-03_Provision and monitoring of real-time airport weather information (PCP)	Required	V4, V5, IOC and FOC dates Updated
METEO-04b_Generate and provide MET information services relevant for Airport and final approach related operations (PCP)	Required	V4, V5, IOC and FOC dates Updated
METEO-05b_Generate and provide MET information relevant for TMA and En-route related operations (PCP)	Required	V4, V5, IOC and FOC dates Updated
APP ATC 169_Approach ATC System to support Optimised Runway Delivery on Approach based on Aircraft ROT categorisation	Optional	CR 03506 pending for the creation of APP ATC 169
STD-093_EUROCONTROL Guidelines for Optimised Runway Delivery	Required	CR 03525 pending for the creation of STD-093

Table 7 : Deviations from SESAR Solution

Apart from these changes, the proper updates regarding the Enablers links to EATMA elements have been done based on the Architecture and modelling developed.

3.1.1.5 Relevant Use Cases

This section lists and describes the relevant operational Use cases covered in this solution

Operational Use Case	Description
[NOV-5][ARR-01] Airport Operational Scenario Planning Phase for PWS, WDS and ORD for Arrivals (ORD, PWS-A, WDS-A)	This Use Case takes place in the planning or tactical execution phase. It describes the coordination workflow and exchanges between ATC supervisors (Tower and Approach) and Controllers when a scenario change is detected. The following scenarios change are identified: - Conditional usage of WDS, based on nowcast and forecast weather conditions - Degraded mode of operations, where the ATCO Separation Delivery Tool or supporting services like GWCS are no longer suitable for operations. Other specific non-nominal/alternative flows in addition to the cases mentioned above (e.g. planned or unplanned change of runway in-use) are detailed in the SESAR1 OFA01.03.01 Enhanced Runway Throughput OSED. The use case starts when the Tower or Approach Supervisor identifies the need for a change in the scenario. The nominal flow ends when the new scenario is implemented. General Conditions (Scope and Summary) Approach and Tower controllers make use of ORD and related SESAR1 and SESAR2020 concepts (e.g. TBS-A, PWS-A, WDS-A) as described in [NOV-5] [ARR-02]. Approach and Tower Supervisors put in place a coordination process that can lead to the following scenarios change: - Conditional usage of WDS, based on nowcast and forecast weather conditions - Degraded mode of operations, where the ATCO Separation Delivery Tool or supporting services like GWCS are no longer suitable for operations. Pre Conditions The Separation Delivery tool and all applicable alerting / monitoring tools are operational. The GWCS is operational. The Approach Arrival Sequence Service is operational. Post Conditions Post conditions are depending on the change scenario implemented: WDS

	The Approach and Tower Supervisors have coordinated the activation/deactivation of the WDS-A concept considering the current wind conditions (and coordinated with the MET service if needed). Degraded Mode The Approach and Tower Supervisors have coordinated the reversion to DBS with or without TDI. The Separation Delivery tool and/or all applicable alerting / monitoring tools and/or GWCS and/or Approach Arrival Sequence Service are no longer operational. For all the scenarios changes an updated flow of arrival aircraft for the aerodrome into the TMA is established. The new flow matches the runway capacity in the prevailing operating conditions. 1.
[NOV-5][ARR-02] Airport Operational Scenario Execution Phase for PWS, WDS and ORD for Arrivals (ORD, PWS-A, WDS-A)	This use case takes place in the execution phase. It describes the operational flow involved in sequencing and delivering arrival aircraft on the approach phase with an Optimised Runway Delivery (ORD) Separation tool, which is available for Approach and Tower Control use. This ORD tool computes two indicators on the HMI (Initial and Final Target Distance Indicators -ITD, FTD-). Indicators are computed according to the different SESAR1 and SESAR2020 concepts which are applied (e.g. ORD, TBS, PWS-A, and/or WDS-A). The use case starts when the flight enters the TDI Area (taking into account that the Flight Deck has prepared and briefed the approach at the end of cruise). The nominal flow ends when the aircraft has landed. General Conditions (Scope and Summary) This Use Case describes the steps involved in sequencing and delivering arrival aircraft using the applicable SESAR1 and SESAR2020 concepts (e.g. TBS, PWS-A, ORD and / or WDS-A) on final approach with the aid of TDIs displayed on the extended runway centreline of the Final Approach Controller radar display and Tower Runway Controller air traffic monitor display. This Use Case takes place from the arrival aircraft entering the TDI area until the arrival aircraft lands and vacates the runway. The Approach Operations in this Use Case are equipped with (some are optional subject to a local safety case): · Separation Delivery tool; · Approach Arrival Sequence Service;

	· Approach Arrival Sequence Display; · Wrong aircraft turned on TDI alert; · Aircraft turned onto wrong localiser; · Speed conformance alert; · ITD catch-up alert; · Separation Delivery tool monitor; · GWCS monitor; · Approach Arrival Sequence monitor; · GWCS and distance display; · Wind monitor / alert; The Tower Operations in this Use Case are equipped with (some are optional subject to a local safety case): · Separation Delivery tool; · Approach Arrival Sequence Display; · Speed conformance alert; · ITD catch-up alert; · Separation Delivery tool monitor; · GWCS monitor; · Approach Arrival Sequence monitor. Pre Conditions Airport Medium / Short Term Planning and Demand and Capacity Balancing have established a flow of arrival aircraft for the aerodrome into the TMA that matches the runway capacity in the prevailing operating conditions. The approach arrival sequence into the IAFs is optimised as far as reasonable and if applicable is reflected in the AMAN. The Separation Delivery tool and all applicable alerting / monitoring tools are operational. The GWCS is operational. The Approach Arrival Sequence Service is operational. If applicable, the Approach and Tower Supervisors have coordinated the activation of the concept (TBS-A or WDS-A) considering the current wind conditions (and coordinated with the MET service if needed). The Flight Crew are aware that an alternative WT scheme (TBS-A, PWS-A or WDS-A) is being employed on final approach through notification via the Aeronautical Information Publication (AIP), the pre-departure briefing, the top of descent briefing, and from the D-ATIS notification as the aircraft enters the TMA. The Flight Crew establish the landing stabilisation speed required for the landing weight, cockpit stabilisation procedures including approach flap setting, and D-ATIS

	reported runway surface wind conditions soon after the aircraft enters the TMA. The Flight Crew are aware of the runway in use and the approach type. Post Conditions The arrival aircraft has landed and vacated the runway. Actors Approach Supervisor, Tower Supervisor, TMA Sector Controllers, Intermediate Approach Controller, Final Approach Controller, Tower Runway Controller, Flight Crew. Trigger Coordination of an arrival aircraft into the assigned IAF is initiated between the TMA Sector Controller and the Intermediate Approach Controller.
[NOV-5][MIX-01] Airport Operational Scenario Planning Phase for PWS, WDS and ORD for Arrivals - Mixed Mode (ORD, PWS-A, WDS-A)	This Use Case takes place in the planning or tactical execution phase. It describes the coordination workflow and exchanges between ATC Supervisors (Tower and Approach) and Controllers when a scenario change is detected. The following scenarios change are identified: - Mix Mode of operations, applying tactical or planned specific scenario spacing (GAP management) - Degraded mode of operations, where the ATCO Separation Delivery Tool or supporting services like GWCS are no longer suitable for operations. Other specific non-nominal/alternative flows in addition to the cases mentioned above (e.g. planned or unplanned change of runway in-use) are detailed in the SESAR1 OFA01.03.01 Enhanced Runway Throughput OSED. The use case starts when the Tower or Approach Supervisor identifies the need for a change in the scenario. The nominal flow ends when the new scenario is implemented. General Conditions (Scope and Summary) Approach and Tower Controllers make use of ORD and related SESAR1 and SESAR2020 concepts (e.g. TBS-A, PWS-A) as described in [NOV-5] [ARR-02]. Approach and Tower Supervisors put in place a coordination process that can lead to the following scenarios change: - Mix Mode of operations, applying tactical or planned specific scenario spacing (GAP management)

	- Degraded mode of operations, where the ATCO Separation Delivery Tool or supporting services like GWCS are no longer suitable for operations. Pre Conditions The Separation Delivery tool and all applicable alerting / monitoring tools are operational. The GWCS is operational. The Approach Arrival Sequence Service is operational. Post Conditions Post conditions are depending on the change scenario implemented: Mix Mode The Approach and Tower Supervisors have coordinated the application of specific scenario spacing. Degraded Mode The Approach and Tower Supervisors have coordinated the reversion to DBS with or without TDI. The Separation Delivery tool and/or all applicable alerting / monitoring tools and/or GWCS and/or Approach Arrival Sequence Service are no longer operational. For all the scenarios changes an updated flow of arrival aircraft for the aerodrome into the TMA is established. The new flow matches the runway capacity in the prevailing operating conditions. 1.
[NOV-5][MIX-02] Airport Operational Scenario Execution Phase for PWS, WDS and ORD for Arrivals - Mixed Mode (ORD, PWS-A, WDS-A)	This use case takes place in the execution phase. It describes the operational flow involved in sequencing and delivering arrival aircraft on the approach phase with an Optimised Runway Delivery (ORD) Separation tool and the applicable SESAR1 and SESAR2020 concepts (e.g. TBS, PWS-A, and /or WDS-A) including additional specific spacing requests previously coordinated by Approach and Tower Supervisors in the [NOV-5][MIX-01] Use Case. Spacing requests are called GAP in the Use Case. The use case starts when the flight enters the TDI Area (taking into account that the Flight Deck has prepared and briefed the approach at the end of cruise). The nominal flow ends when the aircraft has landed. General Conditions (Scope and Summary) As per [NOV-5] [ARR-02].

	Pre Conditions As per [NOV-5][ARR-02] In addition the Approach and Tower Supervisors have coordinated the provision of scenario specific spacing (GAP) between two or more aircraft and they agreed on the position in the sequence (see [NOV-5] [MIX-01]). Post Conditions The arrival aircraft after the spacing has landed and vacated the runway. The aircraft(s) planned for departure within the arrival sequence has been cleared for take-off
[NOV-5][DEP-01] Airport Operational Scenario Execution Phase for Optimised Separation Delivery (OSD) for Pairwise Separation for Departures (PWS-D) and Weather Dependent Separation for Departures (WDS-D)	General Conditions (Scope and Summary) This Use Case describes in detail the steps involved for the Optimised Separation Delivery (OSD) for Pairwise Separation for Departures (PWS-D) and Weather Dependent Separation for Departures (WDS-D) Pre Conditions The OSD or Enhanced OSD system support is deployed and available for supporting PWS-D and WDS-D respectively. The OSD or Enhanced OSD system support is configured to support applying PWS-D and WDS-D respectively and optionally SID route separations and possibly MDI and ADI dependent on local requirements. The OSD or Enhanced OSD system support is being provided with the high integrity departure sequence take-off order on the runway. The OSD or Enhanced OSD system support is being provided with the ““airborne time”” or the ““start of take-off roll time”” for each departure aircraft dependent on local procedures. The OSD or Enhanced OSD system support is being provided with high integrity aircraft type and wake category information for each departure aircraft. The OSD or Enhanced OSD system support is being provided with high integrity SID route information for each departure aircraft. The OSD or Enhanced OSD system support is being informed of departure aircraft taking off from an intermediate position. The OSD or Enhanced OSD system support, dependent on local procedures, is being informed of departure aircraft requesting that the RECAT-EU or the ICAO wake separation be applied. In the local case of supporting distance-based separation for departures, the required wind conditions service over each of the SID routes from the initial airborne positions to the maximum ““Required Minimum Distance Spacing”” is deployed and available for supporting the calculation of the position of

	the ““Required Minimum Distance Spacing Arc”” by the OSD or Enhanced OSD system support. The A-CDM System and DMAN System have been configured to take into account the PWS-D and WDS-D wake separation rules that are being applied so that an appropriate pressure of departure aircraft with an appropriately optimised departure sequence order is delivered to the departure holding points for the departure runway-in-use. The Flight Crew have been informed that the PWS-D and WDS-D wake separation rules are being applied and have been fully briefed and aware of the PWS-D and WDS-D wake separation rules. Post Conditions The departure aircraft has been delivered with optimised separation to the TMA Departure Radar Controller. Actors Tower Runway Controller, Flight Crew, TMA Departure Radar Controller. Trigger Departure aircraft at or approaching the runway holding points, and have contacted the Tower Runway Controller.
[NOV-5][DEP-02] Airport Operational Scenario Execution Phase for Transitioning to and from Weather Dependent Separation for Departures (WDS-D)	General Conditions (Scope and Summary) This Use Case describes in detail the steps involved for transitioning to and from Weather Dependent Separation for Departures (WDS-D). {Pre Conditions} The WDS-D system support is deployed and available for supporting WDS-D. The required wind conditions service over the straight-out initial departure path from becoming airborne to the first SID turn is deployed and available for supporting WDS-D for each departure runway. The Tower Supervisor and Approach Supervisor have coordinated tactically about departure rates when WDS-D reduced wake separations can be applied. The Tower Supervisor and Tower Runway Controller have coordinated when WDS-D reduced wake separations are to be applied taking into account the wind information. The Flight Crew are aware of the operation of the WDS-D reduction of wake turbulence separations, and have been fully briefed and aware of the WDS-D wake separation rules. Post Conditions The WDS-D system support has correctly indicated whether the WDS reduced wake separations can be applied. Actors

	Tower Supervisor, Tower Runway Controller, Flight Crew, TMA Departure Radar Controller, Approach Supervisor. Trigger The wind condition information over the initial departure path for the departures runway is available for determining whether or not the WDS-D reduced wake separations can be applied.
[NOV-5][WDE-01] Airport Operational Scenario Execution Phase for Wake Decay Enhancing Devices	Plate lines constitute a passive, robust and relatively inexpensive method to increase safety and potentially also airport capacity by accelerating the decay of the longest lived and thus most critical wake vortices during final approach. While descending the vortices interact with the plates generating disturbances that propagate both in and against flight direction. These disturbances reduce the lifetime of the longest lived and potentially most hazardous wake vortices by at least 20%. The devices do neither require any procedural changes nor human activities. They just need to be installed at the runway ends and will accelerate wake vortex decay by interaction with the wake vortices during their descent and divergence. Crosswinds below 2 m/s combined with tailwinds and low turbulence conditions favour long-lived wake vortices lingering in the flight track of a follower aircraft. Exactly in this critical situation the plate lines are advantageous by accelerating wake vortex decay and thus increasing safety. After approval of the authorities two temporary plate lines are installed at Vienna airport that will be removed after the completion of the live trial. During the six-month measurement campaign three LiDARs will be used to measure the wake vortex behaviour in five measurement planes situated aloft and next to the plate lines. The accelerated wake vortex decay will be quantified by comparing the strength of the most long-lived wake vortices with and without plate lines within suitable weather classes and aircraft type classes. A cost-benefit analysis will demonstrate whether the achieved safety gain may justify the installation of permanent plate lines. After the development of a technical plate line design for permanent installation that is compatible with airport requirements (e.g. stability, frangibility) and the required approval of authorities, plate lines can be readily installed at airports. Based on the measurement data the potential reduction of separation minima will be assessed for the arrival concepts WDS, S-PWS and dynamic pairwise separations in future wake turbulence separation optimisation research.
[NOV-5][WRM-01] Airport	The Wake Risk Monitoring tool is used for monitoring of the impact on wake turbulence encounter risk as a result of

Operational Scenario Execution Phase for Wake Risk Monitoring	introducing wake turbulence separation optimisation regulations at a given aerodrome to ensure continued safety after their introduction. The tool collects in-flight data from aircraft in operation and analyses it to identify possible wake turbulence encounters. If wake encounters are found, a corresponding wake risk report is created containing relevant data. The analysis carried out by the tool also supports crosschecking with wake encounter reports submitted by Flight Crew or Air Traffic Controllers. In case the analysis over an extended time frame suggests an unacceptable increase in wake encounter risk, corrective actions may be taken by the involved stakeholders.

Table 8 : Relevant Use Cases - NOVs

System Process	Description
[NSV-4][ARR-02] Airport Operation Scenario for PWS, WDS and ORD for Arrivals (PWS-A, WDS-A and ORD)	
[NSV-4][ARR/MIX-01] Airport Operational Scenario Planning Phase for PWS, WDS and ORD for Arrivals or Mix-mode (ORD, PWS-A, WDS-A)	
[NSV-4][DEP-01] Airport Operational Scenario Execution Phase for Optimised Separation Delivery (OSD) for Pairwise Separation for Departures (PWS-D) and Weather Dependent Separation for Departures (WDS-D)	This NSV-4 reflects the Use Case [DEP-01] Airport Operational Scenario Execution Phase for Optimised Separation Delivery (OSD) for Pairwise Separation for Departures (PWS-D) and Weather Dependent Separation for Departures (WDS-D).
[NSV-4][DEP-02] Airport Operational Scenario Execution Phase for Transitioning to and from Weather Dependent Separation for Departures (WDS-D)	This diagram reflects the technical layer of the Use Case [DEP-02] Airport Operational Scenario Execution Phase for Transitioning to and from Weather Dependent Separation for Departures (WDS-D)
[NSV-4][MIX-02] Airport Operational Scenario Execution Phase for PWS, WDS and ORD for Arrivals - Mixed Mode (ORD, PWS-A, WDS-A)	
[NSV-4][WDE-01] Airport Operational Scenario Execution Phase for Wake Decay Enhancing Devices	
[NSV-4][WRM-01] Airport Operational Scenario Execution Phase for Wake Risk Monitoring	

Table 9 : Relevant Use Cases – NSVs

3.1.1.5.1 Relevant Use Cases for Departure concept solutions

This section describes how relevant use cases are addressed for departure concept

A technical architecture has been developed in order to cover the following use cases mentioned in the SPR-INTEROP/OSED [39].

[NOV-5] [DEP-01] / Airport Operational Scenario Execution Phase for Optimised Separation Delivery (OSD) for Pairwise Separation for Departures (PWS-D) and Weather Dependent Separation for Departures (WDS-D)
[NOV-5] [DEP-02] / Airport Operational Scenario Execution Phase for Transitioning to and from Weather Dependent Separation for Departures (WDS-D)

With the two following Technical Use Cases, all the relevant operational Use Cases are covered:

[NSV-4][DEP-01] Airport Operational Scenario Execution Phase for Optimised Separation Delivery (OSD) for Pairwise Separation for Departures (PWS-D) and Weather Dependent Separation for Departures (WDS-D)

The system process for the Optimised Separation Delivery (OSD) for Pairwise Separation for Departures (PWS-D) and Weather Dependent Separation for Departures (WDS-D) is described.

The preconditions are the following:

- The OSD or Enhanced OSD system support is deployed and available for supporting PWS-D and WDS-D respectively.
- The OSD or Enhanced OSD system support is configured to support applying PWS-D and WDS-D respectively and optionally SID route separations and possibly MDI and ADI dependent on local requirements.
- The OSD or Enhanced OSD system support is being provided with the high integrity departure sequence take-off order on the runway.
- The OSD or Enhanced OSD system support is being provided with the “airborne time” or the “start of take-off roll time” for each departure aircraft dependent on local procedures.
- The OSD or Enhanced OSD system support is being provided with high integrity aircraft type and wake category information for each departure aircraft.
- The OSD or Enhanced OSD system support is being provided with high integrity SID route information for each departure aircraft.
- The OSD or Enhanced OSD system support is being informed of departure aircraft taking off from an intermediate position.
- The OSD or Enhanced OSD system support, dependent on local procedures, is being informed of departure aircraft requesting that the RECAT-EU or the ICAO wake separation be applied.
- In the local case of supporting distance-based separation for departures, the required wind conditions service over each of the SID routes from the initial airborne positions to the maximum “Required Minimum Distance Spacing” is deployed and available for supporting the calculation of

the position of the “Required Minimum Distance Spacing Arc” by the OSD or Enhanced OSD system support.

- The A-CDM System and DMAN System have been configured to take into account the PWS-D and WDS-D wake separation rules that are being applied so that an appropriate pressure of departure aircraft with an appropriately optimised departure sequence order is delivered to the departure holding points for the departure runway-in-use.

- The Flight Crew have been informed of the PWS-D and WDS-D wake separation rules are being applied and have been fully briefed and aware of the PWS-D and WDS-D wake separation rules.

The triggering event for the process is the giving of the line-up clearance to the next aircraft. Depending on the local procedures, either the clearance is given to the next aircraft in the sequence, or when the departure clearance is issued with the line-up clearance, it is added to the departure take-off sequence.

Once the departure aircraft is issued with the line-up clearance, the OSD tool calculates the separation with respect to the lead aircraft that is required to be delivered, either in terms of time or distance, depending on the mode that is being applied.

The local procedures determine both the local wake separation procedures and the associated local controller workstation positions support and local surveillance based automatic monitoring support.

The local wake separation procedures determine what event information is required by the OSD tool:

- ‘Airborne Time’ wake separation procedures require notification of ‘Airborne Time’ of the preceding departure aircraft to enable OSD calculation of the NBAT for the follower departure aircraft. Notification of the ‘Start of Take-Off Roll’ of the preceding departure aircraft may also be required to inform the OSD tool of when to start calculating the wake separation time to the follower departure aircraft.
- ‘Take-Off Roll Time’ wake separation procedures require notification of the ‘Start of Take-Off Roll Time’ of the preceding departure aircraft to enable OSD calculation of the NBTOT for the follower departure aircraft
- All wake separation procedures (Time and Distance) require notification of when a departure aircraft is populated into the departure take-off sequence in order for the OSD tool to start the consideration of when to start calculating the wake separation and associated support to be provided to the departure runway controller.

The associated local controller workstation support determines whether the event information is provided from the electronic environment actions of the departure runway controller; for example when the departure aircraft electronic flight progress strip is moved to the runway bay when issued clearance to line-up and moved to the airborne bay when visually confirmed as airborne.

The associated local surveillance based automatic monitoring support determines whether there is automatic monitoring for when each departure aircraft begins to line-up and the associated line-up position, when each departure aircraft commences their start of take-off roll, and when each departure aircraft becomes airborne.

For the calculation of the separation, the OSD tool takes into account both aircraft types (leader and follower), the corresponding wake separation, SID separation, Minimum Radar Separation and any other separation that could be constraining.

The OSD tool considers the most restrictive separation amongst the ones aforementioned and calculates either the preceding aircraft earliest position to issue the take-off clearance (which is shown as a DDI-D) or the earliest take-off clearance time (which could be shown as the NBAT or the NBTOT).

The Tower Runway Controller is provided with this information and waits until:

- The preceding aircraft passes the earliest distance position DDI-D (in distance mode), or;
- The earliest take-off time passes (in time mode)
    - NBTOT is achieved
    - (NBAT – Anticipated Take-Off Roll Time) is achieved

Once the take-off clearance has been issued, the Tower Runway Controller monitors and record the roll time, the aircraft becoming airborne and transfers the flight to the TMA Departure Controller.

[NSV-4][DEP-02] Airport Operational Scenario Execution Phase for Transitioning to and from Weather Dependent Separation for Departures (WDS-D)

The steps involved for transitioning to and from Weather Dependent Separation for Departures (WDS-D are described.

The preconditions are the following:

- The WDS-D system support is deployed and available for supporting WDS-D.

- The required wind conditions service over the straight-out initial departure path from becoming airborne to the first SID turns is deployed and available for supporting WDS-D for each departure runway.

- The Tower Supervisor and Approach Supervisor have coordinated tactically about departure rates when WDS-D reduced wake separations can be applied.

- The Tower Supervisor and Tower Runway Controller have coordinated when WDS-D reduced wake separations are to be applied taking into account the wind information.

- The Flight Crew are aware of the operation of the WDS-D reduction of wake turbulence separations, and have been fully briefed and aware of the WDS-D wake separation rules.

The wind data are provided by Aerodrome ATM-MET to the system through service MET for WTS created by PJ.18-04b. The data consists presumably of wind speed and direction. The OSD tool assesses whether the wind is above or below predefined thresholds, in other words, if conditions are sufficient to apply the WDS-D Xw concept reduced wake separation.

- The OSD tool proposes the activation of WDS-D Xw mode in case the wind conditions are sufficient and the mode is not active. The Tower Supervisor assesses the proposal and decides whether to

switch the mode status to active or not. If rated so, the Supervisor authorises the WDS-D mode and the OSD tool takes into account WDS-D rules.

- The OSD tool de-activates the WDS-D Xw mode in case it detects that the wind conditions have fallen under thresholds and the reduced separations are no longer applicable. Controllers are hence de-authorised to use the WDS-D mode.

- The OSD tool does not change the WDS-D mode status if conditions remain the same as they were in terms of WDS-D Xw concept reduced wake separations applicability.

Controllers are always informed about the WDS-D status in order to maintain situation awareness.

3.1.1.5.1.1 Trace Relevant UC and Technical Models

Table hereunder show the trace of the Technical Use cases developed in the validation against the Operational Use Cases from PJ.02-01 SPR/INTEROP-OSED [39].

Operational Use Case	Related Technical Model
[NOV-5] [DEP-01] Airport Operational Scenario Execution Phase for Optimised Separation Delivery (OSD) for Pairwise Separation for Departures (PWS-D) and Weather Dependent Separation for Departures (WDS-D)	**[NSV-4] [DEP-01] Airport Operational Scenario Execution Phase for Optimised Separation Delivery (OSD) for Pairwise Separation for Departures (PWS-D) and Weather Dependent Separation for Departures (WDS-D)**
[NOV-5] [DEP-02] Airport Operational Scenario Execution Phase for Transitioning to and from Weather Dependent Separation for Departures (WDS-D)	**[NSV-4] [DEP-02] Airport Operational Scenario Execution Phase for Transitioning to and from Weather Dependent Separation for Departures (WDS-D)**

Table 10 : Trace Relevant Operational UC and Technical Models for Departures

3.1.1.5.2 Relevant Use cases for Wake risk monitoring

Wake turbulence detection & monitoring

Identifier	Description	Type
Use Case 01	Continuous analysis of aircraft operational data to identify wake turbulence encounters	Nominal
Use Case 02	Localized monitoring of wake turbulence encounters after introduction of solution 02.01 concepts at an aerodrome	Nominal
Use Case 03	Analysis of pilot/airline-reported wake turbulence encounters	Nominal

3.1.1.5.3 Relevant Use Cases for Wake Decay Enhancing

The primary purpose of the plate lines is to accelerate wake vortex decay of the longest lived and potentially most dangerous wake vortices in the flight phase where most encounters occur. First of all the plates may reduce the frequency of encounters during landing and thus contribute to increasing the safety

level. Thus the plate lines can be considered as a device that may compensate increased encounter risks brought along by reduced separations of landing aircraft. Moreover, a fraction of those safety gains could also be used to increase capacity gains that can be achieved by optimizing separations of landing aircraft.

3.1.1.6 Applicable standards and regulations

3.1.1.6.1 For Wake Decay Enhancing

The plates have to comply with the frangibility requirements of ICAO Annex 14 and the Aerodrome Design Manual, Part 6: Frangibility. Comprehensive documentation of the beneficial effects of the plate lines has been elaborated to form the basis for the preparation of regulations to be endorsed by competent authorities.

3.1.2 Capability Configurations required for the SESAR Solution

Wake Turbulence Separation Optimization (ARR)				
CC	**Op Env**	**Capability**	**Node**	**Stakeholder**
Aerodrome ATM-MET (PJ.18-04b)	Airport;	Aeronautical and Meteorological Information Management; Meteorological Observation and Forecasting Provision;	Meteorological Service Provision;	Civil MET Service Provider; Military MET Service Provider;
APP ACC (PJ.02-01)			Air Traffic Flow and Capacity Management; Airspace Management; Airspace Organisation; En-Route/Approach ATS;	Civil ATS Approach Service Provider;
Civil Aircraft		Adverse Condition Operations Provision; ATSAW-Spacing Monitoring Execution; Clearance/Instruction Management; CTA/CTO Management; Ground Collision Avoidance; Interval Management (IM);	Airspace User Operations; Flight Deck;	Civil Scheduled Aviation;

		Meteorological Observation and Forecasting Provision; Mid-Air Collision Avoidance; Optimised Climb Execution; Optimised Descent Execution; Optimised Take-Off / Landing Execution; PinS Operations Execution; RNP based Operations Execution; Separation Technique Management; Surface Route Management; Trajectory Information Synchronisation; Trajectory Revision in Execution; Wake Turbulence Separation Provision;		
Communication Infrastructure		Airport Operations Management;	Aerodrome ATS;	Civil CNS Service Provider; Military CNS Service Provider;
TWR (PJ.02-01)			Aerodrome ATS; Network Operations;	Civil ATS Aerodrome Service Provider; Military ATS Aerodrome Service Provider;

Table 11 : Capability Configurations - Arrivals

Wake Turbulence Separation Optimization (DEP)		Airport		
CC	**Op Env**	**Capability**	**Node**	**Stakeholder**
Civil Aircraft		Adverse Condition Operations Provision; ATSAW-Spacing Monitoring Execution; Clearance/Instruction Management; CTA/CTO Management; Ground Collision Avoidance;	Airspace User Operations;	Civil Scheduled Aviation;

		Interval Management (IM); Meteorological Observation and Forecasting Provision; Mid-Air Collision Avoidance; Optimised Climb Execution; Optimised Descent Execution; Optimised Take-Off / Landing Execution; PinS Operations Execution; RNP based Operations Execution; Separation Technique Management; Surface Route Management; Trajectory Information Synchronisation; Trajectory Revision in Execution; Wake Turbulence Separation Provision;	Flight Deck;	
Communication Infrastructure		Airport Operations Management;	Aerodrome ATS;	Civil CNS Service Provider; Military CNS Service Provider;
TWR (PJ.02-01)			Aerodrome ATS; Network Operations;	Civil ATS Aerodrome Service Provider; Military ATS Aerodrome Service Provider;

Table 12 : Capability Configurations - Departures

Wake Turbulence Separation Optimization for Wake Risk Monitoring and Wake Decay Enhancing Devices				
CC	**Op Env**	**Capability**	**Node**	**Stakeholder**
Airport		Adverse Condition Operations Provision; Air Traffic Flow Management; Airport Capacity Information Provision (incl. Capacity Changes); Airport Operations Management;	Airport Operations; Airport Ops Support; Airport	Civil APT operator; Military APT

		ATC Team Resource Management; Surface Guidance Provision; Surface Route Management; Trajectory Management; User Driven Prioritisation Process;	Vehicle; Network Operations;	operator;
Civil Aircraft		Adverse Condition Operations Provision; ATSAW-Spacing Monitoring Execution; Clearance/Instruction Management; CTA/CTO Management; Ground Collision Avoidance; Interval Management (IM); Meteorological Observation and Forecasting Provision; Mid-Air Collision Avoidance; Optimised Climb Execution; Optimised Descent Execution; Optimised Take-Off / Landing Execution; PinS Operations Execution; RNP based Operations Execution; Separation Technique Management; Surface Route Management; Trajectory Information Synchronisation; Trajectory Revision in Execution; Wake Turbulence Separation Provision;	Airspace User Operations; Flight Deck;	Civil Scheduled Aviation;
Civil AU Operations Centre		Air Traffic Flow Management; Collaborative Trajectory Planning; Trajectory Information Synchronisation; User Driven Prioritisation Process;	Airspace User Ops Support; Flight Deck;	

Table 13 : Capability Configurations - Wake Risk Monitoring

3.1.2.1 Capability configurations required for Departure concepts

In the table below, list the Capability Configurations (CCs) required by the SESAR Solution, the relevant (sub)-Operating Environments where the CCs operate, and the links between CCs and Capabilities, Nodes and Stakeholders.

SESAR Solution ID and Title	Capability Configurations (CCs) (from EATMA)	Sub-Operating Environment(s) where the CCs operate	Capabilities (from EATMA)	Nodes (from EATMA)	Stakeholders (from EATMA)

PJ02-01: Wake turbulence separation optimization	TWR	TMA High Complexity TMA Medium Complexity Airport High Utilisation Complex Layout Airport High Utilisation Simple Layout	Separation Provision Spacing Meteorological Information Provision	Aerodrome ATS	ANSPs
	Civil Aircraft			Flight Deck	Airspace Users

Table 14 : List of Capability Configuration required for the SESAR Solution PJ02-01 Departures

Aerodrome ATM-MET (PJ.18-04b) CC is not directly impacted by the SESAR Solution, but is responsible for providing the MET for WTS service to TWR CC.

3.2 Changes imposed by the SESAR Solution on the baseline Architecture

Enabler	Element type	Element name	Impact	Change
APP ATC 118 (CR)	ATC System to support static pair-wise wake separation (S-PWS) on approach			
	Function	Compute TDI	Update	
	Function	Display Approach applicable separation	Update	
	Function	Display TDI	Update	
	Function	Manage Inputs	Update	
	Function	Record Inputs	Update	
	Function	Support Traffic Separation	Update	
A/C-30c (CR)	On-board Detection of Wake Turbulence Encounters			
	Function	Record Flight Parameters	Introduce	Aircraft need to be able to provide data for use by the Wake Risk Monitoring tool.
	Function	Transmit Flight Data for Wake Encounter Monitoring	Introduce	Aircraft need to be able to provide data for use by the Wake Risk Monitoring tool.

AERODROME-ATC-68 (CR)	ATC System to support Optimised Runway Delivery on Final Approach			
	Function	Display applicable separation	Update	
	Function	Support Final Approach Traffic Spacing	Update	
APP ATC 120 (CR)	ATC System to support Optimised Runway Delivery on Final Approach			
	FB	Approach Traffic Separation (PJ.02-01)	Introduce	This FB computes the applicable separation between arrivals according to an ICAO-based or RECAT-EU based separation scheme.
	Function	Compute TDI	Update	
	Function	Display Approach applicable separation	Update	
	Function	Display TDI	Update	
	Function	Manage Inputs	Update	
	Function	Record Inputs	Update	
	Function	Support Traffic Separation	Update	
AERODROME-ATC-19 (CR)	Runway Usage Management sub-system capable of processing initial departure path wind conditions information			
	Function	Assess WDS-D Status	Introduce	
	Function	Assess Wind	Update	
	Function	Authorise WDS-D	Introduce	
	Function	De-authorise WDS-D	Introduce	
	Function	Deactivate WDS-D	Introduce	
	Function	Display WDS-D Activation Proposal	Introduce	
	Function	Display WDS-D Status	Introduce	
	Function	Display Wind Conditions	Update	
	Function	Propose WDS-D Application	Introduce	
	Function	Receive WDS-D Authorisation/De-authorisation	Introduce	
AERODRO	Airport ATC tool to support static pair-wise wake separation (S-PWS) in final approach			

ME-ATC-42a (CR)				
	Function	Display applicable separation	Update	
	Function	Support Final Approach Traffic Spacing	Update	
AERODROME-ATC-69 (CR)	ATC system to support optimised departure separation			
	Function	Apply WDS-D mode	Introduce	
	Function	Calculate DDI-D for the SID Separation and MRS (if these are supported)	Introduce	
	Function	Calculate NBAT (for the WST)	Introduce	
	Function	Calculate NBAT for the SID Separation and MRS (if these are supported)	Introduce	
	Function	Calculate NBTOT (for the WST)	Introduce	
	Function	Calculate NBTOT for the SID Separation and MRS (if these are supported)	Introduce	
	Function	Determine the Largest DDI-D	Introduce	
	Function	Determine the Largest NBAT	Introduce	
	Function	Determine the Largest NBTOT	Introduce	
	Function	Display WSD and DDI-D Information	Introduce	
	Function	Display WST and NBAT/NBTOT Information	Introduce	
	Function	Not Apply WDS-D Mode	Introduce	
APP ATC 99 (CR)	ATC System to use Real-Time Meteo Information Received From Met Systems			
	Function	Compute TDI	Update	
	Function	Display Wind Conditions	Introduce	
	Function	Manage Inputs	Update	
	Function	Record Inputs	Update	
	Function	Support Traffic Separation	Update	

AERODROME-ATC-42b (CR)	Airport ATC tool to support static pair-wise wake separation (S-PWS) for departure operations			
	FB	Departure Separation Management (PJ.02-01)	Introduce	This FB computes the applicable separation between departures according to a Static Pair-Wise separation scheme.
	Function	Display WSD and DDI-D Information	Introduce	
	Function	Display WST and NBAT/NBTOT Information	Introduce	
AIRPORT-08 (CR)	Decay Enhancing Devices			
	Function	Analyse Wake Vortex Decay Data	Introduce	
	Function	Measure Wake Vortex	Introduce	
	Function	Provide Wake Vortex Decay Data	Introduce	
APP ATC 74 (CR)	ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach			
	Function	Compute TDI	Update	
	Function	Display Approach applicable separation	Update	
	Function	Display TDI	Update	
	Function	Manage Inputs	Update	
	Function	Record Inputs	Update	
	Function	Support Traffic Separation	Update	

Table 15 : Changes on the baseline PJ.02-01 Architecture

The table hereunder describes the changes imposed on Departure concepts

Enabler ID (from EATMA)	Enabler Title (from EATMA)	Changes

AERODROME-ATC-19 – Runway Usage Management sub-system capable of processing initial departure path wind conditions information	Departure Separation Management	Departure Separation Management is updated to perform the following Functions: - Assess Wind - Assess WDS-D Status - Propose WDS-D Application - Deactivate WDS-D - Receive WDS-D Authorisation/De-authorisation
	Operational Supervision Aerodrome ATC	Operational Supervision Aerodrome ATC is updated to perform the following Functions: - Display Wind Conditions - Display WDS-D Activation Proposal - De-authorise WDS-D - Authorise WDS-D - Display WDS-D Status - Receive WDS-D Status Update
	Controller Human Machine Interaction Management Aerodrome ATC	Controller Human Machine Interaction Management Aerodrome ATC is updated to perform the following Functions: - Display WDS-D Status
AERODROME-ATC-42a – Airport ATC Runway Usage Management sub-system enhanced for processing		Proposal: change the use of WT separations to the execution phase (AMAN and DMAN), it doesn´t make sense to use it in a 'Runway DCB' as the capacity of the Runway(s) is always a fix value. The sub-system doesn´t calculate directly the capacity.

static wake-turbulence information	Departure Separation Management	Departure Separation Management is updated to perform the following Functions: - Calculate NBTOT (for the WTS) - Calculate NBAT (for the WTS) - Calculate DDI-D Position (for the WSD)
AERODROME-ATC-69 – ATC system to support optimised departure separation	Departure Separation Management	Departure Separation Management is updated to perform the following Functions: - Calculate NBTOT (for the WTS) - Calculate NBAT (for the WTS) - Calculate DDI-D Position (for the WSD) - Calculate NBTOT for the SID Separation and MRS (if these are supported) - Calculate DDI-D for the SID Separation and MRS (if these are supported) - Calculate NBAT for the SID Separation and MRS (if these are supported) - Determine the Largest NBTOT - Determine the Largest DDI-D - Determine the Largest NBAT - Apply WDS-D Mode - Not Apply WDS-D Mode
	Controller Human Machine Interaction Management Aerodrome ATC	Controller Human Machine Interaction Management Aerodrome ATC is updated to perform the following Functions: - Display WST and NBAT/NBTOT Information - Display WSD and DDI-D Information

Table 16 : List of changes due imposed related to Departure Concepts

4 Technical Specifications

4.1 Functional architecture overview

This section describes the new system method to achieve the Wake Turbulence Separation Optimization.

A functional architecture overview is provided for the different concepts of the Wake Turbulence Separation Optimization.

Role	Functional Block	Function
[NSV-4][ARR-02] Airport Operation Scenario for PWS, WDS and ORD for Arrivals (PWS-A, WDS-A and ORD)		
	Aerodrome Safety Nets	Aerodrome Safety Nets;
	Approach Traffic Separation (PJ.02-01)	Manage Inputs; Support Traffic Separation;
	Arrival Traffic Separation (PJ.02-01)	Support Final Approach Traffic Spacing;
ATC Executive Controller (PJ.02-01)		Check conditions for gap insertion; Insert GAP Spacing; Monitor and separate traffic; Provide Approach Clearance; Transfer Flight;
	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)	Display applicable separation;
	Controller Human Machine Interaction Management ER/APP (PJ.02-01)	Display Approach applicable separation; Record Inputs; Release Flight;
	Coordination and Transfer	Coordination and Transfer;

	Legacy G/G Datalink Communications	Legacy G/G Datalink Communications;
	Safety Nets	Safety Nets;
Sequence Manager (Sequencer) (PJ.02-01)		Update Sequence;
Tower Runway Controller (PJ.02-01)		Monitor Spacing during Final Approach; Provide Landing Clearance;
[NSV-4][ARR/MIX-01] Airport Operational Scenario Planning Phase for PWS, WDS and ORD for Arrivals or Mix-mode (ORD, PWS-A, WDS-A)		
ACC/Approach/TMA Supervisor (PJ.02-01)		Assess Operational Situation and Conditions at the Approach; Coordinate with Tower Supervisor; Switch to New Mode Operations in APP Control;
Airport Tower Supervisor (PJ.02-01)		Assess Operational Situation and Conditions at the Airport; Coordinate with Approach Supervisor; Switch to New Mode Operations in TWR Control;
	Operational Supervision Aerodrome ATC (PJ.02-01)	Display Wind Conditions;
	Operational Supervision ER/APP ATC (PJ.02-01)	Display Wind Conditions;
[NSV-4][MIX-02] Airport Operational Scenario Execution Phase for PWS, WDS and ORD for Arrivals - Mixed Mode (ORD, PWS-A, WDS-A)		
	Aerodrome Safety Nets	Aerodrome Safety Nets;
	Approach Traffic Separation (PJ.02-01)	Manage Inputs; Support Traffic Separation;

	Arrival Traffic Separation (PJ.02-01)	Support Final Approach Traffic Spacing;
ATC Executive Controller (PJ.02-01)		Identify Aircraft; Insert GAP Spacing; Monitor and separate traffic; Provide Approach Clearance; Transfer Flight;
	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)	Display applicable separation;
	Controller Human Machine Interaction Management ER/APP (PJ.02-01)	Display Approach applicable separation; Display TDI; Record Inputs; Release Flight;
	Coordination and Transfer	Coordination and Transfer;
	Legacy G/G Datalink Communications	Legacy G/G Datalink Communications;
	Safety Nets	Safety Nets;
Sequence Manager (Sequencer) (PJ.02-01)		Update Sequence;
Tower Runway Controller (PJ.02-01)		Assess Departures versus GAP Spacing; Hold Departing Aircraft; Line-up Departing Aircraft; Monitor Spacing during Final Approach; Provide Landing Clearance; Request Cancel GAP; Request New GAP Spacing and/or Position;

[NSV-4][DEP-01] Airport Operational Scenario Execution Phase for Optimised Separation Delivery (OSD) for Pairwise Separation for Departures (PWS-D) and Weather Dependent Separation for Departures (WDS-D)		
	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)	Display WSD and DDI-D Information; Display WST and NBAT/NBTOT Information;
	Departure Separation Management (PJ.02-01)	Calculate DDI-D for the SID Separation and MRS (if these are supported); Calculate DDI-D Position (for the WSD); Calculate NBAT (for the WST); Calculate NBAT for the SID Separation and MRS (if these are supported); Calculate NBTOT (for the WST); Calculate NBTOT for the SID Separation and MRS (if these are supported); Clear Stale Displayed Information; Determine the Largest DDI-D; Determine the Largest NBAT; Determine the Largest NBTOT;
Tower Runway Controller (PJ.02-01)		Check DDI-D Position; Instruct Next Aircraft in the Sequence to Line-up; Issue Take-Off Clearance; Issue Transfer to TMA Departure Controller Clearance; Monitor and Record Roll Time; Monitor for Aircraft Becoming Airborne and Record Airborne Time; Receive NBAT/NBTOT Information;
[NSV-4][DEP-02] Airport Operational Scenario Execution Phase for Transitioning to and from Weather Dependent Separation for Departures (WDS-D)		
Airport Tower Supervisor (PJ.02-01)		Assess WDS-D Activation; Authorise WDS-D Application;

	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)	Display WDS-D Status;
	Departure Separation Management (PJ.02-01)	Compute Separations with WDS-D De-activated; Apply WDS-D mode; Assess WDS-D Status; Assess WDS-D Status; Assess Wind; Deactivate WDS-D; Propose WDS-D Application; Receive WDS-D Authorisation/De-authorisation;
	Operational Supervision Aerodrome ATC (PJ.02-01)	Authorise WDS-D; De-authorise WDS-D; Display WDS-D Activation Proposal; Display WDS-D Status; Display Wind Conditions; Receive WDS-D Status Update;
Tower Runway Controller (PJ.02-01)		Receive WDS-D Status;
[NSV-4][WDE-01] Airport Operational Scenario Execution Phase for Wake Decay Enhancing Devices		
Airport Duty Officer (PJ.02-01)		Analyse Wake Vortex Decay Data;
	Wake Decay Enhancement	Measure Wake Vortex; Provide Wake Vortex Decay Data;
[NSV-4][WRM-01] Airport Operational Scenario Execution Phase for Wake Risk Monitoring		

Table 17 : Functional Architecture Overview

4.1.1 Functional Architecture: focus on Departure concepts

This section describes the Functional breakdown focused on Departure concept

This functional breakdown is consistent with the latest applicable version of EATMA.

It describes the Functions needed to realise the Solution and provides a functional view of how the technical systems, functional block(s), system ports and roles that participate in realising the operational needs.

Some Functional Blocks within the domains impacted by the *Wake Turbulence Separation Optimization for Departures* concept are substantially impacted and will be addressed in detail in this document.

Controller Human Machine Interaction Management provides the controllers with a graphical user interface and with the means to interact with the aerodrome ATC system. CHMIM will provide the ATCO with the separation to be applied to each departure aircraft pair (either as a distance or as time), and will inform about the current mode in use, e.g. WDS-D Xw concept reduced separations mode active or not.

Departure Separation Management is in charge of managing the time or distance separations to be applied between two aircrafts for departure operations with the goal of increasing runway efficiency and throughput while maintaining safety levels. For the separations computation; aircraft types, meteorological information, new wake separations, minimum radar separation and SID constraints are taken into account.

Operational Supervision Aerodrome ATC allows the Supervisor to manage the most appropriate operational configuration, according to traffic demand and aerodrome needs, and to react in case of system fault, re-assigning and distributing available resources in order to maintain adequate safety levels and quality of service. It presents the current mode of separations that is being applied, as well as mode switch proposals depending on the conditions, e.g. WDS-D activation proposal when wind conditions are sufficient for the safe application. Operational Supervision allows the Tower Supervisor to authorise/de-authorise the application of WDS-D.

Some of the functional blocks will be impacted in a minor way only and will only be briefly addressed in this document.

A/G Voice Communication provides the A-G functions performed by a VCS, and the functions performed to handle ground ATS communication through various communication interfaces.

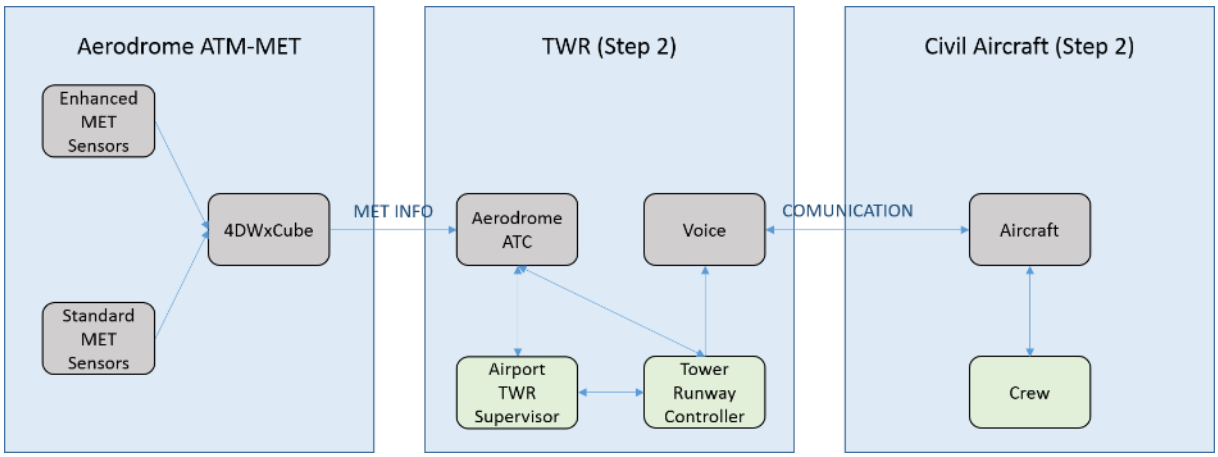

Figure 1 : Overall architecture for PJ.02-01 - Departures

Capability Configuration	Technical System	Functional Block	Function
TWR	Aerodrome ATC	Departure Separation Management	Calculate NBTOT (for the WST); Calculate DDI-D Position (for the WST); Calculate NBAT (for the WST); Calculate NBTOT for the SID Separation and MRS (if these are supported); Calculate DDI-D for the SID Separation and MRS (if these are supported); Calculate NBAT for the SID Separation and MRS (if these are supported); Determine the Largest NBTOT; Determine the Largest DDI-D; Determine the Largest NBAT; Clear Stale Displayed Information and Reformulate Sequence; Assess Wind; Assess WDS-D Status; Propose WDS-D Application; Deactivate WDS-D; Receive WDS-D Authorisation/De-authorisation; Apply WDS-D Mode; Not Apply WDS-D Mode;

		Controller Human Machine Interaction Management Aerodrome ATC	Display WST and NBAT/NBTOT Information; Display WSD-D and DDI_D Information; Display WDS-D Status;
		Operational Supervision Aerodrome	Display Wind Conditions; Display WDS-D Activation Proposal; De-authorise WDS-D; Authorise WDS-D; Receive WDS-D Authorisation/De-authorisation; Display WDS-D Status;
	Voice	A/G Voice Communication	-
Civil Aircraft	-	-	-

Table 18 : Functional architecture overview for PJ.02-01 Departures concept

Capability Configuration	Role	Function	Related to FB
TWR	Tower Runway Controller	Instruct Next Aircraft to Line-up; Receive NBAT/NBTOT Information; Check DDI-D Position; Issue Take-Off Clearance; Monitor and Record Roll Time; Monitor for Aircraft Becoming Airborne and Record Airborne Time;	Departure Separation Management CHMIM Aerodrome ATC

Capability Configuration	Role	Function	Related to FB
		Issue Transfer to TMA Departure Controller Clearance; Receive WDS-D Status;	
	Airport Tower Supervisor	Assess WDS-D Activation; Authorise WDS-D Application;	Operational Supervision Aerodrome ATC
Civil Aircraft	Flight Crew	-	Voice

Table 19 : Roles involved in the PJ.02-01 Departures concept

4.1.2 Functional Architecture focus on Wake Decay Enhancing

The plate line principle provides for passive devices accelerating wake vortex decay in order to increase flight safety. Their operational application is not linked to any data transfer or information exchange. As such their role in EATMA modelling is very limited and considers only the installation of the plates, the measurement of the resulting wake vortex behaviour and the quantification of the acceleration of wake vortex decay. Next steps include the installation of permanent plate lines and reviews of wake separation rules.

4.1.3 Resource Connectivity Model

The following diagrams represent the high-level interactions between the CCs involved. The Resource Connectivity for Solution PJ.02-01: Arrivals and Departure concepts are described.

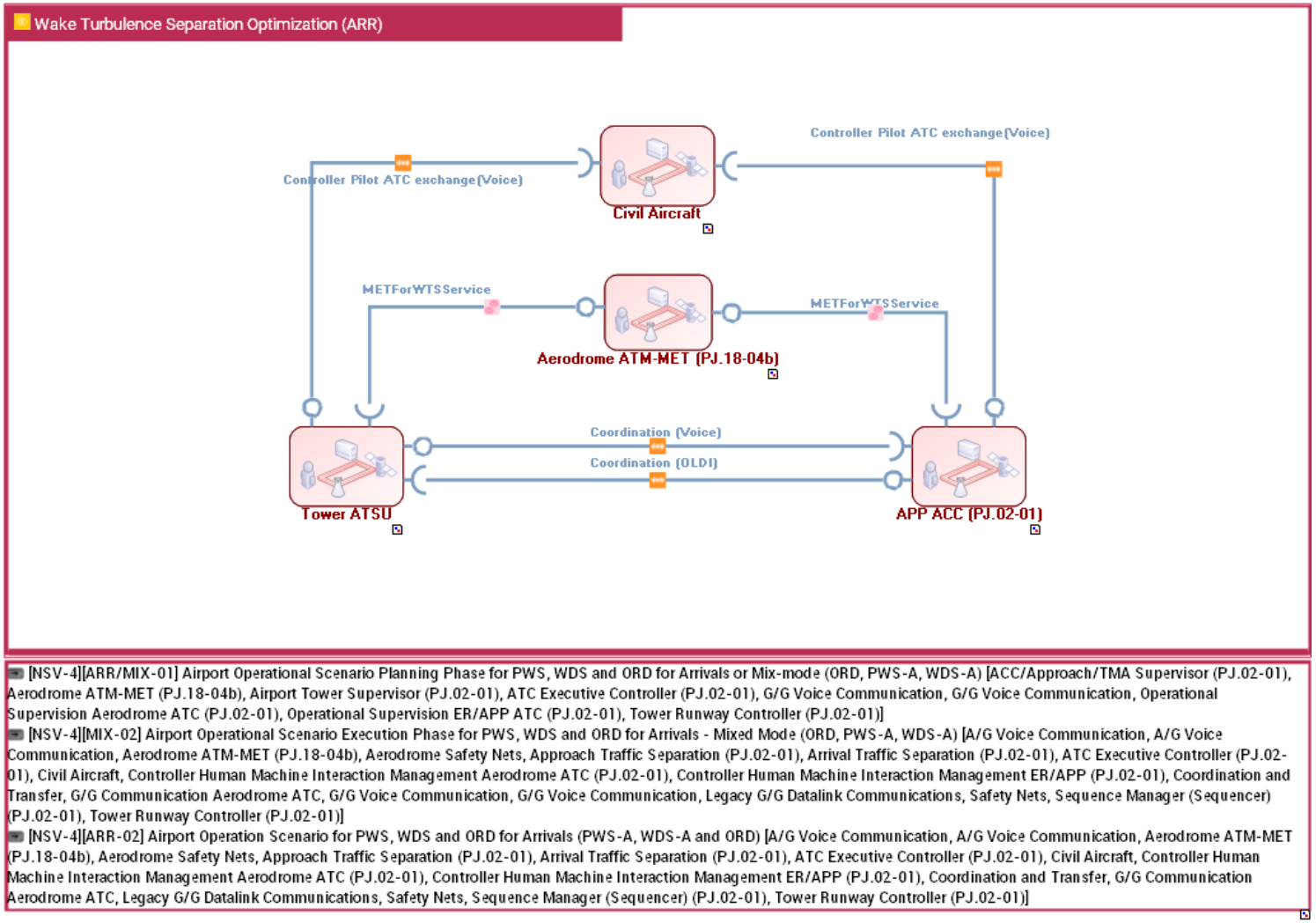

Figure 2 : Resource connectivity for Arrivals

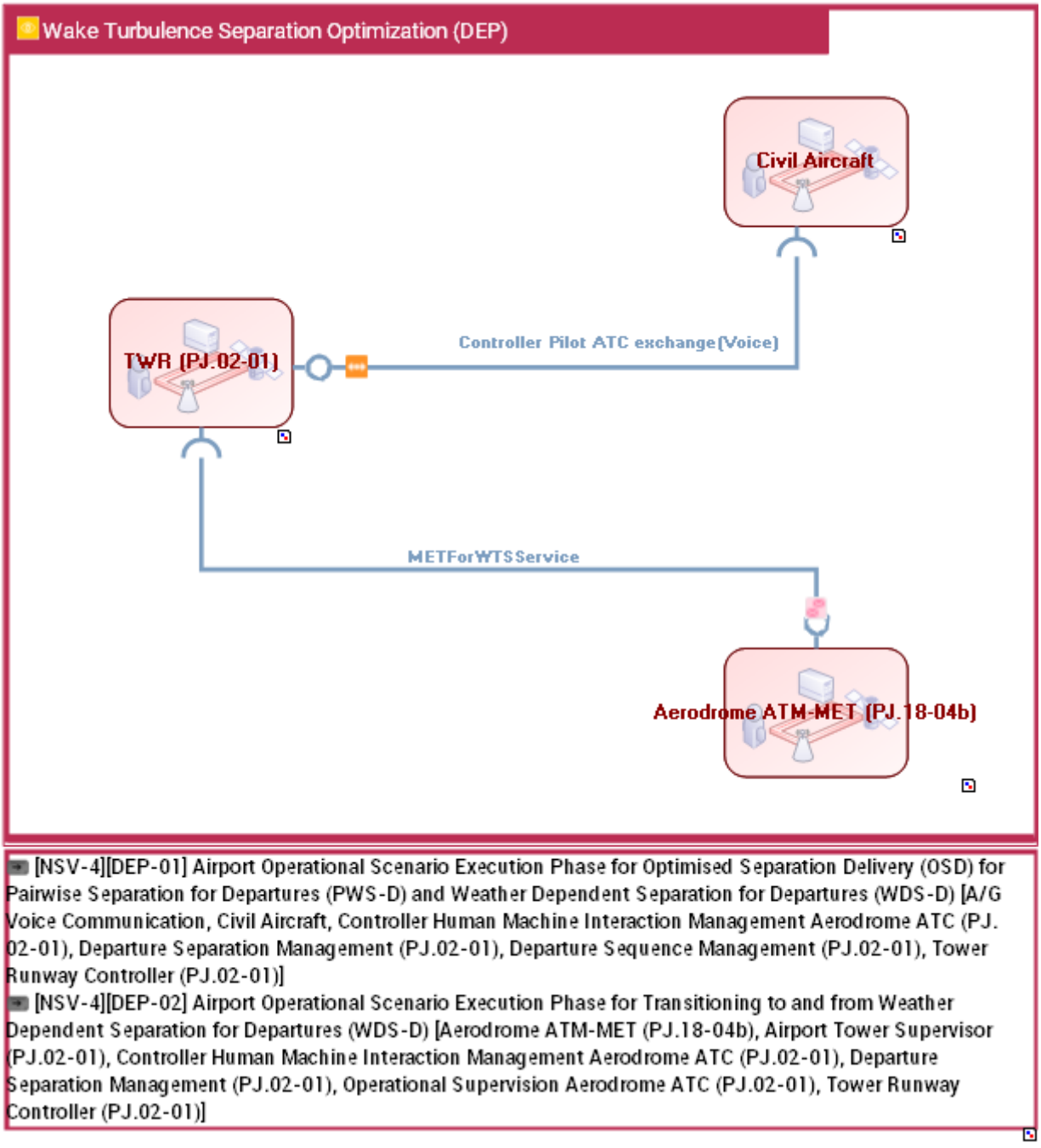

Figure 3 : Resource connectivity for Departures

The high-level interactions between Capability Configurations are simple in this case, since the process and main interactions happen within the TWR CC.

METforWTS Service was created by PJ.18-04b. This Service intends to provide relevant MET data to the calculations computed by departures separation related FB within TWR CC. No other Services were created within PJ.02-01 framework.

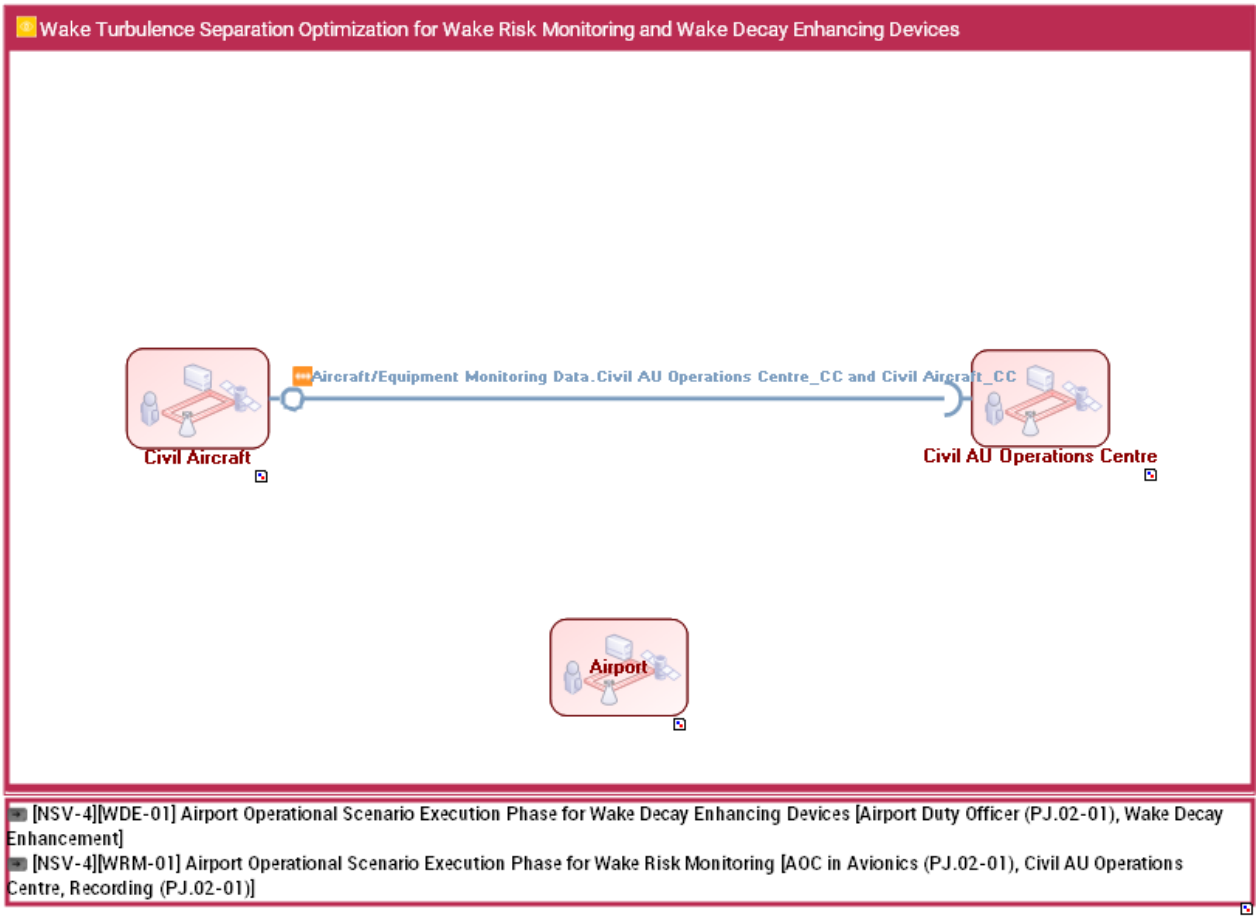

Figure 4: Resource connectivity for Wake Risk Monitoring and Wake Decay Enhancing devices

4.1.4 Resource Orchestration view

The diagrams within this section represent the interactions of the main FBs involved. The logical architecture is modelled in MEGA, and therefore compliant with EATMA, and lists all functional components of the PJ02-01 solution and their dependencies and relations.

The models are available in MEGA. For a better resolution, refer to:

https://www.srvs.nm.eurocontrol.int/mega_prod/hopex/default.aspx#start

Please, refer to Section 3.1.1 to read the description for each model.

4.1.4.1 [NSV-4][ARR-02] Airport Operation Scenario for PWS, WDS and ORD for Arrivals (PWS-A, WDS-A and ORD)

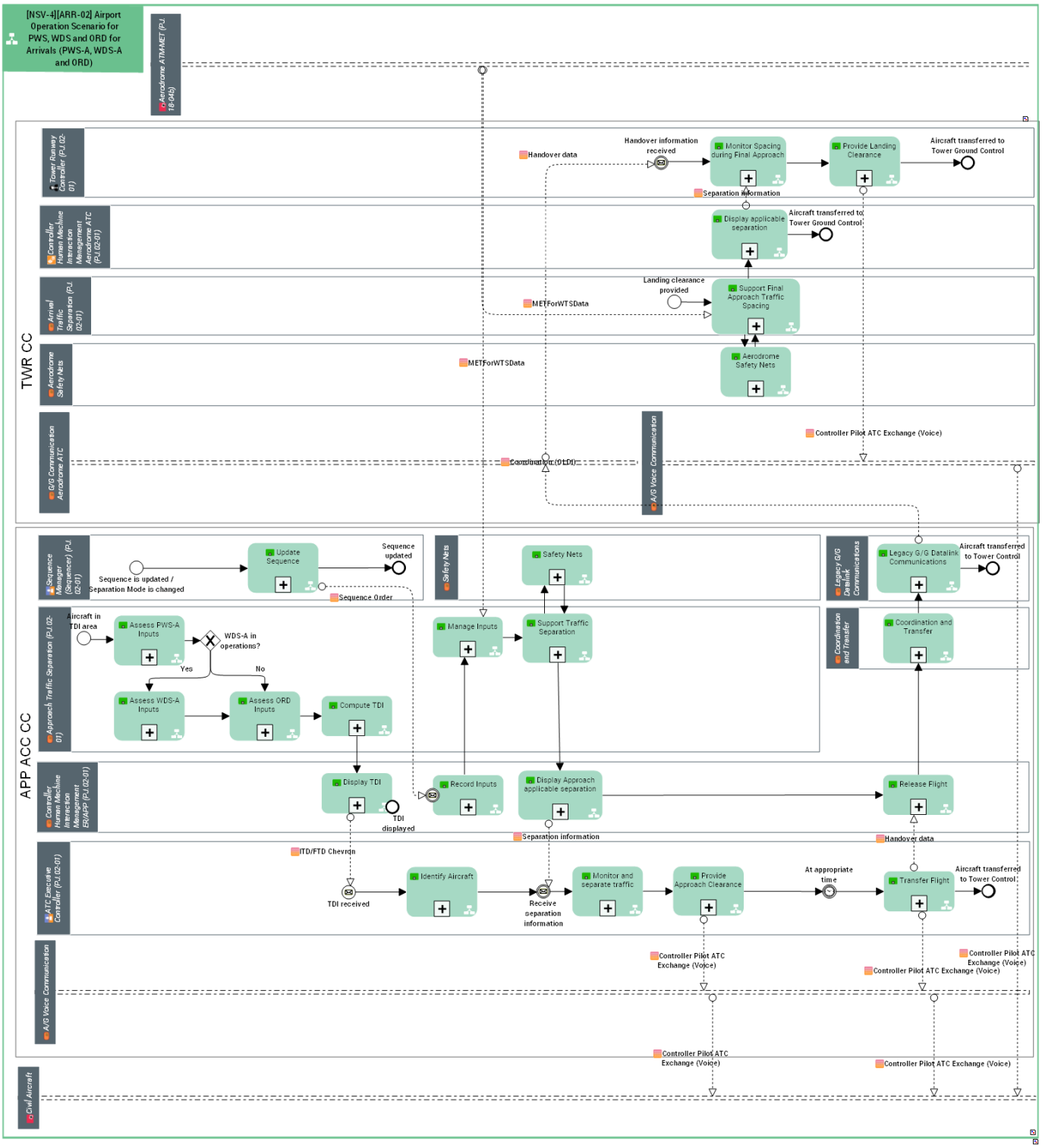

Figure 5 : [NSV-4] [ARR-02]

4.1.4.2 [NSV-4][ARR/MIX-01] Airport Operational Scenario Planning Phase for PWS, WDS and ORD for Arrivals or Mix-mode (ORD, PWS-A, WDS-A)

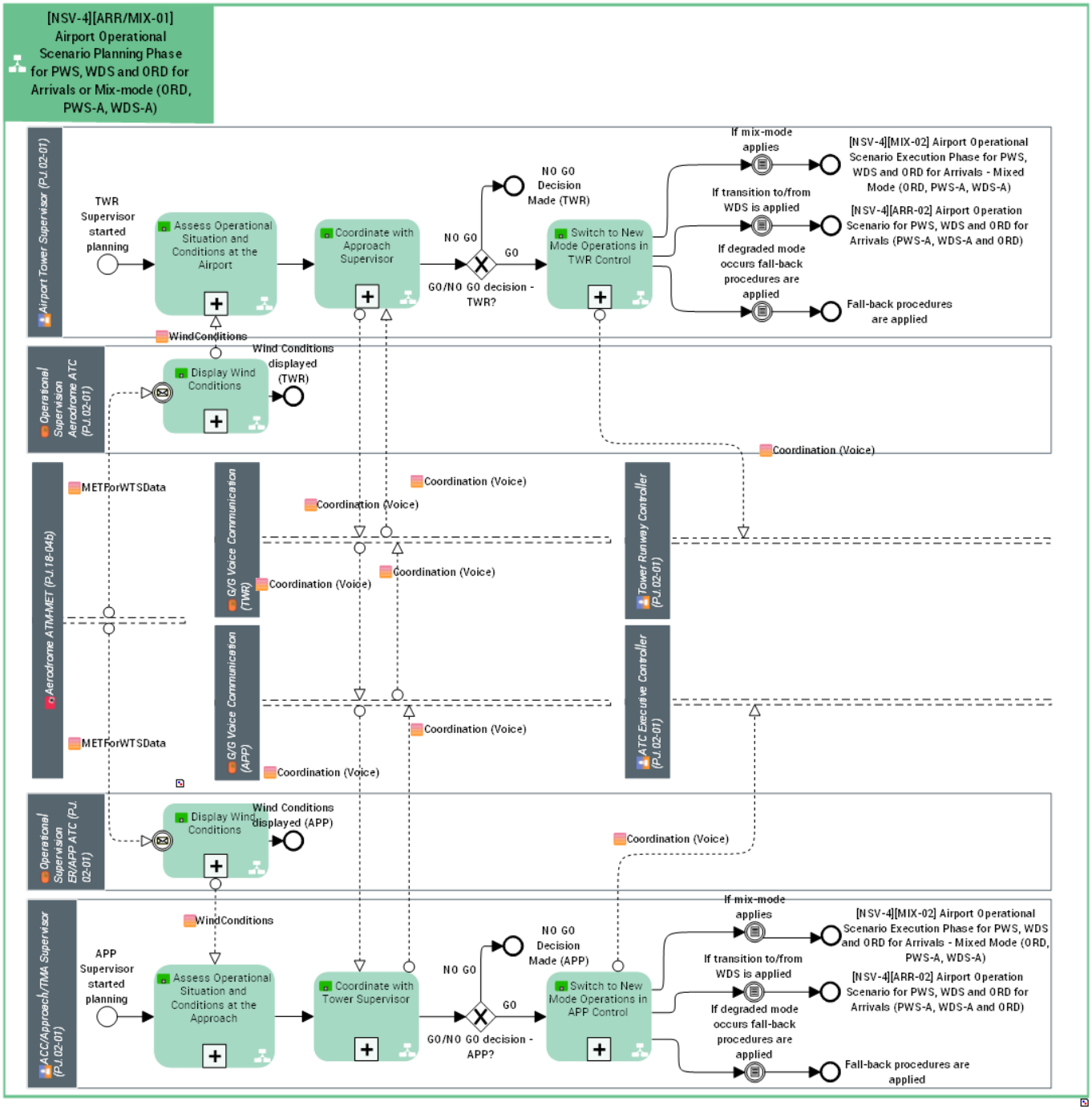

Figure 6: [NSV-4] [ARR/MIX-01]

4.1.4.3 [NSV-4][MIX-02] Airport Operational Scenario Execution Phase for PWS, WDS and ORD for Arrivals - Mixed Mode (ORD, PWS-A, WDS-A)

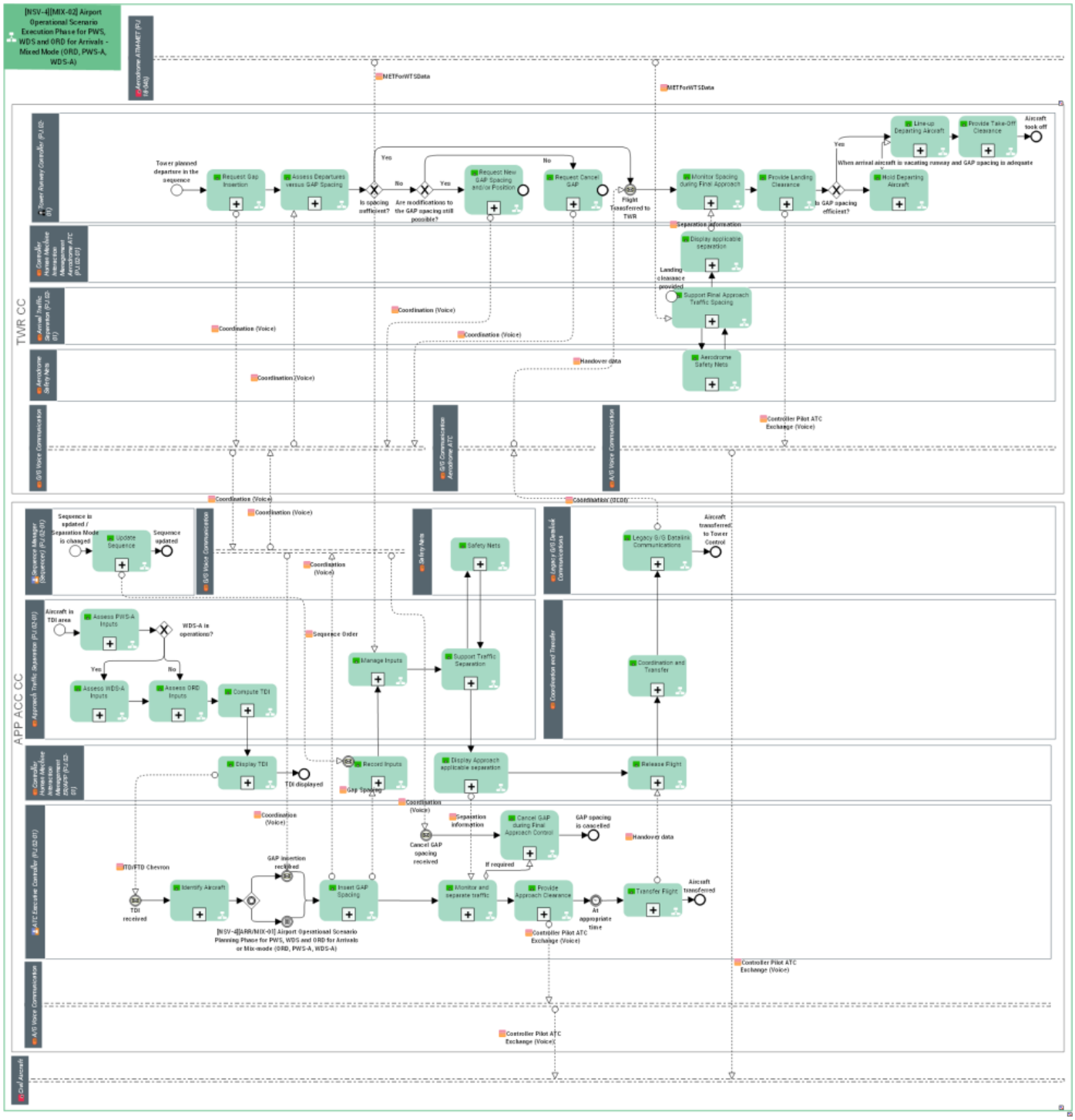

Figure 7 : [NSV-4] [MIX-02]

4.1.4.4 [NSV-4][DEP-01] Airport Operational Scenario Execution Phase for Optimised Separation Delivery (OSD) for Pairwise Separation for Departures (PWS-D) and Weather Dependent Separation for Departures (WDS-D)

This NSV-4 reflects the Use Case [DEP-01] Airport Operational Scenario Execution Phase for Optimised Separation Delivery (OSD) for Pairwise Separation for Departures (PWS-D) and Weather Dependent Separation for Departures (WSD-D).

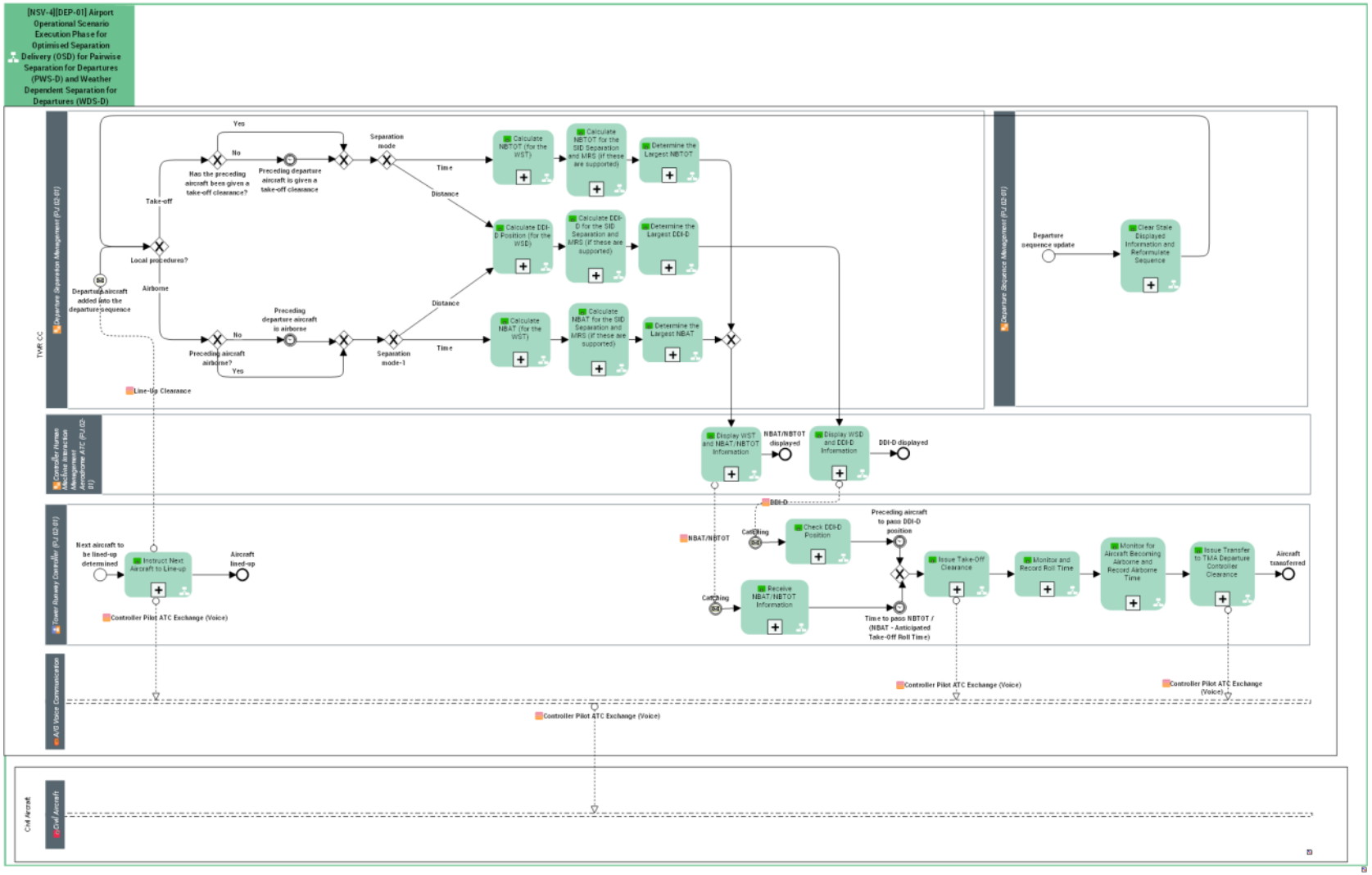

Figure 8 : NSV-4 model. DEP-01 Airport Operational Scenario Execution Phase for Optimised Separation Delivery (OSD) for Pairwise Separation for Departures (PWS-D) and Weather Dependent Separation for Departures (WDS-D)

4.1.4.5 [NSV-4][DEP-02] Airport Operational Scenario Execution Phase for Transitioning to and from Weather Dependent Separation for Departures (WDS-D)

This diagram reflects the technical layer of the Use Case [DEP-02] Airport Operational Scenario Execution Phase for Transitioning to and from Weather Dependent Separation for Departures (WDS-D)

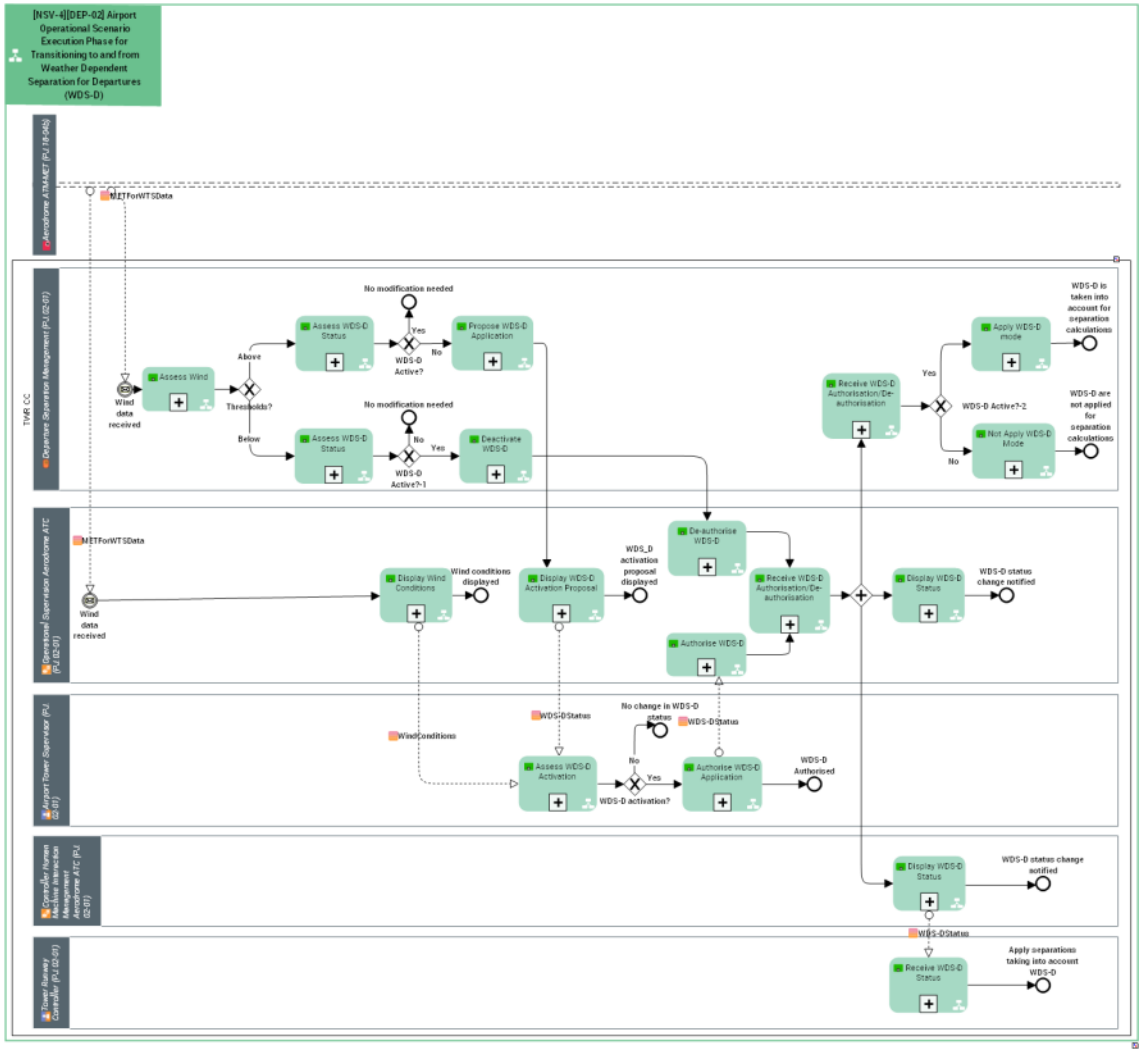

Figure 9 : NSV-4 model. DEP-02 Airport Operational Scenario Execution Phase for Transitioning to and from Weather Dependent Separation for Departures (WDS-D)

4.1.4.6 [NSV-4][WDE-01] Airport Operational Scenario Execution Phase for Wake Decay Enhancing Devices

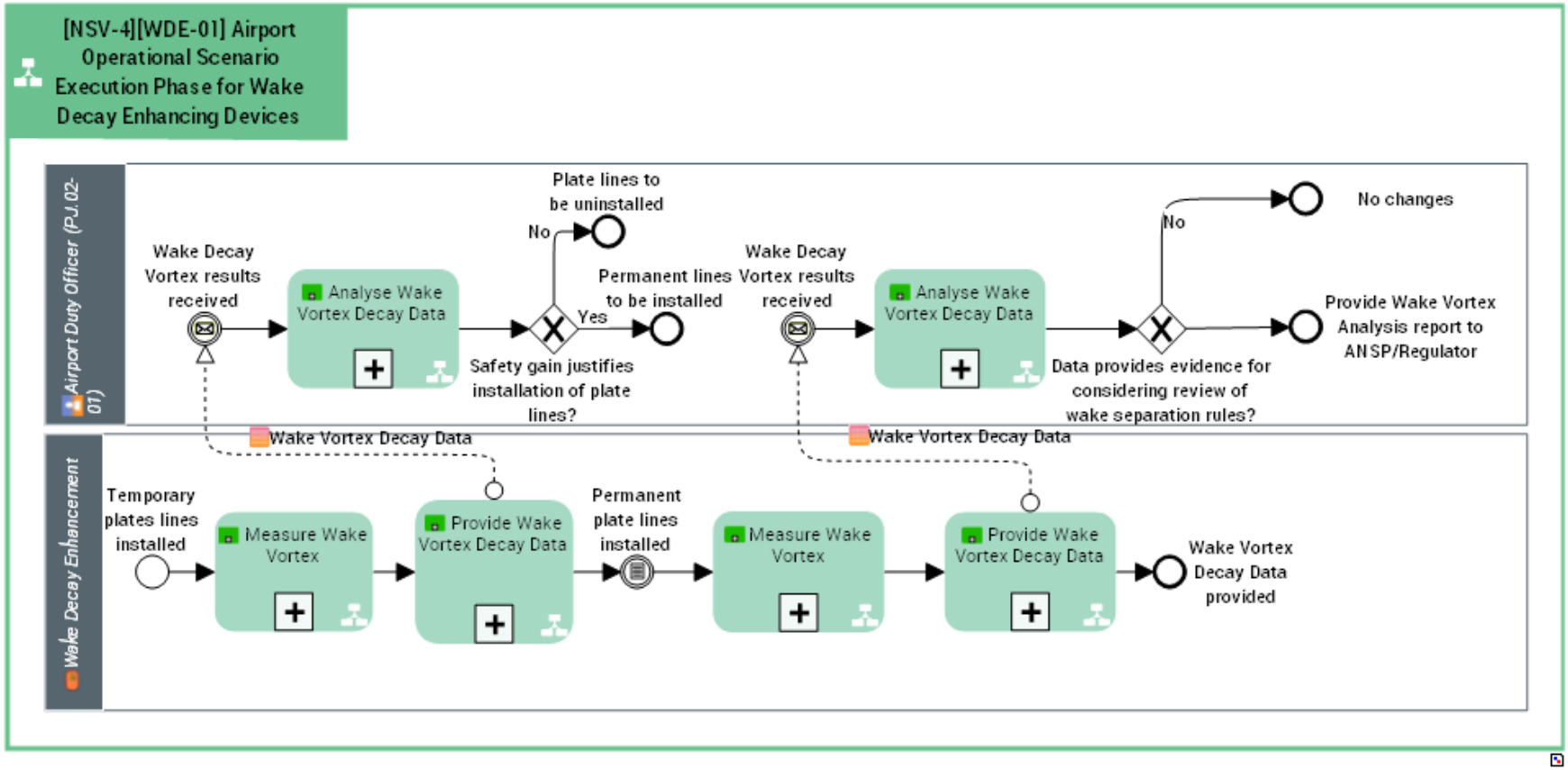

Figure 10 : [NSV-4] [WDE-01] Airport Operational Scenario Execution Phase for Wake Decay Enhancing Devices

4.1.4.7 [NSV-4][WRM-01] Airport Operational Scenario Execution Phase for Wake Risk Monitoring

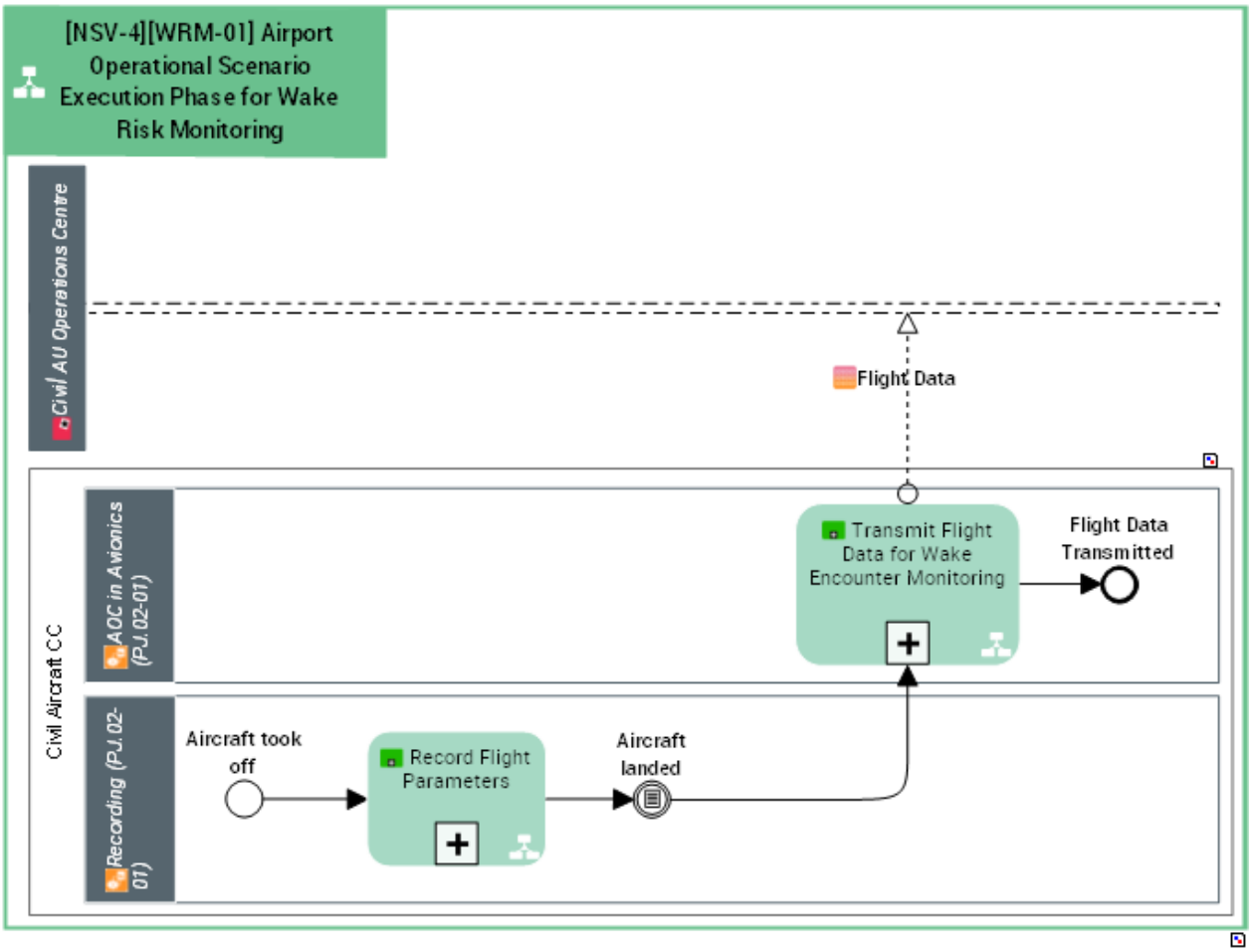

Figure 11: [NSV-4] [WRM-01] Airport Operational Scenario Execution Phase for Wake Risk Monitoring

4.1.5 Infrastructure connectivity model

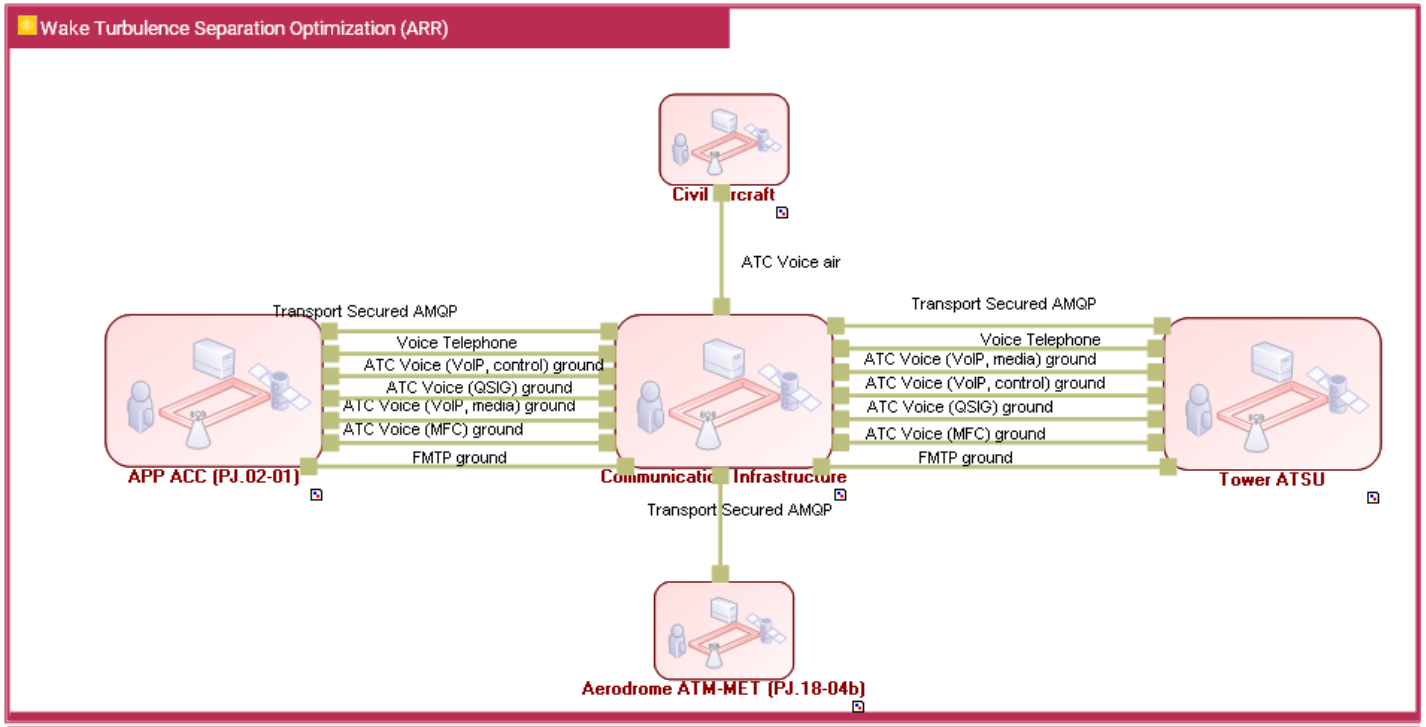

Figure 12 : Infrastructure Connectivity Model for Arrivals

This supporting infrastructure is the set of:

- Capability Configurations:
  - TWR
  - Civil Aircraft
  - Aerodrome ATM-MET (PJ.18-04b)
- Main Technical Systems
  - Aerodrome ATC
  - Voice
  - Aircraft
- System Ports:
  - ATC Voice Air
  - Voice Radio Air
  - ATC Voice Ground
  - Transport Secured AMQP
  - IP Ground

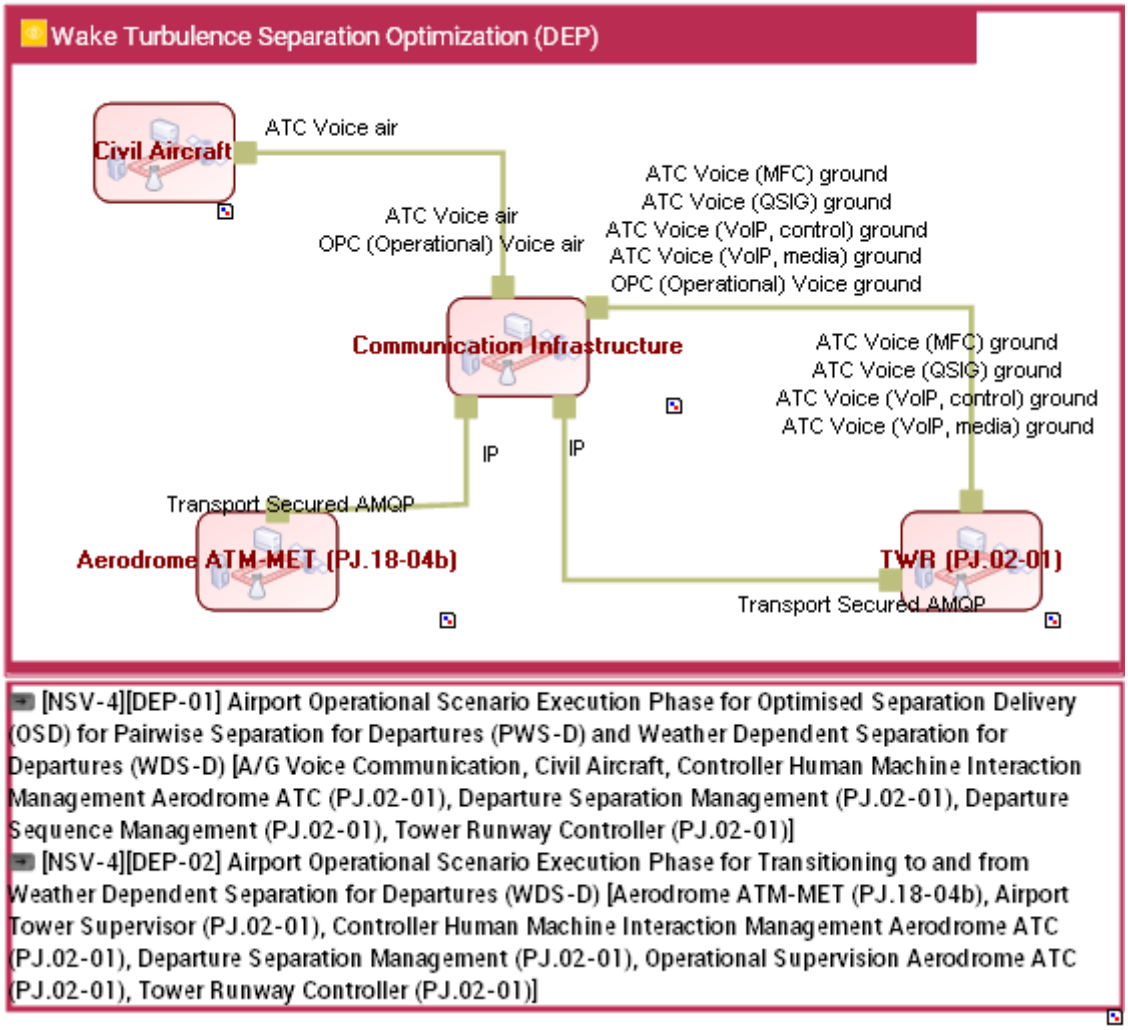

Figure 13 : NSV-2 Infrastructure Connectivity Model for PJ.02-01 Wake Turbulence Separation Optimization (Departures)

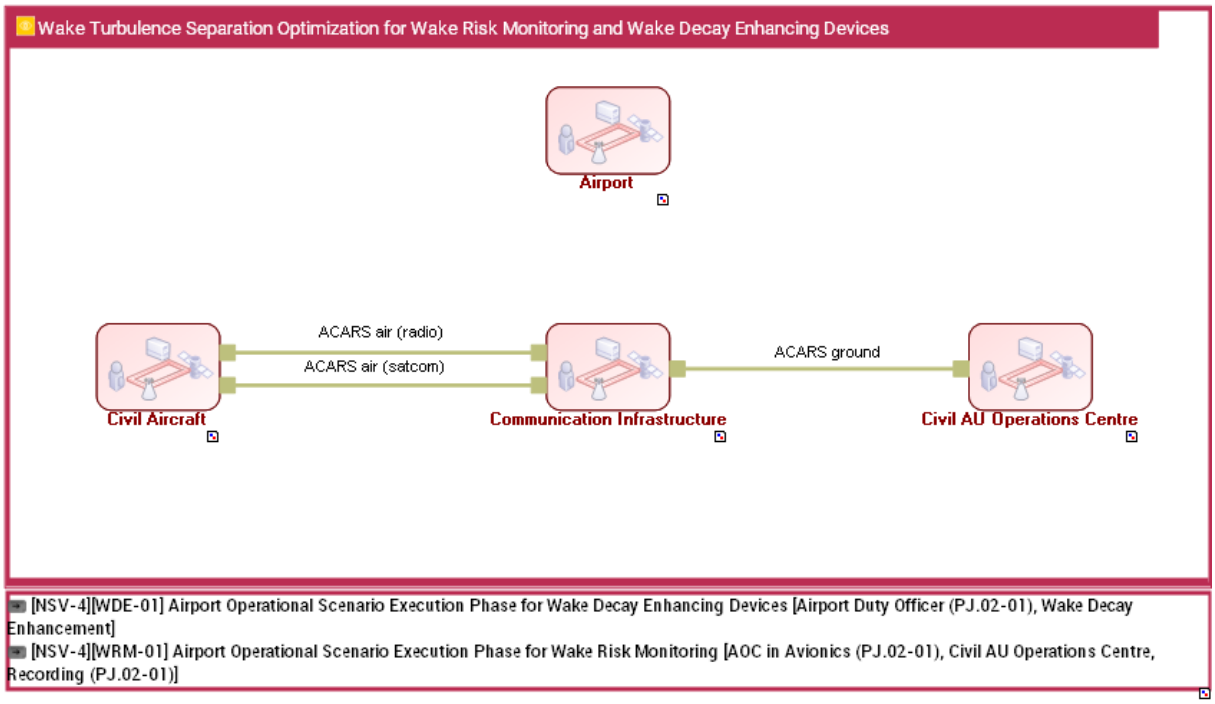

Figure 14 : NSV-2 Infrastructure Connectivity Model for PJ.02-01 Wake Turbulence Separation Optimization (Wake Risk Monitoring and Wake Decay Enhancing Devices)

4.1.6 Service view

No Services were created under PJ.02-01 Departures framework.

METforWTS Service was created by PJ.18-04b Meteorological (MET) information in relation with PJ.02-01 Wake Turbulence Separation Optimization (Departures).

METforWTS Service addresses the dependency with PJ.02-01 where needs for detailed wind information has been identified. Wind information comprises head- and crosswind components along the glide path which will be used for optimising the runway throughput by addressing new arrival and departure concepts. Therefore, a glide path wind profile will be provided as service including current, nowcast and forecast wind information.

Departure and Arrival Concept make use of this Service. Refer to following diagrams (covering related FB, Functions and Activities):

- [NSV-4] [DEP-02] Airport Operational Scenario Execution Phase for Transitioning to and from Weather Dependent Separation for Departures (WDS-D)

[NOV-5][DEP-02] Airport Operational Scenario Execution Phase for Transitioning to and from Weather Dependent Separation for Departures (WDS-D)

4.2 Functional and non-Functional Requirements

4.2.1 Arrivals Concepts Solutions

[REQ]

Identifier	REQ-12.02.02-TS-INT1.0040
Title	Runway Intent
Requirement	Each aircraft's runway intent shall be provided by the Flight Data Processing
Status	<validated>
Rationale	Aircraft live FPL data in appropriate category is necessary for display on the HMI
Category	<Safety> , <Data>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0910
<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information

[REQ]

Identifier	REQ-12.02.02-TS-INT1.0030
Title	Flight data
Requirement	The Flight Data Processing shall provide to the separation delivery tool - a unique identifier - aircraft type - wake category for each arrival aircraft that is correlated in the traffic
Status	<validated>
Rationale	Aircraft live FPL data in appropriate category is necessary for display on the HMI
Category	<Data> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
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		AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-12.02.02-TS-INT1.0020
Title	Traffic data
Requirement	The surveillance system shall provide to the separation delivery tool - a unique identifier - a position value - altitude information - ground speed for each arrival aircraft that is correlated in the traffic
Status	<validated>
Rationale	Aircraft live track data in appropriate category is necessary for display on the HMI
Category	<Safety> , <Data>

[REQ Trace]

Relationship	Linked Element Type	Identifier
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		processing static wake-turbulence information AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-12.02.02-TS-INT1.0013
Title	Forecast runway surface wind
Requirement	The MET data provider shall send the forecast runway surface wind heading and wind speed to the separation delivery tool
Status	<in progress>
Rationale	MET forecast data are necessary for separation provision
Category	<Data> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
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<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0290
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<ALLOCATED_TO>	<Function>	Manage Inputs
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[REQ]

Identifier	REQ-12.02.02-TS-INT1.0012
Title	Runway surface wind
Requirement	The MET data provider shall send the current runway surface wind heading and wind speed to the separation delivery tool
Status	<validated>
Rationale	MET current data are necessary for separation provision
Category	<Safety> , <Data>

[REQ Trace]

Relationship	Linked Element Type	Identifier
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<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR2.1210
<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	METEO-03_Provision and monitoring of real-time airport weather information (PCP) METEO-04b_Generate and provide MET information services relevant for Airport and final approach related operations (PCP)

[REQ]

Identifier	REQ-12.02.02-TS-INT1.0011
Title	Input wind format for prediction
Requirement	The separation delivery tool should receive the following wind data - forecast heading - forecast speed from the MET data provider
Status	<in progress>
Rationale	MET data are necessary for separation provision
Category	<Safety> , <Data>

[REQ Trace]

Relationship	Linked Element Type	Identifier
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[REQ]

Identifier	REQ-12.02.02-TS-INT1.0010
Title	Input Wind format for separation
Requirement	The separation delivery tool shall receive at each online update the following wind data for each Runway and for each predefined altitude layer - current heading to apply - current speed to apply from the MET data provider
Status	<validated>

Rationale	heading and speed are needed to be provided to the separation delivery tool
Category	

[REQ Trace]

Relationship	Linked Element Type	Identifier
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<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0146
<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	METEO-04b_Generate and provide MET information services relevant for Airport and final approach related operations (PCP)

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0170
Title	System failure
Requirement	The separation delivery tool shall send to the HMI an error message in case of system failure
Status	<in progress>
Rationale	Controllers need to be aware of any system failure
Category	<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
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<ALLOCATED_TO>	<Enabler>	APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0160
Title	Sequence alert
Requirement	The separation delivery tool shall send a sequence alert to the HMI when the order of arrival in the arrival sequence list differs from the order of aircraft position on the extended runway centreline starting from the Runway threshold
Status	<validated>
Rationale	Sequence order on the final approach need to be correct for safety
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
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<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1710
<ALLOCATED_TO>	<Function>	Safety Nets
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0150
Title	Catch-up alert
Requirement	The Separation delivery tool may send a catch-up alert to the HMI when a follower aircraft is expecting to reach the ITD in less than T seconds, T being an offline defined parameter.
Status	<validated>

Rationale	Controller may need to be aware of any potential separation infringement in the near future
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR3.1540
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1350
<ALLOCATED_TO>	<Function>	Safety Nets
<ALLOCATED_TO>	<Enabler>	APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0140
Title	Speed conformance alert
Requirement	The Separation Delivery Tool shall send to CWP HMI a speed conformance alert when an aircraft's ground speed exceeds its offline defined air speed - corrected by the wind value - by a predefined offline tolerance value
Status	<validated>
Rationale	Controller needs to aware of any inconsistency between offline data and real data
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0143
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1500
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1510
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1700
<ALLOCATED_TO>	<Function>	Safety Nets
<ALLOCATED_TO>	<Enabler>	APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0132
Title	TDIs display on the centreline 3
Requirement	If - the Leader aircraft is eligible for TDIs display - the Leader aircraft is not established on the centreline - the Leader aircraft's projected position on the centreline is in front of its targeted ITD Then its TDIs shall be displayed on the extended centreline at the correct distance behind the position of the leader's ITD on the extended centreline
Status	<validated>
Rationale	Controllers need an aiming point on the extended centreline
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0490
<ALLOCATED_TO>	<Function>	Display applicable separation
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0130
Title	TDIs display on the centreline 1
Requirement	TDIs shall be displayed on the extended centreline at the correct distance (FTD and ITD) behind the Leader.
Status	<validated>
Rationale	Controllers need an aiming point on the extended centreline
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0050
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR3.0120
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0139
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0133
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR3.0170
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0860
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0410
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR2.1282
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR2.1281

<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR2.1283
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0890
<ALLOCATED_TO>	<Function>	Display applicable separation
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0131
Title	TDIs display on the centreline 2
Requirement	If - the Leader aircraft is eligible for TDIs display - the Leader aircraft is not established on the centreline - the Leader aircraft's projected position on the centreline is behind its targeted ITD Then its TDIs shall be displayed on the extended centreline at the computed distance behind the projected position of the Leader on the extended centreline
Status	<validated>
Rationale	Controllers need an aiming point on the extended centreline
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0490
<ALLOCATED_TO>	<Function>	Display applicable separation
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach

		AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0121
Title	Wake separation Definition for TBS mode
Requirement	In any TBS and WDS mode – ICAO, RECAT-EU or S-PWS - the wake constraint shall match the time to fly defined in the separation table
Status	<validated>
Rationale	Offline data and displayed data need to be consistent in time and in distance
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR1.0020
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR2.0030
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1240
<ALLOCATED_TO>	<Function>	Manage Inputs Assess WDS-A Inputs Assess PWS-A Inputs Assess ORD Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0120
Title	Wake separation Definition for DBS mode
Requirement	In any DBS mode – ICAO, RECAT-EU or S-PWS - the wake constraint shall match the distance to fly defined in the separation table
Status	<validated>
Rationale	Offline data and displayed data need to be consistent in time and in distance
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR1.0020
<ALLOCATED_TO>	<Function>	Manage Inputs Assess WDS-A Inputs Assess PWS-A Inputs Assess ORD Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0110
Title	ITD greater than FTD
Requirement	For a pair of (Leader; Follower) aircraft, if the initially computed ITD value is smaller that the FTD, the ITD shall automatically take the same value as the FTD

Status	<validated>
Rationale	FTD is the minimum applicable separation between 2 consecutive aircraft
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR3.0163
<ALLOCATED_TO>	<Function>	Compute TDI
<ALLOCATED_TO>	<Enabler>	APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0103
Title	Sequence arrival
Requirement	The Sequencing tool shall provide one arrival sequence per runway to the Separation delivery tool
Status	<validated>
Rationale	Each runway needs one and only one sequence as input
Category	<Data> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0300

<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0102
Title	Sequence change
Requirement	For each pair of consecutive arriving aircrafts,(Leader ; Follower), if either the Leader or the Follower changes, TDIs shall be recomputed at the next update
Status	<validated>
Rationale	TDIs must be updated upon any input change
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0560
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0941
<ALLOCATED_TO>	<Function>	Update Sequence Record Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach

		APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0100
Title	Required data for FTD update in TBS mode
Requirement	For a pair of consecutive arriving aircraft (Leader; Follower), the system shall update the FTD upon any online change among the following data - Glide slope wind data (strength and direction) - Wake separation value to apply - Leader's ROT - Follower's Speed Profile - MRS value - Any potential Gap request behind the leader - Leader's position
Status	<validated>
Rationale	TDIs must be updated upon any input change
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0010
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0460
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1090
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1650
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1660
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0142

<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0161
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0570
<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0101
Title	Required data for ITD update in TBS mode
Requirement	For a pair of consecutive arriving aircraft (Leader; Follower), the system shall update the ITD upon any online change among the following data - Glide slope wind data (strength and direction) - Wake separation value to apply - Leader's ROT - Leader's True Air Speed profile on the glideslope - Follower's True Air Speed Profile on the glideslope - MRS value - Any potential Gap request behind the leader - FTD position
Status	<validated>
Rationale	TDIs must be updated upon any input change
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier

<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0010
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0460
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1090
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1650
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1660
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0142
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0161
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0270
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0257
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0570
<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0091
Title	Required data for ITD computation in TBS mode
Requirement	For a pair of consecutive arriving aircraft (Leader; Follower), the system shall compute the ITD based on the following data - Glide slope wind data (strength and direction) - FTD position - Follower's Air Speed Profile - Leader's Air Speed profile
Status	<validated>
Rationale	ITD needs wind and speed information on top of FTD data

Category	<Safety> , <Data>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR3.0160
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0280
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0060
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR3.0040
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR1.0320
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0321
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR3.1000
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR3.0500
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0870
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1270
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1581
<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0090
Title	Required data for FTD computation in TBS mode

Requirement	For a pair of consecutive arriving aircraft (Leader; Follower), the system shall compute the FTD based on the following data - Glide slope wind data (strength and direction) - Wake separation value to apply (in time or distance depending on the chosen mode) - Leader's ROT - Follower's Air Speed Profile - MRS value - Any potential Gap request behind the leader
Status	<validated>
Rationale	FTD computation needs all applicable constraints
Category	<Safety> , <Data>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0130
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR2.0141
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0060
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0270
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0310
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1410
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0970
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1360
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1370
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1421
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1400
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1420
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1430
<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters

		APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0070
Title	FTD computation with constraints
Requirement	For each pair of arriving aircraft, in case one set of TDIs is computed by the system, the FTD shall take the value of the greatest separation constraints among ROT, Gap request, MRS, Wake separation and any other offline defined specific separation involving one of the aircraft in the pair
Status	<validated>
Rationale	FTD represents the most constraining separation to respect between 2 consecutive aircraft
Category	<Safety> , <Data>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0110
<ALLOCATED_TO>	<Function>	Compute TDI
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach

		APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0071
Title	Second FTD computation with constraints
Requirement	For each pair of arriving aircraft, in case a second set of TDIs is computed by the system (infringement of Gap or ROT ITD), the FTD of the second set shall take the value of the greatest separation constraints among MRS and Wake separation.
Status	<validated>
Rationale	Safety critical separation need to be displayed even if not the most constraining separation
Category	<Safety> , <Data>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0110
<ALLOCATED_TO>	<Function>	Display Approach applicable separation
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach

		APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0080
Title	Arrival Sequence
Requirement	The system shall be provided with the online current arrival sequence, updated at least at each change in the sequence among the following - Aircraft removed from the sequence - Aircraft added in the sequence - Change of index of an Aircraft in the sequence - Runway Intent for each aircraft in the sequence
Status	<validated>
Rationale	Any update in the sequence needs to be sent to the separation delivery tool
Category	<Functional> , <Interoperability> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1390
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0560
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0440

<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0441
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0960
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0550
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0561
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0540
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0950
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0940
<ALLOCATED_TO>	<Function>	Update Sequence Manage Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0061
Title	Traffic data
Requirement	The System shall be provided with the following online data for each aircraft, updated at each system timestamp - position - altitude - time of the system - current ground speed
Status	<validated>
Rationale	Aircraft live track data in appropriate category is necessary for display on the HMI

Category	<Data> , <Safety> , <Interoperability>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0180
<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0060
Title	Aircraft Data
Requirement	The Separation delivery tool shall be provided with the following online data for each aircraft in the traffic - ICAO Aircraft Type - Wake Turbulence Category - True air speed profile on the final glide slope - Runway Occupancy Time - Runway Intent
Status	<validated>
Rationale	Aircraft offline data in appropriate category is necessary for display on the HMI
Category	<Interoperability> , <Safety> , <Data>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR1.0070
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0100
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0080
<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0050
Title	TDIs display
Requirement	The CWP HMI shall be able to display the TDIs sent by the system
Status	<validated>
Rationale	Controllers need to visualize separations to apply
Category	<HMI> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier

<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0140
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0630
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0580
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0590
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0470
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0480
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0620
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0690
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0700
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0730
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0740
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0770
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0750
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0760
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0830
<ALLOCATED_TO>	<Function>	Display Approach applicable separation Display TDI
<ALLOCATED_TO>	<Enabler>	APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0040

Title	TDIs transmission in all modes
Requirement	The system shall send to CWP HMI the TDIs values for each pair of arriving aircraft in the sequence for one selected mode among the following TBS WDS S-PWS
Status	<validated>
Rationale	Controllers need to visualize separations to apply
Category	<HMI> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0920
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0880
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR2.1284
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1300
<ALLOCATED_TO>	<Function>	Safety Nets Display Approach applicable separation
<ALLOCATED_TO>	<Enabler>	APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0030
Title	Buffer for uncertainties on wind and speed profile
Requirement	The system shall be provided with offline defined "buffer" separation values - in distance for DBS mode and in time for TBS mode - representing combined impact of the uncertainties for aircraft air speed profile and glideslope wind values
Status	<validated>
Rationale	Uncertainties need to be taken into account for safety matters
Category	<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0132
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR3.0150
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR3.0152
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0130
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR2.1690
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0131
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR3.0151
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0169
<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

		APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0021
Title	MRS value
Requirement	Offline modifiable Minimum Radar Separation values shall be provided to the system
Status	<validated>
Rationale	Safety separations to apply need to be input to the separation delivery tool
Category	<Data> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0230
<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0022
Title	Runway Spacing
Requirement	Offline modifiable specific Spacing values shall be provided to the system
Status	<validated>
Rationale	Specific separations to apply need to be input to the separation delivery tool
Category	<Safety> , <Data>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0200
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0250
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0240
<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0020
Title	Wake separation value
Requirement	Wake separations values shall be provided to the system both - in distance and - in corresponding time to fly
Status	<validated>
Rationale	Safety separations to apply need to be input to the separation delivery tool
Category	<Safety> , <Data>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR1.0070
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0080
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0100
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0380
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0400
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0390
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0420
<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR3.0030
Title	Visual Approach
Requirement	Upon a Visual Approach clearance for aircraft A, CWP HMI shall inhibit the display of the following indications - ITD display - FTD display - Catch-up alert - Speed alert - Infringement alert
Status	<validated>
Rationale	Visual approach separation is under pilot's responsibility
Category	<Safety> , <HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0850
<ALLOCATED_TO>	<Function>	Display Approach applicable separation Safety Nets
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information

[REQ]

Identifier	REQ-12.02.02-TS-OPS1.0010
Title	Wake separation provision
Requirement	The system shall allow to define wake separation tables among the following - ICAO - RECAT-EU - RECAT-PWS - WDS
Status	<validated>
Rationale	Necessary inputs to the separation delivery tool must be offline configurable
Category	<Safety> , <Data>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR1.0020
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1250
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR2.1280
<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR3.0024
Title	EAP TDI's recomputation for follower
Requirement	Upon confirmed change of approach procedure for aircraft A, and if A has a follower in the arrival sequence, the system shall recompute the TDIs of aircraft A, updating - the separation table taking into account aircraft A's new approach and aircraft A's follower approach and - the new speed profile for aircraft A corresponding to its new selected approach
Status	<validated>
Rationale	TDIs must be updated upon any input change
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<ALLOCATED_TO>	<Function>	Determine the Largest DDI-D Determine the Largest NBTOT Record Inputs

[REQ]

Identifier	REQ-02.01-TS-ARR3.0023
Title	EAP TDI's recomputation for leader
Requirement	Upon confirmed change of approach procedure for aircraft A, and if A has a leader in the arrival sequence, the system shall recompute the TDIs targeted by A , updating - the separation table taking into account aircraft A's leader approach and aircrafts A's new selected approach and - the new speed profile for aircraft A corresponding to its new selected approach
Status	<validated>

Rationale	TDIs must be updated upon any input change
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<ALLOCATED_TO>	<Function>	Record Inputs

[REQ]

Identifier	REQ-02.01-TS-ARR3.0022
Title	Air Speed profiles
Requirement	For each aircraft, the system shall include offline defined air speed profiles for each of the procedures applicable to this aircraft among the following ILS VFR IGS SRAP CSPR-DT A-IGS IGS-to-SRAP
Status	<in progress>
Rationale	The separation delivery tool needs inputs related to all applicable enhanced approach procedures
Category	<Data> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<ALLOCATED_TO>	<Function>	Manage Inputs

[REQ]

Identifier	REQ-02.01-TS-ARR3.0021
Title	Offline tables
Requirement	The separation delivery tool shall be provided with the approach separation minima for each combination of published approach procedure (i.e. GLS Z 32R or ILS Y 32R) with different glideslopes, which takes into account the associated navigation means and corresponding vertical accuracy around the published profile
Status	<in progress>
Rationale	The separation delivery tool needs inputs related to all applicable enhanced approach procedures
Category	<Data> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<ALLOCATED_TO>	<Function>	Manage Inputs

[REQ]

Identifier	REQ-02.01-TS-ARR3.0020
Title	List of approaches
Requirement	For each aircraft, the expected and cleared approach procedure selected by the approach controller shall be communicated to the separation delivery tool in order to use the appropriate separation minima between the leader and follower aircraft.
Status	<in progress>
Rationale	The separation delivery tool needs inputs related to all applicable enhanced approach procedures
Category	<Safety> , <HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01

<ALLOCATED_TO>	<Function>	Manage Inputs

[REQ]

Identifier	REQ-02.01-TS-ARR3.0010
Title	Approach procedure HMI
Requirement	For each aircraft in the arrival sequence, the HMI shall display all selectable approach procedures applicable to this aircraft.
Status	<validated>
Rationale	The HMI must display all applicable enhanced approach procedures
Category	<Safety> , <HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<ALLOCATED_TO>	<Function>	Support Final Approach Traffic Spacing

[REQ]

Identifier	REQ-02.01-TS-ARR1.0130
Title	Display approach arrival sequence
Requirement	The HMI may display the approach arrival sequence on all CWPs
Status	<validated>
Rationale	Approach arrival sequence is an additional information needed by the ATCO
Category	<HMI> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01

<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0920
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0930
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1351
<ALLOCATED_TO>	<Function>	Support Final Approach Traffic Spacing Support Traffic Separation Display Approach applicable separation Display applicable separation
<ALLOCATED_TO>	<Enabler>	APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0140
Title	Wind display
Requirement	CWPs HMI may display glideslope and surface wind information
Status	<in progress>
Rationale	Wind information may be useful to approach controllers
Category	<Safety> , <HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1330
<ALLOCATED_TO>	<Function>	Support Final Approach Traffic Spacing Support Traffic Separation

		Display Approach applicable separation
<ALLOCATED_TO>	<Enabler>	APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems

[REQ]

Identifier	REQ-02.01-TS-ARR1.0121
Title	TDI value
Requirement	The HMI may display the TDIs values
Status	<in progress>
Rationale	TDIs are displayed, their values may be needed for additional awareness
Category	<Safety> , <HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0720
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0810
<ALLOCATED_TO>	<Function>	Display Approach applicable separation Display applicable separation
<ALLOCATED_TO>	<Enabler>	APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0122
Title	Distance to TDI
Requirement	The HMI may display the distance between TDIs and the associated follower aircraft
Status	<in progress>
Rationale	Distance values might be useful to controllers
Category	<HMI> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0793
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0795
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0796
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0792
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0820
<ALLOCATED_TO>	<Function>	Display Approach applicable separation
<ALLOCATED_TO>	<Enabler>	APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0120
Title	TDI association

Requirement	The HMI shall be able to show the association between each TDI and its follower aircraft
Status	<validated>
Rationale	Controllers may need to identify which aircraft is associated to each TDI
Category	<Safety> , <HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0800
<ALLOCATED_TO>	<Function>	Display Approach applicable separation
<ALLOCATED_TO>	<Enabler>	APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0110
Title	Distance step resolution
Requirement	The Separation Delivery tool HMI shall display indicators to at least a distance step resolution of 0.1NM
Status	<validated>
Rationale	Resolution needs to be high enough to avoid lack of situational awareness
Category	<Safety> , <Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0780
<ALLOCATED_TO>	<Function>	Display Approach applicable separation Display applicable separation
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0102
Title	Display of infringement alert
Requirement	HMI shall display the FTD upon reception of an infringement alert on an ITD
Status	<validated>
Rationale	Infringement alert of the ITD is needed to be displayed
Category	<HMI> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0796
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0795
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR2.0971

<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0990
<ALLOCATED_TO>	<Function>	Safety Nets
<ALLOCATED_TO>	<Enabler>	APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0091
Title	Hide TDIS
Requirement	The HMI shall be able to hide selected TDIs
Status	<validated>
Rationale	Controller may need to unselect some displays
Category	<HMI> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0168
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR3.0660
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0900
<ALLOCATED_TO>	<Function>	Display Approach applicable separation
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information

		APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0100
Title	Infringement alert 1
Requirement	An infringement alert shall be sent by the separation delivery tool to HMI as soon as the Follower aircraft established on the centreline goes beyond its targeted ITD
Status	<validated>
Rationale	Infringement alert triggered by the separation delivery tool needs to be sent to HMI
Category	<Interoperability> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0795
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0792
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR3.1520
<ALLOCATED_TO>	<Function>	Safety Nets
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0101
Title	Infringement alert 2
Requirement	An infringement alert shall be sent by the separation delivery tool to HMI if both if the following conditions are met - the difference between ITD and FTD is less than x NM - the follower aircraft established on the centreline goes beyond x NM from its targeted FTD
Status	<validated>
Rationale	Controllers need to be warned if the infringement is close but undetectable because of low compression
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR3.1540
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0650
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0710
<ALLOCATED_TO>	<Function>	Safety Nets
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0090
Title	Display Option

Requirement	The HMI may display the TDIs in different shapes depending on the type of TDI
Status	<validated>
Rationale	Controllers preferences need to be taken into account by the HMI
Category	<HMI> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0257
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0670
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0680
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0681
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0691
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1771
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1772
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1773
<ALLOCATED_TO>	<Function>	Display Approach applicable separation Display applicable separation
<ALLOCATED_TO>	<Enabler>	APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0072
Title	Mode Change Display
Requirement	The HMI shall show for each aircraft the mode of operation applied
Status	<validated>
Rationale	Controllers need to be aware of the current mode of operation
Category	<HMI> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1090
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1021
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1222
<ALLOCATED_TO>	<Function>	Support Final Approach Traffic Spacing
<ALLOCATED_TO>	<Enabler>	APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0080

Title	Runway wind
Requirement	The current Runway surface wind may be provided to the Separation delivery tool
Status	<validated>
Rationale	Runway surface wind is not necessary fort TDIs computation but may increase controllers situational awareness
Category	<Data> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0290
<ALLOCATED_TO>	<Function>	Display Wind Conditions Manage Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 99_ATC System to use Real-Time Meteo Information Received From Met Systems

[REQ]

Identifier	REQ-02.01-TS-ARR1.0071
Title	Mode Change
Requirement	Upon each mode change, impacted TDIs shall be recomputed in consistency with the new mode applied
Status	<validated>
Rationale	TDIs must be recomputed upon each input change
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1090

<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1021
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1222
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1020
<ALLOCATED_TO>	<Function>	Compute TDI
<ALLOCATED_TO>	<Enabler>	APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters 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 AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0070
Title	Mode Change HMI
Requirement	The HMI shall allow the following mode change from DBS to TBS from TBS to DBS for each arrival runway
Status	<validated>
Rationale	Controllers need to be able to activate or deactivate TBS mode on demand
Category	<HMI> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1021

<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR2.1222
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1221
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1022
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0980
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1023
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1024
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR2.1060
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1041
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1032
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1030
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1031
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR2.1050
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1070
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1080
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1033
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1040
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1120
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1223
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1034
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1100
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1110
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1290
<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters

		APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0011
Title	Sending Aircraft distance to FTD
Requirement	For each aircraft in the arrival sequence which has a leader aircraft in the arrival sequence, the system shall send the distance value between the aircraft and its targeted FTD to the Tower CWP and to the Approach CWP.
Status	<validated>
Rationale	Distance Aircraft - FTD can improve situational awareness for controllers
Category	<HMI> , <Interoperability>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0165
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0166
<ALLOCATED_TO>	<Function>	Support Final Approach Traffic Spacing Manage Inputs
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters

		APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0010
Title	Display of Aircraft distance to FTD
Requirement	If an aircraft is - eligible for TDIs display - established on the centreline - infringing its targeted ITD, and the separation delivery tool shall send the distance value between the aircraft and the targeted FTD to the HMI
Status	<validated>
Rationale	If the aircraft has infringed ITD, Tower CWP needs to display distance to FTD to verify that the aircrafts does not go beyond the FTD
Category	<Interoperability> , <HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0164
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0490
<ALLOCATED_TO>	<Function>	Display Approach applicable separation
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0020
Title	Gap HMI input

Requirement	The HMI shall provide the possibility to input a gap spacing value, in distance or in time, behind any aircraft eligible for TDI computation
Status	<validated>
Rationale	ATCO needs to be able to insert a gap behind an aircraft for departure or other reason
Category	<HMI> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0255
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0254
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0251
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1380
<ALLOCATED_TO>	<Function>	Record Inputs
<ALLOCATED_TO>	<Enabler>	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 APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information

[REQ]

Identifier	REQ-02.01-TS-ARR1.0026
Title	Feedback following gap insertion

Requirement	The tool shall provide a feedback on whether or not the gap insertion or update is successful
Status	<in progress>
Rationale	Several reasons could lead to the gap insertion to fail, such as insufficient time between two aircrafts on the centre line for the gap value to be inserted, etc.
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0253
<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0021
Title	Gap transmission
Requirement	Upon reception of a gap spacing instruction behind an aircraft, CWP HMI shall send the instruction along with the value to the Separation delivery tool
Status	<in progress>

Rationale	The separation delivery tool takes into account gap requests from HMI
Category	<Safety> , <HMI> , <Interoperability>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0570
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1027
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1025
<ALLOCATED_TO>	<Function>	Record Inputs
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0023
Title	Gap HMI cancel
Requirement	The HMI shall provide the possibility to cancel a gap spacing value previously requested for an aircraft.
Status	<validated>
Rationale	ATCO needs to be able to cancel a gap behind an aircraft
Category	<HMI> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0255
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0254
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1026
<ALLOCATED_TO>	<Function>	Record Inputs
<ALLOCATED_TO>	<Enabler>	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 APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information

[REQ]

Identifier	REQ-02.01-TS-ARR1.0024
Title	Gap cancel recomputation
Requirement	Upon reception of a gap cancel instruction behind an aircraft, the system shall recompute the TDIs attached to the concerned aircraft taking into account the absence of Gap constraint
Status	<validated>
Rationale	Gap cancellations instructed by controllers need to be taken into account by the separation delivery tool
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0162
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0570
<ALLOCATED_TO>	<Function>	Compute TDI
<ALLOCATED_TO>	<Enabler>	APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach 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 APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information

[REQ]

Identifier	REQ-02.01-TS-ARR1.0030
Title	Constraint information transmission
Requirement	For each aircraft, the system shall send to Tower and Approach CWP HMI the constraint type MRS, or GAP, or WAKE, or ROT along with the sent TDIs
Status	<validated>
Rationale	HMI must be able to display the chevron differently taking into account the associated constraint
Category	<Interoperability> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0110

<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1320
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0840
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1301
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1302
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1340
<ALLOCATED_TO>	<Function>	Support Final Approach Traffic Spacing
<ALLOCATED_TO>	<Enabler>	APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters 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 AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0031
Title	TDIs display with constraint
Requirement	The Tower CWP HMI and the Approach CWP HMI shall be able to apply different shapes to the displayed TDIs taking into account the applied constraint
Status	<validated>
Rationale	ATCO must be able to differentiate the constraint behind the TDIs
Category	<Safety> , <HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01

<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0167
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0851
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0651
<ALLOCATED_TO>	<Function>	Display TDI
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0040
Title	TDIs computation WAKE and MRS
Requirement	If the most constraining separation type is of ROT or GAP type, then the system shall automatically compute a second set of TDIs related to the most constraining separation value between MRS and WAKE.
Status	<in progress>
Rationale	System must be able to send the Safety constraint behind non safety constraints
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0791

<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0790
<ALLOCATED_TO>	<Function>	Support Final Approach Traffic Spacing Support Traffic Separation
<ALLOCATED_TO>	<Enabler>	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 APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0041
Title	TDIs display WAKE and MRS
Requirement	If an infringement event is triggered on an ITD representing ROT or GAP constraint, the CWP HMI shall display the ITD related to the second set of TDIs sent by the System.
Status	<in progress>
Rationale	ATCO needs to know what is the Safety constraint behind the non safety constraint
Category	<Safety> , <HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0790
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0791
<ALLOCATED_TO>	<Function>	Safety Nets
<ALLOCATED_TO>	<Enabler>	APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach

		APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0050
Title	Runway change
Requirement	The HMI shall allow each aircraft in one arrival sequence to be assigned to another arrival sequence corresponding to a different runway.
Status	<validated>
Rationale	ATCO needs to have the possibility to change the assigned runway for al aircrafts
Category	<HMI> , <Interoperability> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0560
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0550
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0910
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0950
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0561
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0852
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.1380
<ALLOCATED_TO>	<Function>	Update Sequence
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach

		APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach

[REQ]

Identifier	REQ-02.01-TS-ARR1.0060
Title	CSPR offline
Requirement	The offline configuration file for the system shall allow to specify if 2 runways are CSPR or not
Status	<in progress>
Rationale	Offline configuration of CSPR
Category	<Safety> , <Data>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0200
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0370
<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information 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 APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters

[REQ]

Identifier	REQ-02.01-TS-ARR1.0061

Title	CSPR application
Requirement	For each pair of consecutive arrivals on 2 CSPR the TDIs shall apply an additional longitudinal constraint of a configurable minimum longitudinal separation between the 2 aircrafts.
Status	<in progress>
Rationale	Computation of TDIs in CSPR
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-ARR0.0200
<ALLOCATED_TO>	<Function>	Manage Inputs
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-68_ATC System to support Optimised Runway Delivery on Final Approach AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information APP ATC 74_ATC System Support for Reduced, Weather-Dependent Separation Standards in Final Approach APP ATC 120_ATC System to support Optimised Runway Delivery on Final Approach APP ATC 118_ATC System to Support Pairwise Separation in Specific Conditions based on static parameters

4.2.2 Departure Concepts Solutions

[REQ]

Identifier	REQ-02-01-TS-DEP0.0001

Title	Optimised departure sequence plan for pushback and taxi-out computation
Requirement	The Departure Sequence Management shall compute an optimised departure sequence plan for pushback and taxi-out
Status	<validated>
Rationale	A-CDM/DMAN support will be provided to formulate and optimise the departure sequence order and departure rate for coordinating the TOBTs and TSATs and managing the taxi-out flow of departure aircraft to the runway holding points
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0001
<ALLOCATED_TO>	<Functional block>	Departure Sequence Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Clear Stale Displayed Information and Reformulate Sequence
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.9001
Title	Optimised departure sequence plan for pushback and taxi-out display
Requirement	The CHMIM shall display the optimised departure sequence plan for pushback and taxi-out
Status	<validated>
Rationale	The Tower ATC Roles shall be able to check the initial optimised departure sequence plan for pushback and taxi-out in the HMI

Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0001
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.1001
Title	Optimised departure sequence plan for line-up and take-off computation
Requirement	The Departure Sequence Management should compute an optimised departure sequence plan for line-up and take-off
Status	<validated>
Rationale	This requirement is considered as optional as to whether this support is provided to the Tower Runway Controller and whether the system permits late changes in the sequence due to unexpected events such as aircraft not being ready to line-up and take-off or a change of CTOT.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.1001
<ALLOCATED_TO>	<Functional block>	Departure Sequence Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Clear Stale Displayed Information and Reformulate Sequence

<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.1901
Title	Optimised departure sequence plan for line-up and take-off display
Requirement	The CHMIM should display the optimised departure sequence plan for line-up and take-off
Status	<validated>
Rationale	The Tower ATC Roles should be able to check the initial optimised departure sequence plan for line-up and take-off in the HMI
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.1001
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.0002
Title	Aircraft separation monitoring for distance-based separation
Requirement	The CHMIM shall display the situation view in a way that allows to check the delivery conformance to the required distance-based wake separation
Status	<validated>

Rationale	The HMI shall present in the situation view display the means to check if the right distance-based wake separation is delivered between aircraft to avoid separation minima infringement and to confirm the appropriate application of the OSD tool support
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0002
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WSD and DDI-D Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.1002
Title	Aircraft separation monitoring for time-based separation
Requirement	The CHMIM should display the situation view in a way that allows to check the delivery conformance to the required time-based wake separation
Status	<validated>
Rationale	The HMI should present means to check if the right time-based wake separation is delivered between aircraft to avoid separation minima infringement and to confirm the appropriate application of the OSD tool support.
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01

<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.1002
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WST and NBAT/NBTOT Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.0003
Title	Editable Departure Sequence
Requirement	The Departure Sequence Management departure sequence plan shall be editable
Status	<validated>
Rationale	The possibility of manually editing the departure sequence plan allows the Tower Runway Controller to amend sequence plan/order on a tactical basis in case it is needed, either because of an unexpected event or according to controllers' judgement.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0003
<ALLOCATED_TO>	<Functional block>	Departure Sequence Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Clear Stale Displayed Information and Reformulate Sequence
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.9003
Title	Departure separation recalculation

Requirement	The OSD tool shall take into account any modification made in the departure sequence plan/order to recalculate the separation between leader and follower (even if they are late/tactical changes)
Status	<validated>
Rationale	When the departure sequence order is modified, the former leader-follower pairs are no longer valid, so new separations between pairs need to be computed
Category	<IER> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0003
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0030
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Clear Stale Displayed Information and Reformulate Sequence
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.0004
Title	Wake separation time display
Requirement	The CHMIM shall present the remaining time to next departure that satisfies the wake separation based on the separation mode that is being applied.
Status	<validated>
Rationale	The system shall present the time left until the next departure, either the "airborne time" separation or "start of take-off roll time" separation depending on local procedures
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0004
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WST and NBAT/NBTOT Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.0005
Title	SID separation minima support
Requirement	The CHMIM should display the SID separation minima to be applied between departures
Status	<validated>
Rationale	SID separation is taken into consideration when determining the most restrictive separation between aircraft pairs
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0005
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.0006
Title	Wake separation time calculation

Requirement	The OSD tool shall calculate the time until next departure correctly representing the WDS (departure) or standard wake separation (according to the wake separation in use) for all departure pairs in all normal ranges of weather and operating conditions.
Status	<validated>
Rationale	The system shall take into account the aircraft types and calculate the wake separation time based on the wake separation rules in use for each departing aircraft pair.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0006
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Calculate NBTOT (for the WST) Calculate NBAT (for the WST)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.9006
Title	Time to next departure calculation
Requirement	The OSD tool shall calculate the time to next departure taking into account the wake separation rules in use
Status	<validated>
Rationale	The wake separation rules are based on the defined matrices depending on which separation method is being applied.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0006
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Calculate NBAT (for the WST) Calculate NBTOT (for the WST)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.8006
Title	Take-off from intermediate position
Requirement	The OSD tool shall add 60s to the time to next departure if the flight takes off from an intermediate position relative to the preceding departure aircraft take-off position for time-based separation
Status	<validated>
Rationale	When an aircraft is departing from an intermediate position relative to the preceding aircraft take-off position, it is necessary to add time to the standard wake separation time for that pair as a safety measure. Departing from an intermediate position could increase the likelihood of a wake encounter if this measure is not applied.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0006
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Calculate NBAT (for the WST) Calculate NBTOT (for the WST)

<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.9007
Title	Radar separation minima support
Requirement	The CHMIM should display the Minimum Radar Separation to apply
Status	<validated>
Rationale	The Minimum Radar Separation is taken into account when determining the most restrictive separation between aircraft pairs
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0007
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WST and NBAT/NBTOT Information Display WSD and DDI-D Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.0007
Title	Radar separation minima computation
Requirement	The OSD tool should compute the Minimum Radar Separation to apply
Status	<validated>

Rationale	The Minimum Radar Separation is taken into account when determining the most restrictive separation between aircraft pairs
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0007
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Calculate NBTOT for the SID Separation and MRS (if these are supported) Calculate NBAT for the SID Separation and MRS (if these are supported) Calculate DDI-D for the SID Separation and MRS (if these are supported)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.0008
Title	Wake separation provision
Requirement	The OSD tool shall provide accurate and robust information on the required wake turbulence separation interval between each successive departing aircraft
Status	<validated>
Rationale	The tool shall ensure the delivery of consistent and accurate wake turbulence separation information
Category	<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier

<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0008
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Calculate DDI-D Position (for the WSD) Calculate NBAT (for the WST) Calculate NBTOT (for the WST)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.0009
Title	Determining when aircraft becomes airborne
Requirement	The system should automatically determine when aircraft become airborne
Status	<validated>
Rationale	Accuracy in determining when take-off clearances must be issued is a key element in order to take full advantage of the reduced separations while maintaining safety levels. This will be achieved by the automatic provision of aircraft becoming airborne time by ground systems, which will replace the current detection method based on controllers' judgement.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0009
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.1009

Title	Aircraft take-off roll start determination
Requirement	Aerodrome Surveillance should detect when aircraft start their take-off roll
Status	<validated>
Rationale	When separations are reduced it is important that decisions as to when to issue take-off clearances are based on accurate information. Whilst a manual approach to determining the "start of take-off roll" may be suitable for current operations, it is possible that the level of accuracy will be unacceptable from both a safety (too early could be unsafe) and service delivery (too late is inefficient) perspective for the future. The "start of take-off roll" may be able to be reliably determined using conventional surveillance (radar surveillance, multilateration).
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.1009
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.1909
Title	Aircraft take-off roll start presentation
Requirement	The CHMIM should notify when aircraft start their take-off roll
Status	<validated>

Rationale	When separations are reduced it is important that decisions as to when to issue take-off clearances are based on accurate information. Whilst a manual approach to determining the "start of take-off roll" may be suitable for current operations, it is possible that the level of accuracy will be unacceptable from both a safety (too early could be unsafe) and service delivery (too late is inefficient) perspective for the future. The "start of take-off roll" may be able to be reliably determined using conventional surveillance (radar surveillance, multilateration).
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.1009
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.0018
Title	SID information display
Requirement	The CHMIM shall display SID information for each departure aircraft
Status	<validated>

Rationale	The SID information and its corresponding SID separation is required when determining if a departure pair can apply a WDS-D Xw reduced wake separation. It is necessary to take into account the SID separation to check if it is most restrictive than the wake separation calculated by the OSD tool. If so, the latter cannot be applied as the separation required due to SID is most constraining. Note that the SID information should already be provided by the system to support the application of SID separations as is the case of Heathrow where the planned SID is displayed on the FDE of each departure aircraft, so there is no change required to the current system. For other local environments there may be a need to supplement the provision of SID information.
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0018
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.0020
Title	Aircraft route display for distance-based separation
Requirement	The CHMIM shall present the planned route of each aircraft when applying distance-based separation

Status	<validated>
Rationale	When applying distance-based wake separations the system needs to present the aircraft route to allow the controller to visualise how far along the SID path the lead aircraft needs to progress before giving the take-off clearance to the follower aircraft. This is in order to deliver the required distance-based wake separation when the follower aircraft becomes airborne.
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0020
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.0034
Title	Different MRS and SID timer and WT timer
Requirement	The HMI shall display the countdown time differentiating between MRS and SID separation support and WT support
Status	<validated>
Rationale	This requirement applies when the OSD tool is providing informative support for SID and MRS constraints that the ATCO has the discretion to interpret and issue an earlier take-off clearance. This is so as to clearly distinguish from the WT separation support that the ATCO is required to apply.
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier

<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0034
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WST and NBAT/NBTOT Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.0041
Title	SID information on the HMI
Requirement	The HMI shall display SID information with the adequate prominence
Status	<validated>
Rationale	SID information prominence was identified as a preventative mitigation against CF "ATCO fails to take into account a SID separation constraint within the departure clearance (even though appropriate wake separation applied)". Due to the new HMI element (OSD tool) being "easy to follow", controllers might omit to include the SID separation constraints, when applicable, into the departure clearance.
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0041
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.0042
Title	Display of wake separations for each departure pair
Requirement	The OSD tool shall display the wake separation time or the non-wake pair information for each departure pair on all its HMI elements
Status	<validated>
Rationale	If no separation is displayed for a pair, that means that the tool is unable to provide information, thus there is an OSD tool failure
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0042
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WST and NBAT/NBTOT Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.0043
Title	Distinguish non-wake pair
Requirement	The OSD tool shall distinguish between a wake and a non-wake aircraft pair
Status	<in progress>
Rationale	Aircraft pairs information shall be included in the tool with a field distinguishing if the pair is a wake or a non-wake one
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0043
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Calculate DDI-D Position (for the WSD) Calculate NBTOT (for the WST) Calculate NBAT (for the WST)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.9043
Title	Unambiguous display of non-wake pair information
Requirement	HMI associated with the NBAT and the value displayed by the Countdown timer for a non-wake pair shall be unambiguous
Status	<in progress>
Rationale	"NONE" was displayed in the NBAT field on the FDE in RTS 5. This signified that there was no wake separation constraint to the preceding departure aircraft. This was instead of displaying "0000" which was considered as confusing.
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0043
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WST and NBAT/NBTOT Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.0045
Title	Automatic countdown
Requirement	The OSD tool countdown timer shall automatically start ticking at adequate time.
Status	<in progress>
Rationale	The countdown starts when preceding aircraft either takes off or becomes airborne, depending on whether the calculations are based on take-off time (NBTOT) or airborne time (NBAT)
Category	<Functional> , <HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0045
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WST and NBAT/NBTOT Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.9045
Title	Distinguishing countdown timer status
Requirement	The HMI should display the countdown timer distinguishing a passive status (ticking has not started yet) from an active status (ticking has started)
Status	<in progress>
Rationale	Errors, mis-seeing or mis-judgement of the displayed information are avoided

Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0045
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WST and NBAT/NBTOT Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.0047
Title	Countdown timer on FDE
Requirement	The OSD tool should include the countdown timer on the FDE
Status	<in progress>
Rationale	The countdown timer on the ADIS display increases heads-up time which is seen as a positive benefit
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.0047
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WST and NBAT/NBTOT Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.2001
Title	SID and other constraints
Requirement	The OSD tool should take into account SID constraints and aircraft type speed considerations for the NBTOT calculations
Status	<in progress>
Rationale	The separation tool should take into consideration all of the constraints related to the separations rather than just the wake turbulence separation constraints.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.2001
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Calculate NBTOT for the SID Separation and MRS (if these are supported)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.2002
Title	Calculations for traffic in the holding bay
Requirement	The OSD tool should calculate take-off clearance time indicator for all the traffic in the holding bay (for segregated mode operations)
Status	<in progress>
Rationale	The time indicators should be calculated for all the traffic in the holding bay waiting for line-up with respect to the leader aircraft. This helps the controller to prioritise flights when it is possible to alter the sequence order between the aircrafts in the bay.

Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.2002
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Calculate NBAT (for the WST) Calculate NBTOT (for the WST)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.2902
Title	Time indicators for traffic in the holding bay
Requirement	The HMI should display the take-off clearance time indicator for all the traffic in the holding bay (for segregated mode operations)
Status	<in progress>
Rationale	The time indicators should be calculated for all the traffic in the holding bay waiting for line-up with respect to the leader aircraft. This helps the controller to prioritise flights when it is possible to alter the sequence order between the aircrafts in the bay.
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.2002
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)

<ALLOCATED_TO>	<Function>	Display WST and NBAT/NBTOT Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3003
Title	Alarm for early issued departure clearance
Requirement	The CWP shall trigger an alarm when a departure clearance is issued too early against the timer
Status	<in progress>
Rationale	For Safety purposes (runway is engaged, no departures or crossing are allowed until the departing or arriving aircraft has vacated the runway)
Category	<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3003
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3004
Title	Gap value updates
Requirement	The OSD tool shall deliver gap spacing information in a stable and reliable manner in order to avoid the recalculation and constant updates of the gap values.
Status	<in progress>

Rationale	One potential solution to achieve it could be to use the predicted touch down time based on the standard descend profiles in order to avoid the recalculation and constant updates of the gap values.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3004
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Determine the Largest NBAT Determine the Largest NBTOT Determine the Largest DDI-D
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3005
Title	Gap spacing delivery information
Requirement	The HMI shall display the OSD gap spacing delivery information
Status	<in progress>
Rationale	The information needs to be displayed in a coherent manner for both APP and TWR CWPs
Category	<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3005

<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WST and NBAT/NBTOT Information Display WSD and DDI-D Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3006
Title	Arrival flights consideration
Requirement	The OSD tool (DDI-T) shall take into consideration the arrival flights in case of partially segregated/mixed mode runway operations
Status	<in progress>
Rationale	This could be done by integrating information on the arrivals such as from an arrival management tool into the OSD tool
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3006
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Calculate DDI-D Position (for the WSD)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3009
Title	Required time elapsed

Requirement	The OSD tool could indicate that the required time had elapsed to enable a subsequent departure event
Status	<in progress>
Rationale	The indication would be presented even though an arriving aircraft was imminent, and no departures should be allowed on the runway until the arriving aircraft had landed and exited the runway. This indication aims to increase efficiency and enhance situation awareness.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3009
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS.DEP0.3010
Title	Vertical and lateral separation for MRS
Requirement	The OSD tool should take into account the 1000ft vertical separation and the 3NM lateral separation constraint between the departing aircrafts when determining the DDI-T and DDI-D values for MRS minima if applicable
Status	<in progress>
Rationale	To ensure an appropriate separation is maintained during the departure phase, under the condition that it is also achieved on hand-over to the next sector.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3010
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Calculate DDI-D for the SID Separation and MRS (if these are supported) Calculate NBAT for the SID Separation and MRS (if these are supported) Calculate NBTOT for the SID Separation and MRS (if these are supported)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3906
Title	Line-up support
Requirement	The OSD tool shall indicate the controller when to line up a departure only when it is safe to do so
Status	<in progress>
Rationale	When an arrival is imminent the OSD tool should indicate that no departures are allowed to be cleared for line-up.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3006
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3007
Title	Mixed mode
Requirement	The OSD tool shall have an additional HMI support to visualize the planned arrivals and departures sequence on the runway in partially segregated/mixed mode
Status	<in progress>
Rationale	This could be done using electronic flight strips, or with an AMAN/DMAN or with a bespoke sequencing tool.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3007
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3008
Title	Separation calculations buffer
Requirement	The OSD tool shall integrate the adequate buffers to the separation calculations
Status	<in progress>

Rationale	To accommodate for variability related to aircraft performance on the runway and airborne (on the climb profile) and prevent any separation infringement. The size of the buffer should be based on the analysis of the aircraft performance data derived from operational data collected from the local airport where the OSD is to be implemented.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3008
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Determine the Largest DDI-D Determine the Largest NBTOT Determine the Largest NBAT
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3011
Title	Automatic take-off detection
Requirement	The OSD tool should automatically detect the aircraft take-off based on the aircraft rolling speed in case it is missed to input the take-off instruction in the EFS system. The DDI for the next departure should adapt accordingly.
Status	<in progress>
Rationale	To ensure efficiency as well as to ensure appropriate separations are maintained during the departure phase, lowering the potential of human error.

Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3011
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3911
Title	Adapt DDI according to take-off detection
Requirement	The OSD tool should adapt the DDI accordingly when the aircraft take-off is automatically detected
Status	<in progress>
Rationale	To ensure efficiency as well as to ensure appropriate separations are maintained during the departure phase, lowering the potential of human error.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3011
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3012
Title	Timestamping of instructions
Requirement	The OSD tool/ CWP HMI should timestamp the time of the instructions given/inputted by the controllers.
Status	<in progress>
Rationale	The automatic timestamp prevents controllers from having to write down times of instruction.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3012
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3014
Title	FTD display constraint
Requirement	The HMI should not display the FTD unless ROT is a prevailing constraint
Status	<in progress>
Rationale	To ensure there is not additional clutter on the screen.
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01

<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WSD and DDI-D Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3016
Title	Mixed mode operations warning messages
Requirement	The HMI should display a warning message to show whether sequence changes are possible in mixed mode operations
Status	<in progress>
Rationale	For instance, highlighted in red in case the proposal is not accurate
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3016
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3017
Title	Distinguishing wake separations
Requirement	The HMI should display the wake separations in a different manner depending on whether they are based on wake minima compared to MRS or SID constraints
Status	<in progress>

Rationale	In order to ensure it is clearly shown which factor is most constraining
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3017
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WST and NBAT/NBTOT Information Display WSD and DDI-D Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3018
Title	Runway entry points
Requirement	The OSD tool should consider different runway entry points
Status	<in progress>
Rationale	To be applicable in complex environments
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3018
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Calculate DDI-D Position (for the WSD) Calculate NBTOT (for the WST)

		Calculate NBAT (for the WST)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3918
Title	TMA exit points
Requirement	The OSD tool should consider regulations related to the TMA exit points
Status	<in progress>
Rationale	To be applicable in complex environments
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3018
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3019
Title	AMAN/DMAN integration
Requirement	The ORD and OSD integration (including the DDI-T, DDI-D and gap spacing management tool) should be merged with the AMAN / DMAN
Status	<in progress>
Rationale	To synchronize all data and ensure the ATCO does not have redundant information or different displays.

Category	<IER>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3019
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3020
Title	OSD in mixed mode
Requirement	The OSD tool shall not display the departure separation to be applied to the preceding departure aircraft when the immediately preceding aircraft in the sequence is an arrival aircraft, unless the departure aircraft is given a line-up clearance behind the arrival aircraft in partially segregated/mixed mode operations
Status	<in progress>
Rationale	If the OSD tool is not taking into account the arrivals in mixed mode, when the DDI-T starts counting down or if the DDI-D is shown, it might suggest to the controller that the follower a/c to use the runway could be a departure. This requirement could be achieved via a procedure, by not starting the countdown timer unless the next a/c has been given line-up clearance so separation will be displayed always for a departure pair, or via the system by making the OSD tool take into account the arrival sequence. The exact solution is to be determined at local level.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3020
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WST and NBAT/NBTOT Information Display WSD and DDI-D Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3022
Title	A/C outside the climb envelope considered by the tool
Requirement	The Monitoring Aids shall alert when an a/c is outside the climb profile envelope used by the OSD tool, prior to the follower aircraft being given a take-off clearance
Status	<in progress>
Rationale	If the local airport departure route structure permits catch-up situations
Category	<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3022
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3023
Title	Separation calculation between multiple aircraft

Requirement	The OSD tool shall take into account the separation between the leader and the other aircraft in the sequence (e.g. 1sr and 3rd) and not only between the first pair, when calculating SID, MRS and Wake separations.
Status	<in progress>
Rationale	This is to mitigate the case when there is still some separation/spacing to be applied between e.g. the first and the third departure, after the separation/spacing between the second the third departure has been achieved. I.e. if given take-off clearance, the third departure will be separated with the second departure but it will not be separated compared with the first departure (e.g. MRS constraint between 1st and 2nd a/c and between 2nd and 3rd aircraft but at the same time there is a SID constraint between the 1st and 3rd a/c)
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3023
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Calculate NBTOT for the SID Separation and MRS (if these are supported) Calculate NBAT for the SID Separation and MRS (if these are supported) Calculate DDI-D for the SID Separation and MRS (if these are supported)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3923
Title	Display of separation between multiple aircraft
Requirement	The HMI shall display the separations calculated by the OSD tool between the leader and the other aircraft in the sequence

Status	<in progress>
Rationale	This is to mitigate the case when there is still some separation/spacing to be applied between e.g. the first and the third departure, after the separation/spacing between the second the third departure has been achieved. I.e. if given take-off clearance, the third departure will be separated with the second departure but it will not be separated compared with the first departure (e.g. MRS constraint between 1st and 2nd a/c and between 2nd and 3rd aircraft but at the same time there is a SID constraint between the 1st and 3rd a/c)
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3023
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WSD and DDI-D Information Display WST and NBAT/NBTOT Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP1.0001
Title	PWS-D wake separation minima calculation
Requirement	The OSD tool shall calculate the PWS-D wake separation minima to apply between pairs taking into account each aircraft type
Status	<validated>
Rationale	This calculation is done based on the predefined PWS-D wake separation matrices.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP1.0001
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Calculate DDI-D Position (for the WSD) Calculate NBTOT (for the WST) Calculate NBAT (for the WST)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information

[REQ]

Identifier	REQ-02.01-TS-DEP1.9001
Title	PWS-D wake separation minima presentation
Requirement	The CHMIM shall present the PWS-D wake separation minima to apply between pairs
Status	<validated>
Rationale	This calculation is done based on the predefined PWS-D wake separation matrices.
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP1.0001
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WSD and DDI-D Information Display WST and NBAT/NBTOT Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information

[REQ]

Identifier	REQ-02.01-TS-DEP1.0005
Title	PWS-D wake separation rules
Requirement	The OSD tool shall base PWS-D wake separation calculations on PWS-D wake separation rules, taking into account the pairwise aircraft type rules and the pairwise refined wake category rules on the straight-out initial departure path
Status	<validated>
Rationale	PWS-D wake separation rules shall be provided to the Optimised Separation Delivery tool. These shall and based on be based on the pairwise aircraft type rules and the pairwise refined wake category rules. For the distance-based rules these are the RECAT-EU-PWS distance-based 96x96 aircraft type pairwise wake separation rules and the distance-based 20-CAT wake separation rules. For the time-based rules, draft rules are defined in SPR-INTEROP/OSED derived from the distance-based rules. The full development of these rules has been deferred to SESAR 2020 Wave 2. Validated in NATS RTS5 for the time-based rules. ECTL to confirm validation of the distance-based rules.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP1.0005
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP1.0007

<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Calculate DDI-D Position (for the WSD) Calculate NBAT (for the WST) Calculate NBTOT (for the WST)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-42a_Airport ATC Runway Usage Management sub-system enhanced for processing static wake-turbulence information

[REQ]

Identifier	REQ-02.01-TS-DEP2.0001
Title	Departing phase traffic situation picture
Requirement	The CHMIM shall display for all departing flights during their initial climb phase: • Identification • Position • Optionally, horizontal and vertical speed
Status	<validated>
Rationale	This information conforms the traffic situation picture and supports the application and monitorization of WDS-D X-Wind concept reduced wake separations
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0001
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP2.0004

Title	Meteorological situation picture display
Requirement	The CHMIM shall present an adequate meteorological situation picture covering the area encompassing the initial climb phase of departing flights
Status	<in progress>
Rationale	The meteorological situation picture includes the presentation of wind conditions. It is not necessary that the system displays the complete picture of wind conditions (nowcast and forecast). Runway and surface crosswind speed with respect to runway direction are required to be displayed for employing the WDS-D reduced separation. There is justifiable confidence in the surface wind speed.
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0004
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display Wind Conditions
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP2.9004
Title	Complete aloft profile consideration

Requirement	The OSD tool shall take into consideration the complete wind aloft profile (nowcast and forecast) when determining the Go/No-Go status for the application of the WDS-D reduced separations
Status	<in progress>
Rationale	The complete wind aloft profile (nowcast and forecast) covering the area encompassing the initial climb phase area is required to determine whether the WDS-D Xw reduced separations are applicable
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0004
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Assess Wind
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-19_Runway Usage Management sub-system capable of processing initial departure path wind conditions information

[REQ]

Identifier	REQ-02.01-TS-DEP2.0010
Title	WDS-D Xw concept departure planning information
Requirement	The CHMIM shall display the following information for each departing flight: 1. Aircraft type and wake turbulence category 2. Designated runway and SID 3. First cleared flight level
Status	<validated>
Rationale	To support the consistent application of WDS-D Xw concept reduced separations
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0010
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-19_Runway Usage Management sub-system capable of processing initial departure path wind conditions information

[REQ]

Identifier	REQ-02.01-TS-DEP2.0018
Title	WDS-D Xw concept wake separation minima computation
Requirement	The OSD tool shall calculate the WDS-D Xw concept wake separation minima to be applied between the leader and the follower aircraft
Status	<validated>
Rationale	The system will take into account different inputs such as the leader and follower aircraft type, SID constraints, the application of WDS or the minimum radar separation (MRS) to compute separations between pairs
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0018
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Apply WDS-D mode
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP2.9018
Title	WDS-D Xw concept Applicable wake separation minima
Requirement	The CHMIM shall display the WDS-D separation minima to be applied between the leader and the follower aircraft
Status	<validated>
Rationale	The controllers shall be able to check the separation minima to be applied between pairs in the HMI, as the new mode of operation would make it difficult for the controllers to judge separations taking into account all the concerning factors in its totality
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0018
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-19_Runway Usage Management sub-system capable of processing initial departure path wind conditions information

[REQ]

Identifier	REQ-02.01-TS-DEP2.0022
Title	WDS-D status indication for Controllers
Requirement	The CHMIM shall indicate the WDS-D X-Wind concept reduced separations mode status; activate or non-active, depending on whether the WDS-D Xw concept reduced separations are being applied or not
Status	<validated>

Rationale	Controllers need a clear visual indicator of when the WDS-D Xw concept reduced wake separation is being applied, first to reduce the mental effort and human error risk associated with the controller making the decision about whether or not it is appropriate to apply the reduced wake separation and secondly to help ensure overall compliance with the associated procedures. This could be achieved by highlighting the NBAT and Countdown Time when reduced wake separations are being applied.
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0022
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0086
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WDS-D Status
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP2.0025
Title	Reduction Factors
Requirement	The CHMIM shall present the specific WDS-D Xw concept wake separation minima reduction factors
Status	<validated>
Rationale	The system shall present data that prove that the system is functioning as expected. Details of WDS-D Xw concept reduction factors such as the aircraft SID have been requested to be presented.
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0025
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WDS-D Status
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP2.0029
Title	WDS-D Xw concept departure planning system support for standard departure information
Requirement	The CHMIM shall present standard departure information: 1. Departing flights 2. Allocated runway 3. SID 4. First cleared flight level
Status	<validated>

Rationale	The level of support which is currently given would need to be enhanced in the new operating environment (i.e. the allocation of the task between human actors and technical systems would shift to placing the onus on the technical system). This should help to mitigate any risks associated with reduced or lost information processing capacity. In SESAR 2020 WDS-D Xw concept the departure planning system support includes the A-CDM/DMAN support to formulate and optimise a departure sequence order and departure rate for coordinating the TOBTs and TSATs and for managing the taxi-out flow of the departure aircraft to the runway holding points (see REQ-02.01-SPRINTEROP-DEP0.001). This system support may also be extended to formulating an optimised sequence plan for line-up and take-off; taking into account departure aircraft readiness constraints at the runway holding points (see REQ-02.01-SPRINTEROP-DEP0.002).
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0029
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP2.9029
Title	WDS-D Xw concept departure planning system support for WDS-D Xw concept specific information

Requirement	The CHMIM shall present WDS-D Xw concept specific information: 1. Aircraft types, wake turbulence categories and changes to these categories depending on WDS-D Xw concept reduced separation application or suspension 2. Set of available SIDs 3. Advise on SID use for WDS-D Xw concept reduced separations (upwind, downwind)
Status	<validated>
Rationale	The level of support which is currently given would need to be enhanced in the new operating environment (i.e. the allocation of the task between human actors and technical systems would shift to placing the onus on the technical system). This should help to mitigate any risks associated with reduced or lost information processing capacity.
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0029
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP2.0031
Title	WDS-D Xw concept reduced wake separation applicability
Requirement	The CHMIM shall indicate the WDS-D X-Wind concept reduced wake separation mode applicability depending on whether wind conditions are sufficient for it
Status	<validated>

Rationale	A clear indicator of the WDS-Xw concept Go/No-Go status needs to be displayed to reduce mental effort and human error risk associated to the decision about the applicability of the concept and to help ensure overall compliance with the procedure
Category	<Functional> , <HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0031
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WDS-D Status Display WDS-D Activation Proposal
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-19_Runway Usage Management sub-system capable of processing initial departure path wind conditions information

[REQ]

Identifier	REQ-02.01-TS-DEP2.9031
Title	WDS-D Xw concept reduced wake separation applicability for Supervisor
Requirement	The Operational Supervision shall indicate the WDS-D X-Wind concept reduced wake separation mode applicability depending on whether wind conditions are sufficient for it
Status	<validated>
Rationale	A clear indicator of the WDS-Xw concept Go/No-Go status needs to be displayed to reduce mental effort and human error risk associated to the decision about the applicability of the concept and to help ensure overall compliance with the procedure
Category	<Functional> , <HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0031
<ALLOCATED_TO>	<Functional block>	Operational Supervision Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WDS-D Activation Proposal
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-19_Runway Usage Management sub-system capable of processing initial departure path wind conditions information

[REQ]

Identifier	REQ-02.01-TS-DEP2.0048
Title	WDS-D Xw concept deviation alert
Requirement	The Aerodrome ATC system should alert through audio and/or visual signal when a deviation from planned trajectory is detected for an aircraft when applying WDS-D Xw concept reduced wake separation
Status	<validated>
Rationale	The Controller should need to know when an aircraft is deviating from the planned SID, for any reason, since when applying the WDS-D Xw concept reduced wake separation the conditions to ensure the crosswind transport of the wake vortices out of the path of the follower may no longer be guaranteed and as a consequence this could lead to a risk of a wake encounter with significantly stronger wake vortices compared with standard separation (RECAT-EU or RECAT-EU-PWS) in reasonable worst case conditions.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0048
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0092

<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3013
Title	Initial climb airspeed profile deviation alert
Requirement	The Aerodrome ATC system shall alert in case there is a deviation of the lead aircraft from the anticipated initial climb airspeed profile
Status	<in progress>
Rationale	To give the Controller awareness of any deviation of the lead aircraft airspeed profile when applying the distance-based WDS-Xw concept.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3013
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP2.0067
Title	Configurable wind threshold
Requirement	The OSD tool shall include a configurable wind threshold that will allow the applicability of WDS-D X-Wind concept reduced separations or will force the de-activation of this mode
Status	<in progress>

Rationale	The WDS-D Xw concept wind threshold shall be based on specificities of the local traffic aircraft performance, local weather conditions over the straight-out common initial departure path
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0067
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Assess WDS-D Status Deactivate WDS-D Propose WDS-D Application
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-19_Runway Usage Management sub-system capable of processing initial departure path wind conditions information

[REQ]

Identifier	REQ-02.01-TS-DEP2.0070
Title	WDS-D Xw concept to standard separation transition
Requirement	The OSD tool shall allow the transition from applying WDS-D Xw concept wake separation reductions to applying standard wake separations if requested.
Status	<in progress>
Rationale	The transition is invoked by the Tower Runway Controller in coordination with the Tower Supervisor when circumstances require it (due to weather avoidance or intruder traffic)
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier

<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0070
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Deactivate WDS-D
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP2.0076
Title	WDS-D Xw concept application
Requirement	The WDS-D tool shall apply WDS-D Xw concept
Status	<validated>
Rationale	WDS-D Xw concept applies weather dependent wake turbulence separation rules for departures, over the straight -out initial common departure path until aircraft diverge on to wake independent paths after the first SID turn, defined as minimum crosswind condition with an associated time separation minimum and associated SID pair constraints to be defined locally.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0076
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Apply WDS-D mode
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-19_Runway Usage Management sub-system capable of processing initial departure path wind conditions information

[REQ]

Identifier	REQ-02.01-TS-DEP2.0078
Title	WDS-D Xw concept wake separation rules
Requirement	The Enhanced OSD tool shall include the WDS-D Xw concept wake separation rules
Status	<in progress>
Rationale	The system shall take into account the rules that define the WDS-D Xw concept reduced wake separations in order to apply safely and successfully the new reduced wake separations
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0078
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Apply WDS-D mode
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-19_Runway Usage Management sub-system capable of processing initial departure path wind conditions information

[REQ]

Identifier	REQ-02.01-TS-DEP2.0087
Title	WDS-D reduced wake separations authorisation
Requirement	The WDS-D tool shall support the authorisation of the application of WDS-D reduced wake separations
Status	<in progress>
Rationale	When the wind parameters are met.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0087
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Propose WDS-D Application Display WDS-D Activation Proposal
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-19_Runway Usage Management sub-system capable of processing initial departure path wind conditions information

[REQ]

Identifier	REQ-02.01-TS-DEP2.0088
Title	Automatic de-activation of WDS-D mode
Requirement	The WDS-D tool shall automatically de-activate the application of WDS-D Xw concept reduced wake separations if the pre-defined parameters for applicability are no longer met
Status	<in progress>
Rationale	To ensure the correct delivery of wake separations
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0088
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Deactivate WDS-D
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-19_Runway Usage Management sub-system capable of processing initial departure path wind conditions information

[REQ]

Identifier	REQ-02.01-TS-DEP2.0089
Title	Upwind SID determination
Requirement	The OSD tool shall determine whether the follower aircraft departure SID is upwind of all applicable preceding aircraft departure SIDs (e.g. this may be also the second preceding departure aircraft in the case of an A380 – Light – Light departure sequence)
Status	<in progress>
Rationale	WDS-D Xw reduced wake separations shall be applied when this condition is fulfilled, and controllers are not expected to be responsible for self-determining this.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0089
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP2.0090
Title	Monitoring the conformance of the flight path of the departure aircraft when applying a WDS-D reduced wake separation
Requirement	The WDS-D tool shall provide wake vortex warning(s) when crosswind transport is not assured due to divergence of either the preceding, or follower, aircraft from the straight-out initial common departure path
Status	<in progress>
Rationale	Lateral deviation shall be monitored in order to alert when a deviation is detected that could lead to a risk regarding the WDS-D Xw reduced wake separations applicability

Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0090
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Assess Wind
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-19_Runway Usage Management sub-system capable of processing initial departure path wind conditions information

[REQ]

Identifier	REQ-02.01-TS-DEP2.0093
Title	Positioning of the displayed crosswind speed
Requirement	The HMI shall display the crosswind speed in the centre of/within the regular scanning pattern of the controller
Status	<validated>
Rationale	It is recommended that the displayed crosswind speed should be positioned closer to the centre of controller view.
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP2.0093
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display Wind Conditions
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-19_Runway Usage Management sub-system capable of

		processing initial departure path wind conditions information

[REQ]

Identifier	REQ-02.01-TS-DEP3.0003
Title	Flight data inputs
Requirement	The OSD tool shall receive the aircraft type and the corresponding RECAT-EU Wake Turbulence Category of each one of the departing aircraft pairs, including subsequent updates for new aircraft types
Status	<validated>
Rationale	Validated in NATS RTS5 with respect to inputs to the industry prototype OSD tool provided by Indra for the time-based "airborne time" separation procedures.
Category	<IER>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0003
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Calculate NBTOT (for the WST) Calculate DDI-D Position (for the WSD) Calculate NBAT (for the WST)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP3.0013
Title	Wind profile data provision to the OSD tool for supporting distance-based separation

Requirement	The OSD tool shall be provided with the wind profile data along the SID route of each departure runway out to the maximum wake separation distance from the rotation positions of the follower aircraft types that it is required to support distance-based separation
Status	<in progress>
Rationale	These data are required to calculate the Dynamic Departure Indicator - Distance (DDI-D) position
Category	<IER>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0013
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0028
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Assess Wind
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-19_Runway Usage Management sub-system capable of processing initial departure path wind conditions information

[REQ]

Identifier	REQ-02.01-TS-DEP3.0015
Title	Airspeed profile data provision to the OSD tool for supporting distance-based separation
Requirement	The OSD tool shall be provided with the airspeed profile data for each aircraft type over the departure SID routes out to the maximum distance-based separation that is required to be supported when required for supporting distance-based separation
Status	<in progress>
Rationale	These data are required to calculate the position of the Dynamic Departure Indicator - Distance (DDI-D)

Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0015
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Assess Wind
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP3.0016
Title	Take-off roll time data provision to the OSD tool for supporting distance-based separation
Requirement	The OSD tool shall be configured with take-off roll time data for each aircraft time when required to support distance-based separation
Status	<in progress>
Rationale	These data are required to calculate the position of the Dynamic Departure Indicator - Distance (DDI-D)
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0016
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP3.9016
Title	Dynamic Departure Indicator - Distance (DDI-D) calculation
Requirement	The OSD tool shall calculate the Dynamic Departure Indicator - Distance (DDI-D) in order to support the optimal separation delivery between aircraft pairs
Status	<in progress>
Rationale	The DDI-D is the position the lead aircraft needs to reach before the Tower Runway Controller should issue the clearance to take-off in order to satisfy the required separation when the follower aircraft becomes airborne. The OSD tool calculates the position of the Dynamic Departure Indicator - Distance (DDI-D) taking into account the airspeed profile and associated ground speed impact of the prevailing wind profile over the departure SID route of the lead aircraft out to the required distance-based separation from the anticipated initial airborne position of the follower aircraft. This is so as to calculate the distance the lead aircraft is anticipated to fly over the time the follower aircraft is anticipated to take to become airborne after being given the clearance to take-off. This distance is subtracted from the required wake separation distance to establish the position of where to display the DDI-D.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0016
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Calculate DDI-D Position (for the WSD) Calculate DDI-D for the SID Separation and MRS (if these are supported)

		Determine the Largest DDI-D
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP3.8016
Title	Dynamic Departure Indicator - Distance (DDI-D) presentation
Requirement	The CHMIM shall display the Dynamic Departure Indicator - Distance (DDI-D) in order to support the optimal separation delivery between aircraft pairs
Status	<in progress>
Rationale	The DDI-D is the position the lead aircraft needs to reach before the Tower Runway Controller should issue the clearance to take-off in order to satisfy the required separation when the follower aircraft becomes airborne. The OSD tool calculates the position of the Dynamic Departure Indicator - Distance (DDI-D) taking into account the airspeed profile and associated ground speed impact of the prevailing wind profile over the departure SID route of the lead aircraft out to the required distance-based separation from the anticipated initial airborne position of the follower aircraft. This is so as to calculate the distance the lead aircraft is anticipated to fly over the time the follower aircraft is anticipated to take to become airborne after being given the clearance to take-off. This distance is subtracted from the required wake separation distance to establish the position of where to display the DDI-D.
Category	<HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0016

<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WSD and DDI-D Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP3.0017
Title	OSD tool assurance/integrity
Requirement	The OSD tool shall ensure a minimum predefined level of assurance/integrity
Status	<in progress>
Rationale	In order to ensure all applicable separations on departure. Assurance/integrity level shall be set as appropriate for total ATCO dependence (e.g. as required for the assurance of radar equipment)
Category	<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0017
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP3.0018
Title	Provision of departure sequence
Requirement	The OSD tool shall receive the intended departure sequence
Status	<validated>

Rationale	The tool shall receive the intended aircraft take-off order
Category	<IER>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0018
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP3.0019
Title	Accurate line-up position
Requirement	The OSD tool shall take into account the accurate line-up position of each departure aircraft
Status	<validated>
Rationale	To allow for automatically adding the 60s for intermediate position line-up.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0019
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP3.9019
Title	Accurate line-up position provision
Requirement	Aerodrome Surveillance shall provide the OSD tool with the accurate line-up position
Status	<validated>
Rationale	The OSD tool needs this information detect when an aircraft is departing from an intermediate position
Category	<IER>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0019
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP0.3002
Title	Synchrony between tools
Requirement	The OSD tool shall be synchronized with the other tools (if any) in order to present the same information in a synchronizes way
Status	<in progress>
Rationale	The different tools shall provide the information in the same manner so that appropriate levels of SA are maintained. For instance, displaying "minutes" or "seconds" and not both on different displays.
Category	<IER> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01

<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP0.3002
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP3.0020
Title	Provision of SID to the OSD tool
Requirement	The OSD tool shall receive the SID for each departure aircraft (for WDS-D and distance-based)
Status	<validated>
Rationale	SIDs are a constraint factor when calculating separations between aircraft pairs. The tool shall considerate SID of the different departure aircrafts in order to check if the separation based on SID is predominant
Category	<IER>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0020
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP3.0021
Title	Airborne time provision
Requirement	The OSD tool shall receive the accurate airborne time of each departing aircraft (for time based procedures based on airborne times)

Status	<validated>
Rationale	Airborne time can be provided through different methods such as ATCO's input or automatic determination (based on aerodrome surveillance for instance)
Category	<IER>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0021
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP3.0022
Title	Wind profile information provision to the WDS-D tool
Requirement	The WDS-D tool shall receive accurate and reliable wind measurements at the rotation positions on the runway surface and aloft along the common straight-out initial departure path (for WDS-D)
Status	<validated>
Rationale	Wind information shall be reliable in order to secure the safe and correct application of the WDS-D mode
Category	<IER> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0022

<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Assess Wind
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-19_Runway Usage Management sub-system capable of processing initial departure path wind conditions information

[REQ]

Identifier	REQ-02.01-TS-DEP3.0023
Title	Consideration of staleness criteria for the wind profile information by the WDS-D tool
Requirement	The tool shall take into account staleness criteria with respect to the wind information and the timely suspension of applying associated reduced wake separations (for WDS-D)
Status	<in progress>
Rationale	For Safety purposes
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0023
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Assess Wind
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP3.0024
Title	Software assurance level for the OSD tool

Requirement	The software assurance level of the tool shall be such that ATCOs may justifiably be reliant on the wake separation information provided by the tool.
Status	<in progress>
Rationale	This facilitates the provision of the wake turbulence separation between each successive departure.
Category	<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0024
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP3.0025
Title	Accurate display of the wake separation time
Requirement	The HMI shall accurately display the wake separation time calculated by the OSD tool with respect to indicating the applicable wake separation time interval between each successive departure in the case of wake separation time-based procedures
Status	<validated>
Rationale	The wake separation time needs to be clearly displayed to facilitate the ATCO delivering the correct separation between aircraft pairs
Category	<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier

<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0025
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WST and NBAT/NBTOT Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP3.0026
Title	Accurate display of the wake separation distance
Requirement	The HMI shall accurately display the wake separation distance calculated by the OSD tool with respect to indicating the applicable wake separation distance interval between each successive departure in the case of wake separation distance-based procedures
Status	<in progress>
Rationale	The wake separation distance needs to be clearly displayed to facilitate the ATCO delivering the correct separation between aircraft pairs
Category	<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0026
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-01)
<ALLOCATED_TO>	<Function>	Display WSD and DDI-D Information
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP3.0027
Title	Take-off roll time provision
Requirement	The OSD tool shall be provided with the accurate start of take-off roll time of each departing aircraft
Status	<in progress>
Rationale	For start of take-off roll procedures
Category	<IER> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0027
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP3.0029
Title	Consideration of staleness criteria for the wind profile information by the OSD-D tool
Requirement	The OSD tool shall take into account staleness criteria with respect to determining the DDI-D position for distance-based separation procedures
Status	<in progress>
Rationale	For Safety purposes
Category	<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01

<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0029
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Calculate DDI-D Position (for the WSD)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP3.0030
Title	Informing the OSD tool of late/tactical changes to the departure sequence
Requirement	The Departure Sequence Management system shall inform the OSD tool of late/tactical changes to the departure sequence
Status	<in progress>
Rationale	Tactical rearrangements of the departure sequence are available and OSD tool shall be informed when this happens in order to maintain the fully efficient wake separation calculation
Category	<IER>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0030
<ALLOCATED_TO>	<Functional block>	Departure Sequence Management (PJ.02-01)
<ALLOCATED_TO>	<Function>	Clear Stale Displayed Information and Reformulate Sequence
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

[REQ]

Identifier	REQ-02.01-TS-DEP3.0031
Title	OSD tool ensuring the correctness of the information presented

Requirement	The OSD tool shall ensure the correctness of the wake turbulence separation information presented when there is a late/tactical change to the departure sequence
Status	<in progress>
Rationale	The OSD Tool shall ensure the correctness of the wake turbulence separation information presented to the controller when there is a late/tactical change to the departure sequence
Category	<Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-DEP3.0031
<ALLOCATED_TO>	<Functional block>	Departure Separation Management (PJ.02-01)
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-69_ATC system to support optimised departure separation

4.2.3 Wake Decay Enhancing Device

[REQ]

Identifier	REQ-02.01-TS-DCAY.0030
Title	Compliance with ICAO requirements
Requirement	The plate line design and installation shall comply with ICAO requirements.
Status	validated
Rationale	The decay enhancing devices shall comply with the requirements set forth by ICAO regarding obstacle clearance, stability, frangibility, electromagnetic compatibility with localizer, and guidance lighting visibility.
Category	<Design> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-WDE0.0001
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-WDE0.0002

4.2.4 Wake Risk Monitoring

[REQ]

Identifier	REQ-02.01-TS-WRM0.0010
Title	Wake Risk Monitoring Encounter Detection
Requirement	The Wake Risk Monitoring tool shall detect wake turbulence encounters in recorded aircraft data.
Status	<in progress>
Rationale	The goal of the tool is to objectively identify wake turbulence encounters.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-WRM0.0001
<ALLOCATED_TO>	<Functional block>	Recording (PJ.02-01)
<ALLOCATED_TO>	<Function>	Record Flight Parameters
<ALLOCATED_TO>	<Enabler>	A/C-30c_Onboard Detection of Wake Turbulence Encounters

[REQ]

Identifier	REQ-02.01-TS-WRM0.0020
Title	Wake Risk Monitoring Ground-based Analysis
Requirement	The Wake Risk Monitoring tool shall analyse aircraft-recorded data stored in a database on the ground.
Status	<in progress>
Rationale	The required amount of data and fleet coverage for an efficient use of the tool is only available in ground-based databases. The tool should not require excessive modifications to the aircraft fleet.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-WRM0.0001
<ALLOCATED_TO>	<Functional block>	Recording (PJ.02-01)
<ALLOCATED_TO>	<Function>	Record Flight Parameters
<ALLOCATED_TO>	<Enabler>	A/C-30c_Onboard Detection of Wake Turbulence Encounters

[REQ]

Identifier	REQ-02.01-TS-WRM0.0030
Title	Wake Risk Monitoring Erroneous Detections
Requirement	The Wake Risk Monitoring tool shall not erroneously detect encounters with any other type of atmospheric turbulence.
Status	<in progress>
Rationale	Statistical results provided by the tool shall not be degraded by including events which are not of interest.
Category	<Performance>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-WRM0.0002
<ALLOCATED_TO>	<Functional block>	Recording (PJ.02-01)
<ALLOCATED_TO>	<Function>	Record Flight Parameters
<ALLOCATED_TO>	<Enabler>	A/C-30c_Onboard Detection of Wake Turbulence Encounters

[REQ]

Identifier	REQ-02.01-TS-WRM0.0040
Title	Wake Risk Monitoring User Interface
Requirement	The Wake Risk Monitoring tool shall provide a user interface to an operator on the ground facilitating analysis of the data.
Status	<in progress>
Rationale	The tool shall be easy to use for a user with minimal training.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-WRM0.0004
<ALLOCATED_TO>	<Functional block>	Recording (PJ.02-01)
<ALLOCATED_TO>	<Function>	Record Flight Parameters
<ALLOCATED_TO>	<Enabler>	A/C-30c_Onboard Detection of Wake Turbulence Encounters

[REQ]

Identifier	REQ-02.01-TS-WRM0.0050
Title	Wake Risk Monitoring Report
Requirement	The Wake Risk Monitoring tool shall provide data relevant to a detected wake turbulence encounter in the form of a report.

Status	<in progress>
Rationale	For further assessment or aggregation of the results, the relevant data needs to be available in a compact and portable format.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-WRM0.0003
<ALLOCATED_TO>	<Functional block>	Recording (PJ.02-01)
<ALLOCATED_TO>	<Function>	Record Flight Parameters
<ALLOCATED_TO>	<Enabler>	A/C-30c_Onboard Detection of Wake Turbulence Encounters

[REQ]

Identifier	REQ-02.01-TS-WRM0.0060
Title	Wake Risk Monitoring Identification of Events
Requirement	The Wake Risk Monitoring tool encounter report shall allow identifying the time, date and flight identifier of the involved flight.
Status	<in progress>
Rationale	The tool shall allow assessment of in-service wake turbulence encounters reported by flight crews or ATC.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-WRM0.0003
<ALLOCATED_TO>	<Functional block>	Recording (PJ.02-01)

<ALLOCATED_TO>	<Function>	Record Flight Parameters
<ALLOCATED_TO>	<Enabler>	A/C-30c_Onboard Detection of Wake Turbulence Encounters

[REQ]

Identifier	REQ-02.01-TS-WRM0.0070
Title	Wake Risk Monitoring Interface to eWTER
Requirement	The Wake Risk Monitoring tool shall allow an interface to the ICAO Electronic Wake Turbulence Encounter Reporting (eWTER) tool.
Status	<in progress>
Rationale	Both tools contain complementary information and it could be useful to exchange information between both.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-01
<SATISFIES>	< ATMS Requirement>	REQ-02.01-SPRINTEROP-WRM0.0003
<ALLOCATED_TO>	<Functional block>	Recording (PJ.02-01)
<ALLOCATED_TO>	<Function>	Record Flight Parameters
<ALLOCATED_TO>	<Enabler>	A/C-30c_Onboard Detection of Wake Turbulence Encounters

5 Implementation Options

The concepts listed hereunder can be deployed according to these combinations

5.1 Arrivals concepts

ORD (AO-0328)
ORD (AO-0328) + PWS-A (AO-0306)
ORD (AO-0328) + PWS-A (AO-0306) + WDS-A (AO-0310)
ORD (AO-0328) + WDS-A (AO-0310)

5.2 Departures concepts

OSD (AO-0329)
OSD (AO-0306) + PWS-D (AO-0323)
OSD (AO-0306) +PWS-D (AO-0323)+WDS-D (AO-0304)
OSD (AO-0306) +WDS-D (AO-0304)

5.3 Enhancing Wake Decay

WDE (AO-0325)

5.4 Wake Risk Monitoring

WRM (AO-0327)

6 Assumptions

Arrivals and Departure concepts linked to this solution assume that MET enablers have been validated. PJ18-04 MET Services is assumed to be connected to Arrivals and Departure systems

7 References and Applicable Documents

7.1 Applicable Documents

Content Integration

[1] B.04.01 D138 EATMA Guidance Material

[2] EATMA Community pages

[3] SESAR ATM Lexicon

Content Development

[4] B4.2 D106 Transition Concept of Operations SESAR 2020

System and Service Development

[5] 08.01.01 D52: SWIM Foundation v2

[6] 08.01.01 D49: SWIM Compliance Criteria

[7] 08.01.03 D47: AIRM v4.1.0

[8] 08.03.10 D45: ISRM Foundation v00.08.00

[9] B.04.03 D102 SESAR Working Method on Services

[10]B.04.03 D128 ADD SESAR1

[11]B.04.05 Common Service Foundation Method

Performance Management

[12]SESAR Performance Framework ed. 01.00.01 – 2019 (1.0)

[13]B.04.01 D42 SESAR2020 Transition Validation

[14]B.05 D86 Guidance on KPIs and Data Collection support to SESAR 2020 transition.

[15]16.06.06-D68 Part 1 –SESAR Cost Benefit Analysis – Integrated Model

[16]16.06.06-D51-SESAR_1 Business Case Consolidated_Deliverable-00.01.00 and CBA

[17]Method to assess cost of European ATM improvements and technologies, EUROCONTROL (2014)

[18]ATM Cost Breakdown Structure_ed02_2014

[19]Standard Inputs for EUROCONTROL Cost Benefit Analyses

[20]16.06.06_D26-08 ATM CBA Quality Checklist

[21]16.06.06_D26_04_Guidelines_for_Producing_Benefit_and_Impact_Mechanisms

Validation

[22]03.00 D16 WP3 Engineering methodology

[23]Transition VALS SESAR 2020 - Consolidated deliverable with contribution from Operational Federating Projects

[24]European Operational Concept Validation Methodology (E-OCVM) - 3.0 [February 2010]

System Engineering

[25]SESAR Requirements and V&V guidelines

Safety

[26]SESAR, Safety Reference Material, Edition 4.0, April 2016

[27]SESAR, Guidance to Apply the Safety Reference Material, Edition 3.0, April 2016

[28]SESAR, Final Guidance Material to Execute Proof of Concept, Ed00.04.00, August 2015

[29]SESAR, Resilience Engineering Guidance, May 2016

Human Performance

[30]16.06.05 D 27 HP Reference Material D27

[31]16.04.02 D04 e-HP Repository - Release note

Environment Assessment

[32]SESAR, Environment Reference Material, alias, “Environmental impact assessment as part of the global SESAR validation”, Project 16.06.03, Deliverable D26, 2014.

[33]ICAO CAEP – “Guidance on Environmental Assessment of Proposed Air Traffic Management Operational Changes” document, Doc 10031.

Security

[34]16.06.02 D103 SESAR Security Ref Material Level

[35]16.06.02 D137 Minimum Set of Security Controls (MSSCs).

[36]16.06.02 D131 Security Database Application (CTRL_S)

7.2 Reference Documents

[37]ED-78A GUIDELINES FOR APPROVAL OF THE PROVISION AND USE OF AIR TRAFFIC SERVICES SUPPORTED BY DATA COMMUNICATIONS.[2]

[38]OFA 01.03.01 Enhanced Runway Throughput Consolidated Final Step 1 OSED

[39]D1.1.01 – PJ02-01 OSED-SPR-INTEROP (Final) Part I – 01.00.00

[40]D1.1.01 – PJ02-01 OSED-SPR-INTEROP (Final) Part II – 01.00.00

[41]D1.1.01 – PJ02-01 OSED-SPR-INTEROP (Final) Part IV – 01.00.00

[42]D1.1.01 – PJ02-01 OSED-SPR-INTEROP (Final) Part V – 01.00.00

[43]D1.1.03 – PJ02-01 VALP (Final) Part I – 00.01.00

[44]D1.1.03 – PJ02-01 VALP (Final) Part II – 00.01.00

[45]D1.1.03 – PJ02-01 VALP (Final) Part IV – 00.01.00

[46]D1.1.04 – PJ02-01 VALR (Final) – 01.00.00

[47]D1.1.05 – PJ02-01 CBA – 01.00.00

2

Appendix A Service Description Document (SDD)

N/A

Appendix B Service Technical Design Document (STDD)

SESAR Technical
Service Contract Tem

Appendix C Optimised Separation Delivery in Mixed Mode Operations

Background

During the Real Time Simulation exercise RTS03a, the ORD and OSD tools showed certain limitations to operate mixed mode of operations as they worked separately with no integration. As a result, it was decided to further explore the optimisation of this mode of operations through a set of features to integrate the ORD and OSD data and provide it as support information to the controller. The aim is to enable an optimal and easy coordination between arrival and departure operations by optimizing the gap spacing using this set of information.

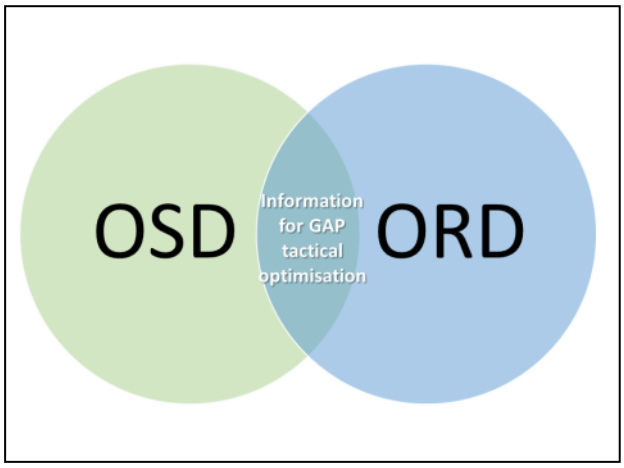

Figure 15: High level view of GAP information between ORD and OSD tools

Description

To cover the tactical management of runway throughput by fully optimizing the gap spacing when mixed mode is in operation on a runway at the airport support information is needed. The assessment of the actual situation of arrivals (on final leg) and the departures (moving to holding point) is assessed and compared to the requested spacing making use of the ORD and OSD separation data. The resulting information is transmitted to Approach and Tower controller as dynamic assistance for a more efficient coordination to optimize gap spacing

In order to give a clear overview of both arrival and departure runway operations at the airport, the Tower ATCO needs to have the integrated arrivals and departures information in a single list. This list shall provide as a minimum:

- The planned sequence of incoming arrivals and departures
- The separation to be applied between each departure pair based on the aircraft performance (OSD input)
- The position and value of the gaps that are inserted with the ORD tool between arrivals pair to insert a certain number of departures (ORD input).

Further information that can help the ATCO when assessing the spacing are:

- The estimated time to touchdown for each arrival

- The spacing (in time) between arrivals pairs determined by the ORD tool not only for the GAP but also for the other constraints (Wake, MRS, ROT, …)
- The information about the nature of the constraints both on arrivals and departures

It shall be noted that the list contains the planned sequence order; how this list is built and managed is not in scope of PJ02.01, this topic is treated in the SESAR Solution PJ02.08. The planned sequence order is an input for the Tower ATCO that can further review it by assessing the actual situation on the ground and in the air. The optimisation of the spacing (e.g. reducing a gap originally planned for 2 departures to 1 departure) might impact the sequence order. Thus it is requested to maintain updated the correct sequence order (e.g. automatically with a system support or manually with ATCO interactions over the system) in the list.

The sequence information should be provided to the ATCO early enough to be usable for the tower controller, at the same time the ATCO needs to receive information that is accurate and stable. In PJ02.01 RTS a look-ahead window of 10-15 minutes is envisaged knowing that there are many factors that can impact the stability of the sequence and the accuracy of the estimation.

Figure 16 represents an HMI example of the list used for the optimisation of separation delivery in Mixed Mode.

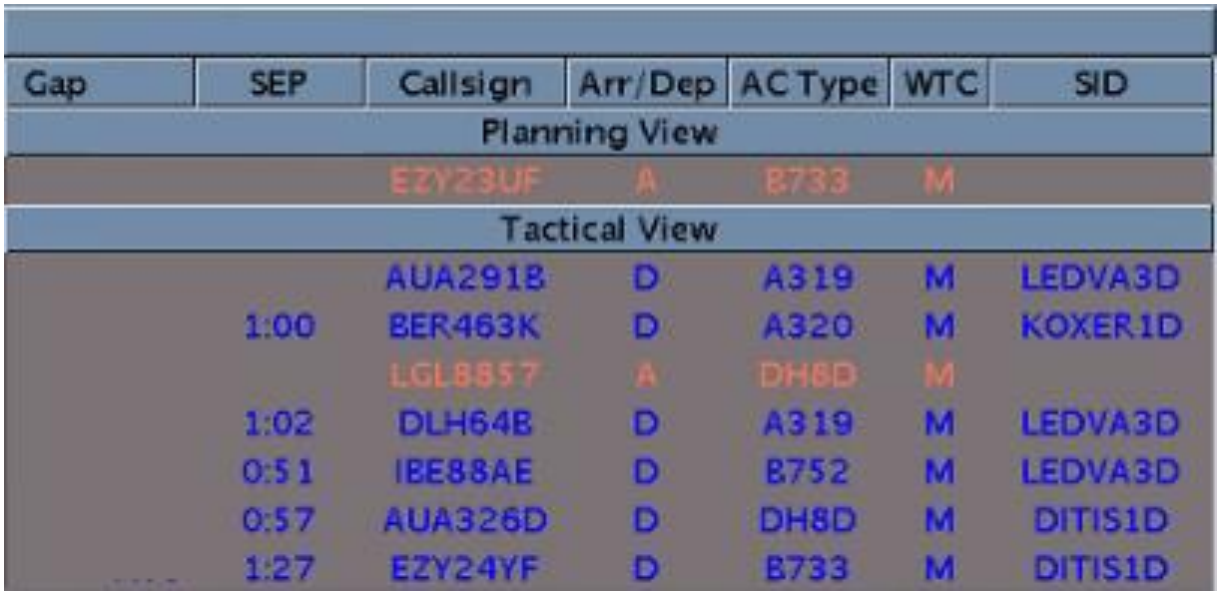

Figure 16: Example of the list operating in Mixed Mode

This list in PJ02.01 RTS is coupled / integrated with the arrival sequencing tool (used by the ORD tool) and is divided in two:

- Planning view: in this block only arrivals aircraft are displayed ordered by the time of arrival and based on the input of the arrival sequencing tool.
- Tactical view: in this block arrivals and departures are merged together but are easily distinguished due to different colours.

In this list:

- The arrival aircraft will be displayed/inserted Planning View once they are inserted into the arrival sequence list of ORD and according to its order. Any changes in this list will trigger an update. Once they have exited their landing runway, they will disappear.
- Departures will be displayed/inserted when they entered a defined area of the airport (see picture below as example). Departures will be removed from the list after they are transferred from the Tower ATCO or are above a certain altitude threshold.

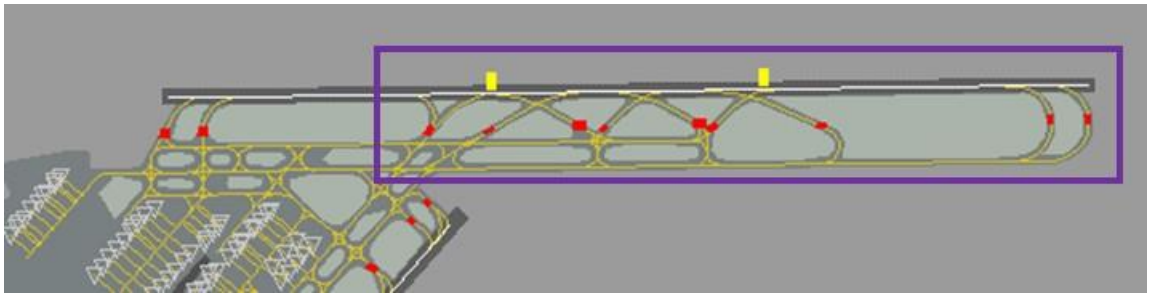

Figure 17: Example of a Runway Departure Detection Area

The ATCO receives an automatic sequence order; however, for optimising tactically the gap spacing he can change the order of the sequence list by dragging and dropping the departures entries.

Interactions between list and ATCO

Figure 18 presents a high-level overview of the interactions of the ATCO in Mixed Mode while managing the Gap and the automatic reactions to the ATCO manual actions that are provided as information support in the list.

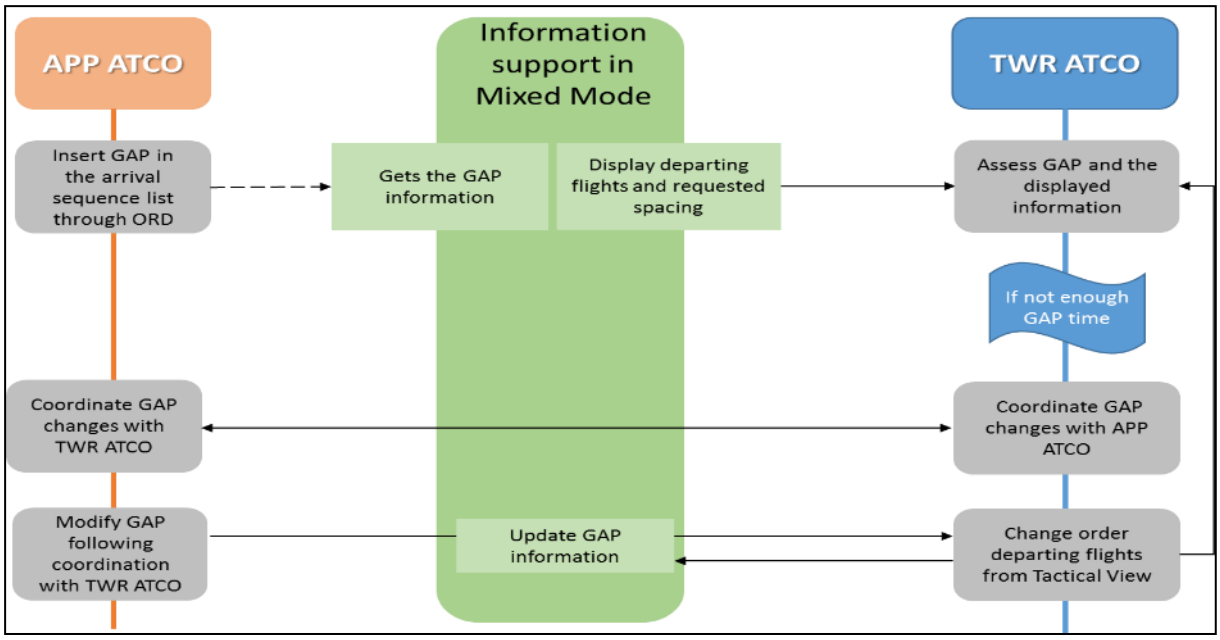

Figure 18: Overview of the ATCO interaction with the list

As Figure 18 reflects, the only ATCO that directly interacts with the list is the Tower Runway controller. Any change on the Gap spacing requires an initial coordination between the Tower Runway controller and the Approach controller that may be via different means (e.g. phone). Consequently, any change that approach control may perform to the GAP in the arrival sequence list (via the ORD tool) is reflected in the list available for the ATCO. This allows the Tower Runway controller to obtain a live update of the upstream actions and react accordingly.

The Tower ATCO has the capability to move a departure row earlier or further in the list to cover the following operational cases

- The runway controller desires to make space for one or mode departures between two consecutive arrivals, by inserting the departure(s) between the two arrivals in the list he obtains obtaining the requested spacing. This might lead to request to the approach controller to increase GAP enough to make space for one or more departures.
- The runway controller detects that will not be possible to depart one or more aircraft. This might lead to request to the approach controller to reduce/cancel GAP.
- A departure could be moved further in the sequence list when we have a departure that is supposed to be cleared for line-up that is not ready / replying in time to your instruction (e.g. aircraft communicates they have a last-minute problem). So the controller decides to switch the next departure (which is coming from a different holding point) ahead in the sequence
- The runway controllers applies tactical vectoring after take-off to a couple of aircraft to manage their spacing constraint (e.g. SID) by giving to the departing sequence an order that is not considered feasible by the support information provided by the list.

To further explain the last bullet point, it is important to note that the list is a mere support tool for the ATCO which provides indications through the display of the information but does not consider the future actions that the ATCO may perform. For instance, after detecting a loss of separation for a departing pair on the same SID, the TWR ATCO could have in mind providing lateral deviations from the SID to both aircraft in order to avoid the infringement (see Figure 19).

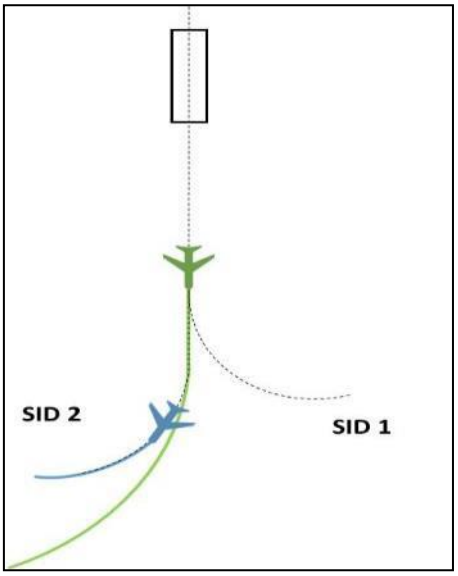

Figure 19: Example of a tactical ATCO action not considered by the list

Note that at this moment, there are still discussions whether it could be useful to introduce features related to alerting monitoring for the Tower ATCO (e.g. for loss of separation).

Manual interactions and associated information support

Each time that the ATCO performs a manual action through 'drag and drop' the order of the sequence is automatically checked for inconsistencies between the moved aircraft and the aircraft above and below the Tactical View. The system will generate warnings if it determines that the Gap is not sufficient or if departures are in the wrong order.

Departing A/C moved to	Warning message
Behind arrival	Need XXXs GAP (Insufficient GAP time with preceding arrival)
Behind departure*	Departure is not the first at the runway holding point
	Need XXXs GAP (Insufficient GAP time with preceding departure)
In front of arrival	Need XXXs GAP (Insufficient GAP time with next arrival)
In front of departure*	Departure is not the first at the runway holding point
	Need XXXs GAP (Insufficient GAP time with next departure)

Table 20: Manual sequence warnings

To generate such warnings, the list considers the following parameters:

- The Estimated time taxiing to reach the Holding point
- The Estimated Take Off Time
- The Estimated Landing Time
- The Separation time between departures computed by the OSD tool.

Based on the warning and the information received, (e.g. the amount of GAP in time necessary to adhere to the sequence selected) the Tower contacts the approach ATCO to verify whether is feasible to apply the proposed change to the GAP spacing Based on the coordination feedback the change could be applied or not. Using as example the request from the Tower ATCO to increase the GAP time from 180s to 195s in order to allocate two departures several cases could be possible:

- The approach ATCO confirms that the spacing can be increased and the change is applied
- The approach ATCO cannot apply the proposed change. It is then suggested to reduce the spacing from 180s to 120s (sufficient for 1 departure).
- The approach ATCO cannot apply the proposed change and nothing is done.

-END OF DOCUMENT-