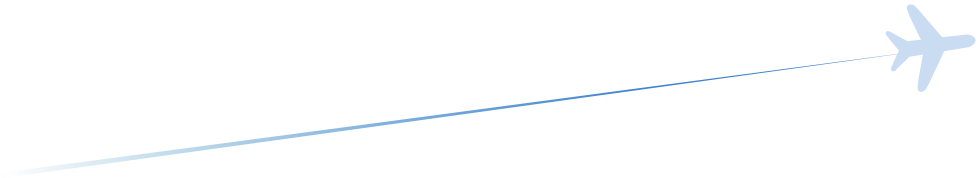

SESAR 2020 Solution 02-03 Technical Specification (TS/IRS) for V3/TRL6

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EARTH

INCREASED RUNWAY AND AIRPORT THROUGHPUT

This TS/IRS 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 is the SESAR 2020 Solution 02-03 TS/IRS document related to the concept of Minimum Pair Separations Based on Required Surveillance Performance (RSP) in support of a reduction of the in-trail Minimum Radar Separation from 2.5 NM to 2 NM on final approach so as to provide a direct positive impact on runway throughput (Capacity, Efficiency and Resilience). It contains requirements for ground-based ATC systems.

The Concept starts in SESAR2020 W1 as V2 and target V3 at the end of SESAR2020 W1, all materials has been developed to reach the V3 maturity level.

The reduction can be done without using any tool, it provides requirements for the surveillance to be able to reduce to 2NM, the used of a tool has an important added value described in the OSED and the Validation report of the solution.

Table of Contents

List of Tables

List of Figures

No table of figures entries found.

1 Executive summary

This document collects and describes the Technical System Requirements (functional and non-functional) which shall guide the development and implementation of addressing the concept of Minimum Pair Separations Based on Required Surveillance Performance (RSP) in support of a reduction of the in-trail Minimum Radar Separation from 2.5 NM to 2 NM on final approach so as to provide a direct positive impact on runway throughput (Capacity, Efficiency and Resilience). These System Requirements are derived from the Operational Requirements collected by the specification of previous R&D projects and studies. Requirements are based on the use cases defined in SPR-INTEROP/OSED (reference [37]).

The Concept starts in SESAR2020 W1 as V2 and target V3 at the end of SESAR2020 W1, all materials has been developed to reach the V3 maturity level.

The reduction can be done without using any tool, it provides requirements for the surveillance to be able to reduce to 2NM, the used of a tool has an important added value described in the SPR-INTEROP/OSED (reference [37]) and the Validation report of the solution [45].

2 Introduction

2.1 Purpose of the document

This TS/IRS document[1] is used to capture and consolidate the set of Technical Requirements related to SESAR Solution 02-03.

The requirements included in this TS/IRS satisfy requirements captured at SPR-INTEROP/OSED and are associated with Functional blocks and Enablers (ENs) available in the EATMA applicable version.

This TS/IRS aims to provide sufficient information so as to allow the functional block (or parts of it in which the project is working) to be designed and implemented either as separate functional block or as part of an integrated system, depending upon the design choice, for the V&V activity within the programme and ultimately for the industrialization, standardization and deployment.

2.2 Scope

Solution 02-03 aims at proving the concept of Minimum Pair Separations Based on Required Surveillance Performance (RSP) in support of a reduction of the in-trail Minimum Radar Separation (MRS) from 2.5 NM to 2 NM on final approach so as to provide a direct positive impact on runway throughput (Capacity, Efficiency and Resilience).

Application of the in-trail 2 NM MRS on final approach will be dependent on the surveillance service being employed by the controllers responsible for spacing delivery on final approach satisfying the RSP requirements for 2 NM separation.

The spacing required between arrival pairs will also be constrained by other factors such as satisfying the Runway Occupancy Time (ROT) requirements for clearance to land, which is being addressed by the Optimised Runway Delivery (ORD) ATC tool support being developed and validated in SESAR Solution PJ02-01.

The RSP requirements for 2 NM separation on final approach will need to be established in such a way that the requirements can be applied to the changing technological and operational environments of the future, and thus are required to be general performance requirements that are disengaged from a specific technological implementation. The proposed approach to establishing these RSP requirements for a 2 NM separation is the expert judgement and modelling extrapolation of the RSP requirements that have been set in Europe for the 5 NM and 3 NM horizontal separations.

[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.

Overall cost efficiency will be ensured by considering revision of the MRS on the basis of the performance of currently deployed surveillance technology options for final approach at very large, large and medium sized airports.

The proposed application of the in-trail 2 NM MRS on final approach is to be demonstrated as safe in design and in application by the controllers responsible for setting up and delivering the arrival aircraft spacing on final approach.

This document contains requirements for ground-based ATC; requirements are based on the use cases defined in SPR-INTEROP/OSED (reference [37]).

2.3 Intended readership

The intended audience of this document is initially the partners of Solution 02-03 in order to support suitable validation exercises.

The others projects in SESAR2020 that are part of PJ02 Increased Runway and Airport Throughput, and the related transversal SESAR Projects PJ19 and PJ22

Ground industries are also a primary audience as the TS/IRS allows them to assess the impact on ground-based ATC systems supporting the implementation of the ORD tool.

Finally, this document will support Airspace Users, ANSPs, Airport Operators and Safety Regulators considering implementing and deploying the MRS reduction supported by the ORD Tool.

2.4 Background

The Required Surveillance Performance (RSP) has been established for 5 NM and 3 NM horizontal separations through the EUROCONTROL specification [40].

A Separation Minima Model has been developed in the EC-6FP RESET Project [41], and applied to investigate and propose preliminary RSP requirements for the reduced minimum pair arrival separation of 2 NM [42].

The impact of employing the in-trail 2 NM MRS on final approach on the controller delivery performance was investigated in SESAR 1 P06.08.01 in the context of employing Time Based Static Pairwise Separation with Optimised Runway Delivery on final approach [38][39].

The proposed RSP requirements and the results of the validation on the controller delivery performance to the in-trail 2NM MRS on final approach have been consolidated into the SESAR 1 OFA 01.03.01 deliverables.

2.5 Structure of the document

The structure of the document is as follows:

- Chapter 1: This section introduces the document.

- Chapter 2: This section provides the document introduction, its scope, purpose, intended audience, background information as well as the glossary of terms and acronyms.
- Chapter 3: This section gives a description overview of the SESAR Solution developed in this TS document.
- Chapter 4: This section provides the Technical Specifications (TS) that have been validated during validation activities at V3 level.
- Chapter 5: This section describes the options that can be chosen when implementing the solution.
- Chapter 6: This section describes any assumptions made that have an impact on the technical specifications described in section 5.
- Chapter 7: This section lists the references and applicable documents used in producing this TS document.

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
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
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
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	OFA 01.03.01 Enhanced Runway Throughput

	compression primarily caused by aircraft decelerating to land.	Consolidated Final Step 1 OSED
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
TBS	Refers to the generic TBS concept that was developed in SESAR 1 Project P06.08.01 which included tool support to show the Controller the required separation.	OFA 01.03.01 Enhanced Runway Throughput Consolidated Final Step 1 OSED
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

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

Acronym	Definition
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 Controller
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)
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

Acronym	Definition
D-ATIS	Digital Automatic Terminal Information Service
DBS	Distance Based Separation
DC	Data Collection
DDI-D	Dynamic Departure Indicator - Distance
DDI-T	Dynamic Departure Indicator - Time
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
FTS	Fast Time Simulation
GH	Ground Handlers
GMC	Ground Movement Controller
GMP	Ground Movement Planner
GNSS	Global Navigation Satellite System

Acronym	Definition
GPS	Global Positioning System
GWCS	Glideslope Wind Conditions Service
HEAVY	ICAO Heavy Wake Category
HIRO	High Intensity Runway Operations
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
KIAS	Knots Indicated Air Speed
KPA	Key Performance Area
kt or kts	knots
KTAS	Knots True Air Speed
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)
MLS	Microwave Landing System

Acronym	Definition
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
SME	Subject Matter Expertise
SMT	Shared Mission Trajectory
SPR	Safety and Performance Requirements
SSR	Secondary Surveillance Radar
STAR	Standard Terminal Arrival Route
SWIM	System Wide Information Model

Acronym	Definition
TAS	True Air Speed
TB	Time Based
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
WTC	Wake Turbulence Category
WTE	Wake Turbulence Encounter
WVE	Wake Vortex Encounter

Table 2: Acronyms and terminology

3 SESAR Solution Impacts on Architecture

3.1 Target Solution Architecture

3.1.1 SESAR Solution(s) Overview

PJ.02-03: Minimum-Pair Separations Based on RSP

Minimum Pair Separations Based on Required Surveillance Performance (RSP) aims at the application (by ATC) of non-wake turbulence pair wise separation (PWS) of 2NM for arrivals on final approach (up to the point that the leading aircraft in the pair crosses the runway threshold), based upon Required Surveillance Performance (RSP)

OI Step		OI description	Open CR
AO-0309		Minimum Radar Separations based upon Required Surveillance Performance (RSP)	CR 03516 Update AO-0309 (PJ02-03) CR 03728 Create ESASSP v1.1 (PJ.14-04-01)
	EN code	EN description	Open CR
	A/C-48a	Air broadcast of aircraft position/vector (ADS-B OUT) compliant with DO260B	
	AERODROME-ATC-59	Enhanced Surveillance data processing on Airport Surface (APT)	
	CTE-S01a	SSR Mode A/C/S	
	CTE-S01	Secondary SUR Radars	
	CTE-S02a	Primary Surveillance Radar	
	CTE-S02	Primary SUR sensor	

	CTE-S04a	Wide Area Multilateration (WAM)	
	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)	
	EN code	EN description	Open CR
	STD-093	EUROCONTROL Guidelines for Optimised Runway Delivery	CR 03525 Create STD-093 (PJ02-01)
	APP ATC 159	Approach ATC system updated for Minimum Separation Based on Required Surveillance Performance (separation delivery)	CR 03526 Update APP ATC 159 (AO-0309 - PJ02-03)
	PRO-257	ATC Procedure to apply spacing minimum of less than 2.5 NM down to 2 NM	CR 03581 Update PRO-257 (AO-0309 - PJ02-03)

Type	Element	EN Code	EN/CR Title	Coverage
		PRO-257	CR 03581 Update PRO-257 (AO-0309 - PJ02-03)	

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

It is considered that to apply a reduced MRS, the Approach and Airport are equipped with a cooperative and non-cooperative surveillance technology, the following table represents one possibility of implementation when the cooperative is Primary Radar and the non-cooperative is a secondary surveillance radar, other possibilities of implementation are possible and the most important is that the surveillance coverage respect the Required Surveillance Performance.

Enabler	Opt/Req	Deviation
A/C-48a_Air broadcast of aircraft position/vector (ADS-B OUT) compliant with DO260B	Optional	No deviation
AERODROME-ATC-59_Enhanced Surveillance data processing on Airport Surface (APT)	Optional	No deviation
CTE-S01a_SSR Mode A/C/S	Required	No deviation

CTE-S01_Secondary SUR Radars	Required	No deviation
CTE-S02a_Primary Surveillance Radar	Required	No deviation
CTE-S02_Primary SUR sensor	Required	No deviation
CTE-S04a_Wide Area Multilateration (WAM)	Optional	No deviation
METEO-03_Provision and monitoring of real-time airport weather information (PCP)	Required	No deviation
METEO-04b_Generate and provide MET information services relevant for Airport and final approach related operations (PCP)	Required	No deviation
STD-093_EUROCONTROL Guidelines for Optimised Runway Delivery	Optional	New Enabler, a standard produced by EUROCONTROL for the use of ORD Tool
APP ATC 159_Approach ATC system updated for Minimum Separation Based on Required Surveillance Performance (separation delivery)	Required	No deviation
PRO-257_ATC Procedure to apply spacing minimum of less than 2.5 NM down to 2 NM	Required	New Enabler, this is to cover the change in the procedure when reducing MRS without using ORD Tool

3.1.1.2 Relevant Use Cases

Operational Use Case	Description
[NOV-5] [MRS-1] Planned Changes of Final Approach Spacing Minimum	The planned change of final approach spacing minimum describes how the tower and approach supervisors coordinate between each other to decide which final approach spacing minimum should be employed (used). in particular they check and coordinate on: · if the weather conditions are met · The planning and timing · the last/first applicable aircraft Once applied, they communicate the information to other actors, Approach control, Final approach control and Tower approach control, as well as check that the correct value is applied.
[NOV-5] [MRS-2a] MRS 2NM with ORD Tool	General Conditions (Scope and Summary) This Use Case describes in detail the steps involved in sequencing and delivering arrival aircraft using the applicable concept (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 Control's radar display and Tower Runway Control's air traffic monitor display. This Use Case takes place during the phase of flight where the arrival aircraft is being metered through the TMA and towards the IAF. This Use Case end upon arrival and the aircraft vacates the runway. Pre Conditions Airport Medium / Short Term Planning and Balance Demand and Capacity 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 and the Approach Arrival Sequence Service are operational. Within the context of locally defined HIRO procedures all components are considered valid for sustained high runway throughput. This shall include but is not limited to a suitable Runway surface and availability of appropriate runway exits. The Flight Crew are aware of the runway in use and the approach type along with the utilisation of HIRO procedures. Post Conditions The arrival aircraft have landed and vacated the runway. Actors Approach Supervisor, Tower Supervisor, Initial Approach Control, Final Approach Control, Tower Runway Control, Flight Crew. Trigger Coordination of an arrival aircraft into the assigned IAF between the TMA Sector Controller and the Intermediate Approach Controller.
[NOV-5] [MRS-2b] MRS 2NM without ORD tool	General Conditions (Scope and Summary) This Use Case describes in detail the steps involved in sequencing and delivering arrival aircraft without using ORD Tool. This Use Case takes place during the phase of flight where the arrival aircraft is being metered through the TMA and towards the IAF. This Use Case end upon arrival and the aircraft vacates the runway. Pre-conditions Airport Medium / Short Term Planning and Balance Demand and Capacity 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. Within the context of locally defined HIRO procedures all components are considered valid for sustained high runway throughput. This shall include but is not limited to a suitable Runway surface and availability of appropriate runway exits. The Flight Crew are aware of the runway in use and the approach type along with the utilisation of HIRO procedures. Post Conditions The arrival aircraft have landed and vacated the runway. Actors Approach Supervisor, Tower Supervisor, Initial Approach Control, Final Approach Control, Tower Runway Control, Flight Crew. Trigger Coordination of an arrival aircraft into the assigned IAF between the TMA Sector Controller and the Intermediate Approach Controller.

System Process	Description
[NSV-4] [MRS-1] Planned change of Final Approach Spacing Minimum	This diagram represents the sequence of events and functions at system level that support the coordination activities between Approach and Tower supervisors to apply a reduction of Final Approach Spacing Minimum.
[NSV-4] [MRS-2a] MRS 2NM with ORD Tool	This diagram represents the sequence of events and functions at system level to allow the reduction to 2NM MRS using the ORD tool.
[NSV-4] [MRS-2b] MRS 2NM without ORD tool	This diagram represents the sequence of events and functions at system level to allow the reduction to 2NM MRS without using the ORD tool.

3.1.1.3 Applicable standards and regulations

Solution PJ02-03 considers reviewing standards for minimum separation it impacts the ESASSP standard developed by EUROCONTROL and the standards GEN-SUR developed by WG102, during the project coordination meetings were held with the standardisations groups and the new requirements developed by the solution were reviewed by the secretary general of EUROCAE WG102 and the received comments were taken into accounts.

3.1.2 Capability Configurations required for the SESAR Solution

MRS				
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; 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 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	Airspace User Operations; Flight Deck;	Civil Scheduled Aviation;

		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;		
APP ACC		Air Traffic Complexity Management; Air Traffic Flow Management; Airspace Configuration Management; Airspace Infringement Avoidance; Airspace Reservation Management; Arrival Sequencing; Arrival/Departure Routes Management; Clearance/Instruction Management; Coordination and Transfer; Crisis Management; CTA/CTO Management; Integrated Arrival/Departure Sequencing; Interval Management (IM); Mid-Air Collision Avoidance; Minimum Pair Separation Provision; Separation Provision (airspace); Separation Technique Management; Trajectory Conformance Monitoring; Trajectory Information Synchronisation; Trajectory Management; Trajectory Revision in Execution; Wake Turbulence Separation Provision; Weather-Dependent Separation Provision;	Air Traffic Flow and Capacity Management; Airspace Management; Airspace Organisation; En-Route/Approach ATS;	Civil ATS Approach Service Provider;
Communication Infrastructure		Airport Operations Management;	Aerodrome ATS;	Civil CNS Service Provider;

				Military CNS Service Provider;
Surveillance Infrastructure Airport (PJ.02-03)		Aeronautical and Meteorological Information Management; Crisis Management; Departure Sequencing; Meteorological Observation and Forecasting Provision; Surface Guidance Provision; Surface Route Management;		Civil CNS Service Provider; Military CNS Service Provider;
Surveillance Infrastructure TMA (PJ.02-03)		Meteorological Observation and Forecasting Provision;		Civil CNS Service Provider; Military CNS Service Provider;
TWR		Adverse Condition Operations Provision; Air Traffic Flow Management; Airspace Infringement Avoidance; Airspace Reservation Management; Arrival Sequencing; Arrival/Departure Routes Management; Crisis Management; Departure Sequencing; Dynamic Runway Allocation; Ground Collision Avoidance; Integrated Arrival/Departure Sequencing; Interval Management (IM); Remote Tower Operations Provision; Separation Provision (airspace); Separation Technique Management; Surface Guidance Provision; Surface Route Management; Wake Turbulence Separation Provision;	Aerodrome ATS; Network Operations;	Civil ATS Aerodrome Service Provider; Military ATS Aerodrome Service Provider;

		Weather-Dependent Separation Provision;		

3.2 Changes imposed by the SESAR Solution on the baseline Architecture

Enabler	Element type	Element name	Impact	Change
APP ATC 159 (CR)	Approach ATC system updated for Minimum Separation Based on Required Surveillance Performance (separation delivery)			
	Function	Compute target report	Introduce	In case of use of ORD tool, the system shall compute Target Distance Indicators taking into account that the Spacing Minimum can be reduced below the current restriction of the 2.5 NM MRS down to 2 NM MRS which facilitates supporting TB ROT Spacing and TB Wake Separations below 2.5 NM down to 2 NM in moderate, strong and very strong headwind conditions on final approach
	Function	Display TDI	Introduce	In case of use of ORD tool, the system shall provide Target Distance Indicators taking into account that the Spacing Minimum can be reduced below the current restriction of the 2.5 NM MRS down to 2 NM MRS which facilitates supporting TB ROT Spacing and TB Wake Separations below 2.5 NM down to 2 NM in moderate, strong and very strong headwind conditions on final approach

PRO-257 (CR)	ATC Procedure to apply spacing minimum of less than 2.5 NM down to 2 NM			
	Function	Identify pairing between ITD/FTD and aircraft	Introduce	In case of use of ORD tool, the system shall provide Target Distance Indicators taking into account that the Spacing Minimum can be reduced below the current restriction of the 2.5 NM MRS down to 2 NM MRS which facilitates supporting TB ROT Spacing and TB Wake Separations below 2.5 NM down to 2 NM in moderate, strong and very strong headwind conditions on final approach

4 Technical Specifications

4.1 Functional architecture overview

Functions required to perform needed Operational Activities can be allocated to Resources of a different type: Human Role, Infrastructure System or Functional Block.

Role	Functional Block	Function
[NSV-4] [MRS-1] Planned change of Final Approach Spacing Minimum		
ACC/Approach Supervisor		Assess operational situation and headwind conditions at the approach; Check final approach spacing minimum change is reflected in arrival sequence at Approach Control; Coordinate with the Tower Supervisor; Switch to new final approach spacing minimum in Approach Control;
Airport Tower Supervisor		Assess operational situation and headwind conditions at the airport; Check final approach spacing minimum change is reflected in arrival sequence at Tower Control; Coordinate with the Approach Supervisor; Switch to new final approach spacing minimum in Tower Control;
[NSV-4] [MRS-2a] MRS 2NM with ORD Tool		
	Aerodrome Surveillance (PJ.02-03)	Compute Target Reports (A-SMGCS);
	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-03)	Display Infringement Alert; Display TDI; Display Tracks;

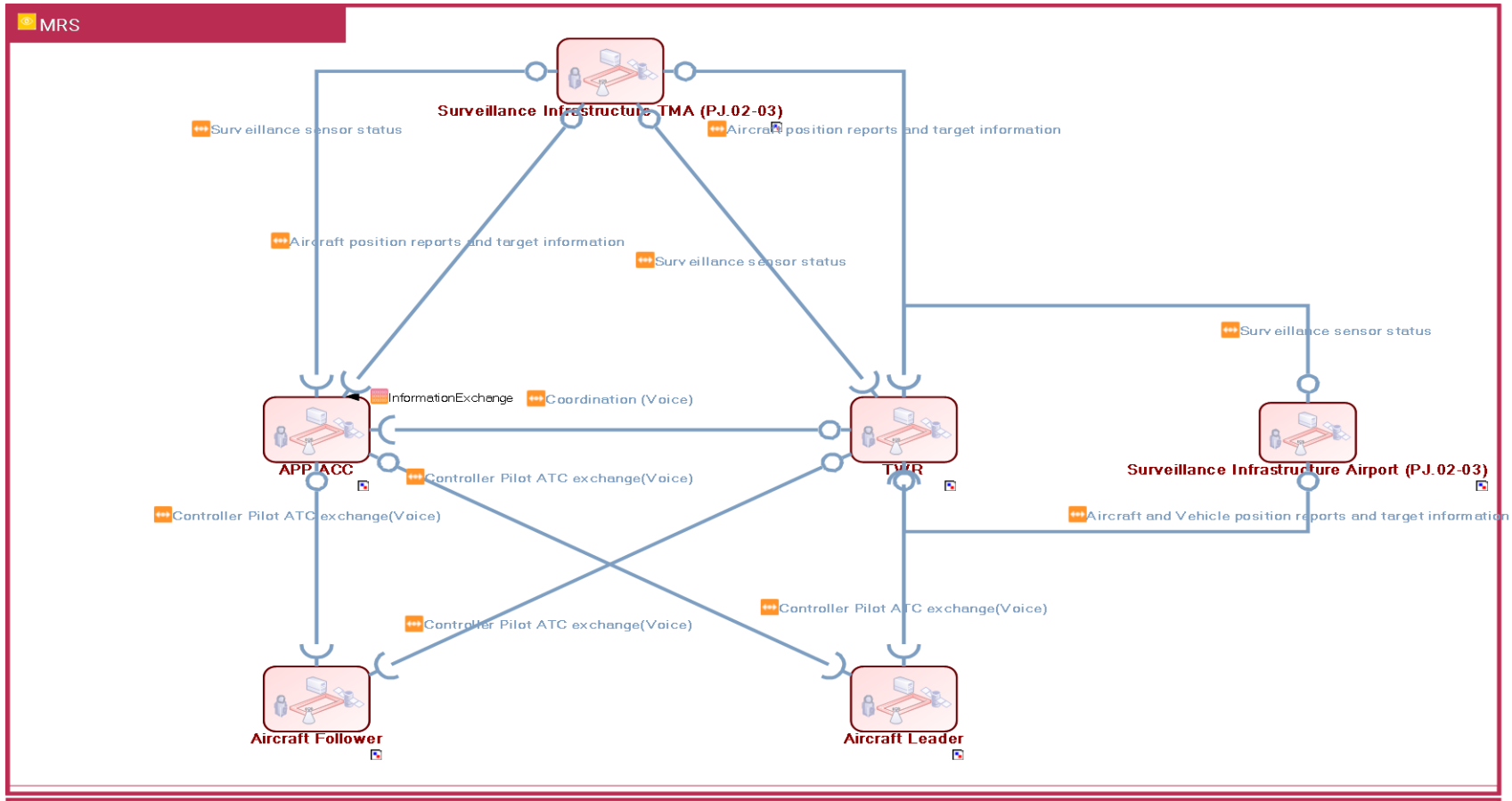
	Controller Human Machine Interaction Management ER/APP (PJ.02-03)	Arrange ORD Sequence; Display Infringement Alert; Display TDI; Display Tracks;
	Optimised Runway Delivery (ORD)	Compute ITD/FTD; Determine Spacing infringement;
	Surveillance (PJ.02-03)	Compute target report;
Tower Runway Controller (PJ.02-03)		identify TDI for follower; Monitor aircraft on runway;
[NSV-4] [MRS-2b] MRS 2NM without ORD tool		
	Aerodrome Surveillance (PJ.02-03)	Compute Target Reports (A-SMGCS);
	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-03)	Display Tracks;
	Controller Human Machine Interaction Management ER/APP (PJ.02-03)	Display Tracks;
Executive Controller (also called Tactical Controller)		Determine Required Spacing; Ensure Spacing with a 2NM MRS; Sequencing and vectoring;
	Surveillance (PJ.02-03)	Compute target report;
Tower Runway Controller		Identify aircraft and needed spacing; Instruct Go-around; Monitor aircraft on runway; Provide Landing clearance;

4.1.1 Resource Connectivity Model

This Diagram describes the overall connection between all actors involved in PJ02-03 Reducing MRS based on the Required Surveillance Performance, it is an aggregation of two NSV4:

- NSV4 MRS-2a: MRS 2NM with ORD Tool

- NSV4 MRS-2b: MRS 2NM without ORD Tool



[NSV-4] [MRS-1] Planned change of Final Approach Spacing Minimum [ACC/Approach Supervisor, Airport Tower Supervisor, Executive Controller (also called Tactical Controller), G/G Voice Communication, G/G Voice Communication APP, Tower Runway Controller]

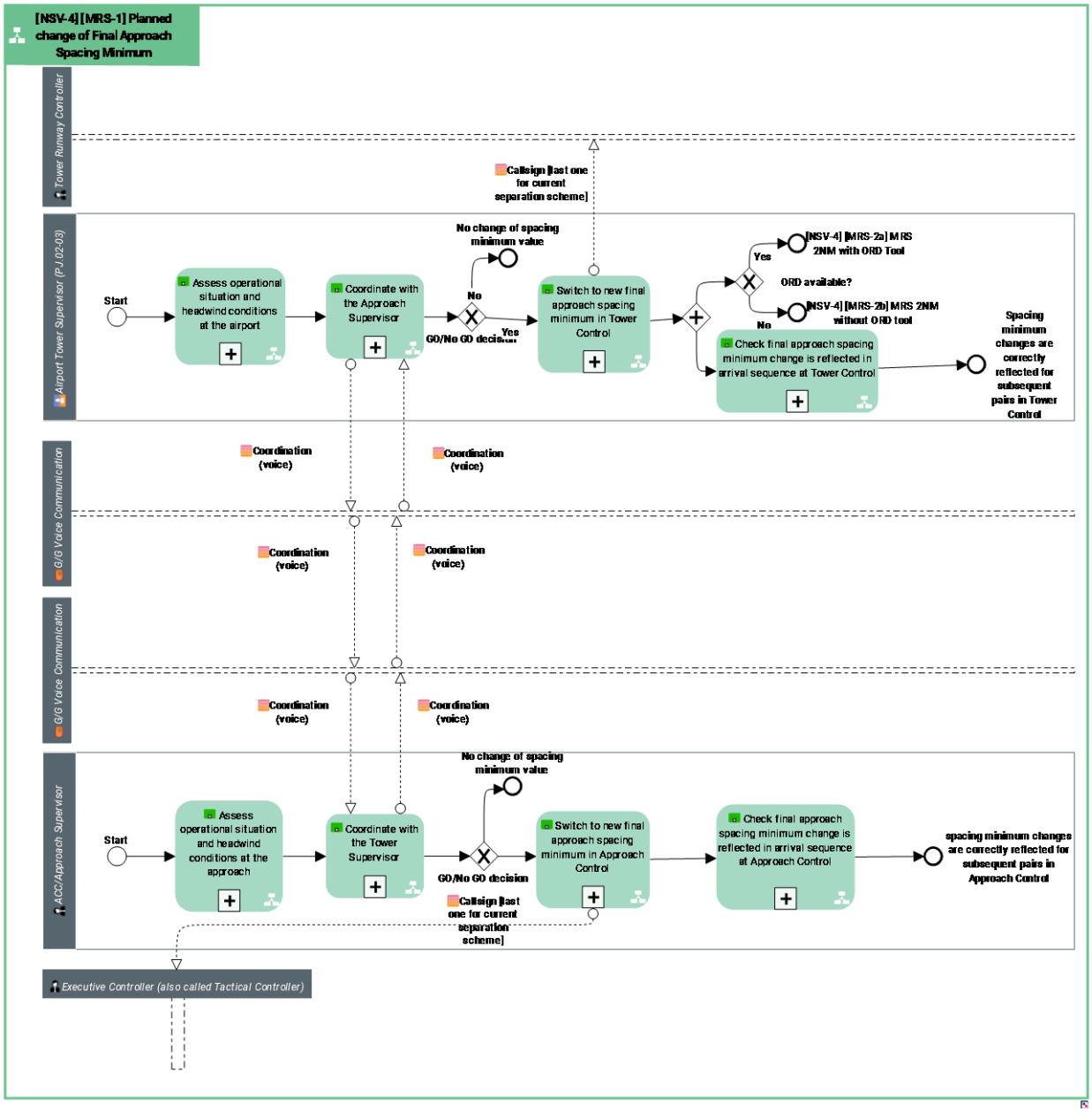
[NSV-4] [MRS-2a] MRS 2NM with ORD Tool [A/G Voice Communication (TWR), Aerodrome Surveillance (PJ.02-03), Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-03), Controller Human Machine Interaction Management ER/APP (PJ.02-03), Optimised Runway Delivery (ORD), Surveillance (PJ.02-03), Surveillance Infrastructure Airport (PJ.02-03), Surveillance Infrastructure TMA (PJ.02-03), Tower Runway Controller (PJ.02-03)]

[NSV-4] [MRS-2b] MRS 2NM without ORD tool [A/G Voice Communication (APP), A/G Voice Communication (TWR), Aerodrome Surveillance (PJ.02-03), Aircraft Follower, Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-03), Controller Human Machine Interaction Management ER/APP (PJ.02-03), Executive Controller (also called Tactical Controller), Surveillance (PJ.02-03), Surveillance Infrastructure Airport (PJ.02-03), Surveillance Infrastructure TMA (PJ.02-03), Tower Runway Controller]

4.1.2 Resource Orchestration view

4.1.2.1 [NSV-4] [MRS-1] Planned change of Final Approach Spacing Minimum

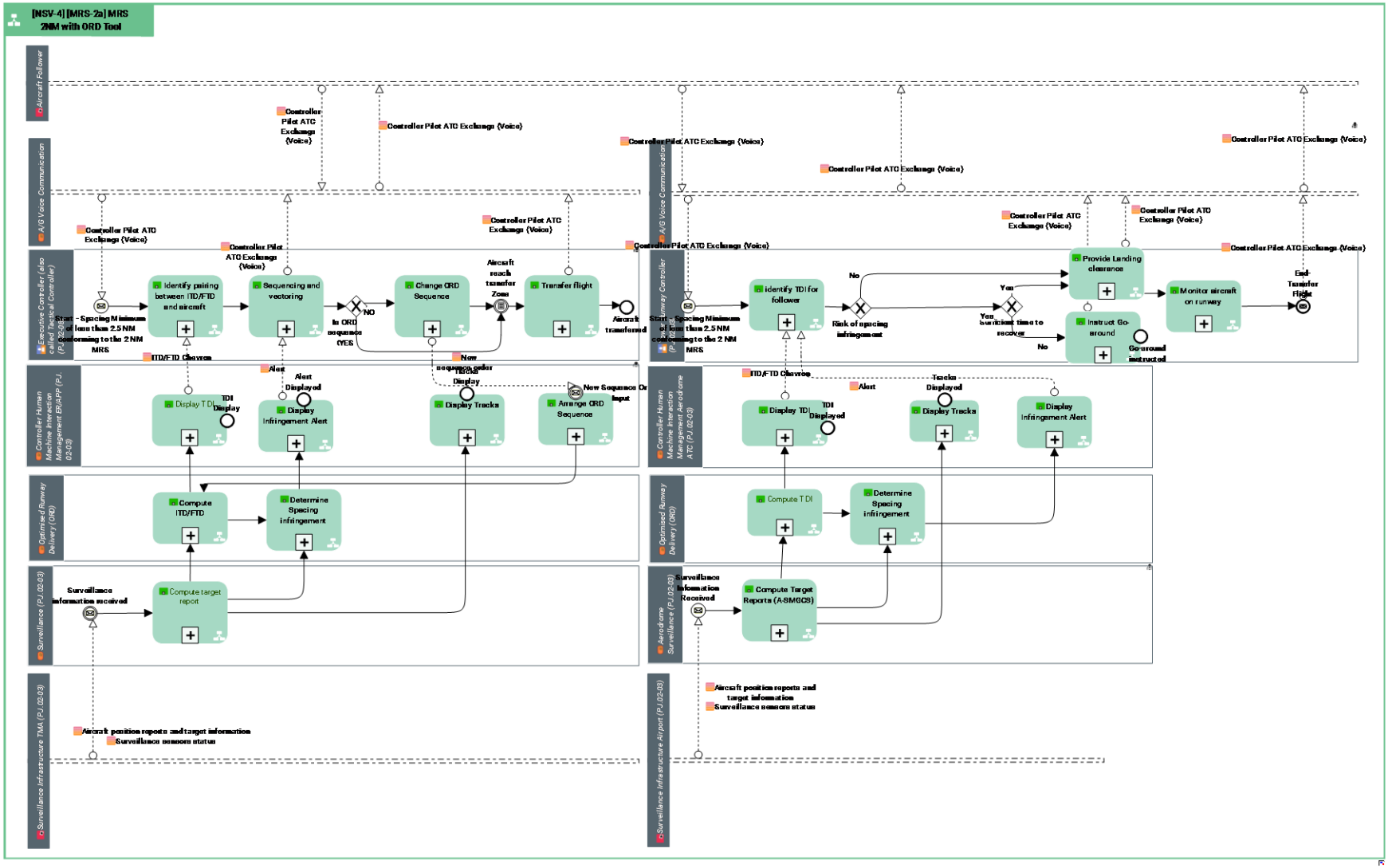
This diagram represents the sequence of events and functions at system level that support the coordination activities between Approach and Tower Supervisors to apply a reduction to the Spacing Minimum below 2.5 NM down to 2 NM enabled by the 2 NM MRS.


[NSV-4] [MRS-1] Planned change of Final Approach Spacing Minimum
Tower Runway Controller
Callsign [last one for current separation scheme]
Airport Tower Supervisor (PJ.02-03)
Start
Assess operational situation and headwind conditions at the airport
Coordinate with the Approach Supervisor
No change of spacing minimum value
No
GO/No GO decision
Yes
Switch to new final approach spacing minimum in Tower Control
Yes
ORD available?
[NSV-4] [MRS-2a] MRS 2NM with ORD Tool
[NSV-4] [MRS-2b] MRS 2NM without ORD tool
No
Check final approach spacing minimum change is reflected in arrival sequence at Tower Control
Spacing minimum changes are correctly reflected for subsequent pairs in Tower Control
G/G Voice Communication
Coordination (voice)
Coordination (voice)
Coordination (voice)
Coordination (voice)
G/G Voice Communication
Coordination (voice)
Coordination (voice)
ACC/Approach Supervisor
Start
Assess operational situation and headwind conditions at the approach
Coordinate with the Tower Supervisor
No change of spacing minimum value
GO/No GO decision
Callsign [last one for current separation scheme]
Switch to new final approach spacing minimum in Approach Control
Check final approach spacing minimum change is reflected in arrival sequence at Approach Control
spacing minimum changes are correctly reflected for subsequent pairs in Approach Control
Executive Controller (also called Tactical Controller)

Function	Description
Assess operational situation and headwind conditions at the airport	The Tower Supervisor assesses the need and check that the required conditions are met to change the spacing minimum on final approach.
Assess operational situation and headwind conditions at the approach	The Approach Supervisor assesses the need and check that the required conditions are met to change the spacing minimum on final approach.
Check final approach spacing minimum change is reflected in arrival sequence at Approach Control	The Approach supervisor checks that the planned final approach separation change is reflected into the Approach Arrivals Sequence Display from the sequence position of the planned change.
Check final approach spacing minimum change is reflected in arrival sequence at Tower Control	The Tower supervisor checks that the planned final approach separation change is reflected into the Approach Arrivals Sequence Display from the sequence position of the planned change.
Coordinate with the Approach Supervisor	The Tower Supervisor and Approach Supervisor coordinate on the need and timing for a planned change of final approach separation
Coordinate with the Tower Supervisor	The Tower Supervisor and Approach Supervisor coordinate on the need and timing for a planned change of final approach separation The Approach Supervisor coordinates with the Initial Approach Controller the identification of the last aircraft, for each arrival runway, for which the current final approach separation shall be applied.
Switch to new final approach spacing minimum in Approach Control	The Approach Supervisor (or the Initial Approach Controller) selects the last aircraft in the Approach arrival sequence and adds the planned change of final approach separation via a system input for each arrival runway.
Switch to new final approach spacing minimum in Tower Control	The planned change of final approach separation is reflected to Tower Runway Control.

4.1.2.2 [NSV-4] [MRS-2a] MRS 2NM with ORD Tool

This diagram represents the sequence of events and functions at system level to allow the reduction to the Spacing Minimum below 2.5 NM down to 2 NM enabled by the 2 NM MRS using the ORD tool.

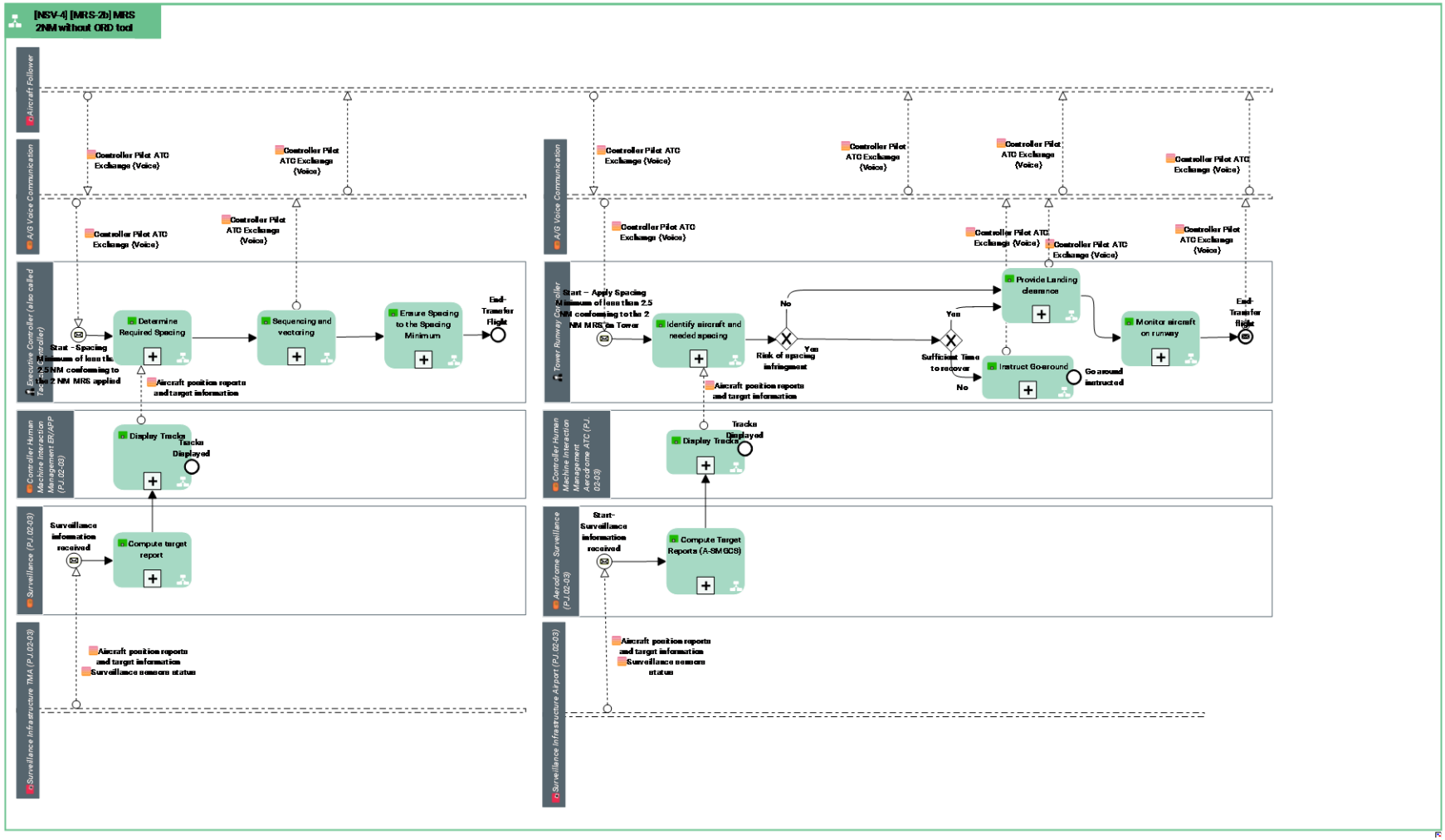

[NSV-4] [MRS-2a] MRS 2NM with ORD Tool
Aircraft Follower
A/G Voice Communication
Executive Controller (also called Tactical Controller) (PJ.02-03)
Controller Human Machine Interaction Management ER/APP (PJ.02-03)
Optimised Runway Delivery (ORD)
Surveillance (PJ.02-03)
Surveillance Infrastructure TMA (PJ.02-03)
Controller Pilot ATC Exchange (Voice)
Identify pairing between ITD/FTD and aircraft
Sequencing and vectoring
Change ORD Sequence
Transfer Flight
Aircraft reach transfer Zone
Aircraft transferred
Start - Spacing Minimum of less than 2.5 NM conforming to the 2 NM MRS
ITD/FTD Cleavrun
Display TDI
TDI Displayed
Alert
Alert Displayed
Display Infringement Alert
Display Tracks
New sequence order Tracks Display
New Sequence Order Input
Arrange ORD Sequence
Compute ITD/FTD
Determine Spacing infringement
Surveillance information received
Compute target report
Aircraft position reports and target information
Surveillance sensors status
Aerodrome Surveillance (PJ.02-03)
Surveillance Infrastructure Airport (PJ.02-03)
Identify TDI for follower
Risk of spacing infringement
Provide Landing clearance
Instruct Go-around
Go-around instructed
Monitor aircraft on runway
End-Transfer Flight
Tracks Displayed
Compute TDI
Determine Spacing infringement
Compute Target Reports (A-SMGCS)

Function	Description
Compute ITD/FTD	This function computes the ITD and FTD for the Approach position
Arrange ORD Sequence	The System shall allow the ATCO to change the arrival sequence, the ORD computes the separation minima based on this sequence.
Change ORD Sequence	The system shall allow the ATCO to change the ORD list to reflect the arrival sequence.
Compute target report	The function calculates the position of the aircraft based on the surveillance input.
Compute Target Reports (A-SMGCS)	The function calculates the mobile position based on the A-SMGCS input.
Compute TDI	This function computes Traffic Display Indicator.
Determine Spacing infringement	The ORD Tool computes the difference between the current position and the TDI position and if the aircraft is behind its chevron (value to be specified locally) an alert is sent to the HMI
Display Infringement Alert	The HMI displays the TDI infringement alert
Display TDI	This function allows the display of the Target Display Indicator, depending on the implementation and local choice, it can be either ITD, FTD or both.
Display Tracks	The function displays mobile position and track on the controller's HMI.
Identify pairing between ITD/FTD and aircraft	ATCO shall identify the TDI for each aircraft in the ORD computation zone.
identify TDI for follower	The controller identifies TDI for the follower aircraft.
Instruct Go-around	The controller instructs an aircraft to execute go-around.

Monitor aircraft on runway	The controller monitors an aircraft on a runway.
Provide Landing clearance	The tower controller provides the landing clearance as well as the wind information while ensuring that the runway is clear of traffic.
Sequencing and vectoring	ATCO shall sequence and separate aircraft using vectoring or speed control
Transfer flight	The controller instructs the aircraft to contact the next ATS Unit.

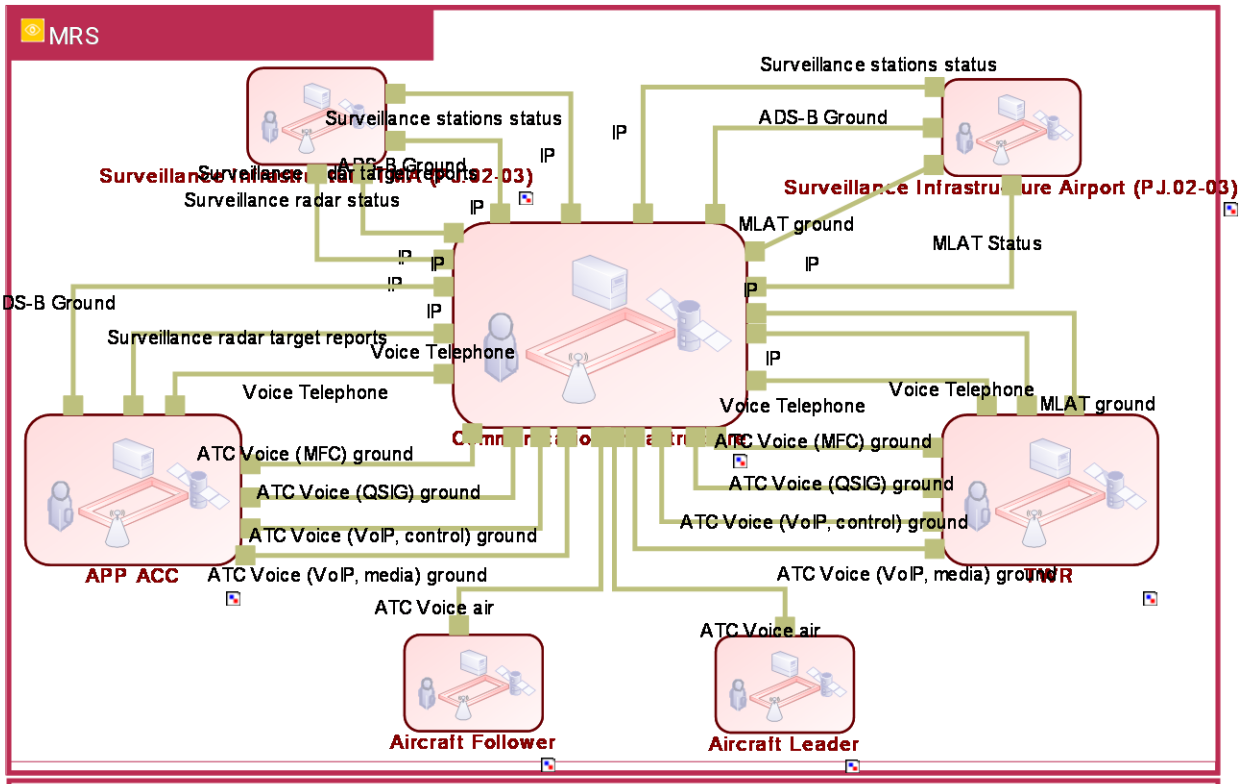
4.1.2.3 [NSV-4] [MRS-2b] MRS 2NM without ORD tool

This diagram represents the sequence of events and functions at system level to allow the reduction to the Spacing Minimum below 2.5 NM down to 2 NM enabled by the 2 NM MRS without using the ORD tool.


[NSV-4] [MRS-2b] MRS 2NM without ORD tool
Aircraft Follower
A/G Voice Communication
Executive Controller (also called Tactical Controller)
Controller Human Machine Interaction Management ER/APP (PJ.02-05)
Surveillance (PJ.02-03)
Surveillance Infrastructure TMA (PJ.02-03)
Controller Pilot ATC Exchange (Voice)
Determine Required Spacing
Sequencing and vectoring
Ensure Spacing to the Spacing Minimum
End-Transfer Flight
Aircraft position reports and target information
Display Tracks
Tracks Displayed
Surveillance information received
Compute target report
Surveillance sensors status
Tower/Runway Controller
Start – Apply Spacing Minimum of less than 2.5 NM conforming to the 2 NM MRS in Tower
Identify aircraft and needed spacing
Risk of spacing infringment
Yes
No
Provide Landing clearance
Sufficient Time to recover
Instruct Go-around
Go around instructed
Monitor aircraft on runway
Aerodrome Surveillance (PJ.02-03)
Start-Surveillance information received
Compute Target Reports (A-SMGCS)
Surveillance Infrastructure Airport (PJ.02-03)

Function	Description
Compute target report	The function calculates the position of the aircraft based on the surveillance input.
Compute Target Reports (A-SMGCS)	The function calculates the mobile position based on the A-SMGCS input.
Determine Required Spacing	Based on the aircraft type the controller determines the minimum required spacing.
Display Tracks	The function displays mobile position and track on the controller's HMI.
Ensure Spacing to the spacing minimum	The controller ensures spacing to the spacing minimum.
Identify aircraft and needed spacing	The controller identifies an aircraft and needed spacing with its leader.
Instruct Go-around	The controller instructs an aircraft to execute go-around.
Monitor aircraft on runway	The controller monitors an aircraft on a runway.
Provide Landing clearance	The tower controller provides the landing clearance as well as the wind information while ensuring that the runway is clear of traffic.
Sequencing and vectoring	ATCO shall sequence and separate aircraft using vectoring or speed control

4.1.3 Infrastructure connectivity model



➡ **[NSV-4] [MRS-1] Planned change of Final Approach Spacing Minimum [ACC/Approach Supervisor, Airport Tower Supervisor, Executive Controller (also called Tactical Controller), G/G Voice Communication, G/G Voice Communication APP, Tower Runway Controller]**

➡ **[NSV-4] [MRS-2a] MRS 2NM with ORD Tool [A/G Voice Communication (TWR), Aerodrome Surveillance (PJ.02-03), Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-03), Controller Human Machine Interaction Management ER/APP (PJ.02-03), Optimised Runway Delivery (ORD), Surveillance (PJ.02-03), Surveillance Infrastructure Airport (PJ.02-03), Surveillance Infrastructure TMA (PJ.02-03), Tower Runway Controller (PJ.02-03)]**

➡ **[NSV-4] [MRS-2b] MRS 2NM without ORD tool [A/G Voice Communication (APP), A/G Voice Communication (TWR), Aerodrome Surveillance (PJ.02-03), Aircraft Follower, Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-03), Controller Human Machine Interaction Management ER/APP (PJ.02-03), Executive Controller (also called Tactical Controller), Surveillance (PJ.02-03), Surveillance Infrastructure Airport (PJ.02-03), Surveillance Infrastructure TMA (PJ.02-03), Tower Runway Controller]**

4.1.4 Service view

4.1.4.1 Service Provisioning

Interaction	Consumer CC	Consumer System	Provider CC	Provider System
Aircraft position reports and target information. APP ACC (Step 2)_CC and Surveillance Infrastructure TMA (PJ.02-03)_CC	APP ACC (Step 2)		Surveillance Infrastructure TMA (PJ.02-03)	Surveillance Systems for Approach (TMA)
Coordination (Voice).APP ACC (Step 2)_CC and TWR (Step 2)_CC	APP ACC (Step 2)	Voice; En-Route / Approach ATC;	TWR (Step 2)	Voice;
Aircraft position reports and target information. TWR (Step 2)_CC	TWR (Step 2)		Surveillance Infrastructure TWR (PJ.02-03)	Surveillance Systems for Tower (TWR)
Surveillance sensor status. APP ACC (Step 2)_CC and Surveillance Infrastructure TMA (PJ.02-03)_CC	APP ACC (Step 2)		Surveillance Infrastructure TMA (PJ.02-03)	Surveillance Systems for Approach (TMA)
Surveillance sensor status. TWR (Step 2)_CC and Surveillance Infrastructure TWR (PJ.02-03)_CC	TWR (Step 2)		Surveillance Infrastructure TWR (PJ.02-03)	Surveillance Systems for Tower (TWR)
Controller Pilot ATC exchange (Voice). Aircraft Leader_CC and TWR (Step 2)_CC	Aircraft Leader	Aircraft;	TWR (Step 2)	Voice;
Controller Pilot ATC exchange (Voice). Aircraft Follower_CC and TWR (Step 2)_CC	Aircraft Follower	Aircraft;	TWR (Step 2)	Voice;

Interaction	Consumer CC	Consumer System	Provider CC	Provider System
Controller Pilot ATC exchange (Voice). Aircraft Follower_CC and APP ACC (Step 2)_CC	Aircraft Follower	Aircraft;	APP ACC (Step 2)	Voice;
Controller Pilot ATC exchange (Voice). Aircraft Leader_CC and APP ACC (Step 2)_CC	Aircraft Leader	Aircraft;	APP ACC (Step 2)	Voice;
Aircraft and Vehicle position reports and target information. TWR (Step 2)_CC and Surveillance Infrastructure Airport (PJ.02-03)_CC	TWR (Step 2)		Surveillance Infrastructure Airport (PJ.02-03)	Surveillance Systems for Tower (TWR)
Surveillance sensor status. TWR (Step 2)_CC and Surveillance Infrastructure Airport (PJ.02-03)_CC	TWR (Step 2)	Aerodrome ATC;	Surveillance Infrastructure Airport (PJ.02-03)	Airport Multilateration; Video Surveillance; Surface Movement Radar; ADS-B Ground Station; Multistatic Primary Radar;

4.1.4.2 Service Realization

4.1.4.2.1 Interaction Aircraft and Vehicle position reports and target information. TWR (Step 2)_CC and Surveillance Infrastructure Airport (PJ.02-03)_CC

System Port: SUR_ADS-B_GND at Surveillance Infrastructure - Airport_CC

Protocol Stack	Protocol
ADS-B Ground	
	Asterix Cat21
	UDP

	IP

System Port: IP_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
IP	

System Port: SUR_MLAT_GND at TWR (Step 2)_CC

Protocol Stack	Protocol
MLAT ground	
	Asterix Cat20
	UDP
	IP

System Port: IP_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
IP	

System Port: IP_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
IP	

System Port: SUR_MLAT_GND at Surveillance Infrastructure - Airport_CC

Protocol Stack	Protocol
MLAT ground	
	Asterix Cat20
	UDP
	IP

4.1.4.2.2 Interaction Aircraft position reports and target information. APP ACC (Step 2)_CC and Surveillance Infrastructure TMA (PJ.02-03)_CC

System Port: IP_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
IP	

System Port: SUR_ADS-B_GND at APP ACC (Step 2)_CC

Protocol Stack	Protocol
ADS-B Ground	
	Asterix Cat21
	UDP
	IP

System Port: SUR_ADS-B_GND at Surveillance Infrastructure - TMA_CC

Protocol Stack	Protocol
ADS-B Ground	
	Asterix Cat21
	UDP
	IP

System Port: IP_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
IP	

System Port: IP_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
IP	

System Port: SUR_PSR_GND at APP ACC (Step 2)_CC

Protocol Stack	Protocol

Surveillance radar target reports	
	Asterix Cat01
	Asterix Cat48
	UDP
	IP

System Port: SUR_PSR_GND at Surveillance Infrastructure - TMA_CC

Protocol Stack	Protocol
Surveillance radar target reports	
	Asterix Cat01
	Asterix Cat48
	UDP
	IP

System Port: IP_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
IP	

4.1.4.2.3 Interaction Aircraft position reports and target information. TWR (Step 2)_CC and Surveillance Infrastructure TMA (PJ.02-03)_CC

4.1.4.2.4 Interaction Controller Pilot ATC exchange (Voice). Aircraft Follower_CC and APP ACC (Step 2)_CC

System Port: VOICE_RADIO_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG

ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP
OPC (Operational) Voice ground	

System Port: ATC_VOICE_GND at APP ACC (Step 2)_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP

System Port: VOICE_RADIO_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	

	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP
OPC (Operational) Voice ground	

System Port: ATC_VOICE_GND at APP ACC (Step 2)_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP

System Port: VOICE_RADIO_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP
OPC (Operational) Voice ground	

System Port: ATC_VOICE_GND at APP ACC (Step 2)_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP

	UDP
	IP

System Port: VOICE_RADIO_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP
OPC (Operational) Voice ground	

System Port: ATC_VOICE_GND at APP ACC (Step 2)_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP

	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP

System Port: VOICE_RADIO_AIR at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice air	
	VHF - AM 25kHz/8.33kHz
	HF - AM 25kHz
OPC (Operational) Voice air	
	VHF
	HF (selcal)

System Port: ATC_VOICE at Civil Aircraft (Step 2)_CC

Protocol Stack	Protocol
ATC Voice air	
	VHF - AM 25kHz/8.33kHz
	HF - AM 25kHz

System Port: VOICE_RADIO_AIR at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice air	
	VHF - AM 25kHz/8.33kHz
	HF - AM 25kHz
OPC (Operational) Voice air	
	VHF
	HF (selcal)

System Port: ATC_VOICE at Civil Aircraft (Step 2)_CC

Protocol Stack	Protocol
ATC Voice air	
	VHF - AM 25kHz/8.33kHz
	HF - AM 25kHz

4.1.4.2.5 Interaction Controller Pilot ATC exchange (Voice). Aircraft Follower_CC and TWR (Step 2)_CC

System Port: VOICE_RADIO_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP
OPC (Operational) Voice ground	

System Port: ATC_VOICE_GND at TWR (Step 2)_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2

ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP

System Port: VOICE_RADIO_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP
OPC (Operational) Voice ground	

System Port: ATC_VOICE_GND at TWR (Step 2)_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP

System Port: VOICE_RADIO_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP

OPC (Operational) Voice ground	

System Port: ATC_VOICE_GND at TWR (Step 2)_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP

System Port: VOICE_RADIO_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP

ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP
OPC (Operational) Voice ground	

System Port: ATC_VOICE_GND at TWR (Step 2)_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP

System Port: VOICE_RADIO_AIR at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice air	
	VHF - AM 25kHz/8.33kHz
	HF - AM 25kHz
OPC (Operational) Voice air	
	VHF

	HF (selcal)

System Port: ATC_VOICE at Civil Aircraft (Step 2)_CC

Protocol Stack	Protocol
ATC Voice air	
	VHF - AM 25kHz/8.33kHz
	HF - AM 25kHz

System Port: VOICE_RADIO_AIR at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice air	
	VHF - AM 25kHz/8.33kHz
	HF - AM 25kHz
OPC (Operational) Voice air	
	VHF
	HF (selcal)

System Port: ATC_VOICE at Civil Aircraft (Step 2)_CC

Protocol Stack	Protocol
ATC Voice air	
	VHF - AM 25kHz/8.33kHz
	HF - AM 25kHz

4.1.4.2.6 Interaction Controller Pilot ATC exchange (Voice). Aircraft Leader_CC and APP ACC (Step 2)_CC

System Port: VOICE_RADIO_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2

ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP
OPC (Operational) Voice ground	

System Port: ATC_VOICE_GND at APP ACC (Step 2)_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP

System Port: VOICE_RADIO_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP
OPC (Operational) Voice ground	

System Port: ATC_VOICE_GND at APP ACC (Step 2)_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP

	UDP
	IP

System Port: VOICE_RADIO_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP
OPC (Operational) Voice ground	

System Port: ATC_VOICE_GND at APP ACC (Step 2)_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP

	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP

System Port: VOICE_RADIO_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP
OPC (Operational) Voice ground	

System Port: ATC_VOICE_GND at APP ACC (Step 2)_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG

ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP

System Port: VOICE_RADIO_AIR at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice air	
	VHF - AM 25kHz/8.33kHz
	HF - AM 25kHz
OPC (Operational) Voice air	
	VHF
	HF (selcal)

System Port: ATC_VOICE at Civil Aircraft (Step 2)_CC

Protocol Stack	Protocol
ATC Voice air	
	VHF - AM 25kHz/8.33kHz
	HF - AM 25kHz

System Port: VOICE_RADIO_AIR at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice air	
	VHF - AM 25kHz/8.33kHz
	HF - AM 25kHz

OPC (Operational) Voice air	
	VHF
	HF (selcal)

System Port: ATC_VOICE at Civil Aircraft (Step 2)_CC

Protocol Stack	Protocol
ATC Voice air	
	VHF - AM 25kHz/8.33kHz
	HF - AM 25kHz

4.1.4.2.7 Interaction Controller Pilot ATC exchange (Voice). Aircraft Leader_CC and TWR (Step 2)_CC

System Port: VOICE_RADIO_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP
OPC (Operational) Voice ground	

System Port: ATC_VOICE_GND at TWR (Step 2)_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP

System Port: VOICE_RADIO_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP

	IP
OPC (Operational) Voice ground	

System Port: ATC_VOICE_GND at TWR (Step 2)_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP

System Port: VOICE_RADIO_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP

ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP
OPC (Operational) Voice ground	

System Port: ATC_VOICE_GND at TWR (Step 2)_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP

System Port: VOICE_RADIO_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG

ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP
OPC (Operational) Voice ground	

System Port: ATC_VOICE_GND at TWR (Step 2)_CC

Protocol Stack	Protocol
ATC Voice (MFC) ground	
	ATS MFC R2
ATC Voice (QSIG) ground	
	ATS QSIG
ATC Voice (VoIP, control) ground	
	SIP
	TCP
	IP
ATC Voice (VoIP, media) ground	
	RTP
	UDP
	IP

System Port: VOICE_RADIO_AIR at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice air	

	VHF - AM 25kHz/8.33kHz
	HF - AM 25kHz
OPC (Operational) Voice air	
	VHF
	HF (selcal)

System Port: ATC_VOICE at Civil Aircraft (Step 2)_CC

Protocol Stack	Protocol
ATC Voice air	
	VHF - AM 25kHz/8.33kHz
	HF - AM 25kHz

System Port: VOICE_RADIO_AIR at Communication Infrastructure_CC

Protocol Stack	Protocol
ATC Voice air	
	VHF - AM 25kHz/8.33kHz
	HF - AM 25kHz
OPC (Operational) Voice air	
	VHF
	HF (selcal)

System Port: ATC_VOICE at Civil Aircraft (Step 2)_CC

Protocol Stack	Protocol
ATC Voice air	
	VHF - AM 25kHz/8.33kHz
	HF - AM 25kHz

4.1.4.2.8 Interaction Coordination (Voice). APP ACC (Step 2)_CC and TWR (Step 2)_CC

System Port: VOICE_GND at Communication Infrastructure_CC

Protocol Stack	Protocol

Voice Telephone	
	PSTN

System Port: VOICE_TELEPHONE at APP ACC (Step 2)_CC

Protocol Stack	Protocol
Voice Telephone	
	PSTN

System Port: VOICE_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
Voice Telephone	
	PSTN

System Port: VOICE_TELEPHONE at TWR (Step 2)_CC

Protocol Stack	Protocol
Voice Telephone	
	PSTN

4.1.4.2.9 Interaction Surveillance sensor status. APP ACC (Step 2)_CC and Surveillance Infrastructure TMA (PJ.02-03)_CC

System Port: PSR_STATUS_GND at Surveillance Infrastructure - TMA_CC

Protocol Stack	Protocol
Surveillance radar status	
	Asterix Cat02
	Asterix Cat34
	UDP
	IP

System Port: IP_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
IP	

System Port: ADS-B_STATUS_GND at Surveillance Infrastructure - TMA_CC

Protocol Stack	Protocol
Surveillance stations status	
	Asterix Cat23
	UDP
	IP

System Port: IP_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
IP	

4.1.4.2.10 Interaction Surveillance sensor status. TWR (Step 2)_CC and Surveillance Infrastructure Airport (PJ.02-03)_CC

System Port: MLAT_STATUS_GND at Surveillance Infrastructure - Airport_CC

Protocol Stack	Protocol
MLAT Status	
	Asterix Cat19
	UDP
	IP

System Port: IP_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
IP	

System Port: ADS-B_STATUS_GND at Surveillance Infrastructure - Airport_CC

Protocol Stack	Protocol

Surveillance stations status	
	Asterix Cat23
	UDP
	IP

System Port: IP_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
IP	

System Port: IP_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
IP	

System Port: SUR_STATUS_GND at TWR (Step 2)_CC

4.1.4.2.11 Interaction Surveillance sensor status. TWR (Step 2)_CC and Surveillance Infrastructure TMA (PJ.02-03)_CC

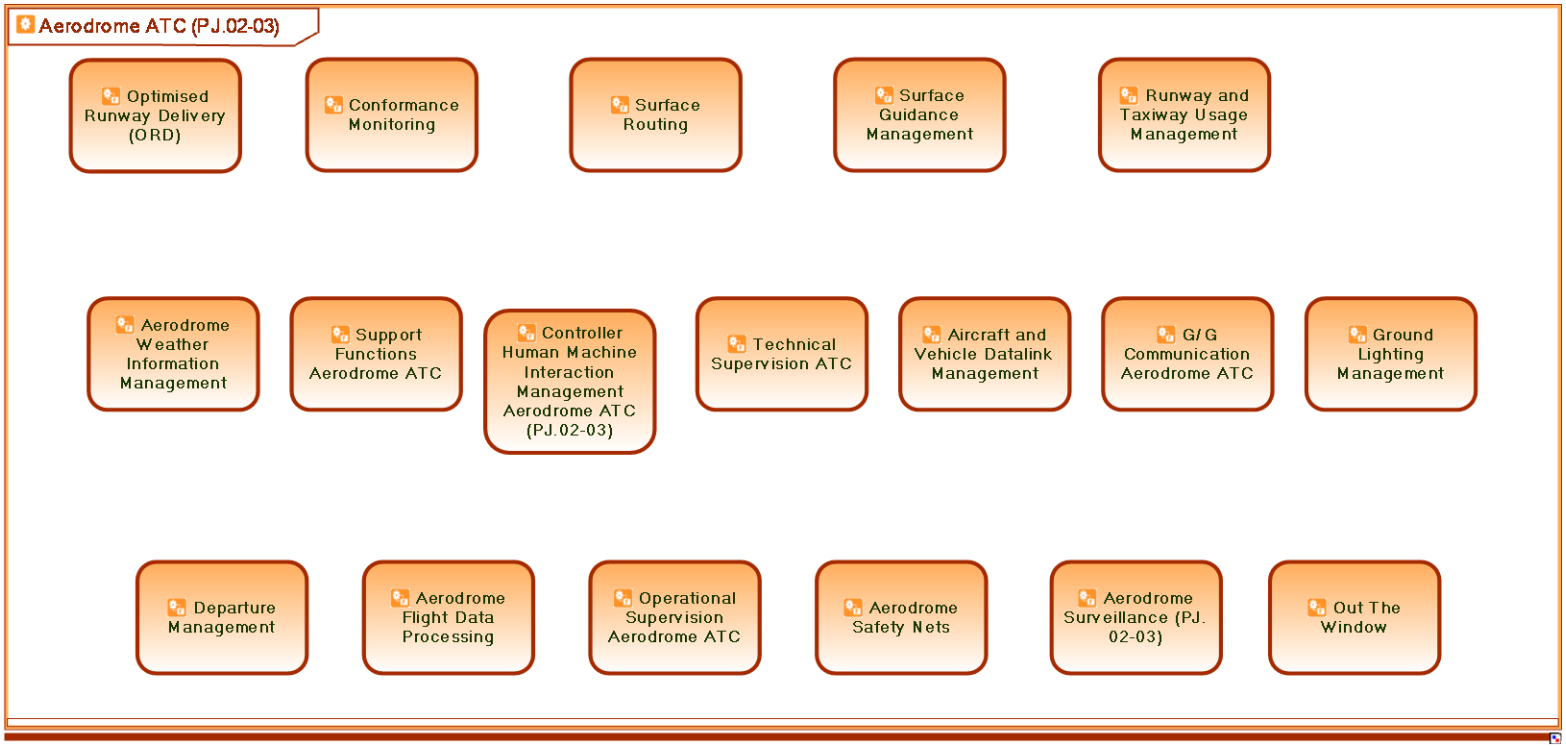
4.1.5 Modified Systems View

4.1.5.1 Aerodrome ATC (PJ.02-03)

Supports the ATC controllers at an aerodrome and provides the following main functionalities:

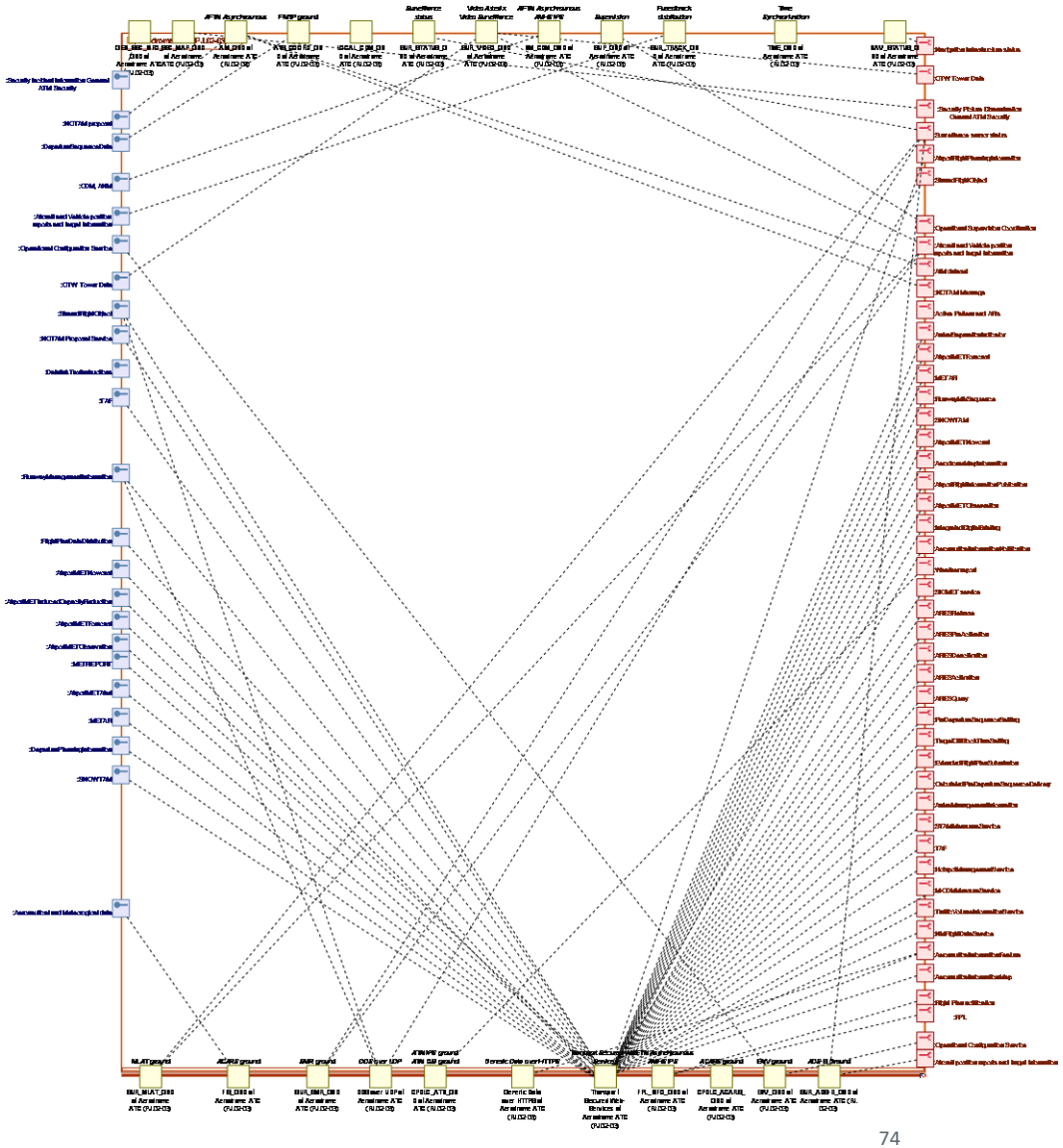
- surface routing and guidance,
- infrastructure (weather, lighting, datalink) management,
- safety nets,
- aerodrome surveillance,
- flight data processing,
- departure management.

4.1.5.1.1 Composition


Aerodrome ATC (PJ.02-03)
Optimised Runway Delivery (ORD)
Conformance Monitoring
Surface Routing
Surface Guidance Management
Runway and Taxiway Usage Management
Aerodrome Weather Information Management
Support Functions Aerodrome ATC
Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-03)
Technical Supervision ATC
Aircraft and Vehicle Datalink Management
G/G Communication Aerodrome ATC
Ground Lighting Management
Departure Management
Aerodrome Flight Data Processing
Operational Supervision Aerodrome ATC
Aerodrome Safety Nets
Aerodrome Surveillance (PJ. 02-03)
Out The Window

https://www.eatmportal.eu/working/data/diagrams/B61CB8B65CA47F97

4.1.5.1.2 System Interfaces Diagram



https://www.eatmportal.eu/working/data/diagrams/B61CB8B75CA480FB

4.1.5.2 En-Route / Approach ATC (PJ.02-03)

Gathers the ground based automated means, used in En-Route and Approach ATC Centres, to support the air traffic controllers in the provision of the following main Air Traffic Services:

· Update and distribution of flight plan data, potentially correlated with track data built from surveillance sources (mode 3/A code or 24 bit ICAO address - Aircraft Identification (Mode S or ADS-B), when available)

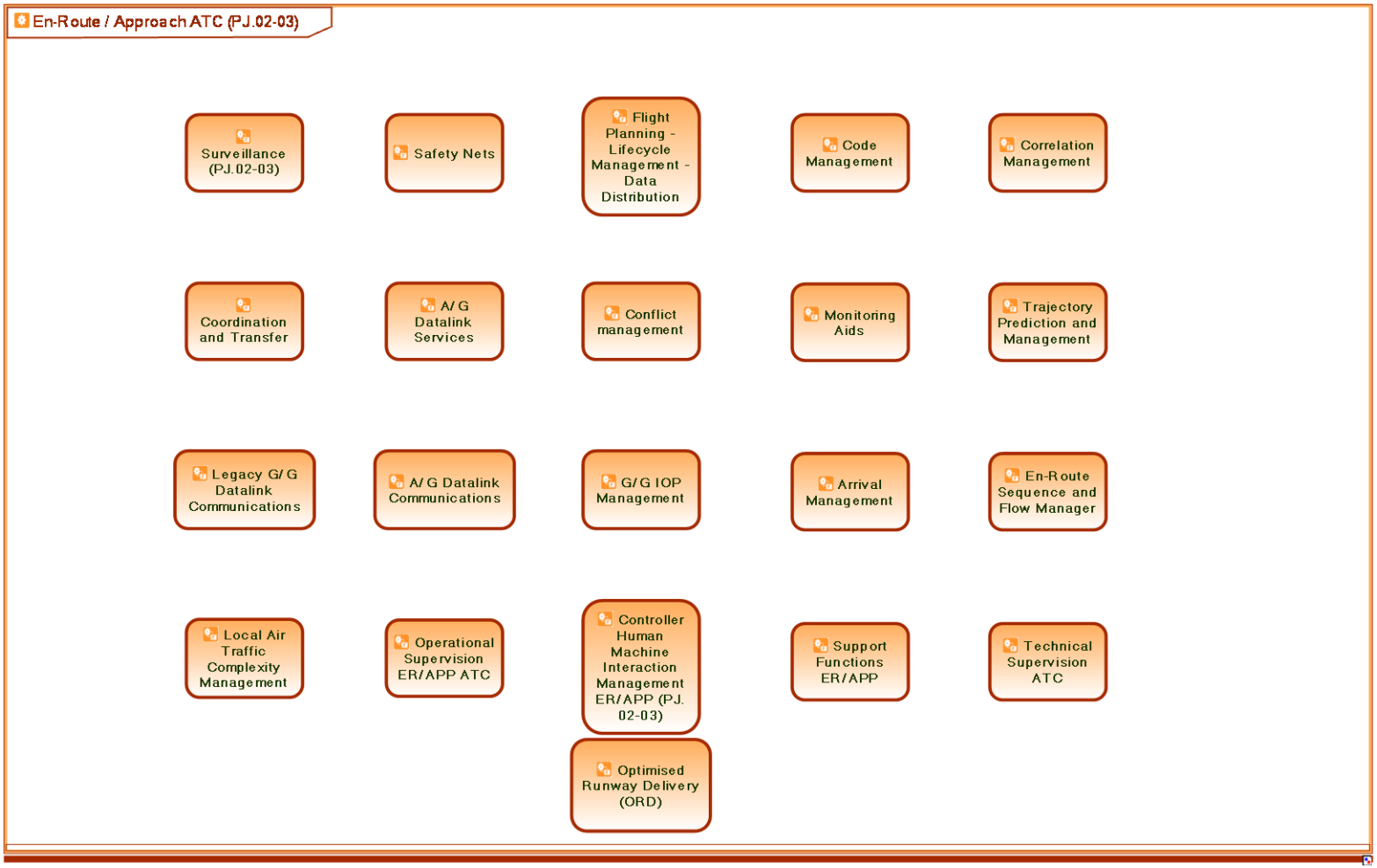
· Distribution of warnings and alerts upon detection of danger areas / separation criteria infringement, or on non-conformance between aircraft behaviour and corresponding flight plan data,

· Medium-term and tactical conflicts detection, conflicts resolution assistance and local traffic complexity assessment

· Sequencing of arrival aircraft on aerodromes or groups of aerodromes,

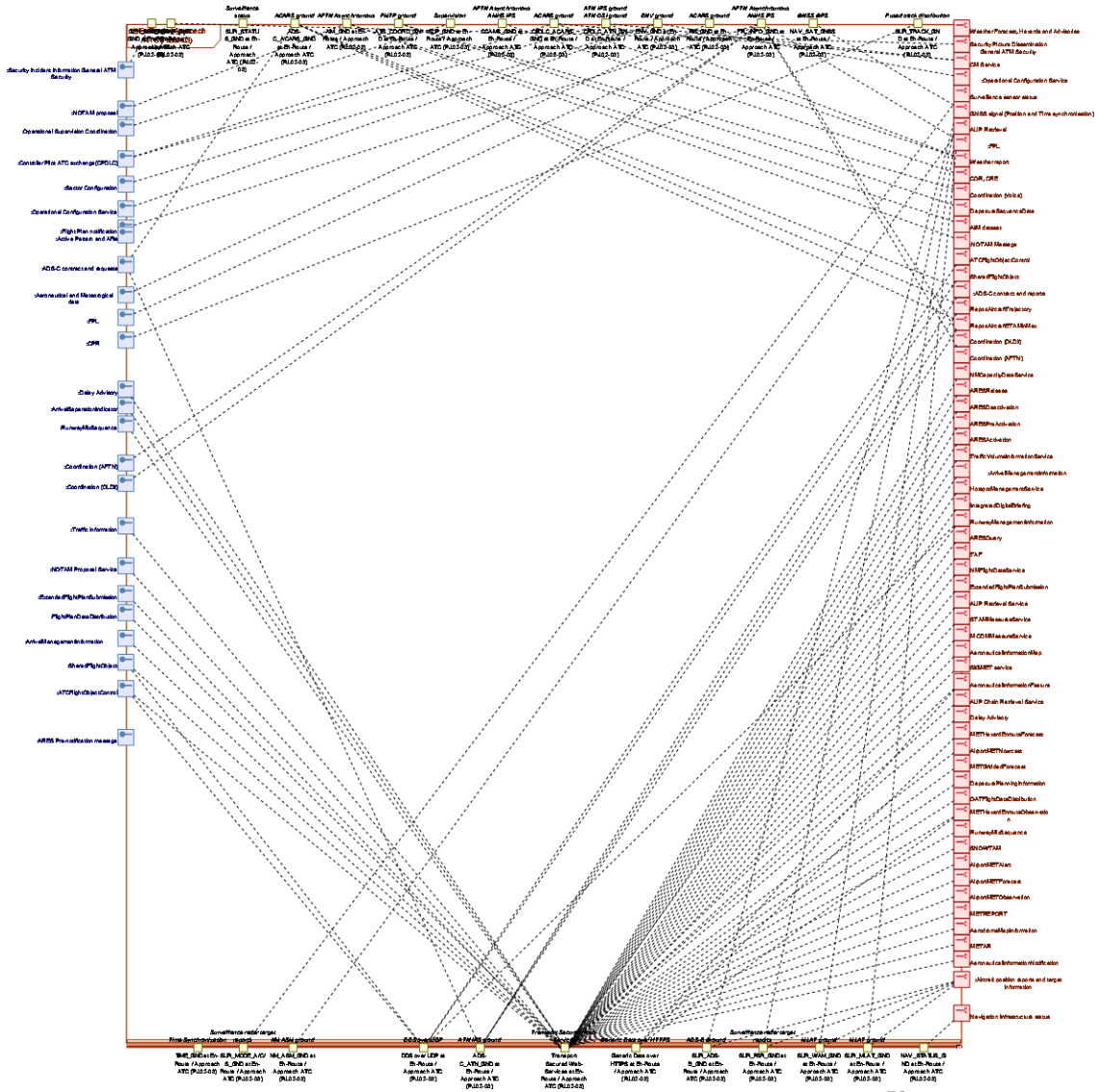
· Ground-ground and air-ground exchanges of flight and environment data

4.1.5.2.1 Composition


En-Route / Approach ATC (PJ.02-03)
Surveillance (PJ.02-03)
Safety Nets
Flight Planning - Lifecycle Management - Data Distribution
Code Management
Correlation Management
Coordination and Transfer
A/G Datalink Services
Conflict management
Monitoring Aids
Trajectory Prediction and Management
Legacy G/G Datalink Communications
A/G Datalink Communications
G/G IOP Management
Arrival Management
En-Route Sequence and Flow Manager
Local Air Traffic Complexity Management
Operational Supervision ER/APP ATC
Controller Human Machine Interaction Management ER/APP (PJ.02-03)
Support Functions ER/APP
Technical Supervision ATC
Optimised Runway Delivery (ORD)

https://www.eatmportal.eu/working/data/diagrams/B61CB7425CA41594

4.1.5.2.2 System Interfaces Diagram



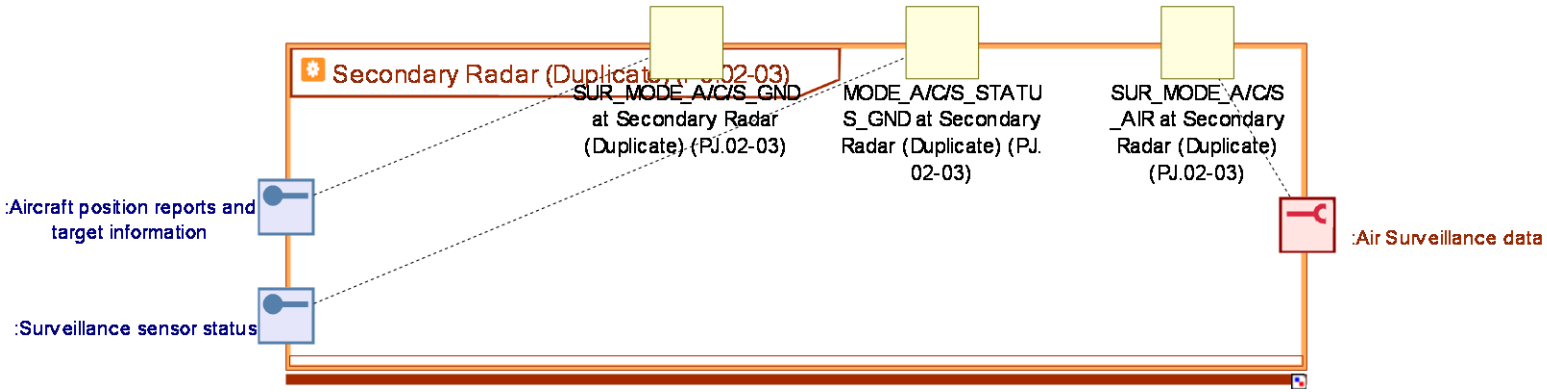
https://www.eatmportal.eu/working/data/diagrams/B61CB7485CA4173D

4.1.5.3 Secondary Radar (Duplicate) (PJ.02-03)

SSR is used for En-Route and Approach surveillance. It provides the position (range and bearing) of the Aircraft as well as its identity (Mode A code) and altitude (Mode C code). The SSR transmits signals on 1030 MHz and receives signals from the transponder on 1090 MHz.
Mode S SSR (Select) has been replacing the classic Mode A/C interrogation/reply scheme by identifying each Aircraft using a unique 24-bit address. This mode allows downloading additional airborne data from the Aircraft for elementary and enhanced surveillance.

4.1.5.3.1 Composition

4.1.5.3.2 System Interfaces Diagram


Secondary Radar (Duplicate) (PJ.02-03)
SUR_MODE_A/C/S_GND at Secondary Radar (Duplicate) (PJ.02-03)
MODE_A/C/S_STATUS_GND at Secondary Radar (Duplicate) (PJ.02-03)
SUR_MODE_A/C/S_AIR at Secondary Radar (Duplicate) (PJ.02-03)
:Aircraft position reports and target information
:Surveillance sensor status
:Air Surveillance data

4.2 Functional and non-Functional Requirements

All requirements below refine a higher-level requirement exposed in the SPR-INTEROP/OSED document (see [37]).

According to [37], the approach procedures that the in-trail 2 NM MRS is required to be applied include the ILS / MLS precision approach procedures, the GBAS approach procedures and the RNAV/GNSS non-precision approach procedures. (in the table PU = Probability of Update)

4.2.1 Required Surveillance Performance requirements

	Metric Description	3 NM Target	2 NM Target
R1	Measurement interval for PU assessments	≤ 5 seconds	≤ 4 seconds
R2	PU of horizontal position	97% for 100% of flights, any below 97% to be investigated	97% for 100% of flights, any below 97% to be investigated
R3	Ratio of missed 3D position in long gaps	≤0.5%	≤0.25%
R4	Horizontal position RMS error	300m global	200m global
	Number of Investigations	330m for 100% flights any above 330m to be investigated	220m for 100% flight, any above 220m to be investigated
R7	PU of correct pressure altitude	96% global	96% global
R8	Forwarded pressure average data age	≤ 2.5 seconds	≤ 2.5 seconds
R10	Ratio of incorrect forwarded pressure altitude	≤ 0.1%	≤ 0.1%
R11	Pressure altitude unsigned error	98.5 percentile less than 300 ft. (climbing/descending)	98.5 percentile less than 300 ft. (climbing/descending)
		99.9 percentile less than 300 feet (stable)	99.9 percentile less than 300 feet (stable)
R12	Emergency Code Changes delayed > 7.5 seconds	0	0
	SPI indicator delayed >7.5 seconds	0	0
R13	Number of aircraft identity changes delayed > 15 seconds	0	0
	Number of Mode S callsign changes delayed > 15 seconds	0	0
R14	PU of correct ac identity	>= 98% global	>= 98% global
R15	Ratio of incorrect ac identity	≤ 0.1%	≤ 0.1%

Table 3: Required Surveillance Performance for 2NM and 3NM

[REQ]

Identifier	REQ-02.03-TS-ARR4.0020
Title	Longitudinal position update interval
Requirement	The longitudinal position update interval shall be less than or equal to 4 seconds.
Status	<validated>
Rationale	This requirement is an update to REQ-06.08.01-SPR-OFA1.0960 requirement from SESAR1, part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R1 and 3N_C-R1. This requirement has been validated as SR3.002 in the Part II SAR.
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0020
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

[REQ]

Identifier	REQ-02.03-TS-ARR4.0030
Title	Pressure altitude update interval
Requirement	The pressure altitude update interval shall be less than or equal to 4 seconds.
Status	<validated>

Rationale	This requirement is an update to the requirement REQ-06.08.01-SPR-OFA1.0970, part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R2 and 3N_C-R2. This requirement has been validated as SR3.003 in the Part II SAR.
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0030
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

[REQ]

Identifier	REQ-02.03-TS-ARR4.0040
Title	Aircraft identity update interval
Requirement	The aircraft identity update interval shall be less than or equal to 4 seconds.
Status	<validated>
Rationale	This requirement is an update of the SESAR1 requirement REQ-06.08.01-SPR-OFA1.0980, part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R3 and 3N_C-R3. This requirement has been validated as SR3.004 in the Part II SAR.
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier

<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0040
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

[REQ]

Identifier	REQ-02.03-TS-ARR4.0050
Title	Longitudinal position update probability
Requirement	The probability of the longitudinal position update shall be greater than or equal to 97%.
Status	<validated>
Rationale	This requirement is an update of the requirement REQ-06.08.01-SPR-OFA1.0990, part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R4 and 3N_C-R4. This requirement has been validated as SR3.005 in the Part II SAR.
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0050
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

[REQ]

Identifier	REQ-02.03-TS-ARR4.0060
Title	Ratio of Missed 3D positions

Requirement	The ratio of missed 3D positions involved in long gaps shall be less than or equal to 0.25%.
Status	<validated>
Rationale	This requirement is an update on name and value of the requirement REQ-06.08.01-SPR-OFA1.1000, part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R5 and 3N_C-R5. This requirement has been validated as SR3.006 in the Part II SAR.
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0060
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

[REQ]

Identifier	REQ-02.03-TS-ARR4.0070
Title	Longitudinal position RMS error
Requirement	The longitudinal positional RMS error shall be less than or equal to 200 metres per flight.
Status	<validated>
Rationale	This requirement is part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R6 and 3N_C-R6. This requirement has been validated as SR3.007 in the Part II SAR.
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0070
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

[REQ]

Identifier	REQ-02.03-TS-ARR4.0080
Title	Ratio of incorrect longitudinal position update interval
Requirement	The ratio of longitudinal position update interval involved in a series of at least 3 consecutive errors larger than 0.5 Nm shall be less than or equal to 0.003%.
Status	<validated>
Rationale	This requirement is an update of the requirement REQ-06.08.01-SPR-OFA1.1020, it is part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R7 and 3N_C-R7. This requirement has been validated as SR3.008 in the Part II SAR.
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0080
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

[REQ]

Identifier	REQ-02.03-TS-ARR4.0090

Title	Average data age of the forwarded pressure altitude
Requirement	The average data age of the forwarded pressure altitude shall be less than or equal to 2.5 seconds.
Status	<validated>
Rationale	This requirement is an update of the requirement REQ-06.08.01-SPR-OFA1.1030, it is part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R8 and 3N_C-R8. This requirement has been validated as SR3.009 in the Part II SAR.
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0090
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

[REQ]

Identifier	REQ-02.03-TS-ARR4.0100
Title	Ratio of incorrect pressure altitude
Requirement	The ratio of incorrect forwarded pressure altitude shall be less than or equal to 0.01%.
Status	<validated>

Rationale	This requirement is part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R10 and 3N_C-R10. This requirement has been validated as SR3.010 in the Part II SAR.
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0100
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

[REQ]

Identifier	REQ-02.03-TS-ARR4.0110
Title	Unsigned pressure altitude error
Requirement	The unsigned pressure altitude error shall be less than or equal to 300ft in 98.5% of the cases.
Status	<validated>
Rationale	This requirement is an update of the requirement REQ-06.08.01-SPR-OFA1.1060, it is part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R11 and 3N_C-R11. This requirement has been validated as SR3.011 in the Part II SAR.
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03

<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0110
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

[REQ]

Identifier	REQ-02.03-TS-ARR4.0120
Title	Emergency indicator change delay
Requirement	The delay in the change in emergency indicator/SPI report shall be less than or equal to 7.5 seconds.
Status	<validated>
Rationale	This requirement is an update to requirement REQ-06.08.01-SPR-OFA1.1070 from SESAR1 with 5.25 seconds updated to 7.5 seconds. This requirement is part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R12 and 3N_C-R12. This requirement has been validated as SR3.012 in the Part II SAR.
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0120
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

[REQ]

Identifier	REQ-02.03-TS-ARR4.0130
Title	Aircraft identity change delay
Requirement	The delay in the change in aircraft identity shall be less than or equal to 15 seconds.
Status	<validated>

Rationale	This requirement is an update to requirement REQ-06.08.01-SPR-OFA1.1080 from SESAR1 with 10.5 seconds updated to 15 seconds. This requirement is part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R13 and 3N_C-R13. This requirement has been validated as SR3.013 in the Part II SAR.
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0130
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

[REQ]

Identifier	REQ-02.03-TS-ARR4.0140
Title	Aircraft identity Probability
Requirement	The probability that the update of the aircraft identity with valid and correct values shall be greater than or equal to 98%.
Status	<validated>
Rationale	This is unchanging requirement REQ-06.08.01-SPR-OFA1.1090 from SESAR1. This requirement is part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R14 and 3N_C-R14. This requirement has been validated as SR3.014 in the Part II SAR.
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0140

<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

[REQ]

Identifier	REQ-02.03-TS-ARR4.0150
Title	Incorrect aircraft identity ratio
Requirement	The ratio of incorrect aircraft identity shall be less than or equal to 0.1%.
Status	<validated>
Rationale	This is unchanged requirement REQ-06.08.01-SPR-OFA1.1100 from SESAR1. This requirement is part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R15 and 3N_C-R15. This requirement has been validated as SR3.015 in the Part II SAR.
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0150
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

[REQ]

Identifier	REQ-02.03-TS-ARR4.0160
Title	Rate of descent RMS error
Requirement	The rate of descent RMS error should be less than or equal to 500 ft/min.
Status	<validated>

Rationale	This is unchanged requirement REQ-06.08.01-SPR-OFA1.1110 from SESAR1. This requirement is part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R16 and 3N_C-R16. This requirement has been validated as SR3.016 in the Part II SAR.
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0160
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

[REQ]

Identifier	REQ-02.03-TS-ARR4.0170
Title	Track velocity RMS error
Requirement	The track velocity RMS error shall be less than or equal to 4 m/s.
Status	<validated>
Rationale	This is unchanged requirement REQ-06.08.01-SPR-OFA1.1120 from SESAR1. This requirement is part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R17 and 3N_C-R17. This requirement has been validated as SR3.017 in the Part II SAR.
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0170
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

[REQ]

Identifier	REQ-02.03-TS-ARR4.0180
Title	Track velocity angle RMS error
Requirement	The track velocity angle RMS error shall be less than or equal to 10 degrees.
Status	<validated>
Rationale	This is unchanged requirement REQ-06.08.01-SPR-OFA1.1130 from SESAR1. This requirement is part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R18 and 3N_C-R18. This requirement has been validated as SR3.018 in the Part II SAR.
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0180
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

[REQ]

Identifier	REQ-02.03-TS-ARR4.0190
Title	False target report density
Requirement	The density of uncorrelated false target reports shall be less or equal to 1 false target report per 855 updates.
Status	<validated>

Rationale	This is unchanged requirement REQ-06.08.01-SPR-OFA1.1140 from SESAR1. This requirement is part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R19 and 3N_C-R19. This requirement has been validated as SR3.019 in the Part II SAR.
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0190
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

[REQ]

Identifier	REQ-02.03-TS-ARR4.0200
Title	Critical failure probability
Requirement	The probability of a critical failure shall be less than or equal to 2.5x10^-5 per hour of operation.
Status	<validated>
Rationale	This is unchanged requirement REQ-06.08.01-SPR-OFA1.1150 from SESAR1. This requirement is part of the Required Surveillance Performance criteria and is derived from the EUROCONTROL Specification for ATM Surveillance System Performance requirements 5N_C-R21 and 3N_C-R21. This requirement has been validated as SR3.020 in the Part II SAR.
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0200
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

4.2.2 ORD Tool Requirements

[REQ]

Identifier	REQ-02.03-TS-ARR4.0300
Title	Glideslope wind conditions input
Requirement	The forecast (or nowcast) glide-slope wind conditions for the applicable section of the final approach path shall be provided to the Separation Delivery tool.
Status	<validated>
Rationale	The glideslope wind conditions is required to convert time based separation (either when using the TBS or WDS concept) into equivalent distance based separation. This is to calculate the anticipated distance spacing compression. This will need to be of appropriate performance for supporting the employment of the in-trail 2NM MRS.
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0354
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0351
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0352
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0353

[REQ]

Identifier	REQ-02.03-TS-ARR4.0400
Title	Runway surface wind conditions data inputs
Requirement	The actual runway surface wind conditions may be provided to the Separation Delivery tool.

Status	<validated>
Rationale	The actual runway surface wind conditions may be required as input into the ITD calculation. Also if applying a conditional version of a concept (TBS or WDS) then the actual runway surface wind needs to be monitored to ensure the Separation Delivery tool is being used in the correct mode of operation. This is to calculate the anticipated distance spacing compression. This will need to be of appropriate performance for supporting the employment of the in-trail 2NM MRS.
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0354
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0351

[REQ]

Identifier	REQ-02.03-TS-ARR4.0500
Title	MRS constraint
Requirement	The FTD shall not be less than the applicable MRS.
Status	<validated>

Rationale	The Separation Delivery tool must respect the MRS constraint Now including support for the in-trail 2NM MRS when the surveillance service selected by the final approach controller has been approved as having the required surveillance performance for employing the in-trail 2NM MRS. May need to support the final approach controller selecting an alternative surveillance service without the required surveillance performance and thus approval to support the in-trail 2NM MRS. This may be due to the approved surveillance service having periods of planned maintenance or unplanned loss of service. Note that the FTD may be less than the MRS when RSVA is being applied once the lead aircraft is inside of the RSVA procedure threshold (e.g. DF at Heathrow and 2NM from the runway landing threshold at Vienna).
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0351
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0354

[REQ]

Identifier	REQ-02.03-TS-ARR4.0600
Title	Minimum runway spacing rule inputs
Requirement	Minimum runway spacing shall be provided to the Separation Delivery tool.
Status	<validated>

Rationale	The minimum runway spacing rules (both in-trail and if applicable not-in-trail) are needed in the TDI calculation to find the largest constraint. For the in-trail 2NM MRS, includes the in-trail spacing minimum with support for 2NM to 2.5NM in 0.1NM steps.
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0354
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0351

[REQ]

Identifier	REQ-02.03-TS-ARR4.0700
Title	FTD constraint
Requirement	The maximum of all applicable separation or spacing distances shall be selected by the Separation Delivery tool as the FTD.
Status	<validated>
Rationale	There are several constraints that need to be considered such as MRS, wake separations and ROT. Including the in-trail 2NM MRS when RSVA is not being employed.
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03

<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0351
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0354

[REQ]

Identifier	REQ-02.03-TS-ARR4.0800
Title	Approach type inputs
Requirement	The approach type of each aircraft may be provided to the Separation Delivery tool.
Status	<validated>
Rationale	The approach type could impact the separation to be applied hence could be considered when calculating the Final Target Distance. This may be important to the context of applying the in-trail 2NM MRS as some approach types such as non-precision approaches may have larger constraints with respect to the MRS that is required to be observed when intercepting the final approach path outside of the intermediate fix.
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0351
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0354

[REQ]

Identifier	REQ-02.03-TS-ARR4.0900
Title	ITD calculation

Requirement	The ITD shall be computed by the Separation Delivery tool by considering the glide-slope wind conditions, surface wind conditions (if applicable) and an expected speed / time-to-fly profile(s) for the leader and follower aircraft.
Status	<validated>
Rationale	The ITD needs to be calculated depending on the difference in groundspeed of the leader and follower aircraft from the time the leader passes the DF until the leader reaches the delivery point. This is taking onto account the calculated anticipated distance spacing compression. This will need to be of appropriate performance for supporting the employment of the in-trail 2NM MRS.
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0351
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0354
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0352
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0353

[REQ]

Identifier	REQ-02.03-TS-ARR4.0910
Title	ITD not less than FTD
Requirement	The ITD shall not be less than the FTD.
Status	<validated>
Rationale	The ITD cannot be less than the FTD otherwise the Controllers may inadvertently under separate an aircraft.
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0354

[REQ]

Identifier	REQ-02.03-TS-ARR4.0920
Title	Insufficient information to calculate a TDI
Requirement	If there is insufficient information to calculate a TDI then that TDI shall not be provided together with a visual warning.
Status	<validated>
Rationale	If the Separation Delivery tool is unable to provide a TDI then the Controller needs a clear indication so they know to use the procedure for no TDI available which is to apply a DBS separation ahead and behind the affected aircraft. In the context of the in-trail 2NM MRS, it is important that for spacing minimum pairs that sufficient spacing is set up for the ROT Spacing for the clearance to land procedure.
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0351
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0354

[REQ]

Identifier	REQ-02.03-TS-ARR4.0930

Title	TDI display criteria
Requirement	Criteria to determine when to display indicators for each CWP shall be specified depending upon the local operation's needs.
Status	<validated>
Rationale	The time to display TDIs depends upon each local implementation. TDIs can be displayed late (such as on base leg) if another form of tool support is provided to support the initial turn from downwind. Example criteria for indicator display can include altitude, perpendicular distance from the extended runway centreline, distance to the runway threshold parallel to the runway centreline and heading. For 2NM MRS this includes consideration for supporting the transition from the 3NM MRS in the radar manoeuvring area on downwind and base to the 2.5NM MRS and then the 2NM MRS.
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0354

[REQ]

Identifier	REQ-02.03-TS-ARR4.0940
Title	TDI update rate
Requirement	The indicator display should update at the same time with no discernible difference as the radar update of the associated aircraft.
Status	<validated>

Rationale	This is to ensure the distance between the aircraft and the TDI always represents the intended separation or spacing. For the in-trail 2NM MRS this will need to be at the update rate of the approved surveillance service being used by the final approach controller.
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0350

[REQ]

Identifier	REQ-02.03-TS-ARR4.0950
Title	TDI step resolution
Requirement	The Separation Delivery tool shall display indicators to at least a distance step resolution of 0.1NM
Status	<validated>
Rationale	This is the smallest step distance that the Controllers can visualise and use. Anticipated to be sufficient for the application of the in-trail 2NM MRS.
Category	<Functional> , <Safety>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0010

<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0354
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0351

[REQ]

Identifier	REQ-02.03-TS-ARR4.0960
Title	ITD catch-up alert
Requirement	The Separation Delivery tool may provide automatic monitoring and alerting of catch up of the indicator.
Status	<validated>
Rationale	This is to reduce the risk of an aircraft crossing the ITD which also reduces the risk of an infringement scenario occurring further along the final approach. May be important to the application of the in-trail 2NM MRS.
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0351
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0354

[REQ]

Identifier	REQ-02.03-TS-ARR4.0970
Title	Speed conformance alert
Requirement	The Separation Delivery tool shall provide automatic monitoring and alerting on non-conformant final approach airspeed behaviour as expected by the speed profile / time-to-fly model.
Status	<validated>

Rationale	The FTD and ITD calculation assumes a certain speed / time-to-fly profile. If the actual speed / time-to-fly profile deviate from this expected speed / time-to-fly profile, then the Controllers need to be alerted as there is an increased risk of an infringement. May be important to the application of the in-trail 2NM MRS.
Category	<Safety> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0351
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0354

[REQ]

Identifier	REQ-02.03-TS-ARR4.0980
Title	Alert on infringement of separation minimum
Requirement	Via the Air Surveillance Display HMI, the separation delivery tool shall feature an automatic alert function to warn the Approach Controller in case of aircraft infringement of the indicator for separation minimum
Status	<validated>
Rationale	For the Approach and Tower Controllers to be able to detect situations where an aircraft is infringing the separation with the preceding traffic with a risk of loss of separation minima.
Category	<Functional> , <HMI>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03

<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0351
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0354

[REQ]

Identifier	REQ-02.03-TS-ARR4.0990
Title	Alert on catch-up of separation minimum
Requirement	Via the Air Surveillance Display HMI, the separation delivery tool with TDI for optimum spacing shall feature an automatic alert function to warn the Approach Controller in case of aircraft significant catch-up of the indicator for optimum spacing
Status	<validated>
Rationale	For the Approach and Tower Controllers to be able to detect situations where an aircraft is significantly catching-up the preceding traffic, hence increasing the risk to encounter wake vortex from the preceding aircraft.
Category	<HMI> , <Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	02-03
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0351
<SATISFIES>	< ATMS Requirement>	REQ-02.03-SPRINTEROP-ARR4.0354

5 Implementation Options

PJ02-03 solution considers two option of implementation than can be implemented in incremental way, the reduction of the MRS can be applied without tool in a first step and can be enhanced in a second step. ANSP can also decide also to implement the reduction only when a tool is available for the controller, the validation recommendation conducted during the solution proved that it is preferable to implement the reduction with the implementation of an ORD tool.

6 Assumptions

N/A

7 References and Applicable Documents

7.1 Applicable Documents

This TS complies with the requirements set out in the following 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

The following documents were used to provide input / guidance / further information / other:

[37] SESAR Solution 02-03 SPR-INTEROP/OSED for V3 – Part I, Edition 00.01.12, November 2019

[38]P06.08.01 Operational Service Environment Definition for Time Based Static Pairwise Separation with Optimised Runway Delivery for Arrivals, M156, 00.00.04, 06/06/2016

[39]P06.08.01 TB S-PWS with ORD for Arrivals – Safety Assessment Report, M163, 00.02.00, 05/07/2016

[40]EUROCONTROL Specification for ATM Surveillance System Performance. s.I.: EUROCONTROL, 2012. EUROCONTROL-SPEC-0417

[41]Mosquera-Benitez, Daniel and Groskreutz, Alan Ross and Fucke, Lars. Separation Minima Model. S.I.: Eighth USA/Europe Air Traffic Management Research and Development Seminar (ATM2009)

[42]Groskreutz, Alan R and Dominguez, Pablo Munoz. Required Surveillance Performance for reduced minimal-pair arrival separations. S.I.: Eleventh USA/Europe Air Traffic Management Research and Development Seminar (ATM2015)

[43]SESAR Solution 02-03 SPR-INTEROP/OSED for V3 – Part II SAR, Edition 00.00.04, November 2019

[44]SESAR Solution 02-03 SPR-INTEROP/OSED for V3 – Part IV HPAR, Edition 00.00.03, September 2019

[45]SESAR Solution 02-03 VALR, Edition 00.00.03, June 2019

Appendix A Service Description Document (SDD)

N/A

Appendix B Service Technical Design Document (STDD)

SESAR Technical
Service Contract Tem

-END OF DOCUMENT-