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00.00.02	20/10/2022	Draft	Skysoft	Review and added content for Use Cases and Requirements.
00.00.03	26/10/2022	Draft	Hungarocontrol	Added content for the safety aspects
00.00.04	21/11/2022	Draft	LDO	EATMA Model and sections 5 added
00.01.00	02/12/2022	Final	LDO	Final version for submission
00.02.00	14/02/2023	Final	SkySoft	Take into account SJU's comments

Copyright Statement

PJ.10-W2 PROSA

SEPARATION MANAGEMENT AND CONTROLLER TOOLS

Abstract

The PJ.10-W2-Sol.96 AG deals with new methods of controller interaction with Human Machine Interface (HMI), implementing a fade-out algorithm in a very high complexity environment to bring a positive effect on the controller productivity with no negative impact on human performance, safety and capacity.

This document aims to present the technical specification (TS) of the Attention Guidance function at technology readiness level (TRL) 6 and provides a consolidated set of technical requirements focused on the fade-out algorithm and controller interaction with the Human Machine Interface (HMI).

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1 Executive summary

This document presents the TRL6 Technical Specification (TS) of PJ.10-W2 Sol.96 Attention Guidance activity. The Functional Block "Attention Guidance" for En-route (ER) of the European Air Traffic Management (ATM) Architecture (EATMA) is created with new AG-related functions: Attention Guidance Logic and Attention Guidance Measures. These functions will also deal with the

- identification of AG impacts on the overall architecture, and

- development of functional and non-functional requirements.

Impacts and imposed changes on the architecture will be detailed as well as technical specifications, implementation options, and assumptions. The content of this deliverable was developed in the frame of TRL6 activities. The findings during validation exercises have been incorporated in retrospective.

2 Introduction

2.1 Purpose of the document

This document provides the requirements specification, covering functional, non-functional and interface requirements related to SESAR Solution 96 AG at a TRL6 level.

This Technical Specifications address the "what" and not the "how", therefore it doesn't aim at specifying the physical design of the functional block (which remains for the industry), but the functional description and the necessary logical interfaces with other functional blocks.

This document is one of the PMP deliverables for the TRL6 phase.

This document also defines the target architecture by defining a set of domain level "systems" that will be further broken down into functional blocks based on performance requirements. The target architecture will be maintained in EATMA while the further breakdown will be done in the TS/IRS for each of the ATM functional block.

This document is used to capture and consolidate the set of Technical Requirements for SESAR Solution 96 AG. Those are needed to implement attention guidance in ATC systems.

The requirements will be used in order to develop the System Prototype for technical validation exercises to be conducted by Skyguide/Skysoft and will take into account the validation results.

This is the final version of this document, for SJU review.

2.2 Scope

The Technical Specification Requirements describe the functions that the system must fulfil to satisfy the Operational, Safety, Performance and Interoperability requirements raised in Sesar 2020 W1 (see D3_1_030-SESAR 2020 PJ_16-04 TRL2 FRD-AG_v01_00_00) System requirements lie in the solution domain and are captured in the TS document.

This is the final TS/IRS for SESAR Solution 96 AG, for TRL6 maturity level updated after the technical validation results of the exercise and constitutes the technical reference for the TRL-6 Data Pack.

The Technical Specification Requirements describe functional and capabilities specifications, covering performance, physical characteristics, environmental and facility conditions under which the functional blocks enabling a SESAR Solution have to perform, requirements to interfaces and data definitions, security specifications as well as design constraints.

Additionally, it is important to highlight that the requirements of this Technical Specifications are restricted to improvements on the ER ATC Domain System mainly in the Attention Guidance functional block.

2.3 Intended readership

This Technical Specification is of particular interest for all enabled SESAR ATM Solution focusing on defining improved operational processes based on Human machine interface. Therefore this document is mainly intended for:

- **SESAR JOINT UNDERTAKING (SJU)** as SESAR 2020 Programme coordinator.
- **SESAR 2020 PJ.10-W2** consortium members in order to be aware of activities and methods being used to allow for coherency, consistency and comparability of the validation results through all SESAR 2020 solutions.
- **SESAR 2020 Solution PJ.10-W2-96** consortium members in order to have a common and shared view on all technologies related to the CWP HMI.
- **SESAR 2020 Solution PJ.05-W2-97** consortium members in order to have a common and shared view on all technologies related to the CWP HMI.
- **SESAR 2020 PJ.19 Content Integration** that aims at assuring coherency, consistency, and comparability of the validation results throughout all SESAR2020 Solutions.
- **SESAR 2020 PJ.22** that maintains the SESAR2020 V&V platforms and Demonstration platforms catalogue.
- Any **SESAR 2020 solution**, which wants to use aspects of any development in SOL 96 AG
- **Academic Researchers** in the fields of the AG activities.
- Representatives of civil stakeholders: **ANSPs**.

2.4 Background

PJ.10-W2-Sol.96 AG starts taking into account the work performed by S2020 SOL16-03 Wave 1 project. PJ.10-W2-Sol.96 AG's starting maturity level is TRL4 and it targets to reach TRL6 maturity at the end of Wave 2 activities.

During PJ16.03 Attention Guidance (AG) activity fulfilled in achieving a better understanding of the phenomenon "attention" and interdependencies with other cognitive processes which helps to better understand the mechanisms of attention guidance and consequently, to avoid pitfalls along the design of attention guidance assistance systems. It constitutes the basis for the envisioned attention guidance and adaptive automation concepts.

Moreover in PJ16.04-03 Wave 1 project, the use of eye tracking coupled with the information of the current air traffic situation on sectorless ATM contributed to assess the demand of an attention-shift; visual stimuli of various escalation levels were displayed on the radar screen to direct the controller's attention to important information. Depending on the escalation levels, the information was not displayed on the same way. At escalation level 0 (low importance), the information was displayed in the aircraft label. In higher escalation level (medium, high and very high importance), additional attention guidance was shown intensifying the visual cue (e.g.: displaying elements with higher degree of salience by colouring, flashing or motion).

Some recommendations have been proposed with respect to:

- ATCOs appropriate training to ensure a safe and efficient transition with the implementation of the AG.

- fine tuning activities with the collaboration of the ATCOs to finalize HMI once the concept was implemented.

On PJ.10-W2-96 AG, a sectorized ATM airspace is used. Moreover, the exercise will take place on sectors with a high traffic density. The objective is to reduce ATCO's workload by reducing the amount of information to analyse in their traffic situation scanning cycles by fading out "largely non-conflictual" flights. When an information turns to be important on fade-out flights, attention guidance is used with the help of visual cues (e.g: displaying elements with higher degree of salience by colouring, flashing). ATCO's reaction time is recorded and acceptability of the concept is assessed by the ATCO.

Moreover, to take into consideration the recommendations raised on Wave1, there fine tuning is fulfilled with ATCOs to finalize HMI and appropriate training before and during the exercise simulation is provided to ensure a safe and efficient transition with the implementation of the AG.

2.5 Structure of the document

The document is divided into seven sections:
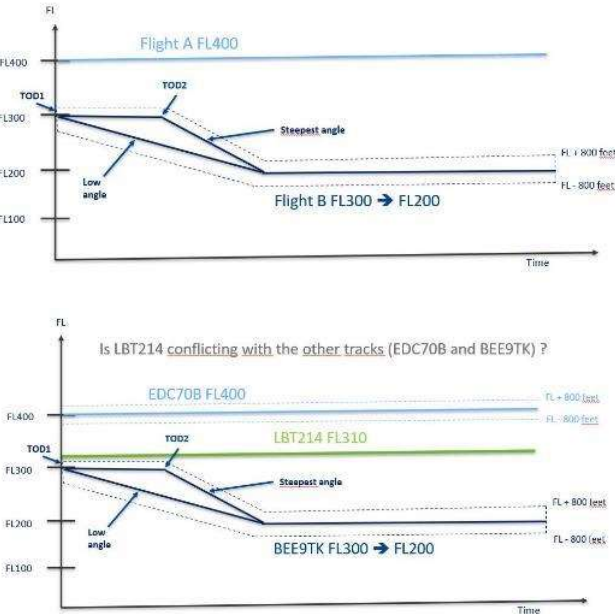
- Chapter 1: Executive Summary.
- Chapter 2: Introduction. This chapter contains a general introduction, the scope and purpose of the document. This chapter provides also the glossary of terms, acronyms and terminology used in this TS IRS document.
- Chapter 3: SESAR Solution Impacts on Architecture. This chapter describes the architecture and relationships with EATMA.
- Chapter 4: Technical Specifications. This chapter forms the majority of the document. It includes EATMA views and the functional and non-functional requirements.
- Chapter 5: Implementation Options.
- Chapter 6 Assumptions.
- Chapter 7: References and Applicable Documents. This chapter lists the resources used throughout this document.

Appendices A [Service Description Document (SDD)] from the template are not applicable as this solution does not introduce new services.

2.6 Glossary of terms

Term	Definition	Source of the definition
Abnormal conditions	Conditions that are not nominal. For instance, alerts (CLAM, EHS CLAM, etc) are considered in the solution as abnormal conditions. Emergency SSR code and emergency tracks also.	Sol. 96 AG
Area of Responsibility	An airspace of defined dimensions within which an ATC unit provides air traffic services.	ATM Lexicon

Attention Guidance	The Attention Guidance system guides the attention of air traffic controllers to focus only on flights which will possibly need to interact with them during the navigation across their airspace.	Sol. 96 AG
"Fade-out"	Algorithm which will put in background traffic that presumably will not request interaction with ATCOs.	Sol. 96 AG
"Fade-out" status	Status of a flight for which no interaction with ATCOs will be needed. The flight is impacted by the fade-out algorithm. 	Sol. 96 AG
"Intermediate Fade-out" status	Flight impacted by the fade-out algorithm. The flight is candidate to be in "fade-out" status. To keep ATCO's situation awareness, the flight is turned to "intermediate fade-out" status. Then the ATCO can manually give his/her approbation. Once given, the flight turns to "fade-out" status. 	Sol. 96 AG
"Intermediate normal display" status	Flight impacted by the fade-out algorithm. When a flight in "fade-out" status is no longer Largely non-conflictual, it turns to "Intermediate normal display" status. To keep ATCO's situation awareness, this latter	Sol. 96 AG

must manually give his/her approbation. Once given, the flight turns to "normal display" status.

Interaction	An interaction is defined as the simultaneous presence of two aircraft in the same cell viewed for each aircrafts' perspective.	2006 Complexity metrics report
Largely non-conflictual	A largely non-conflictual flight is a flight for which the minimum lateral distance is above 20 NM or the vertical profile is not intercepting with other flights.	Sol. 96 AG

	Is BEE9TK conflicting with the other tracks (EDC70B and LBT214) ? EDC70B FL400 LBT214 FL310 TOD1 TOD2 Steepest angle Low angle BEE9TK FL300 → FL200 Flight A FL400 Flight B FL390	
"Normal display" status	A flight in "normal display" status is a flight monitored and scanned by the ATCO who has the flight under its the Area of Responsibility. In other words, this is a flight not impacted by the fade-out algorithm. LBT214 360	Sol. 96 AG
Speed line	The speed line indicates the direction and x, y position of the track in x minutes.	Sol. 96 AG

Table 1: Glossary

2.7 Acronyms and Terminology

Term	Definition
ACC	Air Centre Control
ADD	Architecture Definition Document
AG	Attention Guidance

ANSP	Air Navigation Service Provider
AOR	Area of responsibility
ATC	Air Traffic Control
ATCO	Air Traffic Controller Operator
ATM	Air Traffic Management
CAP	Capacity
CEF	Cost Efficiency
CFL	Cleared Flight Level
CLAM	Cleared Level Adherence Monitoring
COF	Change of Frequency
CPDLC	Controller Pilot Datalink Communications
CWP	Controller Working Position
E-ATMS	European Air Traffic Management System
EC	Executive Controller
ECAT	Exit Conflict Alert Tool
EHS-CLAM	Enhanced Cleared Level Adherence Monitoring
EM	Emergency
E-OCVM	European Operational Concept Validation Methodology
ER	En-Route
FA	Focus Area
FO	Fade-out algorithm
HMI	Human Machine Interface
IRS	Interface Requirements Specification
KPA	Key Parameter Area
KPI	Key Parameter Indicator
OI	Operational Improvement
PC	Planner Controller

PI	Performance Indicator
NM	Nautical Miles
RAM	Route Adherence Monitoring
SA	Situation Awareness
SATI	SHAPE Automation Trust Index
SDD	Situation Data Display
SESAR	Single European Sky ATM Research Programme
S3JU	SESAR3 Joint Undertaking (Agency of the European Commission)
SPR-INTEROP/OSED	Safety and Performance Requirements – Interoperability / Operational Service and Environment Definition
SUT	System Under Test
TOD	Top of Descent
TRL	Technology Readiness Level
TS	Technical Specification
TVALP	Technological Validation Plan
TVALR	Technological Validation Report
VALS	Validation Strategy
XFL	Exit Flight Level
XPT	Exit Point

Table 2: Acronyms and terminology

3 SESAR Solution Impacts on Architecture

This section provides a brief description of the impact made by the solution on the EATMA framework.

3.1 Target Solution Architecture

3.1.1 SESAR Solution(s) Overview

This section covers Solution 96 Attention Guidance, which deals with the implementation of an algorithm to support Controllers in En-Route environment.
Controllers in Air Traffic Control (ATC) centres rely on the human machine interface (HMI) of their Controller Working Position (CWP) to manage the separation of traffic within their airspace. This is especially true for the CWP's Situation Data Display (SDD) with regard to safely controlling current air traffic. Situational awareness and attention are two important skills that controllers need to keep at a high level when controlling aircraft at a radar screen.

For safety and efficiency reasons most CWPs issue a series of notifications with increasing severity (such as information, warning, alert and finally alarm) allowing the Controller to take action in due time if a potentially dangerous traffic situation is detected to occur in the near or medium future. Because in high complexity En-Route environment Controllers are subject to a huge traffic to be controlled, this SESAR Solution aims at reducing workload by guiding the attention of the ATCOs to focus only on those flights which will possibly interact with each other during their flights across the controlled airspace.
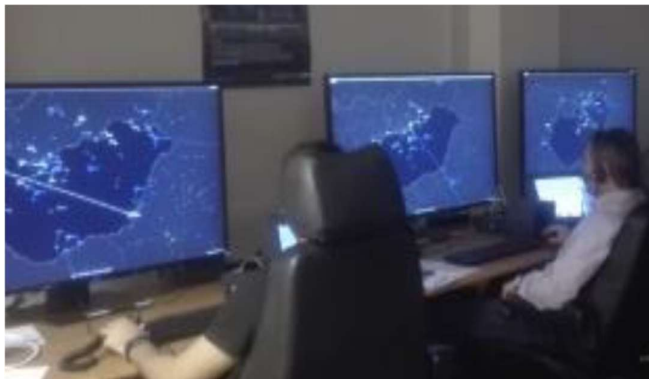
The Solution is an enabling solution in the S2020 framework and covers the SESAR Roadmap OIs and Enablers described in Table 3. The corresponding Change Request will be endorsed in (DS22).

Table 3. Operational Improvement steps and Enablers for Solution 96.

OI Step	OI description	Open CR
POI-0053-SDM	Improving controller productivity by Attention Guidance (AG) at the ER CWP/HMI	No CR opened in Wave 2, the POI-0053-SDM has been created in Wave 1.

EN code	EN description	Open CR
ER ATC 182	Introduction of new automated functions for Attention Guidance at the CHMI Management ER for improving the controller productivity.	CR 05659 has been raised in order to create ER ATC 182, as well as to update the EATMA elements (links to Functions)

The following Functional Blocks are the building blocks of the Architecture and modelling in EATMA and justify the coverage of the Enabler in the Solution through the Function included in the diagrams summarising the Use Cases.

SESAR Solution ID and Title	Functional Blocks/Role impacted by the SESAR Solution (from EATMA)	Enabler ID (from EATMA)	Enabler Title (from EATMA)	Enabler coverage
PJ10-W2-96 AG (Attention Guidance)	Attention Guidance	ER ATC 182	Controller productivity enhancements by Attention Guidance at the CWP/HMI	**Fully**

Table 4: SESAR Solution 96 AG Scope and related Functional Blocks/roles & Enablers

The addressed technical system is En-Route/Approach ATC.

One main functional block is within the scope of solution PJ.10-W2-96 AG

- Attention Guidance, performing the algorithm function.

This main functional block interfaces with the following blocks in the scope of the solution:

- Flight Planning Lifecycle Management Data Distribution

- Controller Human Machine Interaction Management ER, displaying the flights in normal and fade out status.

The main and strongest interaction among functional blocks for this solution is defined between the main impacted functional blocks Controller Human Machine interaction Management ER and Attention guidance module.

Two roles are considered to be within the scope of this solution:

- ATC Executive Controller, being the role that mainly benefits from Attention guidance fade out algorithm.

- ATC Planner Controller, being a role that benefits from Attention guidance fade out algorithm.

No changes to system ports are required at capability configuration and technical system levels.

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

No deviation.

3.1.1.2 Relevant Use Cases

In this section the Use Cases addressed by the SESAR Solution PJ.10-W2-Sol.96 AG are described.

Specifically, and included in the above Use Cases, safety and human performance are the addressed KPAs from the performance framework that are envisaged to be improved by the introduction of the attention guidance function in Solution 96 AG activity.

Solution 96 AG will support the achievements of the following top level performance objectives:

- Increased safety;

- Increase in situational awareness of the controller;

- Reduction of controller workload;

- Increased ATCO efficiency;

- Improved HMI in usability and performance of interactions.

Hereafter are the Use Cases addressed by the Sol.96 AG. The Use Cases cover the whole scope of the Solution with a focus on nominal situations, but not only:

Name	Description
UC-10-96-TRL6-TS-101	Guiding the ATCO's attention on relevant air traffic *Flights that are largely non-conflictual are put in "fade-out" status. Supporting the controller in maintaining timely the relevant flights to scan in normal display and fading-out the others leads to increase the ability to focus on relevant flights and may at the end increase efficiency and safety as well as reduce workload.*
UC-10-96-TRL6-TS-102	ATCO's input triggering the fade out algorithm

Name	Description
	Flights that are largely non-conflictual are put in "fade-out" status. If the ATCO performs an input on the flight, the fade out algorithm is processed.
UC-10-96-TRL6-TS-103	Acknowledgement of a flight in "intermediate fade-out" status A flight in "intermediate fade-out" status is acknowledged by the ATCO to keep the situation awareness
UC-10-96-TRL6-TS-104	Flight turning to "intermediate normal display" status When in "fade-out" status, the flight turns to "intermediate normal display" status if the minimum lateral distance is strictly lower than 18 NM with another flight during 3 track updates.
UC-10-96-TRL6-TS-105	Acknowledgement of a flight in "intermediate normal display" status A flight in "intermediate normal display" status is acknowledged by the ATCO to keep the situation awareness
UC-10-96-TRL6-TS-106	Refusal of a flight in "intermediate normal display" status When in "intermediate normal display" status, a manual refusal is performed by the ATCO to turn the flight in "normal display" status if the minimum lateral distance is higher than 10 NM.
UC-10-96-TRL6-TS-107	Impossibility to refuse a flight in "intermediate normal When in "intermediate normal display" status and a manual refusal is performed by the ATCO, an indication is displayed to inform of the impossibility to refuse the flight if the minimum lateral distance is below 10 NM.
UC-10-96-TRL6-TS-108	Warn ATCO in case the Top of Descent is reached In case a flight is in fade-out status, the system raises an alert when the Top of descent is reached (TOD1 or TOD2).

Name	Description
UC-10-96-TRL6-TS-109	Warn ATCO in case the flight is at a certain distance from the XPT In case a flight is in fade-out status, the system raises an alert when the track is at a certain distance from the XPT.
UC-10-96-TRL6-TS-110	Warn ATCO in case an exit conflict is raised In case a flight is in fade-out status, the system raises an alert if two flights exit the centre at the same point, the same level and more or less the same time.
UC-10-96-TRL6-TS-111	Warn ATCO in case an electronic coordination is received and does not trigger a conflict In case a flight is in fade-out status, the system raises an alert when an electronic coordination is received and does not trigger a conflict
UC-10-96-TRL6-TS-112	Warn ATCO in case an electronic coordination is received and triggers a conflict In case a flight is in fade-out status, the system raises an alert when an electronic coordination is received and triggers a conflict. The flight is displayed in "normal display" status and flashes.
UC-10-96-TRL6-TS-113	Warn ATCO in case the system raises a RAM alert In case the flight is in fade-out status, the system raises a RAM alert when the flight does not follow its route. The flight turns to "normal display" status and flashes.
UC-10-96-TRL6-TS-114	Warn ATCO in case the system raises a CLAM alert In case the flight is in fade-out status, the system raises a CLAM alert when the flight does not follow the CFL. The flight turns to "normal display" status and flashes.
UC-10-96-TRL6-TS-115	Warn ATCO in case the system raises an EHS CLAM alert In case the flight is in fade-out status, the system raises an EHS CLAM alert when the ATCO does not follow the selected altitude of the flight. The flight turns to "normal display" status and flashes.
UC-10-96-TRL6-TS-116	Warn ATCO in case the SSR code is set to 7500, 7600 or 7700

Name	Description
	In case the flight is in fade-out status, the system raises an alert when the SSR code of the flight is set to 7500, 7600 or 7700. The flight turns to "normal display" status and flashes.
UC-10-96-TRL6-TS-117	Warn ATCO in case of emergency In case the flight is in fade-out status, the system raises an alert when the flight is in emergency. The flight turns to "normal display" status and flashes.
UC-10-96-TRL6-TS-118	Warn the ATCO in case of conflict when changing a level In case of a level change on a non-fade-out flight, the system shall warn the user on levels potentially in conflict with fade-out flights.

3.1.1.2.1 UC-10-96-TRL6-TS-101/Guiding the ATCO's attention on relevant air traffic

Scope/Description

Flights that are largely non-conflictual are put in "fade-out" status. Supporting the controller in maintaining timely the relevant flights to scan in normal display and fading-out the others leads to increase the ability to focus on relevant flights and may at the end increase efficiency and safety as well as reduce workload

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

Flight is:

- correlated,
- not transferred to the next centre.
- is assumed on the first sector of the airspace

Post conditions

The flight is displayed in "intermediate fade out" status on the Controller's HMI.

Trigger

Every 4 seconds, the system checks for flight largely non-conflictual.

Nominal Flow

- Flight is assumed on the first sector of the airspace

- The minimum lateral distance with the other flights is above 20 NM

- The vertical profile of the flight is not intercepting any other flight

- The flight is in "Intermediate fade-out" status
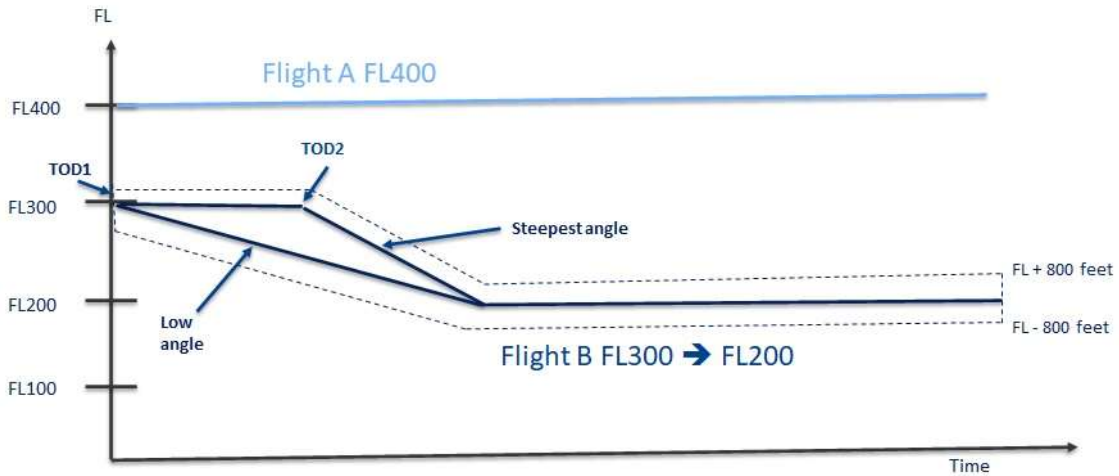
Stable flight A and descending flight B are vertically non-conflictual

Stable flights A and B are vertically non-conflictual

3.1.1.2.2 UC-10-96-TRL6-TS-102/ ATCO's input triggering the fade out algorithm
Scope/Description

Flights that are largely non-conflictual are put in "fade-out" status. If the ATCO performs an input on the flight, the fade out algorithm is processed.

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

Flight is:

- correlated,

- within the AOR

- not transferred to the next centre.

Post conditions

The flight is in "intermediate fade out" status.

Trigger

- ATCO performs a heading on the flight.

Nominal Flow

- Flight is assumed on a sector

- ATCO performs a heading on the flight

- The system processes the fade out algorithm

- The minimum lateral distance with the other flights is above 20 NM

- The vertical profile of the flight is not intercepting any other flight

- The flight is in "Intermediate fade-out" status

Alternative Flow 1

- Flight is assumed on a sector

- The ATCO performs a direct on the flight

- The system processes the fade out algorithm

- The minimum lateral distance with the other flights is above 20 NM

- The vertical profile of the flight is not intercepting any other flight

- The flight is in "Intermediate fade-out" status

Alternative Flow 2

- Flight is assumed on a sector

- The ATCO change the speed of the flight

- The system processes the fade out algorithm

- The minimum lateral distance with the other flights is above 20 NM

- The vertical profile of the flight is not intercepting any other flight

- The flight is in "Intermediate fade-out" status

Alternative Flow 3

- Flight is assumed on a sector

- The ATCO change the EFL of the flight

- The system processes the fade out algorithm

- The minimum lateral distance with the other flights is above 20 NM

- The vertical profile of the flight is not intercepting any other flight

- The flight is in "Intermediate fade-out" status

Alternative Flow 4

- Flight is assumed on a sector

- The ATCO change the CFL of the flight

- The system processes the fade out algorithm

- The minimum lateral distance with the other flights is above 20 NM

- The vertical profile of the flight is not intercepting any other flight

- The flight is in "Intermediate fade-out" status

Alternative Flow 5

- Flight is assumed on a sector

- The ATCO change the XFL of the flight

- The system processes the fade out algorithm

- The minimum lateral distance with the other flights is above 20 NM

- The vertical profile of the flight is not intercepting any other flight

- The flight is in "Intermediate fade-out" status

3.1.1.2.3 UC-10-96-TRL6-TS-103/ Acknowledgement of a flight in "intermediate fade-out" status

Scope/Description

A flight in "intermediate fade-out" status is acknowledged by the ATCO to keep the situation awareness

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

The flight is in "Intermediate fade-out" status

Post conditions

The flight is in "fade-out" status

Trigger

The ATCO perform an input on the flight.

Nominal Flow

- The flight is in "intermediate fade-out" status

- The ATCO acknowledge the flight

- The flight turns into "fade-out" status

Alternative Flow 1

- The flight is in "intermediate fade-out" status

- After 1 minute, the flight starts to flash because it has not been acknowledged by the ATCO

- The ATCO acknowledges the flight

- The flight stops flashing and turns into "fade-out" status

3.1.1.2.4 UC-10-96-TRL6-TS-104/ Flight turning to "intermediate normal display" status

Scope/Description

> When in "fade-out" status, the flight turns to "intermediate normal display" status if the minimum lateral distance is strictly lower than 18 NM with another track during 3 track updates.

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

The flight is in "fade-out" status

Post conditions

The flight is in "intermediate normal display" status

Trigger

Every 4 seconds, the system checks for flight largely non-conflictual.

Nominal Flow

- The flight is in "fade-out" status

- The system checks for flight largely non-conflictual

- The minimum lateral distance is strictly lower than 18 NM with another flight during 3 track updates

3.1.1.2.5 The flight turns into "intermediate normal display" statusUC-10-96-TRL6-TS-105/ Acknowledgement of a flight in "intermediate normal display" status

Scope/Description

A flight in "intermediate normal display" status is acknowledged by the ATCO to keep the situation awareness

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

The flight is in "Intermediate normal display" status

Post conditions

The flight is in "normal display" status

Trigger

The ATCO perform an input on the flight.

Nominal Flow

- The flight is in "intermediate normal display" status

- The ATCO acknowledges the flight

- The flight turns into "normal display" status

Alternative Flow 1

- The flight is in "intermediate normal display" status

- After 1 minute, the flight starts to flash because it has not been acknowledged by the ATCO

- The ATCO acknowledges the flight

- The flight stops flashing and turns into "normal display" status

3.1.1.2.6 UC-10-96-TRL6-TS-106/ Refusal of a flight in "intermediate normal display" status.

Scope/Description

When in "intermediate normal display" status, a manual refusal is performed by the ATCO to turn the flight in "normal display" status if the minimum distance is higher than 10 NM.

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

The flight is in "Intermediate normal display" status

Post conditions

The flight turns to "fade-out" status

Trigger

The ATCO perform an input on the flight.

Nominal Flow

- The flight is in "intermediate normal display" status

- The ATCO refuses the flight

- The minimum lateral distance is higher than 10 NM between the other flight considering uncertainty

3.1.1.2.7 UC-10-96-TRL6-TS-107/ Impossibility to refuse a flight in "intermediate normal display" status.

Scope/Description

When in "intermediate normal display" status and a manual refusal is performed by the ATCO, an indication is displayed to inform of the impossibility to refuse the flight if the minimum lateral distance is below 10 NM.

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

The flight is in "Intermediate normal display" status

Post conditions

An indication of the refusal is displayed on the flight

Trigger

The ATCO perform an input on the flight.

Nominal Flow

- The flight is in "intermediate normal display" status

- The ATCO refuses the flight

- The minimum lateral distance is lower or equal to 10 NM between the other flight considering uncertainty

- An information is displayed on the flight to indicate the impossibility to refuse

3.1.1.2.8 UC-10-96-TRL6-TS-108/ Warn ATCO in case the Top of Descent is reached.

Scope/Description

In case a flight is in fade-out status, the system raises an alert when the Top of descent is reached (TOD1 or TOD2).

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

The flight is in "fade-out" status

Post conditions

An indication is displayed on the flight in case the top of descent is reached

Trigger

The system detects that the top of descent is reached.

Nominal Flow

- The flight is in "fade-out" status

- The top of descent 1 is reached

- An information is displayed on the flight indicating the Top of Descent 1

Alternative Flow 1

- The flight is in "fade-out" status

- The top of descent 1 is reached but no ATCO input has been performed

- The top of descent 2 is reached

- An information is displayed on the flight indicating the Top of Descent 2

3.1.1.2.9 UC-10-96-TRL6-TS-109/ Warn ATCO in case the flight is at a certain distance from the XPT.

Scope/Description

In case a flight is in fade-out status, the system raises an alert when the track is at a certain distance from the XPT.

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

The flight is in "fade-out" status

Post conditions

An indication is displayed on the flight in case the flight is at a certain distance from the XPT

Trigger

The system detects that the flight in case the flight is at a certain distance from the XPT.

Nominal Flow

- The flight is in "fade-out" status

- The flight is at a certain distance from the XPT

- An information is displayed on the flight indicating that the flight needs to be transferred to the next centre

Alternative Flow 1

- The flight is in "fade-out" status

- The flight is at a certain distance from the XPT but no ATCO input has been performed

- The flight is at a warning distance from the XPT

- An information is displayed on the flight that the flight needs to be transferred to the next centre

3.1.1.2.10 UC-10-96-TRL6-TS-110/ Warn ATCO in case an exit conflict is raised

Scope/Description

In case a flight is in fade-out status, the system raises an alert if two flights exit the centre at the same point, the same level and more or less the same time.

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

The flight is in "fade-out" status

Post conditions

An indication is displayed on the flight in case an exit conflict is raised between two flights

Trigger

The system detects an exit conflict between two flights.

Nominal Flow

- The flight is in "fade-out" status

- Two flights exit the centre at the same point, the same level and more or less the same time

- An information is displayed on the flight indicating the exit conflict

3.1.1.2.11 UC-10-96-TRL6-TS-111/ Warn ATCO in case an electronic coordination is received and does not trigger a conflict

Scope/Description

In case a flight is in fade-out status, the system raises an alert when an electronic coordination is received and does not trigger a conflict

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

The flight is in "fade-out" status

Post conditions

An indication is displayed on the flight in case an electronic coordination is received

Trigger

The ATCO performs an electronic coordination.

Nominal Flow

- The flight is in "fade-out" status

- The ATCO of the upstream sector performs a heading electronic coordination

- A heading electronic coordination is received on the current sector

- No conflict is raised due to this electronic coordination

- An information is displayed on the flight indicating the electronic coordination

Alternative Flow 1

- The flight is in "fade-out" status

- The ATCO of the upstream sector performs a level electronic coordination

- A level electronic coordination is received on the current sector

- No conflict is raised due to this electronic coordination

- An information is displayed on the flight indicating the electronic coordination

Alternative Flow 2

- The flight is in "fade-out" status

- The ATCO of the upstream sector performs a speed electronic coordination

- A speed electronic coordination is received on the current sector

- No conflict is raised due to this electronic coordination

- An information is displayed on the flight indicating the electronic coordination

3.1.1.2.12 UC-10-96-TRL6-TS-112/ Warn ATCO in case an electronic coordination is received and triggers a conflict

Scope/Description

In case a flight is in fade-out status, the system raises an alert when an electronic coordination is received and triggers a conflict. The flight is displayed in "normal display" status and flashes.

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

The flight is in "fade-out" status

Post conditions

- An indication is displayed on the flight in case an electronic coordination is received

- The flight turns in "normal display" status

Trigger

The ATCO performs an electronic coordination.

Nominal Flow

- The flight is in "fade-out" status

- The ATCO of the upstream sector performs a heading electronic coordination

- A heading electronic coordination is received on the current sector

- A conflict is raised due to this electronic coordination

- An indication is displayed indicating that the received coordination is potentially conflictual

- An information is displayed on the flight indicating the electronic coordination

- The ATCO acknowledges the flashing flight

- The flight stops flashing

Alternative Flow 1

- The flight is in "fade-out" status

- The ATCO of the upstream sector performs a level electronic coordination

- A level electronic coordination is received on the current sector

- A conflict is raised due to this electronic coordination

- An indication is displayed indicating that the received coordination is potentially conflictual

- An information is displayed on the flight indicating the electronic coordination

- The ATCO acknowledges the flashing flight

- The flight stops flashing

Alternative Flow 2

- The flight is in "fade-out" status

- The ATCO of the upstream sector performs a speed electronic coordination

- A speed electronic coordination is received on the current sector

- A conflict is raised due to this electronic coordination

- An indication is displayed indicating that the received coordination is potentially conflictual

- An information is displayed on the flight indicating the electronic coordination

- The ATCO acknowledges the flashing flight

- The flight stops flashing

3.1.1.2.13 UC-10-96-TRL6-TS-113/ Warn ATCO in case the system raises a RAM alert

Scope/Description

In case the flight is in fade-out status, the system raises a RAM alert when the flight does not follow its route. The flight turns to "normal display" status and flashes

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

The flight is in "fade-out" status

Post conditions

- An indication is displayed on the flight in case a RAM alert is raised

- The flight turns in "normal display" status

Trigger

The system detects a RAM alert

Nominal Flow

- The flight is in "fade-out" status

- The system raises a RAM alert

- The flight turns into "normal display" status and flashes

- An information is displayed on the flight indicating the RAM alert

- The ATCO acknowledges the flashing flight

- The flight stops flashing

3.1.1.2.14 UC-10-96-TRL6-TS-114/ Warn ATCO in case the system raises a CLAM alert

Scope/Description

In case the flight is in fade-out status, the system raises a CLAM alert when the flight does not follow the CFL. The flight turns to "normal display" status and flashes.

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

The flight is in "fade-out" status

Post conditions

- An indication is displayed on the flight in case a CLAM alert is raised

- The flight turns in "normal display" status

Trigger

The system detects a CLAM alert

Nominal Flow

- The flight is in "fade-out" status

- The system raises a CLAM alert

- The flight turns into "normal display" status and flashes

- An information is displayed on the flight indicating the CLAM alert

- The ATCO acknowledges the flashing flight

- The flight stops flashing

3.1.1.2.15 UC-10-96-TRL6-TS-115/ Warn ATCO in case the system raises an EHS CLAM alert

Scope/Description

In case the flight is in fade-out status, the system raises an EHS CLAM alert when the ATCO does not follow the selected altitude of the flight. The flight turns to "normal display" status and flashes.

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

The flight is in "fade-out" status

Post conditions

- An indication is displayed on the flight in case an EHS CLAM alert is raised

- The flight turns in "normal display" status

Trigger

The system detects an EHS CLAM alert

Nominal Flow

- The flight is in "fade-out" status

- The system raises an EHS CLAM alert

- The flight turns into "normal display" status and flashes

- An information is displayed on the flight indicating the EHS CLAM alert

- The ATCO acknowledges the flashing flight

- The flight stops flashing

3.1.1.2.16 UC-10-96-TRL6-TS-116/ Warn ATCO in case the SSR code is set to 7500, 7600 or 7700

Scope/Description

In case the flight is in fade-out status, the system raises an alert when the SSR code of the flight is set to 7500, 7600 or 7700. The flight turns to "normal display" status and flashes.

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

The flight is in "fade-out" status

Post conditions

- An indication is displayed on the flight in case SSR code alert is raised
- The flight turns in "normal display" status

Trigger

The system detects an SSR code alert

Nominal Flow

- The flight is in "fade-out" status
- The system raises an SSR code alert
- The flight turns into "normal display" status and flashes
- An information is displayed on the flight indicating the SSR code alert
- The ATCO acknowledges the flashing flight
- The flight stops flashing

3.1.1.2.17 UC-10-96-TRL6-TS-117/ Warn ATCO in case of emergency alarm

Scope/Description

In case the flight is in fade-out status, the system raises an alert when the flight is in emergency. The flight turns to "normal display" status and flashes.

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

The flight is in "fade-out" status

Post conditions

- An indication is displayed on the flight in case of emergency

- The flight turns in "normal display" status

Trigger

The system detects an emergency alert

Nominal Flow

- The flight is in "fade-out" status

- The system raises an emergency alert

- The flight turns into "normal display" status and flashes

- An information is displayed on the flight indicating the emergency

- The ATCO acknowledges the flashing flight

- The flight stops flashing

3.1.1.2.18 UC-10-96-TRL6-TS-118/ Warn the ATCO in case of conflict when changing a level
Scope/Description

In case of a level change on a non-fade-out flight, the system shall warn the user on levels potentially in conflict with fade-out flights.

In case of a level change on a non-fade-out flight, the system shall warn the user on levels potentially in conflict with fade-out flights.

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

Some flights are in "fade-out" status

Post conditions

- An indication is displayed on the list of level of the non-fade-out flight

Trigger

The user opens the level menu to change the level on a non-fade-out flight

Nominal Flow

- Some flights are in "fade-out" status

- The system displays the levels potentially in conflict with fade-out flights

3.1.1.2.19 UC-10-96-TRL6-TS-119/ ATCO's input triggering a conflict with another flight

Scope/Description

Flights in fade-out becoming conflicting with another flight upon an ATCO input on the flight not in fade-out.

Actors

En-Route Executive Control (En-Route EC) and En-Route Planner Control (En-Route PC).

Preconditions

Flight is:

- correlated,
- within the AOR
- not transferred to the next centre.

Post conditions

The flight is in "intermediate normal display" status.

Trigger

- ATCO performs a heading on the flight that is not in fade-out.

Nominal Flow

- Flight not in fade out is assumed on a sector
- ATCO performs a heading on the flight not in fade-out
- The system processes the fade out algorithm
- The minimum lateral distance with a fade out flight is below 18 NM or the vertical profile of the flight is intercepting any a fade-out flight
- The fade out flight is in "Intermediate normal display" status

Alternative Flow 1

- Flight not in fade out is assumed on a sector

- ATCO performs a direct on the flight not in fade-out

- The system processes the fade out algorithm

- The minimum lateral distance with a fade out flight is below 18 NM or the vertical profile of the flight is intercepting any a fade-out flight

- The fade out flight is in "Intermediate normal display" status

Alternative Flow 2

- Flight not in fade out is assumed on a sector

- The ATCO change the speed of the flight not in fade-out

- The system processes the fade out algorithm

- The minimum lateral distance with a fade out flight is below 18 NM or the vertical profile of the flight is intercepting any a fade-out flight

- The fade out flight is in "Intermediate normal display" status

Alternative Flow 3

- Flight not in fade out is assumed on a sector

- The ATCO change the EFL of the flight not in fade-out

- The system processes the fade out algorithm

- The minimum lateral distance with a fade out flight is below 18 NM or the vertical profile of the flight is intercepting any a fade-out flight

- The fade out flight is in "Intermediate normal display" status

Alternative Flow 4

- Flight not in fade out is assumed on a sector

- The ATCO change the CFL of the flight not in fade-out

- The system processes the fade out algorithm

- The minimum lateral distance with a fade out flight is below 18 NM or the vertical profile of the flight is intercepting any a fade-out flight

- The fade out flight is in "Intermediate normal display" status

Alternative Flow 5

- Flight not in fade out is assumed on a sector

- The ATCO change the XFL of the flight not in fade-out

- The system processes the fade out algorithm

- The minimum lateral distance with the other flights is above 20 NM

- The vertical profile of the flight is not intercepting any other flight

- The fade out flight is in "Intermediate normal display" status

-

3.1.1.3 Applicable standards and regulations

3.1.2 Capability Configurations required for the SESAR Solution

The following table lists the Capability Configurations (CCs) required by the SESAR Solution, the relevant (sub)-Operating Environments where the CCs operate, and the links between CCs and Capabilities, Nodes and Stakeholders:

SESAR Solution ID and Title	Capability Configurations (CCs) (from EATMA)	Sub-Operating Environment(s) where the CCs operate	Capabilities (from EATMA)	Nodes (from EATMA)	Stakeholders (from EATMA)
PJ.10-W2-96 AG (Attention Guidance)	En Route ACC	Very High Complexity	Controller Machine Interface Design	En-Route	Civil En-Route Service Provider

Table 5: List of Capability Configuration required for the SESAR Solution

3.2 Changes imposed by the SESAR Solution on the baseline Architecture

This section describes which system changes are needed compared to the baseline architecture in EATMA to deliver the Capabilities improvements (using the EATMA architecture elements such as Technical Systems, Functional Blocks, Functions and Roles).

The baseline EATMA architecture is modified in order to reflect the improvements brought in operation by the Solution.

The information is provided by Enablers, listing the changes applied to their definition or the EATMA elements related to them, e.g. new Functions introduced and allocated to a Functional Block in order to support the development of a system Enabler.

Enabler ID (from EATMA)	Enabler Title (from EATMA)	Changes
ER ATC 182	Controller productivity enhancements by Attention Guidance at the CWP/HMI	Introduction of the new fade-out algorithm will reduce Controllers'workload and will increase the throughput of the sectors under their control by putting in background color traffic that presumably will not request any ATCO's instruction for spacing.

Table 6: List of changes due to the SESAR Solution

4 Technical Specifications

4.1 Functional architecture overview

This Solution impacts the EATMA Dataset 22 Architecture, by introducing the following function in the functional block "Attention Guidance". The description of this function is the introduction of a new algorithm, the fade-out algorithm which aims to guide the ATCOs' attention to the traffic that presumably will request ATCO's instruction for spacing.

The new function will impact the following Functional blocks:

- **Attention Guidance**: The Attention Guidance system needs to analyse whether the information for controllers is relevant in the current situation and therefore requires their attention and, optionally, where the controllers are currently looking at. Aircraft radar data, flight plan data, meteorological and airspace data are taken into account to evaluate the current air traffic situation and give weights for different ATC events. Afterwards, it can be determined which ATC event (e.g. medium-term/short-term conflict alert, handover) should be paid attention to.
  The Attention Guidance Logic informs the CWP to perform the respective attention guidance cues. These can be visual cues such as frames around aircraft labels as well as flashlight and glowing flashlight effects around aircraft icons or airspace areas depending on escalation levels for different ATC events. It can also be the presentation of additional (un)certainty values for critical ATC situations or potential auditory cues.

4.1.1 Resource Connectivity view (one section per NSV-1)

N/A since the Solution is just affecting one Technical system, hence no new interactions between Capability Configurations are introduced.

4.1.1.1 Resource Infrastructure view (of the NSV-2)

N/A as it is just affecting one Technical system, hence no new interactions between Capability Configurations are introduced.

4.1.1.2 Resource Orchestration view (all NSV-4s linked to the NSV-1)

This section describes the sequence of how the resources interact. This must be consistent with the content defined at EATMA level and available in the latest applicable version in EATMA.
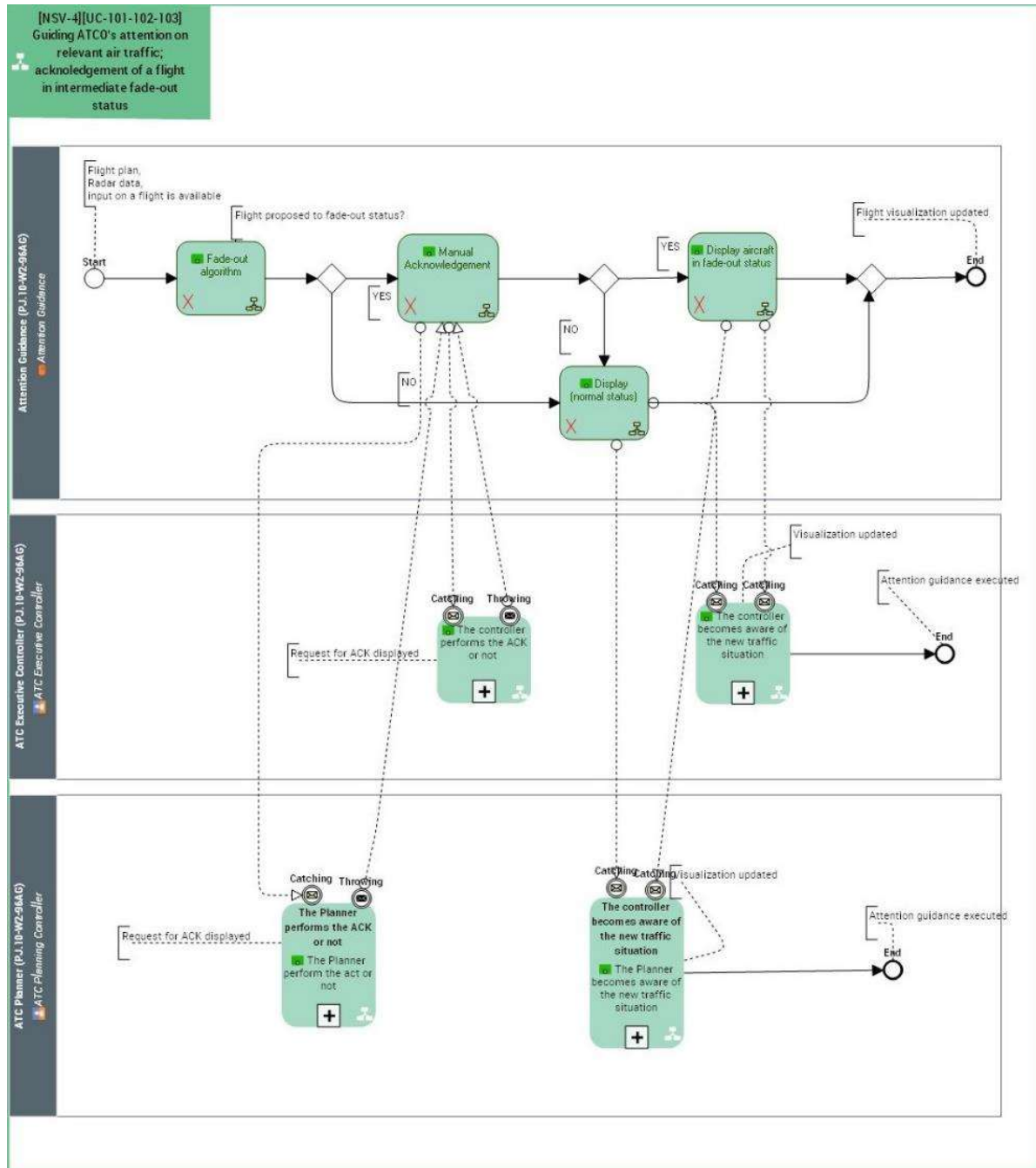
Figure 1 Orchestration view: Flights that are largely non-conflictual are put in "fade-out" status.
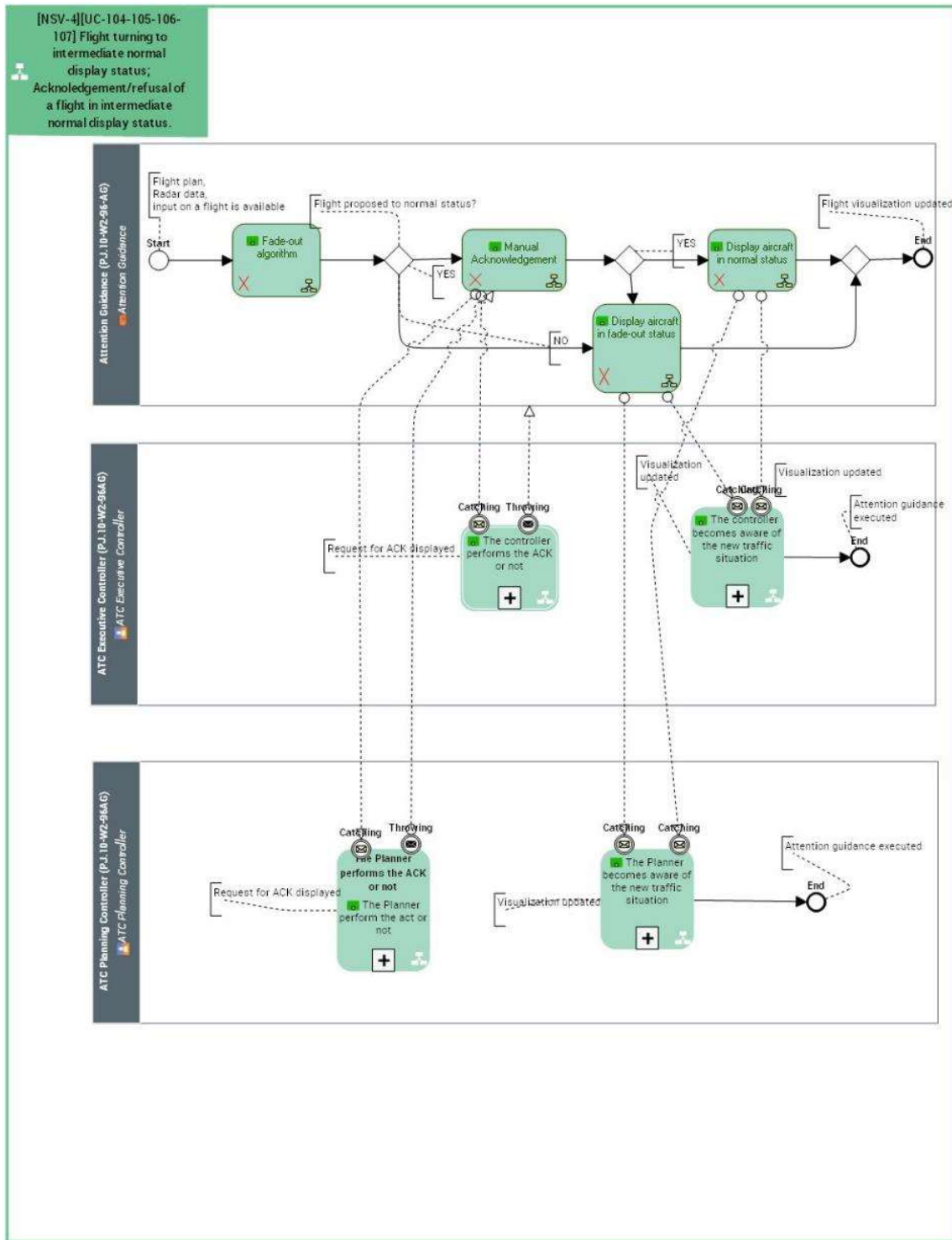
Figure 2 Orchestration view: Turn back to normal status under certain conditions.
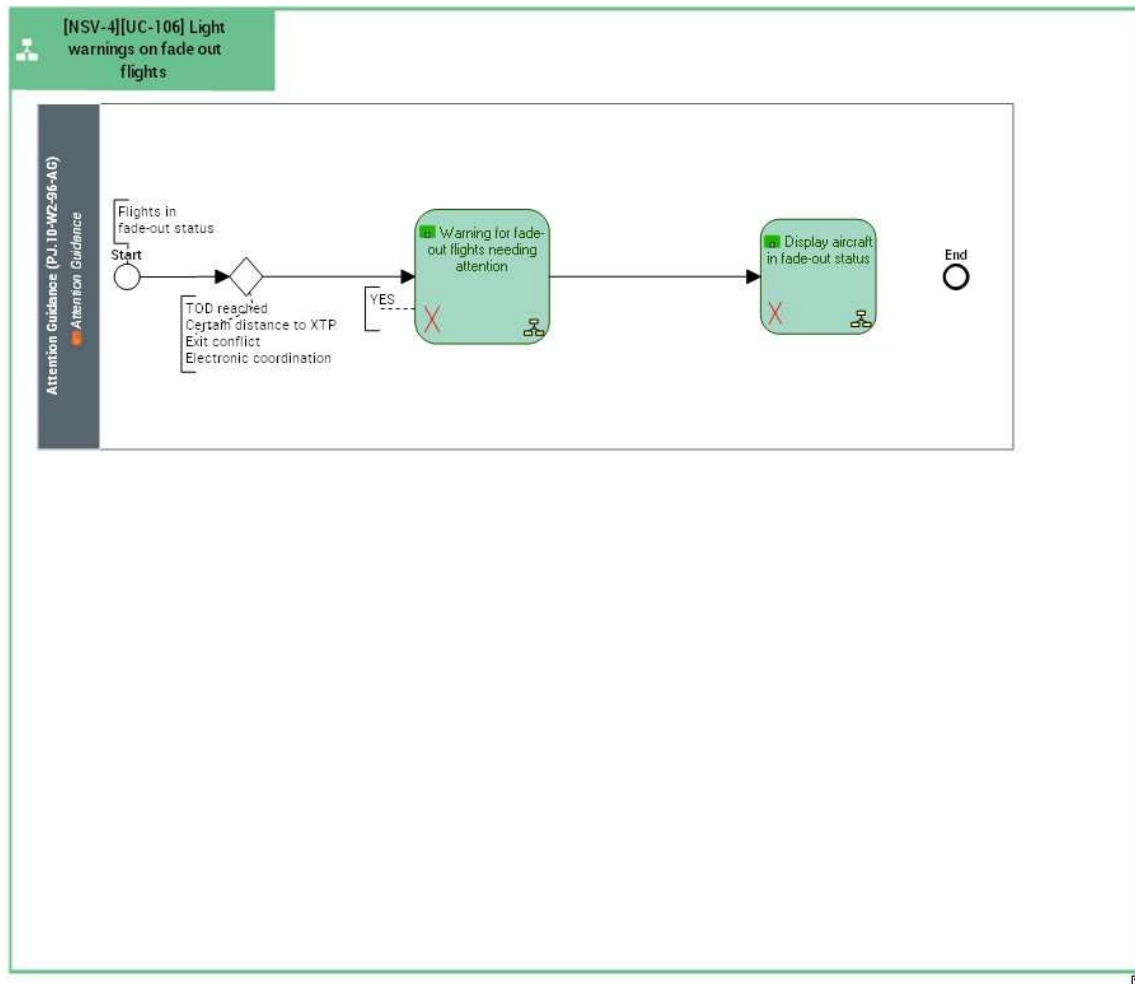
Figure 3 Orchestration view: Raise of alerts (RAM, CLAM, EHS CLAM, Specific SSR Code) for flights in fade-out status.
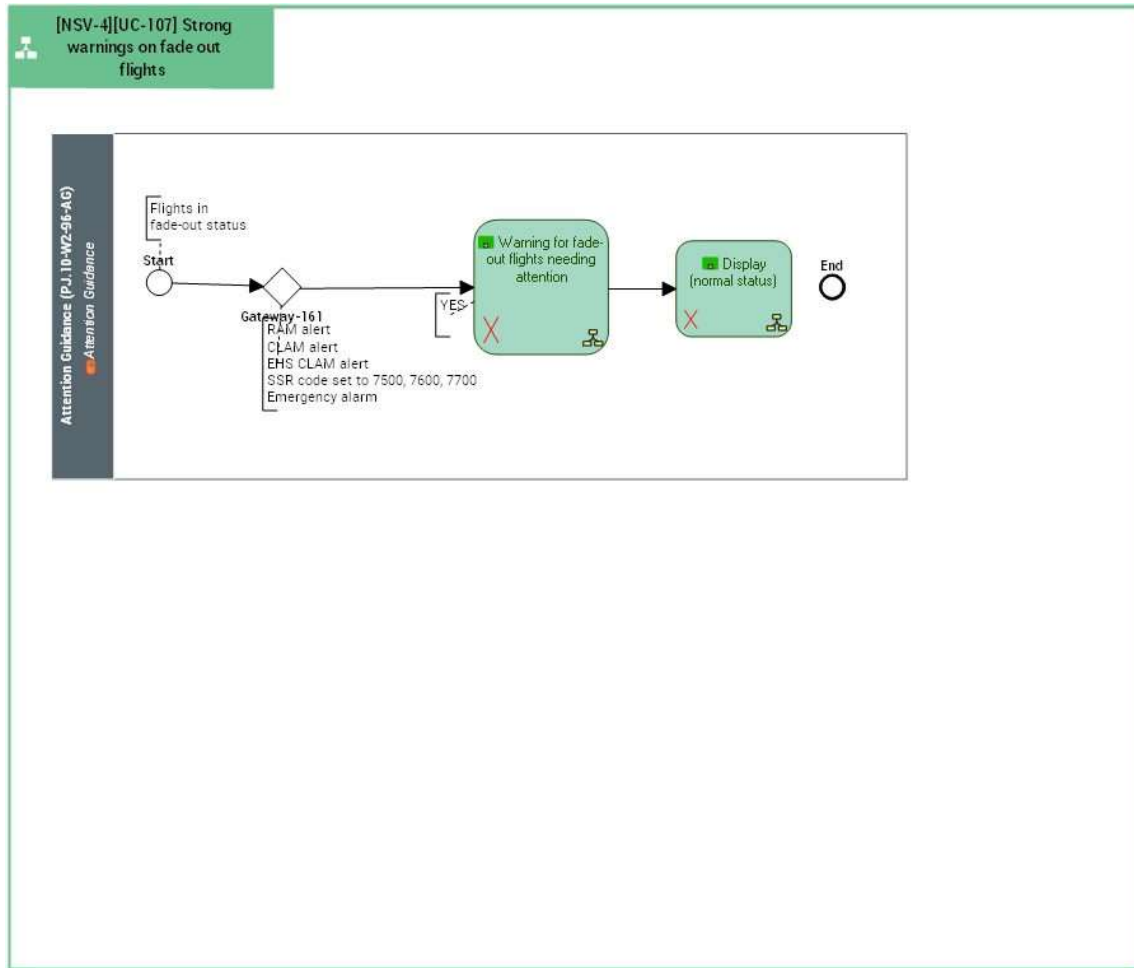
Figure 4 Orchestration view: Turn to normal status for an emergency flight.

Function	Description
Attention Guidance Logic	The Attention Guidance system needs to analyse whether the information for controllers is relevant in the current situation and therefore requires their attention and, optionally, where the controllers are currently looking at. Aircraft radar data, flight plan data, and airspace data are taken into account to evaluate the current air traffic situation and give weights for different ATC events. Afterwards, it can be determined which ATC event (e.g. medium-term/short-term conflict alert, handover) should be paid attention to. Further controller interaction data such as eye-tracking, mouse interaction or speech data can be used to determine where or on which aircraft the current controller's attention focusses. If there is a

	mismatch between the desired area of attention and the actual area of attention, the Attention Guidance Measures can be used.

Table 7 Functional Description (derived from EATMA)

4.1.2 Resource Composition

The Functional Block addressed by the Solution has already been created in EATMA and a new Function has been introduced. The Functional Block is:

- Attention Guidance

4.1.3 Service view

N/A as it is just affecting one Technical system, hence no new interactions between Capability Configurations are introduced.

4.2 Functional and non-Functional Requirements

This set of technical Requirements is subject to refinement and modification in further versions of the document.

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0001
Title	Ensuring ATCO Efficiency
Requirement	The system shall not introduce additional delay in the workflow of the operator (controller).
Status	Release
Rationale	In order to increase efficiency of the operations, the modifications of the HMI shall maintain system usability at the same level.
Category	Safety, Performance, HMI

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182

<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0003

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0002
Title	Ensuring Usability
Requirement	The system shall provide a high level of usability, i.e. support ATCOs to reach their task goals efficiently and to appropriate user acceptance levels.
Status	Release
Rationale	The contents of HMI elements shall have a straightforward interpretation, no additional workload to infer their meaning shall be introduced. Inputs to the system shall not require additional time to introduce information, compared to a system without attention guidance. Measurements of the system usability of the HMI system with attention guidance shall be at least at the same level than a comparable system without attention guidance.
Category	Safety, Performance, HMI

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0005

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0003
Title	Ensuring Safety
Requirement	The system shall at least support controllers to maintain an acceptable level of situational awareness.
Status	Release

Rationale	The additional HMI elements normally used by the CWP system shall help the controller to better and faster assess the current air traffic situation.
Category	Safety, Performance, HMI

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0006

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0004
Title	Reducing Controller Workload
Requirement	The system shall reduce the workload of the controller.
Status	Release
Rationale	The application of the attention guidance elements shall result in a reduction of controller workload in terms of his/her own perception of the workload and measured workload indicators (e.g. time until an event was noticed).
Category	Safety, Performance, HMI

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0007

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0005
Title	Implementation of an intelligent fade out algorithm
Requirement	The system shall provide an intelligent fade out algorithm in order to reduce the number of displayed flights (in normal status display colour) at each moment. A flight can be faded out if and only if the flight is largely non-conflictual
Status	Release
Rationale	The application of an intelligent fade out algorithm shall result in a reduction of the number of displayed flights that the controller has to take care of at the same time. Therefore he/she can concentrate in the flights which are more likely to come to a conflict.
Category	Functional, Performance, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Flight Management
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0001 REQ-16.04-FRD-AG01.0005 REQ-16.04-FRD-AG01.0006 REQ-16.04-FRD-AG01.0007

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0033
Title	A flight largely nonconflictual
Requirement	A flight shall be considered as largely non-conflictual if the minimum lateral distance is above 20NM from the other flights or the vertical profile is not intercepting the other flights.
Status	Release

Rationale	Considering all the largely non-conflictual flights for the fade out algorithm will result in a reduction of the number of displayed flights that the controller has to take care of at the same time.
Category	Functional, Performance, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Flight Management Conflict Prediction
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0001 REQ-16.04-FRD-AG01.0005 REQ-16.04-FRD-AG01.0006 REQ-16.04-FRD-AG01.0007

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0006
Title	Enabling of the fade out algorithm
Requirement	The system shall enable the adjustment of the fade out algorithm between certain limits for the ATCO in every CWP.
Status	Release
Rationale	The number of flights in fade out status may not be the same depending on the role (Executive or Planner) for the same sector. In fact the fade out algorithm will be automatic but the controller will have the possibility to manually set a flight in fade-out or not until certain limits.
Category	Functional

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic HMI configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0001 REQ-16.04-FRD-AG01.0005

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0007
Title	Eligibility calculation
Requirement	Flight shall be considered eligible for fading out when it is correlated, and assumed on the first sector of the airspace.
Status	Release
Rationale	Only correlated and assumed flights can be faded out as non-assumed entry flights need to be displayed to be visible for the controller upon the first frequency contact and already transferred flight are displayed as non-relevant anymore.
Category	Functional

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Flight Management
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0001 REQ-16.04-FRD-AG01.0005

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0008
Title	Fade out algorithm recalculation
Requirement	The system shall recalculate the fade out algorithm upon a controller input that implies a change in the profile (level (CFL, XFL, EFL), direct or heading, speed).
Status	Release
Rationale	Upon an ATCO input that implies a change in the profile, the fade out algorithm is recalculated.
Category	Functional, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Flight Management Trajectory Prediction
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0001 REQ-16.04-FRD-AG02.0002

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0009
Title	Flight eligibility to "fade-out" status
Requirement	If a flight is largely non-conflictual, the system shall turn it into an "intermediate fade-out" status.
Status	Release
Rationale	The "intermediate fade-out" status permits the user to have a full situation awareness before the flight turns into "fade-out" status.
Category	Functional, Performance, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Flight Management Conflict Prediction
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0001

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0010
Title	Display of flight in "intermediate fade-out" status.
Requirement	The system shall provide a facility to display a flight in an "intermediate fade-out" status. In this case, the callsign and a one-minute speed vector of the flight will be displayed in "fade-out" colour. The other element of the flight remains in "normal" colour.
Status	Release
Rationale	The "intermediate fade-out" status permits the user to have a full situation awareness before the flight turns into "fade-out" status.
Category	Functional, Performance, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic HMI configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0001

		REQ-16.04-FRD-AG01.0005
		REQ-16.04-FRD-AG01.0006
		REQ-16.04-FRD-AG01.0007

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0011
Title	Manual acknowledgement of the flight in "intermediate fade-out" status
Requirement	The system shall provide a facility to manually acknowledge a flight in "intermediate fade-out" status. Once acknowledged, the flight turns to fade out colour.
Status	Release
Rationale	The manual acknowledgement allows the user to have a full situation awareness.
Category	Functional, Performance, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0006 REQ-16.04-FRD-AG01.0007

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0012
Title	Flight in "intermediate fade-out" status not acknowledged by the user
Requirement	The system shall provide a facility to flash a flight in "intermediate fade-out" status when not manually acknowledged by the user after one minute. The callsign and the one-minute speed vector will flash.

Status	Release
Rationale	The "intermediate fade-out" status for one-minute permits the user to maintain a full situation awareness. Moreover, the flash of the callsign and one-minute speed vector allows the user to pay attention to the flight if it was not already the case.
Category	Functional, HMI

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0006 REQ-16.04-FRD-AG01.0007

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0013
Title	Acknowledgement of the "intermediate fade-out" status when flashing.
Requirement	The system shall provide a facility to acknowledge a flight in "intermediate fade-out" status when flashing. The flight will turn into "fade-out" colour.
Status	Release
Rationale	The acknowledgement of the user permits to maintain a full situation awareness when the flight is flashing.
Category	Functional, HMI

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182

<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0006 REQ-16.04-FRD-AG01.0007

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0014
Title	Flight candidate to "normal display" status when in fade-out
Requirement	When in "fade-out" status, the system shall turn a flight into an "intermediate normal display" status if the minimum lateral distance becomes strictly below 18NM during 3 track updates.
Status	Release
Rationale	The "intermediate normal display" status permits the user to have the full situation awareness before turning to "normal display" status.
Category	Functional, Performance, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Trajectory Prediction HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG02.0002

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0015

Title	Display of flight in "intermediate normal display" status
Requirement	The system shall provide a facility to display a flight in an "intermediate normal display" status. In this case, the callsign, the callsign and the one-minute speed vector will be displayed in "normal display" colour. The other elements of the flight will remain in "fade out" colour.
Status	Release
Rationale	The "intermediate normal display" status permits the user to have the full situation awareness before turning to "normal display" status.
Category	Functional, Performance, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG02.0001 REQ-16.04-FRD-AG01.0005 REQ-16.04-FRD-AG01.0006

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0016
Title	Manual acknowledgement of the flight candidate in "intermediate normal display" status
Requirement	The system shall provide a facility to manually acknowledge a flight in "intermediate normal display" status. All the elements of the flight will turn to "normal display" colour and the one-minute speed vector won't be displayed any longer.

Status	Release
Rationale	The manual acknowledgement allows the user to have a full situation awareness.
Category	Functional, Performance, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0006

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0017
Title	Refusal of a flight candidate in "intermediate normal display" status.
Requirement	The system shall provide a facility to refuse a flight in "intermediate normal display" status when the minimum lateral distance between two flights' profile is higher than 10 NM. In this case a "PLTCA" indication on the flight will be displayed in "normal display colour to warn the user.
Status	Release
Rationale	Refusing a flight in "intermediate normal display" status permits the user to have a full situation awareness.
Category	Functional, HMI

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance

<ALLOCATED_TO>	<Function>	Attention Guidance Logic
		Trajectory Prediction
		HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0006

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0018
Title	Impossibility to refuse a flight candidate to "intermediate normal display" status.
Requirement	The system shall prevent the user from refusing a flight in "intermediate normal display" status when the minimum lateral distance between two flight's profiles is below 10 NM considering the uncertainty. In this case, a "PLTCA" indication on the flight will be displayed in "warning display" colour to warn the user.
Status	Release
Rationale	A warning indication permits the user to have a full situation awareness.
Category	Functional, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic
		Trajectory Prediction
		HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0004

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0019
Title	Flight in "intermediate normal display" status not acknowledged by the user.

Requirement	The system shall provide a facility to flash a flight in "intermediate normal display" status when not manually acknowledged by the user after one minute. The callsign and the one-minute speed vector will flash.
Status	Release
Rationale	The "intermediate normal display" status during one-minute permits the user to maintain a full situation awareness. Moreover, the flash of the callsign and one-minute speed vector allows the user to pay attention on the flight if it was not already the case.
Category	Functional, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0006

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0020
Title	Acknowledgement of the "intermediate normal display" status when flashing.
Requirement	The system shall provide a facility to acknowledge a flight in "intermediate normal display" status when flashing. The flight will turn into "normal display" colour.
Status	Release
Rationale	The acknowledgement of the user permits to maintain a full situation awareness when the flight is flashing.
Category	Functional, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0006

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0021
Title	Warning of the user when the first Top of Descent (TOD1) is reached and the flight is in "fade-out" status.
Requirement	If the flight is in "fade-out" status, the system shall warn the user if the TOD1 is reached. In this case, the call sign, the XFL and a TOD indication on the flight will be displayed in white colour.
Status	Release
Rationale	The ATCO has to be aware of the need to interact with the flight to clear the aircraft for descent.
Category	Functional, Performance, HMI

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Trajectory Prediction HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG02.0002

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0022
Title	Warning of the user when the second Top of descent (TOD2) is reached and the flight is in "fade-out" status.
Requirement	If the flight is in "fade-out" status, the system shall warn the user if the TOD2 is reached. In this case, the call sign, the XFL of the flight will be displayed in white colour. Moreover, a TOD indication on the flight will be displayed in warning colour.
Status	Release
Rationale	The ATCO has to be aware of the need to interact with the flight to clear the aircraft for descent.
Category	Functional, Performance, HMI

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Trajectory Prediction HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG02.0002

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0023
Title	Warning of the user when the flight is at a certain distance from the XPT and the flight is in "fade-out" status.
Requirement	If the flight is in "fade-out" status, the system shall warn the user when the flight is at a certain distance from the XPT. In this case, the call sign of the flight will be displayed in white colour. Moreover, the frequency of the flight will be forced to display in white colour.
Status	Release

Rationale	The user has to be aware of the need to handover the flight to next centre.
Category	Functional, Performance, HMI

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Trajectory Prediction HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG02.0002

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0024
Title	Warning of the user when the flight is at a warning distance from the XPT and the flight is in "fade-out" status.
Requirement	If the flight is in "fade-out" status, the system shall warn the user when the flight is at a warning distance from the XPT. In this case, the call sign of flight will be displayed in white colour. Moreover, the frequency of the flight will be forced to display in warning colour.
Status	Release
Rationale	The user has to be aware of the need to handover the flight to next centre.
Category	Functional, Performance, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic

		Trajectory Prediction
		HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG02.0002

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0034
Title	Warning of the user when an Exit conflict is raised and the flight is in "fade-out" status.
Requirement	If the flight is in "fade-out" status, the system shall warn the user when the flight exits the centre at the same point, the same level and more or less the same time. In this case, the call sign of flight will be displayed in white colour. Moreover, the XFL of the flight will be forced to display in warning colour.
Status	Release
Rationale	The user has to be aware of the need to solve the exit conflict before the handover the flight to next centre.
Category	Functional, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic
		Flight Management
		Trajectory Prediction
		HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG02.0002

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0031
Title	Warning of the user when an electronic coordination is received and the flight is in "fade-out" status.

| Requirement | If the flight is in "fade-out" status and an electronic coordination is received , the system shall warn the user. In this case, the call sign of the flight will be displayed in white colour and the coordination in blue colour.

Moreover, if the coordination is received before reaching TOD1, an additional indication is added to check the presence of a conflict before accepting the coordination. |
|---|---|
| Status | Release |
| Rationale | The user is aware of the full situation awareness. |
| Category | Functional, Performance, HMI, Safety |

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic

HMI Configuration |
| <SATISFIES> | <ATMS-REQUIREMENT> | REQ-16.04-FRD-AG02.0002 |

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0032
Title	Warning of the user when an electronic coordination is received and the flight is in "fade-out" status involving a conflict.
Requirement	If the flight is in "fade-out" status and an electronic coordination is received triggering a conflict, the system shall warn the user. In this case, the call sign of the flight will be displayed in white colour and the coordination in blue colour. Moreover, a an indication on the flight will be displayed to indicate that the received coordination triggers a conflict.
Status	Release
Rationale	The user is aware of the full situation awareness.
Category	Functional, Performance, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Conflict Prediction HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG02.0002

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0025
Title	Warning of the user when there is a CLAM or EHS CLAM alert and the flight is in "fade-out" status.
Requirement	If the flight is in "fade-out" status, the system shall warn the user when there is a CLAM or EHS CLAM alert. In this case, the flight will flash with all the elements of the flight displayed in green colour except the CFL that will be displayed in warning colour.
Status	Release
Rationale	The user has to be aware of the need to contact the flight.
Category	Functional, Performance, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Conflict Prediction HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG02.0002

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0026
Title	Warning of the user when there is a RAM alert and the flight is in "fade-out" status.
Requirement	If the flight is in "fade-out" status, the system shall warn the user when there is a RAM alert (Route Adherence Monitoring). In this case, the flight will flash with all the elements of the flight displayed in green colour except the heading that will be displayed in warning colour.
Status	Release
Rationale	The user has to be aware of the need to contact the flight.
Category	Functional, Performance, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Flight Monitoring HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG02.0002

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0027
Title	Emergency situation when in "fade-out" status.
Requirement	If a flight is in "fade-out" status and an emergency situation occurs (SSR code set to 7500, 7600 or 7700), the system shall turn all the elements of the flight in "normal display" colour and flash the flight.
Status	Release
Rationale	In case of emergency situation, the user is aware of the full situation.
Category	Functional, Performance, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Flight Management HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG02.0002

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0028
Title	Emergency situation when in "fade-out" status.
Requirement	If a flight is in "fade-out" status and an emergency situation occurs, the system shall allow the user to turn all the elements of the flight in "normal display" colour to make a change in the route or the diversion for instance. In this case, the track will flash. Once the change is performed, the system shall newly process the algorithm.
Status	Release
Rationale	In case of emergency situation, the user has to quickly react.
Category	Functional, Performance, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Flight/Route Management HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG02.0002

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0029
Title	Acknowledgement of a flashing flight.
Requirement	In case the flight is flashing, the system shall allow the user to acknowledge the flash in order to stop it.
Status	Release
Rationale	The user is aware of the full situation awareness.
Category	Functional, Performance, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG02.0002 REQ-16.04-FRD-AG01.0006

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0030
Title	Manual enabling/disabling the algorithm
Requirement	The system shall provide a facility to enable/disable the fade-out algorithm per CWP.
Status	Release
Rationale	The user can visually notice the impact of the fade-out algorithm in its full situation awareness.
Category	Functional, Performance, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0006

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0034
Title	Indication of levels potentially in conflict with fade-out flights
Requirement	When changing the level of a non-fade-out flight, the system shall provide a facility to indicate the levels potentially in conflict with fade-out flights.
Status	Release
Rationale	The user increases the safety and keep the full situation awareness.
Category	Functional, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic HMI Configuration Flight/Conflict Management
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG02.0002

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0035
Title	Likelihood of an aircraft incorrectly stays in "fade-out" status

Requirement	The likelihood of an aircraft incorrectly stays in "fade-out" status shall be operationally acceptable as per regulation applicable to local implementation.
Status	Release
Rationale	Such a malfunction potentially results in a situation when ATCO.is not aware of a conflict in time and will lead to a delayed or missed action.
Category	Functional, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Performance/Safety Management
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0004

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0036
Title	Likelihood of ATCO is incorrectly able to change an aircraft status to fade-out
Requirement	The likelihood of ATCO is incorrectly able to change an aircraft status to fade-out shall be operationally acceptable as per regulation applicable to local implementation.
Status	Release
Rationale	Such a malfunction potentially results in a situation when ATCO.is not aware of a conflict in time and will lead to a delayed or missed action.
Category	Functional, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182

<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Performance/Safety Management
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0004

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0037
Title	Likelihood of an aircraft's status changes to "fade-out" without ATCO approval
Requirement	The likelihood of an aircraft's status changes to "fade-out" without ATCO approval shall be operationally acceptable as per regulation applicable to local implementation.
Status	Release
Rationale	Such a malfunction potentially results in a situation when ATCO.is not aware of a conflict in time and will lead to a delayed or missed action.
Category	Functional, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Performance/Safety Management
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0004

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0038
Title	Likelihood of ATCO is unable to change aircraft status to normal
Requirement	The likelihood of ATCO is unable to change aircraft status to normal shall be operationally acceptable as per regulation applicable to local implementation.

Status	Release
Rationale	Such a malfunction potentially results in a situation when ATCO.is not aware of a conflict in time and will lead to a delayed or missed action.
Category	Functional, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Performance/Safety Management
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0004

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0039
Title	Likelihood of RAM/ CLAM/ TOD/ Emergency detection failure
Requirement	The likelihood of RAM/ CLAM/ TOD/ Emergency detection failure in case of aircraft in fade-out shall be operationally acceptable as per regulation applicable to local implementation.
Status	Release
Rationale	Such a malfunction potentially results in a situation when ATCO.is not aware of a conflict in time and will lead to a delayed or missed action.
Category	Functional, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic

		Performance/ Safety management
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0004

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0040
Title	Status of Attention Guidance
Requirement	The Controller shall be informed about the status of the AG and be alerted in case of a failure.
Status	Release
Rationale	In order to increase ATCO situational awareness in case of failure.
Category	Functional, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic HMI Configuration Technical Supervision
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0006 REQ-16.04-FRD-AG02.0002

[REQ]

Identifier	REQ-PJ.10-W2-96-AG-TS-AG01.0041
Title	Status in case of failure
Requirement	In case of system failure all aircraft shall be displayed in normal status.
Status	Release
Rationale	In order to maintain ATCO situational awareness and increase safety.
Category	Functional, HMI, Safety

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.10-W2-96 AG
<ALLOCATED_TO>	<Enabler>	ER APP ATC 182
<ALLOCATED_TO>	<Functional block>	Attention Guidance
<ALLOCATED_TO>	<Function>	Attention Guidance Logic Contingency Management HMI Configuration
<SATISFIES>	<ATMS-REQUIREMENT>	REQ-16.04-FRD-AG01.0004

5 Recommendation for Implementation

Recommendations regard the following aspects:

Deployment:

A centralised architecture is recommended in the implementation of the Fade-out algorithm regarding its deployment in the system architecture of ER ACC capability configuration (regardless of sub-operating environment). The fade out algorithm will be running on the same server, giving service to all the controllers and working positions of the system.

Training session:

During the exercise run, the fade-out tracks were largely non-conflictual meaning that the minimum lateral distance between 2 tracks were higher than 20NM.

Even if after one day of training, the ATCO feels at ease with the solution, he/she recommends keeping 20NM as the minimum lateral distance at the beginning and reduce progressively this distance to 15NM at the end. If so, more tracks will be in fade-out, reducing the ATCO workload accordingly.

CWP/HMI and ATC Support tools:

The controllers support tools have been considered efficient during the validation exercises. However, some recommendations to improve their performance and improve the accuracy of the functionality have been raised and listed below:

- The profile could be more accurate using the aircraft on board trajectory. This solution coupled with the PJ18.53, 56 could improve the accuracy of the profiles and therefore contributes to an improvement on the fade-out algorithm

- The use of ATN B2 standard based advanced CPDLC clearances could bring benefits:

    o Less workload on radio communication with the pilot

    o Route clearances on geographical points to avoid conflicts

- The frequency is appearing too early. The ATCO can wait a little bit more to transfer the aircraft because it is in fade-out. It was an ATCO request to display this frequency earlier but they changed their mind during the exercise run. Moreover, the transfer of the flight should be done by the planner and not the executive. This is to balance the workload between the executive and the planner. Today above level 360, the executive ATCO is very loaded whereas the planner is much less loaded.

- All ATCOs agreed that the timing and flashing function was appropriate. However, the blinking track label was not appreciated by all ATCOs. The highlight of flights requiring status change from fade-out to intermediate normal status should be further discussed.

- Fade-out should be inactive during adverse weather situations.

- Controllers stated that the alerts were appropriately driving their attention towards relevant flights and acted as task drivers to trigger correct actions at the correct time. It should be considered during further development to distinguish between alerts and task drivers and follow suitable design principles.

- System degradations were not covered in this TRL stage. In case of system degradations, fade-out should be inactive.

6 Assumptions

No particular assumptions were made.

7 References and Applicable Documents

7.1 Applicable Documents

Content Integration

[1] D5-11: PJ19 EATMA Guidance Material and Report (2019) (edition 01.00.01)

[2] EATMA Community pages

[3] SESAR ATM Lexicon

Content Development

[4] D3_1_030-SESAR 2020 PJ_16-04 TRL2 FRD-AG_v01_00_00 (1)

System and Service Development

[5]

Performance Management

[6]

Validation

[7]

System Engineering

[8]

Safety

[9]

Human Performance

[10]

[11]

Environment Assessment

[12].

Security

[13]

7.2 Reference Documents

[14] ED-78A GUIDELINES FOR APPROVAL OF THE PROVISION AND USE OF AIR TRAFFIC SERVICES SUPPORTED BY DATA COMMUNICATIONS.[1]

[15] SESAR Solution PJ.16-04 datapack

1

Appendix A   Service Description Document (SDD)

Not applicable as no new services have been developed within this solution.

-END OF DOCUMENT-

Insert beneficiary's logos below, if required