

# SESAR Solution PJ.02-W2- 21.4 TS/IRS Final version for V3

<b>Deliverable ID:</b>	<b>D6.4.004</b>
<b>Dissemination Level:</b>	<b>PU</b>
<b>Project Acronym:</b>	<b>AART</b>
<b>Grant:</b>	<b>874477</b>
<b>Call:</b>	<b>H2020-IBA-SESAR-2019</b>
<b>Topic:</b>	<b>Airport Airside and Runway Throughput</b>
<b>Consortium Coordinator:</b>	<b>Eurocontrol</b>
<b>Edition Date:</b>	<b>05th December 2022</b>
<b>Edition:</b>	<b>00.02.01</b>
<b>Template Edition:</b>	<b>02.00.06</b>

## Authoring & Approval

### Authors of the document

Beneficiary	Date
Indra	29/10/2020
Indra Navia (Indra's LTP)	02/07/2021

### Reviewers internal to the project

Beneficiary	Date
Indra Navia	30/09/2022
HungaroControl	30/09/2022

### Reviewers external to the project

Beneficiary	Date
-------------	------

### Approved for submission to the S3JU By - Representatives of all beneficiaries involved in the project

Beneficiary	Date
DFS	
ENAV	
Hungarocontrol	
Indra	
Leonardo	

### Rejected By - Representatives of beneficiaries involved in the project

Beneficiary	Date
-------------	------

### Document History

Edition	Date	Status	Beneficiary	Justification
00.00.01	29 <sup>th</sup> October 2020	Draft	Indra	Initial draft created
00.00.02	26 <sup>th</sup> March 2021	Draft	Indra	Content update and introduction of the EATMA elements

00.00.03	15 <sup>th</sup> July 2021	Draft	Indra Indra Navia Leonardo	Update of the EATMA content and technical requirements
00.00.04	19 <sup>th</sup> August 2021	Draft	Indra Indra Navia Leonardo	Introduction of new NSV-4 diagrams, technical requirements and its traceability to OSED requirements and EATMA elements
00.01.00	27 <sup>th</sup> August 2021	Intermediate version	Indra	Update after review from partners
00.01.01	05 <sup>th</sup> November 2021	Draft	Indra	Based on D6.2.007 Standalone for Sol. 21.4
00.01.02	22 <sup>nd</sup> February 2022	Draft	Indra	Update of the requirements and modelling after the validation exercise
00.01.03	23 <sup>rd</sup> September 2022	Draft	Indra	Update with relevant inputs from Safety and Human Performance activities
00.02.00	30 <sup>th</sup> September 2022	Final	Indra	Final version with updates from partners
00.02.01	05 <sup>th</sup> December 2022	Final Data Pack	Indra	Update based on the feedback from S3JU for the VALR. Update of the institutional Enablers

**Copyright Statement** © 2020-2022 – PJ02-W2 WP6 Beneficiaries. All rights reserved. Licensed to SESAR3 Joint Undertaking under conditions.

# AART

## PJ.02 AIRPORT AIRSIDE AND RUNWAY THROUGHPUT

This TS/IRS is part of a project that has received funding from the SESAR3 Joint Undertaking under grant agreement No 874477 under European Union's Horizon 2020 research and innovation programme.



### Abstract

---

This document collects and describes the Technical System Requirements (functional and non-functional) which shall guide the development of procedures and required system support for the digital evolution of integrated surface management , through the Full Guidance Assistance to mobiles using 'Follow the Greens' procedures based on Airfield Ground Lighting.

Such System Requirements are derived from the Operational Requirements collected by the specification of previous R&D projects and studies, and from SESAR project PJ.02-W2-21.4.

## Table of Contents

Abstract .....	4
<b>1 Executive summary .....</b>	<b>8</b>
<b>2 Introduction .....</b>	<b>10</b>
2.1 Purpose of the document.....	10
2.2 Scope .....	10
2.3 Intended readership .....	11
2.4 Background .....	12
2.5 Structure of the document.....	12
2.6 Glossary of terms.....	13
2.7 Acronyms and Terminology .....	14
<b>3 SESAR Solution Impacts on Architecture .....</b>	<b>17</b>
3.1 Target Solution Architecture .....	17
<b>3.1.1 SESAR Solution Overview.....</b>	<b>17</b>
3.1.1.1 Deviations with respect to the SESAR Solution(s) definition .....	21
3.1.1.2 Relevant Use Cases .....	22
3.1.1.3 Applicable standards and regulations .....	26
<b>3.1.2 Capability Configurations required for the SESAR Solution .....</b>	<b>26</b>
3.2 Changes imposed by the SESAR Solution on the baseline Architecture .....	27
<b>4 Technical Specifications.....</b>	<b>30</b>
4.1 Functional architecture overview .....	30
<b>4.1.1 Resource Connectivity view (NSV-1).....</b>	<b>32</b>
4.1.1.1 Resource Infrastructure view (NSV-2) .....	33
4.1.1.2 Resource Orchestration view (NSV-4s) .....	34
4.1.1.2.1 [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an inbound flight (AGL) .....	35
4.1.1.2.2 [NSV-4] [GUID-01b] Plan and Provide Taxi-out Guidance for an Outbound Flight (AGL).....	38
4.1.1.2.3 [NSV-4] [GUID-02] Guidance of Vehicles (AGL) .....	42
4.1.1.2.4 [NSV-4] [CMAC-03] No FtG Alert .....	45
<b>4.1.2 Resource Composition .....</b>	<b>1</b>
<b>4.1.3 Service view .....</b>	<b>1</b>
4.2 Functional and non-Functional Requirements.....	1
<b>4.2.1 General AGL requirements (AGLG).....</b>	<b>1</b>
<b>4.2.2 Requirements for segments and single TCL lamp control (AGLS).....</b>	<b>6</b>

<b>4.2.3</b>	<b><i>Requirements for Conflicts, Prioritization and Control of Mobiles (AGLC).....</i></b>	<b><i>13</i></b>
<b>4.2.4</b>	<b><i>Requirements for Stop Bar Control (STBC).....</i></b>	<b><i>20</i></b>
<b>4.2.5</b>	<b><i>Safety AGL Requirements (SAFE).....</i></b>	<b><i>29</i></b>
<b>4.2.6</b>	<b><i>Interoperability AGL Requirements (INTEROP).....</i></b>	<b><i>36</i></b>
<b>4.2.7</b>	<b><i>Security Requirements (SEC1) .....</i></b>	<b><i>41</i></b>
<b>4.2.8</b>	<b><i>Performance Requirements (PERF) .....</i></b>	<b><i>43</i></b>
<b>5</b>	<b><i>Recommendation for Implementation.....</i></b>	<b><i>49</i></b>
<b>6</b>	<b><i>Assumptions .....</i></b>	<b><i>50</i></b>
<b>7</b>	<b><i>References and Applicable Documents .....</i></b>	<b><i>51</i></b>
<b>7.1</b>	<b><i>Applicable Documents .....</i></b>	<b><i>51</i></b>
<b>7.2</b>	<b><i>Reference Documents.....</i></b>	<b><i>52</i></b>
<b>Appendix A</b>	<b><i>Service Description Document (SDD).....</i></b>	<b><i>54</i></b>

## List of Tables

Table 1.	EATMA elements used in the Architecture and Modelling activities for PJ.02-W2-21.4 .....	9
Table 2.	PJ.02-W2-21.4 OIs and System Enablers .....	11
Table 3:	Glossary .....	14
Table 4:	Acronyms and terminology .....	16
Table 5:	SESAR Solution PJ.02-W2-21.4 Scope and related Functional Blocks/roles & System Enablers .....	19
Table 6.	PJ.02-W2-21.4 Solution Overview - Open Change Requests.....	21
Table 7 :	PJ.02-W2-21.4 Solution Overview - Relevant Use Cases and its corresponding NSV-4 diagrams .....	22
Table 8.	PJ.02-W2-21.4 Solution Overview - System Process .....	25
Table 9.	List of Capability Configuration required for the SESAR Solution PJ.02-W2-21.4 .....	27
Table 10.	List of changes due to the SESAR Solution PJ.02-W2-21.4.....	29
Table 11.	Functional Blocks introduced by PJ.02-W2-21.4 .....	31
Table 12.	List of PJ.02-W2-21.4 [NSV-4] [GUID-01a] Functions .....	37
Table 13.	List of PJ.02-W2-21.4 [NSV-4] [GUID-01b] Functions .....	41
Table 14.	List of PJ.02-W2-21.4 [NSV-4] [GUID-02] Functions .....	44

Table 15. [NSV-4][CMAC-03] No FtG Alert Functions.....	46
--	----

## List of Figures

Figure 1: Functional Blocks included in the Aerodrome ATC system impacted by PJ.02.W2-21.4.....	18
<b>Figure 2: Surface Guidance and Routing Management context diagram.....</b>	<b>32</b>
Figure 3. Resource Connectivity model NSV-1 for PJ.02-W2-21.4.....	33
Figure 4. Resource Infrastructure model NSV-2 for PJ.02-W2-21.4.....	34
Figure 5. [NSV-4] [GUID-01a]Plan and Provide Taxi-in Guidance for an inbound flight (AGL).....	35
Figure 6: [NSV-4] GUID-01b Plan and provide taxi-out routing for an outbound flight (AGL).....	38
Figure 7. [NSV-4] [GUID-02] Guidance of Vehicles (AGL) .....	42
Figure 8. [NSV-4] [CMAC-03] No FtG/ No FtG Alert (in coordination with PJ.02-W2-21.1) .....	45
Figure 9. Aerodrome ATC (PJ.02-W2-21-4) Technical System Artifact Assembly diagram .....	1

# 1 Executive summary

---

This document lists and details the Technical System Requirements (functional and non-functional) that shall guide the development and implementation of prototypes involved in PJ.02-W2-21.4 Validation exercises. This document also addresses Interface Requirements.

It is based on the work developed within SESAR2020 Wave 1 project PJ.03a-01: Enhanced Guidance Assistance to Aircraft and Vehicles on the Airport Surface Combined with Routing.

The content for the solution is in line with the SPR-INTEROP/OSED produced within PJ.02-W2-21.4 framework. The set of functional and non-functional requirements are addressing the following OI and its corresponding Enablers, which are detailed in the document:

- **PJ.02-W2-21.4** — Full Guidance Assistance to mobiles using 'Follow the Greens' procedures based on Airfield Ground Lighting (aprons/taxiways/runways) (AO-0222-B)

The requirements included in this document address the functional description and the necessary logical interfaces with other functional blocks. The functional blocks with relevant impact in these Solutions included in the “Aerodrome ATC” system are:

- “Controller Human Machine Interaction Management Aerodrome ATC”: This Functional Block provides controllers with a graphical user interface and with the means to interact with the Aerodrome ATC system.
- “Surface Routing”: This functional block aims to select the most appropriate taxi plan for each departing/arriving flight based on the aerodrome flight information, current operational airport resources conditions (i.e. availability and restrictions for surface traffic on runways, taxiways and aircraft stands) and potential interactions with other mobiles. It corresponds to the A-SMGCS Routing service as defined in EUROCONTROL's A-SMGCS Specification [30].
- “Surface Guidance Management”: This functional block provides automatic dynamic ground signs switching and on-board guidance to aircraft, in addition to the current provision of guidance service to aircraft and other vehicles on the apron and the manoeuvring area using visual aids and including lighting systems. It corresponds to the A-SMGCS Guidance service.
- “Surface Control”: This Functional Block is responsible for providing conflict detection and resolution/control for mobiles being guided by AGL on the surface of the airport. Conflicting situations between aircraft are automatically detected, and the guidance of one of them is controlled so that the conflicting situation is prevented.

Control is provided by restricting guidance or temporarily ceasing guidance by AGL, as an instruction to stop until instructed (through guidance by AGL) to taxi again.

- “Conformance Monitoring”: This functional block is responsible for monitoring and detecting deviations of an aircraft from its taxi plan (including taxi route, parking-bay, runway, and clearance requested and approved as Push-Back, Taxi, Line-Up, Crossing Runway, Take-Off, Landing) and/or from planning times. This function checks the actual aircraft position against the predicted trajectory. In case of detected deviation this function triggers warning



distribution in order to alert concerned controllers. This function also perform the detection of non-conformance to ATC instructions and/or procedures.

Regarding the “Airport Vehicle” Technical System, a Functional Blocks has been created for the Solution addressing this system.

- Voice: This Functional Block provides the functionalities to manage the communication via voice for the Airport Vehicle.

The Architecture of the main EATMA elements (Capability Configurations, Roles, Technical Systems and Functional Blocks) is summarized in the following table:

Capability Configuration	Role	Technical System	Functional Block
TWR	Tower Clearance Delivery Controller Tower Ground Controller Tower Runway Controller	Aerodrome ATC	CHMIM Aerodrome ATC
			Conformance Monitoring
			Surface Routing
			Surface Guidance Management
			Surface Control
			A/G Voice Communication
Airport	Vehicle Driver	Airport Vehicle	Voice
Civil Aircraft	Flight Crew	Aircraft	N/A

**Table 1. EATMA elements used in the Architecture and Modelling activities for PJ.02-W2-21.4**

In SESAR2020 the intention is to ensure consistency and coherency between the delivered documents using EATMA, and the architectural diagrams showed in this document are present in EATMA.

## 2 Introduction

---

### 2.1 Purpose of the document

The objective of the implementation of the TS/IRS document is to complete the V3 SESAR Solution data-pack in order to increase the SESAR Solution maturity level. The different deliverables as per type of project are divided in three groups: ATM Solution Projects, Enabling Projects and VLD's, being this TS document part of the ATM Solution Projects group [29].

This TS/IRS document provides the requirements specification for the following Solution:

- PJ.02-W2-21.4 addressing Full Guidance Assistance to mobiles using 'Follow the Greens' procedures based on Airfield Ground Lighting (aprons/taxiways/runways)

The document covers the functional, non-functional and interface requirements related to the aforementioned SESAR Solution. This document focuses on specifying the functional description and the logical interfaces between the different functional blocks impacted by the Solution.<sup>1</sup>

The aim is not to answer *how* the Full Guidance Assistance to mobiles procedure is implemented, but to describe on a general level the functionality such solution must provide in order to fulfil the operational methods and scenarios described in the corresponding OSED.

The Technical Specification includes the Functional Blocks impacted by the Solution, as well as the functional breakdown of the system, in order to understand how the systems that play a key role in the EATMA Architecture and modelling are structured.

### 2.2 Scope

This Technical Specification (TS/IRS) covers functional, non-functional and interface requirements related to the SESAR Solution PJ.02-W2-21.4 aiming for V3 maturity.

The listed requirements shall satisfy the operational requirements listed in the SPR-INTEROP/OSED document for the concerned Solution [29].

The Validation preparation activities give early advice to drive correctly the technical specifications. Besides, TS/IRS requirements are updated based on consolidation of technical feedback from the validation activities performed within the PJ.02-W2.21.4 framework.

The TS/IRS covers the aspects related to the following Enablers (the description for each Enabler is presented in the following sections of the document):

---

<sup>1</sup> The opinions expressed herein reflect the author's view only. Under no circumstances shall the SESAR3 Joint Undertaking be responsible for any use that may be made of the information contained herein.

SESAR Solution	OI Step code	OI Step title	Enabler	Required / Optional	V3 coverage
PJ.02-W2-21.4	AO-0222-B	Full Guidance Assistance to mobiles using 'Follow the Greens' procedures based on Airfield Ground Lighting (aprons/taxiways/runways)	AERODROME-ATC-61b	Required	Fully
			AERODROME-ATC-07c	Optional	Fully

Table 2. PJ.02-W2-21.4 OIs and System Enablers

This TS/IRS document considers the outcomes of the following SESAR2020 validation exercise:

- EXE-02-W2-21.4-V3-005 – INDRA/HUNGAROCNTR0L (AO-0222-B)

## 2.3 Intended readership

This document is intended for various stakeholders;

### Internal to SESAR 2020

- Project PJ02 - Increased Runway and Airport Throughput – consistency with PJ.02-W2 solutions (PJ.02-W2-17, PJ.02-W2-21), alignment with ATM Master Plan managed by PJ.02-W2 PCIT.
- Solution PJ.02-W2-21.1 – Enhanced Airport Safety Nets for Controllers at A-SMGCS Airports – common interest for guidance related No FtG alert.
- Solution PJ.02-W2-21.3 – Digital surface management for airport vehicles.
- Solution PJ.02-W2-21.5 – Enhanced Safety in LVP through use of Dynamic Virtual Block Control – shared responsibility for enhanced guidance of vehicles.
- Solution PJ.02-W2-21.6 – Advanced Automated Assistance to Controller for Surface Movement Planning and Routing.
- SESAR 2020 Transversal Projects:
  - PJ19 (Content Integration) responsible for managing the content integration process to ensure the needed coherency (in terms of operational concept, architecture) between the different SESAR 2020 projects.
  - PJ20 (Master Plan Maintenance) responsible for ATM Master Plan maintenance.

### External to SESAR Programme

- EUROCAE Working Group WG41.
- Post SESAR 2020 Wave 2 - Future audience involved in industrialisation (V4) and deployment activities (V5).

## 2.4 Background

This section provides information on previous activities relevant for SESAR Solutions PJ.02-W2-21.4, including the work performed both internal and external to SESAR 1 Programme and SESAR2020 Programme Wave 1.

The basis for Solutions PJ.02-W2-21.4, and from which this document has been written consists of:

### Internal to SESAR 1

- OFA 04.02.01 – Integrated Surface Management (SESAR1)

In addition, the work performed during SESAR2020 Wave 1, as a continuation of the abovementioned SESAR 1 work.

### Internal to SESAR2020

- PJ.03a-01 - Enhanced Guidance Assistance to Aircraft and Vehicles on the Airport Surface Combined with Routing in Wave 1 (SESAR2020)

The execution of Release 5 activities in the framework of SESAR1 and the consequent analysis allowed outlining the main conclusions and recommendations concerning the definition of A-SMGCS Routing and Guidance services. Those outcomes were considered as basis for the development of Solution PJ03a-01 as they represented the final consolidation of all the results achieved during SESAR 1 lifecycle in the context of OFA04.02.01.

Regarding the inputs coming from external activities, it is important to mention the activities conducted by:

### External to SESAR Programme

- EUROCAE WG 41 (Surface Movement Guidance and Control System) development of A-SMGCS Minimum Aviation System Performance Specification (MASPS) for A-SMGCS including Airport Safety Support Service Routing Service and Guidance Service EUROCAE ED-87E, [31],.
- EUROCONTROL A-SMGCS task force, in collaboration with EUROCAE WG 41, as result of the revision of the A-SMGCS Implementation Package, producing Specification for the A-SMGCS services [30].

Thus, PJ.02-W2-21. 4 Solution will continue the work done by PJ.03a-01 during SESAR2020 Wave 1, taking the content developed, conclusions and recommendations as a basis for Wave 2 activities.

## 2.5 Structure of the document

The document is organised as described hereafter:

- **Section 1** gives an executive summary of this Technical Specification document
- **Section 2** gives an introduction to the document
- **Section 3** describes the Functional Blocks included in the Solution as well as the Capability Configurations and the changes from the architecture in EATMA.
- **Section 4** describes the Functional Architecture and the Functions needed to realise the Solution and provides a functional view of how the technical systems, functional blocks,

system ports and roles participate in realising the operational needs. It contains the technical Requirements.

- **Section 5** lists the recommendations for implementations
- **Section 6** explains the assumptions for the technical feasibility of the solution
- **Section 7** lists the Applicable documents and the references
- **Appendix A** – Service Description Document (SDD)
- **Appendix B** – Service Technical Design Document (STDD)

## 2.6 Glossary of terms

Term	Definition	Source of the definition
Advanced Surface Movement Guidance and Control System (A-SMGCS)	A system providing as a minimum Surveillance and can include Airport Safety Support, Routing and Guidance to aircraft and vehicles in order to maintain the airport throughput under all local weather conditions whilst maintaining the required level of safety.	EUROCONTROL-SPEC-171 for A-SMGCS Services [30]
Conflict (abstract)	A situation where there is a risk for collision between aircraft and/or vehicles.	ICAO Doc 9830 (Advanced Surface Movement Guidance and Control Systems (A-SMGCS) Manual) [40]
Air traffic control clearance	<p>Authorization for an aircraft to proceed under conditions specified by an air traffic control unit.</p> <p><i>Note 1. — For convenience, the term “air traffic control clearance” is frequently abbreviated to “clearance” when used in appropriate contexts.</i></p> <p><i>Note 2. — The abbreviated term “clearance” may be prefixed by the words “taxi”, “take-off”, “departure”, “en-route”, “approach” or “landing” to indicate the particular portion of flight to which the air traffic control clearance relates.</i></p>	ICAO Doc 4444 – PANS ATM [36]
Air traffic control instruction.	Directives issued by air traffic control for the purpose of requiring a pilot to take a specific action.	ICAO Doc 4444 – PANS ATM [36]

Term	Definition	Source of the definition
ECI	Electronic Clearance Input. Throughout this document the term ECI is used generically as the means to digitally input the clearances into the ATC System.	As used per Solution PJ.02-W2-21.4
Mobile	A mobile is either an aircraft, aircraft being towed or a vehicle.  Note: when referring to an aircraft or a vehicle, and not another obstacle, the term “Mobile” is preferred to “Target”. The term “Target” is only used when considering an image of a mobile or other obstacle displayed on a surveillance screen.	EUROCONTROL-SPEC-171 for A-SMGCS Services [30]
Restricted Area	An area on an aerodrome where the presence of a mobile is permanently or temporarily forbidden.	EUROCONTROL-SPEC-171 for A-SMGCS Services [30]
Runway	A defined rectangular area on a land aerodrome prepared for the landing and task-off of aircraft.	ICAO Doc 4444 [36]

Table 3: Glossary

## 2.7 Acronyms and Terminology

Term	Definition
A-CDM	Airport Collaborative Decision Making
A-CWP	Advanced Controller Working Position
A/C	Aircraft
ADD	Architecture Description Document
AGL	Airfield Ground Lighting
AMAN	Arrival Manager
ANS	Air Navigation Service
ANSP	Air Navigation Service Provider
AO	Airport Operator
APT	Airport

<b>A-SMGCS</b>	Advanced Surface Movement Guidance and Control System
<b>ATC</b>	Air Traffic Control
<b>ATCO</b>	Air Traffic Controller
<b>ATM</b>	Air Traffic Management
<b>ATS</b>	Air Traffic Services
<b>ATSU</b>	Air Traffic Services Units
<b>AU</b>	Airspace User
<b>CATC</b>	Conflicting ATC Clearances
<b>CMAC</b>	Conformance Monitoring Alert for Controllers
<b>CC</b>	Capability Configuration
<b>CHMIM</b>	Controller Human Machine Interaction Management
<b>CMAC</b>	Conformance Monitoring Alerts for Controllers
<b>CPDLC</b>	Controller Pilot Data Link Communication
<b>CR</b>	Change Request
<b>CWP</b>	Controller Working Positions
<b>DMAN</b>	Departure Manager
<b>DS</b>	Dataset
<b>EASA</b>	European Aviation Safety Agency
<b>EATMA</b>	European ATM Architecture
<b>E-ATMS</b>	European Air Traffic Management System
<b>ECI</b>	Electronic Controller Input
<b>EIBT</b>	Estimated In-Block Time
<b>FB</b>	Functional Block
<b>FtG</b>	Follow the Greens
<b>HMI</b>	Human Machine Interface
<b>ICAO</b>	International Civil Aviation Organization
<b>INTEROP</b>	Interoperability Requirements
<b>IRS</b>	Interface Requirements Specification
<b>ISRM</b>	Information Services Reference Model
<b>LVC</b>	Low Visibility Conditions
<b>LVP</b>	Low Visibility Procedures

<b>MASPS</b>	Minimum Aviation System Performance Standard
<b>N/A</b>	Not Applicable
<b>NAF</b>	NATO Architecture Framework
<b>NSOV</b>	NAF Service Oriented View
<b>NOV</b>	NAF Operational View
<b>NSV</b>	NAF System View
<b>OFA</b>	Operational Focus Area
<b>OSED</b>	Operational Service and Environment Definition
<b>PANS</b>	Procedures for Air Navigation Services
<b>PJ</b>	Project
<b>SDD</b>	Service Description Document
<b>SESAR</b>	Single European Sky ATM Research Programme
<b>SJU</b>	SESAR Joint Undertaking
<b>SPR</b>	Safety and Performance Requirements
<b>SRS</b>	Surface Routing Server
<b>SWIM</b>	System Wide Information Model
<b>TCL</b>	Taxiway Centreline Lights
<b>TLDT</b>	Target Landing Time
<b>TS</b>	Technical Specification
<b>TSAT</b>	Target Start-up Approval Time
<b>TVALP</b>	Technical Validation Plan
<b>TVALR</b>	Technical Validation Report
<b>TWR</b>	Tower
<b>VALP</b>	Validation Plan
<b>VALR</b>	Validation Report
<b>VLD</b>	Very Large Demonstration
<b>VSP</b>	Variable System Parameter

Table 4: Acronyms and terminology



## 3 SESAR Solution Impacts on Architecture

---

### 3.1 Target Solution Architecture

The tables presented in this section are extracted from MEGA modelling activities that were conducted for the concepts addressed by this Solution. The following OI is covered:

- AO-0222-B – Full Guidance Assistance to mobiles using 'Follow the Greens' procedures based on Airfield Ground Lighting (aprons/taxiways/runways)

#### 3.1.1 SESAR Solution Overview

##### **Full Guidance Assistance to mobiles using 'Follow the Greens' procedures based on Airfield Ground Lighting (aprons/taxiways/runways)**

---

This solution intends to automate the prioritization of mobiles along their cleared route on the whole movement area. The Guidance Service takes into account other traffic to guide the mobile as it progresses along its assigned route and at the holding points. It allocates priorities between mobiles based on local operating rules (e.g. runway exit versus parallel taxiways, aircraft versus vehicle, aircraft converging or crossing at intersections and taxiways passing close to push back routes or other taxiways where insufficient wingtip separation exists) as well as known constraints from the surface management system. Automatic Guidance will be provided using "Follow the Green" concept on the Airfield Ground Lighting infrastructure.

PJ.02-W2-21.4 Solution extends the functionality of some of the Functional Blocks included in the Aerodrome ATC system that were developed previously in the SESAR1 OFA04.02.01 project and SESAR2020 PJ.03a-01.

The Aerodrome ATC system provides a set of functionalities split in different Functional Blocks. The functionalities related with this Solution are guidance and infrastructure management (lighting).

The image below shows all the Functional Blocks included in the Aerodrome ATC system. The Functional Blocks related to this Solution are highlighted in blue and they are further described in the following sections.

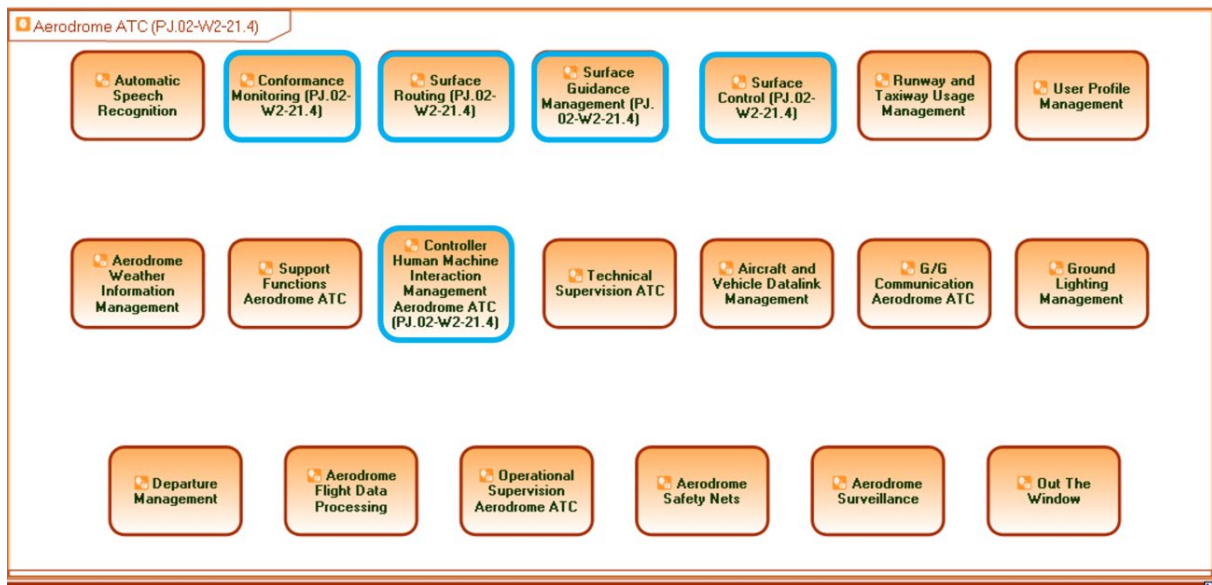


Figure 1: Functional Blocks included in the Aerodrome ATC system impacted by PJ.02.W2-21.4

These Functional Blocks are the ones impacted by the mandatory Enablers of this Solution, as presented in the figure below.

The following table and figure details the ID, description and coverage of the Enablers, the related Functional Blocks and the Roles involved in this Solution according to the EATMA DS23. Some enablers that are not linked to any Functional Block in EATMA were filled following PJ.02-W2-21.4 project's view.

SESAR Solution ID and Title	Functional Blocks/Role impacted by the SESAR Solution (from EATMA)	Enabler (from EATMA)	ID (from EATMA)	Enabler Title (from EATMA)	Enabler coverage	Required / Optional
PJ.02-W2-21.4 - Full Guidance Assistance to mobiles using 'Follow the Greens' procedures based on Airfield Ground Lighting (aprons/taxiways/runways)	Surface Guidance Management	AERODROME-ATC-61b		Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the route issued by ATC	Fully	Required
	Surface Control					

Controller Human Machine Interaction Management Aerodrome ATC					
Controller Human Machine Interaction Management Aerodrome ATC	AERODROME- ATC-07c	A-SMGCS incorporating the function that provides No FtG CMAC Alert for Controllers	Fully	Optional	
Conformance Monitoring					

**Table 5: SESAR Solution PJ.02-W2-21.4 Scope and related Functional Blocks/roles & System Enablers**

The roles directly impacted by this Solution are the Tower Controller (Tower Clearance Delivery, Tower Ground Controller, Tower Runway Controller and Apron Manager), Flight Crew and Vehicle Driver.

- Tower Controller:** The Tower Ground and Tower Runway Controllers are responsible for monitoring that all movements on the manoeuvring area comply with the clearances issued. In case an aircraft deviates from the route indicated by the AGL, the Tower Controller has to inform the Flight Crew immediately by R/T communication as an additional safety net accompanying the reaction of the guidance network. Related information may also be provided to the other mobiles involved, if applicable. Depending on the automation of prioritisations at crossing or converging taxiway, the Tower Controller will have to enter, accept, or monitor guidance instructions with the ultimate possibility to intervene whenever needed. In case of AGL service degradation, the Tower Controller is responsible for taking appropriate action. More specifically:
  - Tower Ground Controller is responsible for the provision of ATS to aircraft and vehicles on the manoeuvring area. Ground Controller will issue a taxi clearance to “Follow the Greens” and monitor that the mobile conform to the guidance information provided by the AGL. Besides Tower Ground Controller can also issue regular taxi clearances to aircraft and instructions to vehicles.
  - Tower Runway Controller is responsible for provision of ATS to aircraft in the runway and airspace within the designated area of responsibility of the control tower. Tower

Runway Controller will also clear departing aircraft at holding point to line-up (or directly to take-off, or a conditional clearance), where the input of the clearance will control both stop bars and TCL for the entry to the runway. For arrivals, Tower will clear the aircraft to vacate the runway, and may issue the further taxi clearance, but this is most probably done by Tower Ground Controller.

- **Flight Crew:** Flight crews are responsible to follow the cleared taxi route indicated by the AGL, and any instructions (stop or move slowly) indicated by the AGL. Flight crews are also responsible to report if not able to comply with a clearance or instruction, and make request if any clearance or instruction is undesired
- **Vehicle Driver:** The vehicle driver is responsible to follow the guidance information provided via AGL. They are also responsible for indicating any inability to act according to received AGL instructions.

The following table presents the Opened Change Requests (if any) raised for the OI Steps and Enablers within the Solution.

OI Step	OI description	Opened CR
AO-0222-B	Full Guidance Assistance to mobiles using 'Follow the Greens' procedures based on Airfield Ground Lighting (aprons/taxiways/runways)	CR 05573 Update AO-0222-B links to EATMA  CR 06690 Unlink AERODROME-ATC-07b and link AERODROME-ATC-07c to AO-0222-B
EN Code	EN description	Open CR
AERODROME-ATC-61b	Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the route issued by ATC	CR 05582 Update AERODROME-ATC-61b links to EATMA  CR 07076 Addition of STD-105 as an enabling Enabler
AERODROME-ATC-07b	A-SMGCS incorporating the function that provides an advanced set of Conformance Monitoring Alerts for Controllers (CMAC) on the movement area	CR 05578 Update AERODROME-ATC-07b links to EATMA  CR 06691 Unlink AERODROME-ATC-07b from AO-0222-B

AERODROME-ATC-07c	A-SMGCS incorporating the function that provides No FtG CMAC Alert for Controllers	<p>CR 06690 Create AERODROME-ATC-07c and Update links to EATMA</p> <p>CR 06691 Link AERODROME-ATC-07c to AO-0222-B</p> <p>CR 07002 for setting AERODROME-ATC-07c as Optional/Developed for AO-0222-B (it was previously set as Required by mistake)</p>
-------------------	--	---

Table 6. PJ.02-W2-21.4 Solution Overview - Open Change Requests

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

AERODROME-ATC-07b (A-SMGCS incorporating the function that provides an advanced set of Conformance Monitoring Alerts for Controllers (CMAC) on the movement area) was at a first stage linked to AO-0222-B as 'Used'. This Enabler was shared between PJ.02-W2 Solution 21.1 and 21.4, but at a later stage it was decided that a new Enabler should be created as an extension of AERODROME-ATC-07c in order to focus on the 21.4 related aspects.

Therefore, AERODROME-ATC-07b was updated (CR 05578) by removing the reference to the CMAC No FtG (Follow-the-Greens) via CR 05578. A new Enabler, AERODROME-ATC-07c (A-SMGCS incorporating the function that provides No FtG CMAC Alert for Controllers) was created via CR 06690 as an extension of AERODROME-ATC-07b.

Afterwards, AO-0222-B was updated by removing the link to AERODROME-ATC-07b and adding AERODROME-ATC-07c as an Optional/Developed Enabler via CR 06691 (actually, AERODROME-ATC-07c was firstly set as Required by mistake in CR 06691, which was corrected by CR 07002, setting it as Optional/Developed).

Concerning the applicable standards and regulations, there are some actions that have been performed in EATMA for reflecting the findings of the Solution in this aspect, namely:

- CR 06673 - Update of STD-105 (for update of EUROCONTROL-SPEC-171) and subsequent CR 07003 for updating the EUROCONTROL-SPEC-171 publication date to the one corresponding to Edition 2.0 (30<sup>th</sup> April 2020)
- CR 07076 – Add STD-105 as an enabling Enabler for AERODROME-ATC-61b
- CR 06674 - Creation of STD-131 (for update of ICAO Doc 4444 for possible update of phraseology)
- CR 06675 - Creation of REG-0541 (for update of EASA Appendix 1 to AMC1 SERA.14001 General for possible update of phraseology)
- CR 07030 - Deletion of STD-106 (as STD-016 is an advanced version of this STD and is already linked to the proper Enablers)

The reason for these changes are presented more in detail in section 3.1.1.3.

### 3.1.1.2 Relevant Use Cases

All relevant SESAR Solution PJ.02-W2-21.4 Operational Use Cases are described in Section 3.3.2.5 of the PJ.02-W2-21.4 SPR-INTEROP/OSED [28].

OSD Use Case	TS/IRS NSV-4 diagram
Use Case 1: Plan and Provide Taxi-In/Out Routing for an inbound/outbound flight – AGL environment only (no data link)	[NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an inbound flight (AGL)
	[NSV-4] [GUID-01b] Plan and Provide Taxi-out Guidance for an Outbound Flight (AGL)
Use Case 2: Guidance of vehicles – AGL environment (no data link)	[NSV-4] [GUID-02] Guidance of Vehicles (AGL)
Use Case 3: No Taxi Alert / No FtG Alert	[NSV-4][CMAC-03] No FtG Alert

**Table 7 : PJ.02-W2-21.4 Solution Overview - Relevant Use Cases and its corresponding NSV-4 diagrams**

A technical Architecture and its corresponding system models have been developed in order to cover the abovementioned operational Use Cases described in the PJ.02-W2-21.4 SPR-INTEROP/OSED [28]. The technical modelling is included in the dedicated sections of this document (see 4.1).

System Process	Description
[NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an inbound flight (AGL)	<p><b>General Conditions (Scope and Summary)</b></p> <p>This Use Case describes how the planned taxi route will be transmitted to the Flight Crew for an inbound flight and how the Flight Crew will exploit the planned taxi route information. This Use Case also describes the guidance provided for an inbound flight, how the cleared taxi route is presented to the Tower Controller, how the cleared taxi route will be transmitted to the Flight Crew and how the Flight Crew will exploit the taxi route clearance. It will also describe how the AGL are operated in conjunction with the cleared route. This Use Case takes place in the Arrival phase (preparation of the landing activities) of the flight.</p> <p>The airport in this Use Case is equipped with an AMAN, A-CDM and AGL.</p> <p>The tower is equipped with A-SMGCS and ECI.</p> <p><b>Pre-Conditions</b></p> <p>The assigned landing runway, allocated stand and TLDT are known in the ATC system.</p> <p>The Use Case is applicable in all weather conditions.</p>

System Process	Description
	<p><b>Post-Conditions</b> The Flight Crew arrives at the assigned stand.</p> <p><b>Trigger</b> Availability of assigned landing runway, stand and TLDT in the ATC system.</p>
[NSV-4] [GUID-01b] Plan and Provide Taxi-out Guidance for an Outbound Flight (AGL)	<p><b>General Assumption</b> This Use Case assumes that push-back and start-up clearances are provided by the same Tower Controller and in this order. However, local procedures may affect this as both clearances can be provided simultaneously, or starting up the aircraft engines during push back may be prohibited, leading to clearances being provided in the reverse order. Also, different Tower Controllers may be in charge of start-up and push-back clearances.</p> <p><b>General Conditions (Scope and Summary)</b> This Use Case describes how the calculated planned taxi-out route is presented to the Tower Controller for an outbound flight. It then describes the guidance provided to the flight, how the cleared taxi route is presented to the Tower Controller, how the cleared taxi route will be transmitted to the Flight Crew and how the Flight Crew will exploit the taxi route clearance. It also describes how the AGL are operated in conjunction with the cleared route. This Use Case takes place in the Short-Term planning phase, and more specifically near the end of the Turn-Round Process. The airport in this Use Case is equipped with a DMAN, A-CDM and AGL. When there is an operational need for de-icing, the airport in this Use Case is also equipped with a De-icing Manager. The tower is equipped with A-SMGCS and ECI.</p> <p><b>Pre-Conditions</b> The Stand, Assigned Departure Runway and TSAT for the flight are known in the ATC system. When de-icing conditions prevail, the requirement for de-icing (i.e. no de-icing, de-icing at stand, de-icing after push back or remote de-icing), the allocated de-icing area (for remote de-icing) and the expected de-icing time (in the case de-icing is required) for the flight are known in the ATC system. Note: This information will be obtained from the De-icing Manager. The requirement for de-icing and the allocated de-icing area will be possibly updated by the Tower Controller in the ATC system. The Use Case is applicable in all weather conditions.</p>



System Process	Description
	<p><b>Post-Conditions</b> The aircraft is lined up and ready for departure.</p> <p><b>Trigger</b> Availability of stand, assigned departure runway and TSAT in the ATC system.</p>
[NSV-4] [GUID-02] Guidance of Vehicles (AGL)	<p><b>General Conditions (Scope and Summary)</b> This Use Case describes the guidance provided for a vehicle on the maneuvering area, how the cleared route is presented to the Tower Controller, how the cleared route will be transmitted to the Vehicle Driver and how the driver will exploit the route information. It also describes how the AGL are operated in conjunction with the cleared route. This Use Case takes place in the Medium to Short-Term Planning operational scenario, although vehicles are not strictly speaking concerned with the same phases as an aircraft. The airport in this Use Case is equipped with an A-SMGCS, ECI and AGL. The vehicle is equipped with R/T.</p> <p><b>Pre-Conditions</b> The Use Case is applicable in all weather conditions.</p> <p><b>Post-Conditions</b> The vehicle has reached his destination.</p> <p><b>Trigger</b> Vehicle driver requests a clearance to proceed to his destination</p>
[NSV-4][CMAC-03] No FtG Alert	<p>This View describes the Use Case CMAC-03 No FtG Alert.</p> <p>This alert takes into account the Guidance through AGL (Follow the Greens) (covered by solution PJ.02-W2-21.4) and is triggered if the mobile does not respect the lit TCL and overruns them.</p> <p><b>No FtG Alert trigger conditions –</b></p> <ol style="list-style-type: none"> <li>1. When the aircraft is starting to taxi without an input ATC clearance after its push-back or directly from a stand position where taxi is possible without push back. (Solution #02)</li> <li>2. When a mobile has been given instructions to stop at an intermediate point on the taxi route (e.g. hold short of taxiway bravo) and fails to adhere to the instruction. (Solution #02)</li> <li>3. When a mobile is being guided by the TCL (Follow the Greens) and</li> </ol>



System Process	Description
	<p>overruns the last lit segment of activated TCL. (new in Solution PJ.02-W2-21.4)</p> <p>The following Use Case describes the flow of activities that lead to the trigger of a No FtG CMAC alert when a mobile is being guided by the TCL (Follow the Greens) and overruns the last lit segment of activated TCL.</p> <p><b>General conditions (Scope and summary)</b> This Use Case describes how the Controller deals with a No FtG CMAC alert, which is detected by the ATC system when a mobile is being guided by the TCL (following the greens) and overruns the last lit segment of activated TCL and how it is presented on the Tower Runway Controller's/Tower Ground Controller's/Apron Manager's HMI.</p> <p><b>Pre-Conditions</b> The ATC system is equipped with A-SMGCS surveillance, Routing and a means to input ATC clearances.  The airport is equipped with a guidance function that automatically switches Taxiway Centre Line lights (TCLs) ("Follow the Greens") according to cleared trajectories validated by the Controller and de-conflicted by the AGL guidance function.</p> <p><b>Post Conditions</b>  The No FtG CMAC is resolved and the alert is no longer displayed on the Controller's HMI.</p> <p><b>Actor</b>  Tower Runway Controller/Tower Ground Controller/Apron Manager (collectively referred to as Controller) and Flight Crew</p> <p><b>Trigger</b>  A mobile guided by TCL (Follow the Greens) overruns the last lit segment of activated TCL.</p>

Table 8. PJ.02-W2-21.4 Solution Overview - System Process

### 3.1.1.3 Applicable standards and regulations

This section identifies the list of standards and regulations that are applicable to SESAR Solution PJ.02-W2-21.4.

The Guidance Assistance through Airfield Ground Lighting may require updating ICAO standards for phraseology, which is mainly defined in ICAO Doc 4444 (PANS-ATM) [37]. Doc 4444 12.3.4.7 specifies phraseology for Taxi procedures and it is recommended to add new standard phraseology, where the following is proposed: “TAXI TO HOLDING POINT [number] [RUNWAY (number)] (or STAND [number]) FOLLOW THE GREENS”, associated to a “Condition” of “...where surface movement guidance by airfield ground lighting exist”.

Also, EASA SERA (Standardised European Rules of the Air) (EU regulation 923/2012) [39], specifies taxi phraseology in Appendix 1 to AMC1 SERA.14001 General with ATC PHRASEOLOGIES (1.4.7). Also here it is proposed to add new standard phraseology for taxiing via “Follow the Greens”, in the same way as proposed above for ICAO Doc 4444: “TAXI TO HOLDING POINT [number] [RUNWAY (number)] (or STAND [number]) FOLLOW THE GREENS” associated to a “Circumstance” of “...where surface movement guidance by airfield ground lighting exist”.

Moreover, SERA contains as well an appendix (Appendix 1) for Signals. Using light signals for taxi guidance may need to be described here.

Besides, the solution must be interoperable with other solutions focusing the guidance of aircraft on ground. System level specifications, such as EUROCONTROL SPEC-171 [31], need updating. This specification contains description and requirements for A-SMGCS Guidance Service (by TCL and Stop Bars), and the descriptions and requirements should be updated/detailed based on PJ.02-W2-21.4 developments, captured in the deliverables within the Solution Data Pack.

These standards are needed regardless of other foreseen evolutions that will involve more non-vocal COM (digital, CPDLC) to free the frequencies for urgent matters.

For the purpose of reflecting these needs, a series of 4 Change Requests (CR 06673, CR 06674, CR 06675 and CR 07076) have been raised and endorsed in EATMA in the context of PJ.02-W2-21.4. These Change Requests are further detailed in section 3.1.1.1.

Other standards that should be considered are:

- EUROCAE MASPS for A-SMGCS, Edition ED-87E [32]. (version E was released in April 2022 and this latest version include A-SMGCS Guidance service in its scope)
- ICAO Annex 14 [38]
- Commission Regulation (EU) No 139/2014c [39]

Finally, within the Standards domain, CR 07030 was raised and endorsed in order to delete STD-106 (EUROCAE ED-87D), which was previously linked to AERODROME-ATC-61b and AERODROME-ATC-07c. This has been done due to the fact that STD-016 is an advanced version of this STD and is already linked to the mentioned Enablers. It is to be noted that the coordination with PJ.02-W2-21.1 was ensured, since STD-106 was also linked to AERODROME-ATC-06b and AERODROME-07b (both Required for Solution 21.1), that were facing the same situation.

## 3.1.2 Capability Configurations required for the SESAR Solution

Founding Members



The following table provides a picture of the Capability Configurations required for implementing the SESAR Solution PJ.02-W2-21.4.

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.02-W2-21.4 - Full Guidance Assistance to mobiles using 'Follow the Greens' procedures based on Airfield Ground Lighting (aprons/taxiways/runways)	Civil Aircraft	Airport;	Adverse Condition Operations Provision; Clearance/Instruction Management; Ground Collision Avoidance; Surface Route Management;	Airspace User Operations; Flight Deck;	Civil Scheduled Aviation;
	Communication Infrastructure	Airport;	Communication;		Civil CNS Service Provider;
	TWR (PJ.02-W2-21.4)				Civil ATS Aerodrome Service Provider;
	Airport (PJ.02-W2-21.4)				Civil APT operator ;

Table 9. List of Capability Configuration required for the SESAR Solution PJ.02-W2-21.4

## 3.2 Changes imposed by the SESAR Solution on the baseline Architecture

This section describes which changes are needed compared to the baseline in EATMA in order to deliver the Capabilities improvements (using Technical Systems/Functional Blocks, Functions and Roles). The information in this section is provided by Enablers (system Enablers in the case of PJ.02-W2-21.4).

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

AERODROME-ATC-61b	Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the route issued by ATC	<p>Surface Guidance Management is able to perform the following Functions (documented in CR 05582):</p> <ul style="list-style-type: none"> <li>- Determine Temporary Instruction to not Proceed</li> <li>- Illuminate TCLs for all possible runway exits</li> <li>- Monitor Progress and Conflicts</li> <li>- Switch Off TCL behind of the Mobile Automatically</li> <li>- Switch Off TCLs for Not Used Runway Exits</li> <li>- Switch On TCL in front of the Mobile Automatically</li> <li>- Switch On/Off TCL in front of the Mobile</li> <li>- Turn On Stop Bar</li> <li>- Turn Off Stop Bar</li> <li>- Turn On AGL Showing Taxi Route onto the Runway</li> <li>- Turn On TCL Associated to the Cleared Route</li> <li>- Turn On TCL Associated to the Cleared Taxi Route</li> </ul> <p>Controller Human Machine Interaction Management Aerodrome ATC is able to perform the following Function:</p> <ul style="list-style-type: none"> <li>- Display TCL Status</li> <li>- Indicate Temporary New Limit</li> </ul>
-------------------	---	--

AERODROME-ATC-07c	A-SMGCS incorporating the function that provides No FtG CMAc Alert for Controllers	<p>The following improvements have been introduced (documented in CR 06690).</p> <p>Conformance Monitoring is able to perform the following Functions:</p> <ul style="list-style-type: none"> <li>- Monitor Clearance Conformance</li> <li>- Monitor Adherence to Taxi Clearance</li> <li>- Deactivate No FtG Alert</li> </ul> <p>Controller Human Machine Interaction Management Aerodrome ATC is able to perform the following Function:</p> <ul style="list-style-type: none"> <li>- Raise No FtG Alert</li> <li>- Remove No FtG Alert</li> </ul>
-------------------	--	--

**Table 10. List of changes due to the SESAR Solution PJ.02-W2-21.4**

## 4 Technical Specifications

### 4.1 Functional architecture overview

Solution PJ.02-W2-21.4 impacts the EATMA Dataset 23 Architecture, by improving the following existing Functional Blocks (by duplicating them and creating new Functions for them):

Technical System	Functional Block	Description
Aerodrome ATC	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)	<p>This functional block provides controllers with a graphical user interface and with the means to interact with the Aerodrome ATC system. The CHMIM Functional Block collects and integrates different Human Machine Interfaces developed for the different airport systems into just one homogenous set of configurable and customizable Tower Human Machine Interfaces.</p> <p>This duplication intends to provide the CHMI with functionalities to deal with the provision of routes to mobiles via AGL, such as displaying the illuminated lights.</p>
	Surface Guidance Management (PJ.02-W2-21.4)	<p>This functional block provides automatic dynamic ground signs switching and on-board guidance to aircraft, in addition to the current provision of guidance service to aircraft and other vehicles on the apron and the manoeuvre ring area using visual aids and including lighting systems.</p>
	Surface Control (PJ.02-W2-21.4)	<p>This Functional Block is responsible for providing conflict detection and resolution/control for mobiles being guided by AGL on the surface of the airport. Conflicting situations between aircraft are automatically detected, and the guidance of one of them is controlled so that the conflicting situation is prevented.</p> <p>Control is provided by temporarily ceasing guidance by AGL, as an instruction to stop until instructed (through guidance by AGL) to taxi again.</p>
	Surface Routing (PJ.02-W2-21.4)	<p>This functional block aims to select the most operationally relevant taxi route for each departing/arriving flight and vehicles under ATC on the basis of the aerodrome flight information, current operational airport resources conditions (i.e. availability and restrictions for surface traffic on runways, taxiways and aircraft stands) and potential interactions with other mobiles.</p>
	Conformance Monitoring (PJ.02-W2-21.4)	<p>This functional block is responsible for monitoring and detecting deviations of an aircraft from its taxi plan (including taxi route, parking-bay, runway, and clearance requested and approved as</p>

Technical System	Functional Block	Description
		<p>Push-Back, Taxi, Line-Up, Crossing Runway, Take-Off, Landing) and/or from planning times. This function checks the actual aircraft position against the predicted trajectory. In case of detected deviation this function triggers warning distribution in order to alert concerned controllers. This function also perform the detection of conflicting ATC clearances (CATC) and the detection of non-conformance to ATC instructions and/or procedures.</p> <p>In addition, this Functional Block detects an overrun of the lit segment of TCL by a mobile when it is being guided by means of AGL, which triggers a CMAC No FtG Alert in the system.</p>

**Table 11. Functional Blocks introduced by PJ.02-W2-21.4**

New Functions are defined for the abovementioned Functional Blocks (which are part of the Aerodrome ATC Technical System), in order to improve them so that the Solution concept can be implemented.

The Guidance through AGL Service provides the guidance information by automatically switching the following visual aids:

- **Taxiway Centreline Lights (TCL):** they consist of light segments where the number of lights per segment is locally configurable. The TCL are illuminated to a specific distance ahead of the mobile in question, switching the lights on and off automatically, showing the cleared route and the priorities provided by the Controller. This operation is called Follow the Greens (FtG).
- **Stop Bars:** they consist in a single light or a group of lights creating a short segment that can be activated or deactivated together. Their functionality is to indicate where the aircraft is required to stop.

The information displayed in the Controller HMI needs to provide:

- Status of AGL (lights on/off, maintenance, failure or unknown): the representation of the lights need to be clear in order to avoid any misunderstanding to the Controller.
- Means to prioritize one mobile over another: the Controllers need to have an indicator when two or more mobiles are converging and a mobile's TCL are being restricted in order to give way to the other mobile. Any priority change done by the Controller need to be executed easily and rapidly in the Controller HMI.
- TCL and Stop Bars maps.

The guidance via TCL is purely a ground-based service which works in conjunction with the A-SMGCS Surveillance and Routing Services as well as the Electronic Controller Input (ECI) given by the Controller. It is predominantly intended for pilots and drivers, helping them to follow clearances, priorities and instructions given by the controller, and improving flight crew and vehicle drivers' situational awareness to reduce the risk of deviation from their assigned routes and from intruding into restricted areas.

The Guidance Service through AGL is in charge of:

- Management and provision of the Guidance information to controller HMI: makes available to Controllers' CHMIM (CWP) the Guidance Information and manages the Airport data and Guidance information for the Guidance function.
- Management of lights and visual aids.

The following context diagram depicts the functions, inputs and outputs of the Surface Guidance and Routing Management that enable its correct functioning. The diagram belongs to EUROCONTROL SPEC-171 [31].

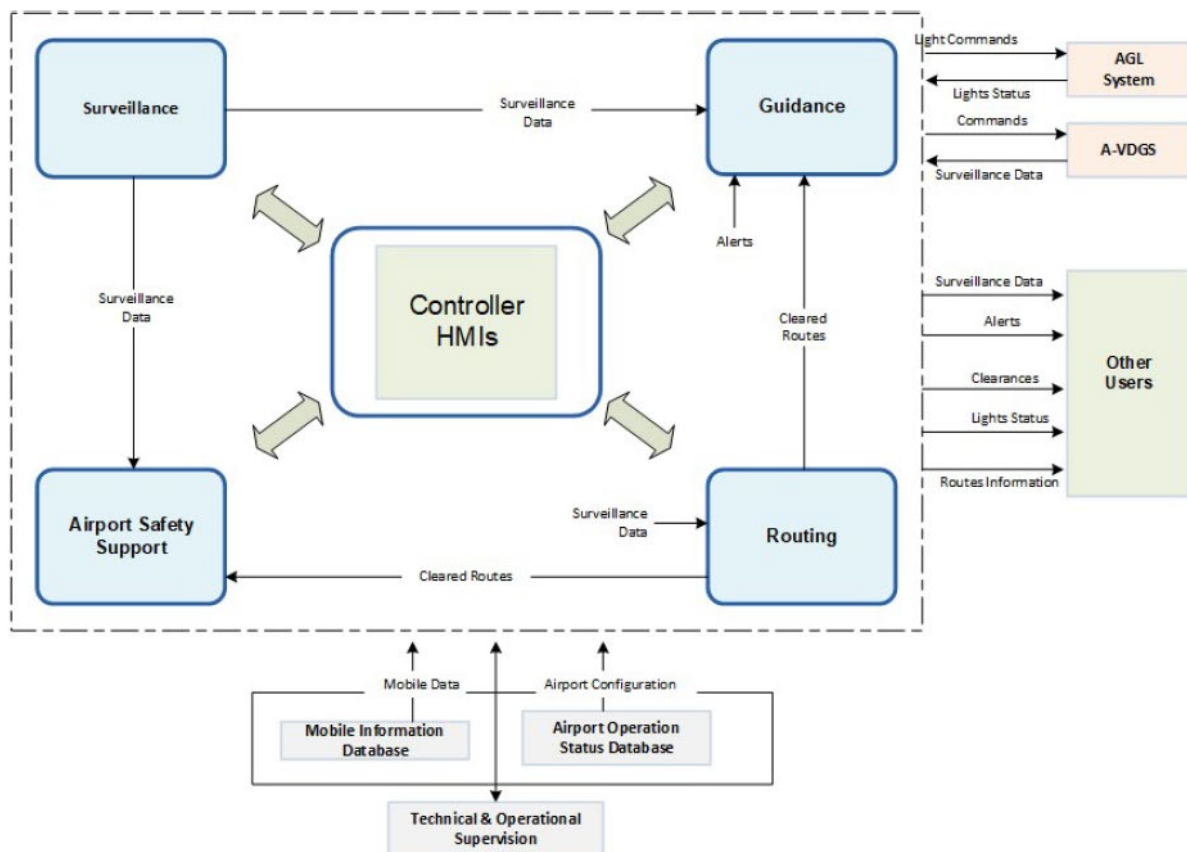


Figure 2: Surface Guidance and Routing Management context diagram

#### 4.1.1 Resource Connectivity view (NSV-1)

The following NSV-1 diagram represents the high-level interactions among the Capability Configurations involved in the Solution PJ.02-W2-21.4, namely the voice exchanges between the Tower Controller and the Civil Aircraft or Airport Vehicle.



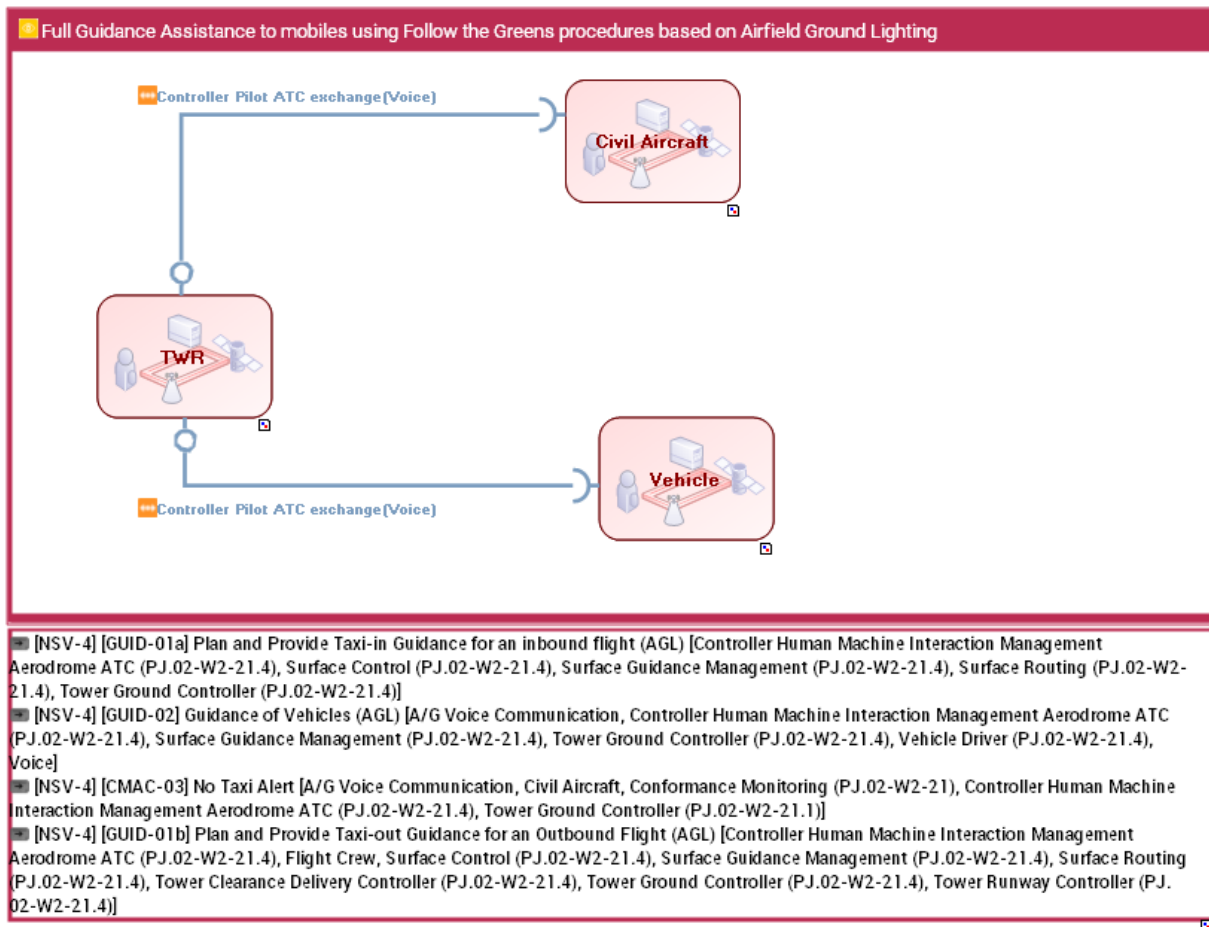


Figure 3. Resource Connectivity model NSV-1 for PJ.02-W2-21.4

#### 4.1.1.1 Resource Infrastructure view (NSV-2)

The following NSV-2 diagram represents the high-level interactions among the Capability Configurations involved in the Solution PJ.02-W2-21.4 at the infrastructure level.

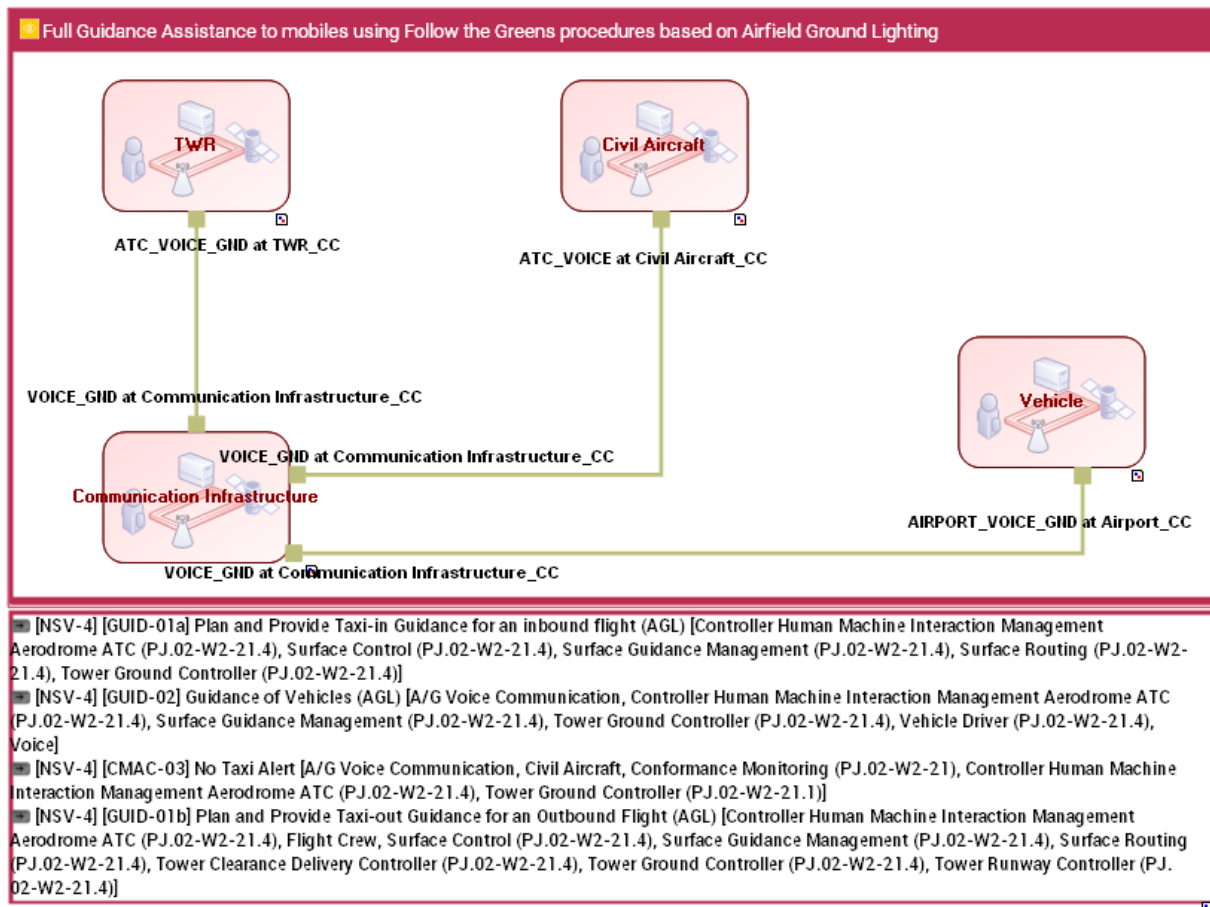


Figure 4. Resource Infrastructure model NSV-2 for PJ.02-W2-21.4

#### 4.1.1.2 Resource Orchestration view (NSV-4s)

The diagrams included in the following sections were modelled in MEGA and show the interactions of the main Functional Blocks involved. For a better visualization of the models refer to the folder located in the route "EATMA Draft / [SESAR Programme 2020] / W2 Solution Architectures / Airport Operations / PJ.02-W2 / PJ.02-W2-21.4" at this link: <https://www.srvs.nm.eurocontrol.int/Hopex/default.aspx#start>.

#### 4.1.1.2.1 [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an inbound flight (AGL)

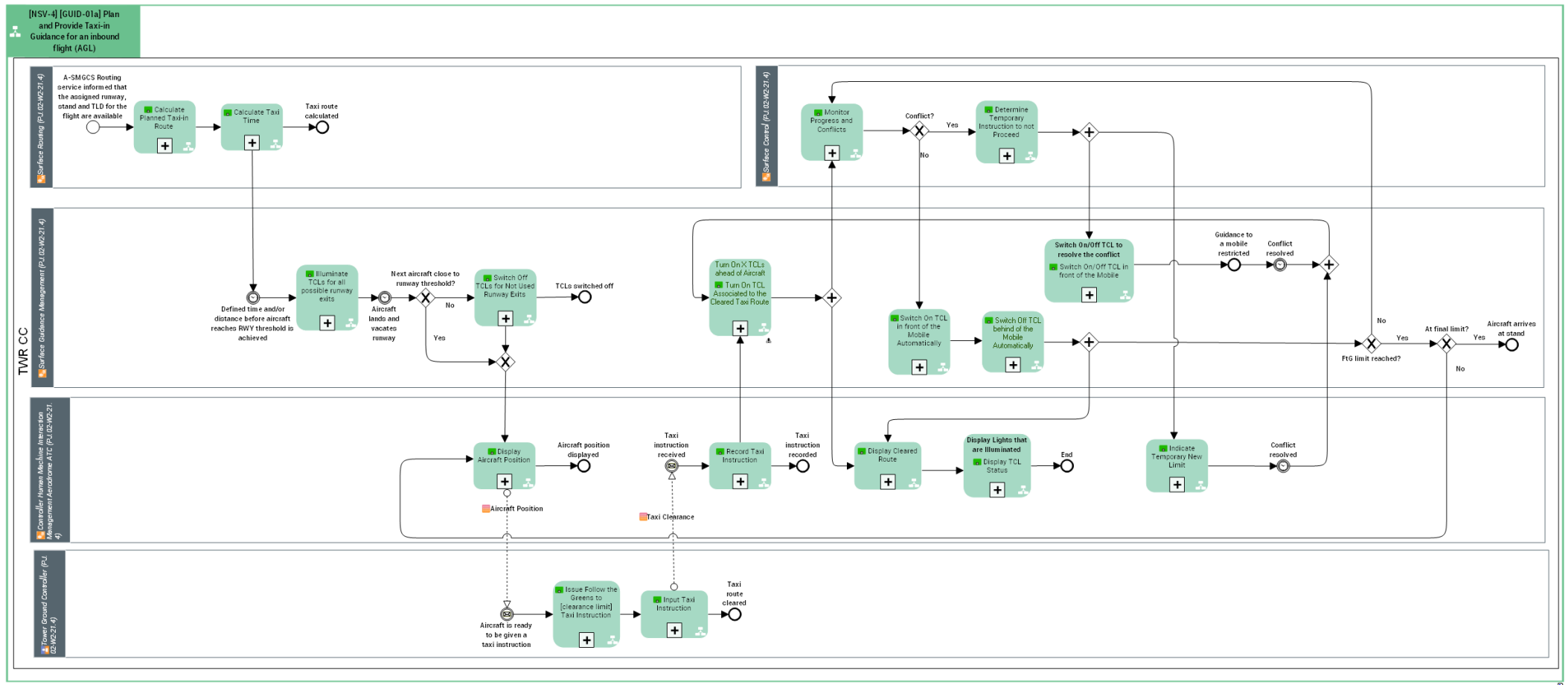


Figure 5. [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an inbound flight (AGL)

Function	Description
Calculate Taxi Time	{The planned taxi-in route is used by the ATC system to calculate an accurate taxi time. This taxi time is used by the ATC system to refine the EIBT.}
Calculate Planned Taxi-in Route	The A-SMGCS Routing service calculates the planned taxi-in route, based on information available in the ATC system, such as taxiway rules, closed taxiways and standard taxi routes, as well as allocated stand and anticipated runway exit. This function is performed once the A-SMGCS system is informed by the ATC system that the assigned landing runway, stand and TLDT for the flight are available.
Determine Temporary Instruction to not Proceed	The system determines instruction to temporarily not proceed, in order to solve a conflict between mobiles, based on the priority rules established for the operational environment. This is the area of the Surface Management Service associated to the Control part.
Display Aircraft Position	The aircraft position on the airport surface is displayed on the HMI
Display Cleared Route	The A-SMGCS HMI displays the part of the route that has been cleared
Display TCL Status	The A-SMGCS HMI displays the individual lamps or segments of the AGL that are illuminated
Illuminate TCLs for all possible runway exits	At a defined time and/or distance before the aircraft reaches the runway threshold, the AGL system illuminates the TCLs for all possible runway exits for guidance purposes
Indicate Temporary New Limit	The temporary new limit for resolving the conflict situation between mobiles is presented to the ATCO
Input Taxi Instruction	The ATCO enters the instruction for the cleared taxi route of the selected aircraft into the ground system HMI.
Issue 'Follow the Greens to <clearance limit>' Taxi Instruction	<p>{The Tower Ground Controller issues the taxi instruction “Follow the Greens to &lt;clearance limit&gt;” via R/T and updates the ATC system by making an input to the HMI.}</p> <p>Note: It is assumed that the &lt;clearance limit&gt; will normally be either the assigned stand or the limit of the area of responsibility of the Tower Ground Controller issuing the “Follow the Greens” instruction.</p>
Monitor Progress and Conflicts	The system monitors the progress of the mobiles along the cleared route, as well as the conflicts between mobiles that could appear
Record Taxi Instruction	The ATCO HMI records the taxi route input made by the ATCO.

Function	Description
Switch On/Off TCL in front of the mobile	TCL in front of the aircraft are switched On/Off automatically, according to Surface Control, in order to resolve a conflict between mobiles. The conflict is resolved by temporarily ceasing guidance by AGL, through an instruction to stop (limiting the lit TCL) until taxi is allowed again.
Switch Off TCL behind of the Mobile Automatically	The AGL system switches off lamps behind the aircraft.
Switch Off TCLs for Not Used Runway Exits	The AGL system switches off the TCLs for the not used runway exits, unless the next aircraft landing on the runway is already within the defined time and/or distance before the runway threshold
Switch On TCL in front of the Mobile Automatically	The AGL system automatically switches on individual lamps or segments of lamps in front of the aircraft, according to the aircraft position and the route
Turn On TCL Associated to the Cleared Taxi Route	The AGL system turns on individual lamps or segments of lamps of the taxiway centre lights (TCL) associated to the cleared route

**Table 12. List of PJ.02-W2-21.4 [NSV-4] [GUID-01a] Functions**

#### 4.1.1.2.2 [NSV-4] [GUID-01b] Plan and Provide Taxi-out Guidance for an Outbound Flight (AGL)

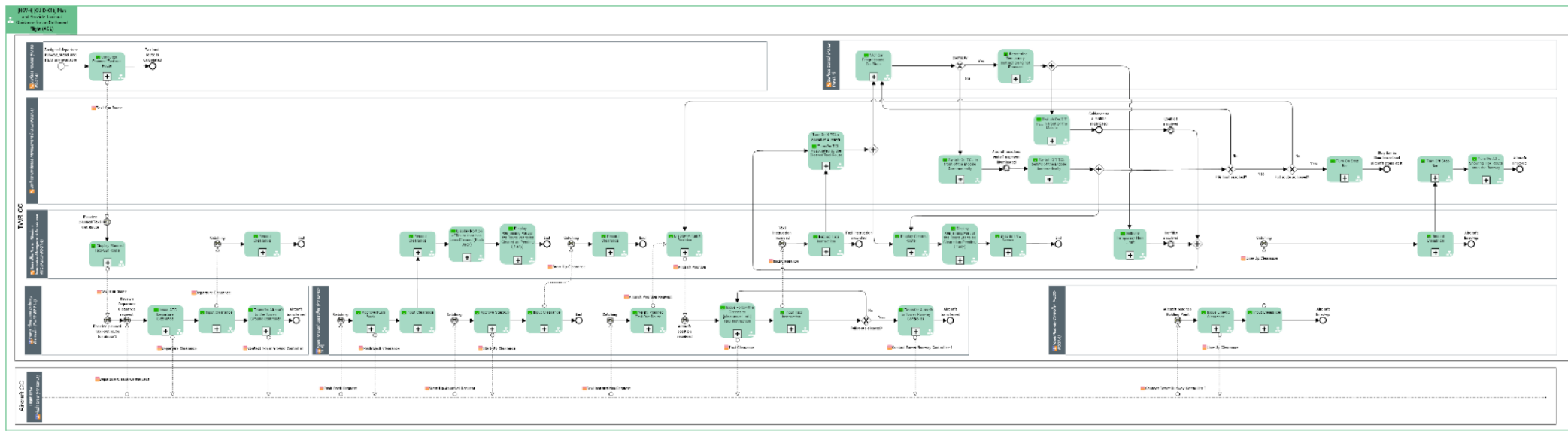


Figure 6: [NSV-4] GUID-01b Plan and provide taxi-out routing for an outbound flight (AGL)

Function	Description
Approve Push Back	The Tower Ground Controller approves the push back via R/T
Approve Start-Up	The Tower Ground Controller approves the start-up via R/T
Calculate Planned Taxi-out Route	The A-SMGCS Routing service calculates the planned taxi-out route, based on information available in the ATC system, such as taxiway rules, closed taxiways and standard taxi routes. This process is performed once the A-SMGCS Routing service is informed by the ATC system that the assigned departure runway, stand and TSAT for the flight are available.
Determine Temporary Instruction to not Proceed	The system determines instruction to temporarily not proceed, in order to solve a conflict between mobiles, based on the priority rules established for the operational environment. This is the area of the Surface Management Service associated to the Control part.
Display Aircraft Position	The aircraft position on the airport surface is displayed on the HMI
Display Cleared Route	The A-SMGCS HMI displays the part of the route that has been cleared
Display Planned Taxi-Out Route	The planned Taxi-out route is displayed in the HMI
Display Portion of Route that has been Cleared (Push Back)	The A-SMGCS HMI displays the portion of route that has been cleared (push back)
Display Remaining Part of the Route yet to be Cleared as Pending (if any)	The A-SMGCS HMI displays the remaining part of the route as yet to be cleared (pending).
Display TCL Status	The A-SMGCS HMI displays the individual lamps or segments of the AGL that are illuminated
Indicate Temporary New Limit	The temporary new limit for resolving the conflict situation between mobiles is presented to the ATCO
Input Clearance	The ATCO inputs the clearance in the system
Input Taxi Instruction	The ATCO enters the instruction for the cleared taxi route of the selected aircraft into the ground system HMI.
Issue 'Follow the Greens to <clearance limit>' Taxi Instruction	<p>{The Tower Ground Controller issues the taxi instruction “Follow the Greens to &lt;clearance limit&gt;” via R/T and updates the ATC system by making an input to the HMI.}</p> <p>Note: It is assumed that the &lt;clearance limit&gt; will normally be either the assigned stand or the limit of the area of responsibility of the</p>

Function	Description
	Tower Ground Controller issuing the “Follow the Greens” instruction.
Issue ATC Departure Clearance	The Tower Clearance Delivery Controller issues the ATC Departure clearance
Issue Line-Up Clearance	On reaching the Holding Point the Tower Runway Controller issues line up clearance by R/T to the Flight Crew
Monitor Progress and Conflicts	The system monitors the progress of the mobiles along the cleared route, as well as the conflicts between mobiles that could appear
Record Clearance	The ATC Clearance is recorded in the CHMI.
Record Taxi Instruction	The ATCO HMI records the taxi route input made by the ATCO.
Switch Off TCL behind of the Mobile Automatically	The AGL system switches off lamps behind the aircraft.
Switch On/Off TCL in front of the mobile	TCL in front of the aircraft are switched On/Off automatically, according to Surface Control, in order to resolve a conflict between mobiles. The conflict is resolved by temporarily ceasing guidance by AGL, through an instruction to stop (limiting the lit TCL) until taxi is allowed again.
Switch On TCL in front of the Mobile Automatically	The AGL system automatically switches on individual lamps or segments of lamps in front of the aircraft, according to the aircraft position and the route. If the system detects the aircraft is queuing, the Surface Guidance Management shall reduce the distance of the lit TCL segment in front of the aircraft.
Transfer Aircraft to the Tower Ground Controller	The Tower Clearance Delivery Controller transfers the aircraft to the Tower Ground Controller (or to the Apron Manager, depending on the airport organization) via R/T
Transfer Aircraft to Tower Runway Controller	The Tower Ground Controller instructs the Flight Crew by R/T to contact the Tower Runway Controller
Turn Off Stop Bar	The stop bar turns off and the AGL turns on showing the taxi route onto the runway
Turn On AGL Showing Taxi Route onto the Runway	The stop bar turns off and the AGL turns on showing the taxi route onto the runway
Turn On Stop Bar	The Stop Bar turns on. The TCL after the Stop Bar for a minimum distance of 90 m are switched off. The Stop Bar will be automatically switched on if one or more mobiles have passed over it by D meters or T seconds.



Function	Description
Turn On TCL Associated to the Cleared Taxi Route	The AGL system turns on individual lamps or segments of lamps of the taxiway centre lights (TCL) associated to the cleared route
Verify Planned Taxi-Out Route	The Tower Ground Controller verifies the planned taxi-out route

**Table 13. List of PJ.02-W2-21.4 [NSV-4] [GUID-01b] Functions**

#### 4.1.1.2.3 [NSV-4] [GUID-02] Guidance of Vehicles (AGL)

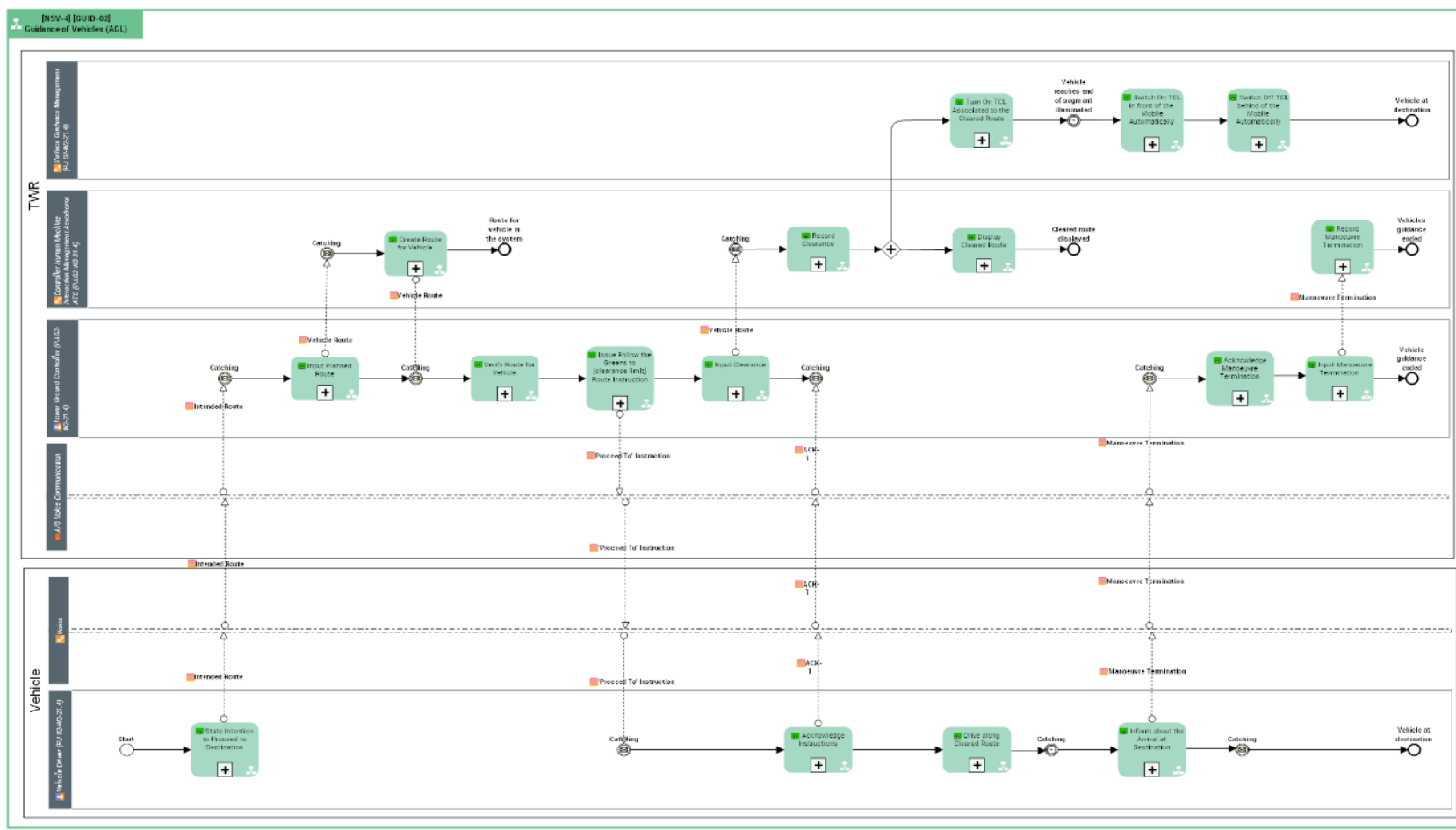


Figure 7. [NSV-4] [GUID-02] Guidance of Vehicles (AGL)

Founding Members

Function	Description
Acknowledge Instructions	The Vehicle Driver acknowledges the instruction via R/T.
Acknowledge Manoeuvre Termination	The Tower Ground Controller acknowledges to the Vehicle Driver about the maneuver termination.
Create Route for Vehicle	The planned route for Vehicle is created in the CHMIM.
Display Cleared Route	The A-SMGCS HMI displays the part of the route that has been cleared
Drive along Cleared Route	The Vehicle Driver commences to drive along the cleared route following AGL.
Inform about the Arrival at Destination	The Vehicle Driver arrives at the destination and informs the Tower Ground Controller via R/T.
Input Clearance	The ATCO inputs the clearance in the system
Input Manoeuvre Termination	The Tower Ground Controller informs the system via an input to the HMI that the maneuver is terminated
Input Planned Route	The Tower Ground Controller creates the planned route in the System via the HMI.
Issue 'Follow the Greens to <clearance limit>' Route Instruction	<p>{The Tower Ground Controller verifies the previously created route and issues the instruction "Follow the Greens to &lt;clearance limit&gt;" via R/T and makes an input to the HMI.}</p> <p>Note: It is assumed that the &lt;clearance limit&gt; will normally be either the destination at the airfield or the limit of the area of responsibility of the Tower Ground Controller issuing the "Follow the Greens" instruction.</p>
Record Clearance	The ATC Clearance is recorded in the CHMI.
Record Manoeuvre Termination	The controller's working position logs the information about the manoeuvre termination entered from the ATCO.
State Intention to Proceed to Destination	The Vehicle Driver contacts the Tower Ground Controller via R/T and states his/her intention to proceed to his/her destination.
Switch Off TCL behind of the Mobile Automatically	The AGL system switches off lamps behind the aircraft.
Switch On TCL in front of the Mobile Automatically	The AGL system automatically switches on individual lamps or segments of lamps in front of the aircraft, according to the aircraft position and the route

Function	Description
Turn On TCL Associated to the Cleared Route	The AGL system turns on individual lamps or segments of lamps of the taxiway centre lights (TCL) associated to the cleared route
Verify Route for Vehicle	The Tower Ground Controller verifies the previously created route for Vehicle.

**Table 14. List of PJ.02-W2-21.4 [NSV-4] [GUID-02] Functions**

#### 4.1.1.2.4 [NSV-4] [CMAC-03] No FtG Alert

This Use Case and its corresponding NSV-4 view presented here, has been developed under coordination with PJ.02-W2-21.1.

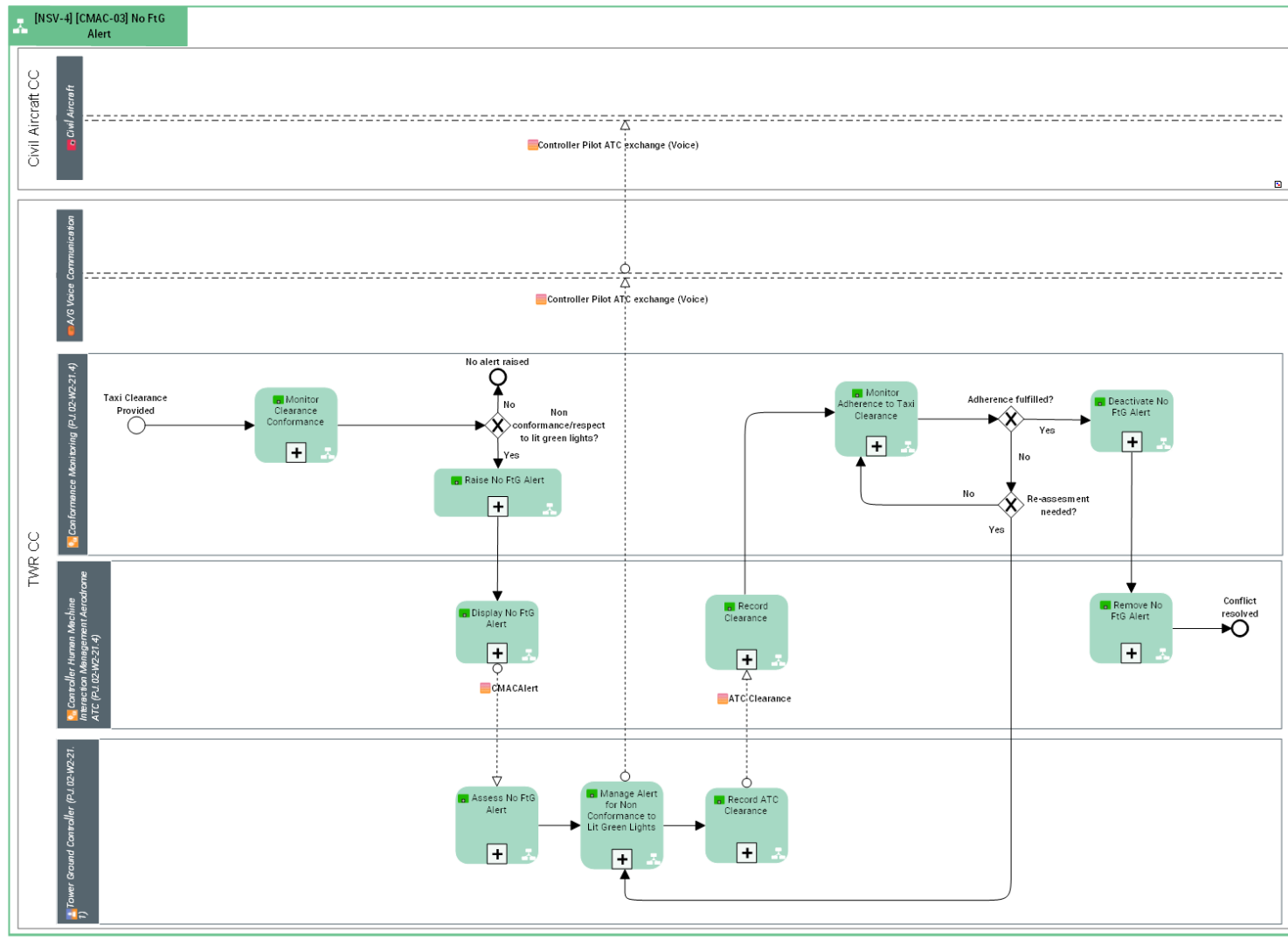


Figure 8. [NSV-4] [CMAC-03] No FtG/ No FtG Alert (in coordination with PJ.02-W2-21.1)

Founding Members

Function	Description
Assess No FtG Alert	The Tower Ground Controller/Apron Manager verifies and assess the situation.
Display No FtG Alert	A CMAC No FtG alert is displayed on the Tower Ground Controller's/Apron Manager's HMI.
Monitor Clearance Conformance	Monitor the adherence to a taxi clearance (e.g. failure to adhere to stop taxiing instruction or overrun of the last lit segment of activated TCL)
Record ATC Clearance	The Tower Ground Controller/Apron Manager updates the ATC system with the instructions issued to the Flight Crew/vehicle driver.
Deactivate No FtG Alert	The CMAC No FtG alert is removed when it is checked that the aircraft adheres to the lit TCL associated to the issued taxi clearance.
Manage Alert for Non Conformance to Lit Green Lights	The Tower Ground Controller/Apron Manager issues the necessary instructions to the Flight Crew/vehicle driver.
Monitor Adherence to Taxi Clearance	The ATC system verifies that the aircraft adheres to the cleared taxi route entered by the Tower Ground Controller/Apron Manager.
Raise No FtG Alert	A No FtG alert is raised when a non-conformance to taxi clearance via Follow-the-Greens is detected. This happens if an aircraft overruns the last lit segment of activated TCL.
Record Clearance	The ATC Clearance is recorded in the CHMI.
Remove No FtG Alert	The CMAC No FtG alert is removed from the Tower Ground Controller's/Apron Manager's HMI

**Table 15. [NSV-4][CMAC-03] No FtG Alert Functions**

## 4.1.2 Resource Composition

The Solution impacts already existing Functional Blocks that are part of the Aerodrome ATC Technical System (within TWR CC), which have been already mentioned and that are presented in the Artifact Assembly diagram below:

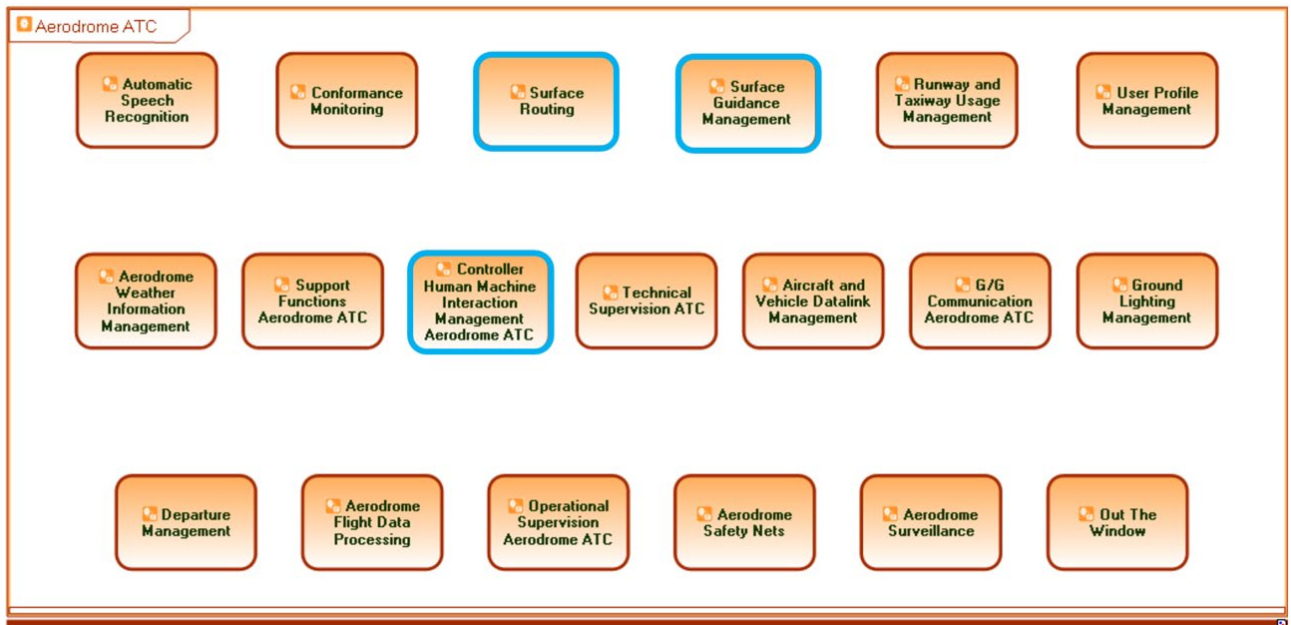


Figure 9. Aerodrome ATC (PJ.02-W2-21-4) Technical System Artifact Assembly diagram

## 4.1.3 Service view

N/A since all the interactions are performed through Resource Interactions previously available, thus no Services need to be created.

## 4.2 Functional and non-Functional Requirements

### 4.2.1 General AGL requirements (AGLG)

[REQ]

Identifier	REQ-02.W2.21.4-TS-AGLG.0010
Title	TCL status display
Requirement	The CWP HMI shall display the TCL status (on/off/other).
Status	<validated>
Rationale	So that the ATCO is aware of the TCL status.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0040
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Display Lights that are Illuminated
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLG.0020
Title	Control of the Surface Guidance Management by the Controller
Requirement	The CWP HMI shall provide to the Controller the possibility to activate or deactivate the Surface Guidance Management functions.
Status	<validated>
Rationale	In case of failure, the Controller would need to override the function.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0060



<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the route
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLG.0030
Title	AGL intensity regulation
Requirement	The CWP HMI shall provide to the Controller the possibility to regulate the AGL intensity.
Status	<in progress>
Rationale	The intensity of the lights shall be configurable.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0060
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the route
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLG.0040
Title	Status of the service information
Requirement	The Controller HMI shall inform the status of the guidance service to the ATCO (Fault, Degraded or On).
Status	<in progress>
Rationale	The ATCO shall be aware of the status of the A-SMGCS Guidance function at every moment.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-RG01.0110
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Display TCL Status
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLG.0050
Title	Failure case alert
Requirement	The Controller HMI shall display an alert in case of failure in the guidance service.

Status	<in progress>
Rationale	The ATCO should be rapidly warned.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0330
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Display TCL Status
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLG.0060
Title	Clearances inputted on HMI
Requirement	The Controller HMI shall display the clearances/instructions that have been inputted on the HMI.
Status	<validated>
Rationale	The ATCO needs to know the clearances and instructions that have already been given to mobiles. (requirement derived from OSED Part II – SAR framework)
Category	<HMI>, <Safety>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0390
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL)  [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)  [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)  [NSV-4][CMAC-03] No FtG Alert

#### 4.2.2 Requirements for segments and single TCL lamp control (AGLS)

[REQ]

Identifier	REQ-02.W2.21.4-TS-AGLS.0010
Title	TCL activation via ECI
Requirement	The Surface Guidance Management shall activate a VSP number of TCLs or length of lit TCLs ahead of an aircraft when it receives via ECI a Taxi, Line Up, Cross, Enter, Tow or Proceed Clearance (using VSP as <i>Variable System Parameter</i> ).
Status	<validated>
Rationale	If a Tower Ground or Runway Controller gives a cleared route, the lamps will show the path illuminated in front of the corresponding aircraft. Single lamps or segments can be activated depending on the TCLs configuration.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
--------------	---------------------	------------

<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0010
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	<p>Switch On TCL in front of the Mobile Automatically</p> <p>Turn On AGL Showing Taxi Route onto the Runway</p> <p>Turn On TCL Associated to the Cleared Route</p> <p>Turn On TCL Associated to the Cleared Taxi Route</p>
<ALLOCATED_TO>	<FunctionView>	<p>[NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)</p> <p>[NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)</p>

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLS.0020
Title	Guiding by progressively illuminated TCL
Requirement	The Surface Guidance Management shall command the TCL to be progressively switched on in sequence in front of the mobile in order to guide the movement of a mobile along its cleared route. Note: the number of TCL is as in requirement REQ-02.W2.21.4-TS-AGLG.0052
Status	<validated>
Rationale	The Surface Guidance Management is in charge of the correct TCL activation to safely guide the pilot/driver along the mobiles cleared route.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4

<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0180
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Switch On TCL in front of the Mobile Automatically Turn On TCL Associated to the Cleared Taxi Route Turn On TCL Associated to the Cleared Route
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLS.0030
Title	Progressive switch off of TCL
Requirement	The Surface Guidance Management shall switch off the TCL behind the mobile as it progresses along its route.
Status	<validated>
Rationale	The Surface Guidance Management is in charge of the correct TCL deactivation to safely guide the pilot/driver along the mobiles cleared route.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0181
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout

<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Switch Off TCL behind of the Mobile Automatically
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-02] Guidance of Vehicles (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLS.0040
Title	Automatic TCL off after the Stop bar
Requirement	The Surface Guidance Management shall switch off the TCL after the Stop bar for a minimum distance of 90 m if the Stop bar is illuminated.
Status	<validated>
Rationale	When the stop bars are interlocked with the TCL, if the TCL beyond the stop bar are illuminated the stop bar is extinguished and vice versa.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0250
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Turn On Stop Bar
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)

		[NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)
--	--	--

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLS.0050
Title	Cleared Route Indication via TCL
Requirement	The Surface Guidance Management shall switch on the appropriate TCL in front of the mobile to indicate the cleared route.
Status	<validated>
Rationale	By using Follow the Greens, pilots (especially those not familiar with the airport layout) will easily be able to follow the cleared taxi route, thus making route deviations less likely.
Category	<Safety>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0180
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Turn On TCL Associated to the Cleared Taxi Route Turn On TCL Associated to the Cleared Route
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]



Identifier	REQ-02.W2.21.4-TS-AGLS.0060
Title	TCL activation limit
Requirement	The Surface Guidance Management shall not activate TCL for the follower mobile beyond the position of the leading mobile in the case of one mobile following another.
Status	<validated>
Rationale	To avoid the situation where they are splitting up at a junction and two routes would be shown to the leading mobile.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0010
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Switch On TCL in front of the Mobile Automatically
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLS.0070
Title	Runway exit TCL activation for landing aircraft
Requirement	The Surface Guidance Management should activate a VSP number of TCLs of the available runway exits, either a VSP time or VSP distance before an aircraft arrives at the runway threshold (using VSP as <i>Variable System Parameter</i> ).
Status	<validated>

Rationale	To clearly indicate the exit options to vacate the runway the respective TCLs shall be activated. If a runway exit is not available (e.g. closed or occupied) the TCL of this runway stays deactivated.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0030
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Illuminate TCLs for all possible runway exits
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)  [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLS.0080
Title	TCL activation after Conditional Clearance
Requirement	The Surface Guidance Management shall activate a VSP number of TCLs ahead of an aircraft when it receives via ECI a Conditional Clearance and the condition associated to the clearance is satisfied (using VSP as Variable System Parameter).
Status	<in progress>
Rationale	If a Tower Ground or Runway Controller gives a cleared route via a Conditional Clearance, the lamps will show the path illuminated in front of the corresponding aircraft once the condition associated to the clearance is satisfied. Single lamps or segments can be activated depending on the TCLs configuration.  (requirement derived from OSED Part II – SAR activities)

Category	<Functional>, <Safety>
----------	------------------------

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0020
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Switch On TCL in front of the Mobile Automatically  Turn On AGL Showing Taxi Route onto the Runway  Turn On TCL Associated to the Cleared Route  Turn On TCL Associated to the Cleared Taxi Route
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)  [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

### 4.2.3 Requirements for Conflicts, Prioritization and Control of Mobiles (AGLC)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLC.0010
Title	Priority rules configuration
Requirement	The Surface Control shall consider priorities based on off-line configured rules, when conflicting situations between mobiles occur.
Status	<validated>

Rationale	<p>Airports need to define the configurations of priorities in order to configure the Surface Guidance Management to work automatically.</p> <p>The configuration criteria may differ from the airport and local policies, and may be data such distance from intersection, departure/arrival, TTOT or order of electronic flight strips.</p>
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0090
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	<p>Turn On TCL Associated to the Cleared Taxi Route</p> <p>Turn On TCL Associated to the Cleared Route</p> <p>Turn On Stop Bar</p> <p>Turn Off Stop Bar</p>
<ALLOCATED_TO>	<FunctionView>	<p>[NSV-4] [GUID-02] Guidance of Vehicles (AGL)</p> <p>[NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)</p> <p>[NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)</p>

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLC.0020
Title	Lights indication of priority

Requirement	In case there is a converging situation that requires to give priority to one mobile over the other(s), the Surface Guidance Management shall stop switching on the TCL in front of the appropriate mobile(s) such that the minimum spacing between the mobiles will be maintained according to spacing rules. The Service gives the priority to the other mobile leaving its TCL turned on.
Status	<validated>
Rationale	The Flight Crews and Vehicle Drivers comprehend the resolution of these situations based on the status of the lamps they have in front.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0110
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL)  [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)  [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLC.0030
Title	TCL activation when LVP is in force
Requirement	The Surface Guidance Management shall not activate TCL beyond the defined spacing rule for LVP operation, in the case of one mobile following another when LVP is in force.
Status	<validated>

Rationale	The number of lit TCL will be less if the speed should be reduced due to LVP procedures applied.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0410
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0190
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Turn On TCL Associated to the Cleared Taxi Route  Switch On TCL in front of the Mobile Automatically
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)  [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLC.0040
Title	Spacing control
Requirement	The Surface Guidance Management shall use spacing rules that take into account types of aircraft, the presence of vehicles, weather conditions, day time, local and other conditions requiring different spacing.
Status	<validated>
Rationale	All the relevant factors on which the separation distance relies will be taken into account.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0190
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Switch On TCL in front of the Mobile Automatically  Switch Off TCL behind of the Mobile Automatically
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL)  [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)  [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLC.0050
Title	Cancellation of automated guidance decisions
Requirement	The CWP HMI shall provide functionality for the Tower controller to swap the priority between converging mobiles or mobiles in a predicted deadlock situation, switching the TCL accordingly and clearly indicating that the action has been performed.
Status	<validated>
Rationale	There must be always an option to intervene the automated decisions of the Surface Guidance Management.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4

<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0150
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLC.0060
Title	Display of the automatically resolved conflicting situations
Requirement	The CWP HMI shall indicate which of the mobile's TCLs are being restricted, and where it will be restricted (the last TCL that will remain lit) when a prioritization to one mobile over the other(s) is given due to a converging situation or a deadlock detection.
Status	<validated>
Rationale	The representation on the HMI could be a red mark or a line at the end of the TCL indication.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0140
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)



<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL)  [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)  [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)
----------------	----------------	---

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLC.0070
Title	Display of conflicting routing
Requirement	The CWP HMI shall indicate that a conflict is detected by the system and where the predicted conflict is, preferably without no input required.
Status	<validated>
Rationale	The indication could be linked to the display of the routing, indicating where the route conflict will occur, and the prioritization given by the system. This will be ahead of when TCLs are being restricted, and this is when the ATCO have the opportunity to swap priorities.  (requirement derived from OSED Part IV - HPAR activities)
Category	<Functional> <HMI>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0400
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Indicate Temporary New Limit
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL)  [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)

		[NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)
--	--	--

## [REQ]

Identifier	REQ-02.W2.21.4-TS-AGLC.0080
Title	Aircraft with priority
Requirement	The CWP HMI shall present the aircraft that is being prioritised when a conflict is detected, preferably with no input required.
Status	<validated>
Rationale	<p>To clearly distinguish between the mobile with priority and the one being restricted.</p> <p>The order of priority may be presented by means of numbering or using a colour code.</p> <p>(requirement derived from OSED Part IV - HPAR activities)</p>
Category	<Functional> <HMI>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0400
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)
<ALLOCATED_TO>	<FunctionView>	<p>[NSV-4] [GUID-02] Guidance of Vehicles (AGL)</p> <p>[NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)</p> <p>[NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)</p>

## 4.2.4 Requirements for Stop Bar Control (STBC)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-STBC.0010
Title	Indication of cleared route via Stop Bars
Requirement	The Guidance Service shall switch off the appropriate Stop Bars on the cleared route in front of the mobile, when the distance between the mobile and the stop bar become less than a VSP distance (using VSP as <i>Variable System Parameter</i> ).
Status	<in progress>
Rationale	The Surface Guidance Management needs to turn the stop bars off along the route so they match the TCL and the given clearances.
Category	<Safety>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0210
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Turn Off Stop Bar
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-STBC.0020
Title	Activation of Stop Bar by Controller

Requirement	The CWP HMI shall provide to the Controller the possibility to activate or deactivate any stop bar.
Status	<in progress>
Rationale	The status of the stop bars can be modified by the Controller overriding the system's decisions.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0050
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Turn Off Stop Bar Turn On Stop Bar
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-STBC.0030
Title	Stop bar regulation - line-up
Requirement	In case 'Line-Up' is entered via the CWP HMI the Surface Guidance Management shall de-activate the runway stop bar in front of the aircraft.
Status	<validated>
Rationale	Entering a 'Line-Up' clearance shall start the guidance process to guide the mobile to the line-up position.

Category	<Functional>
----------	--------------

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0230
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Turn Off Stop Bar
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-STBC.0040
Title	Stop bar regulation - conditional line-up
Requirement	In case 'Conditional Line-Up' is entered via the CWP HMI the Surface Guidance Management shall de-activate the runway stop bar in front of the aircraft when the condition associated to the clearance is satisfied.
Status	<in progress>
Rationale	Entering a 'Conditional Line-Up' clearance shall start the guidance process to guide the mobile to the line-up position as soon as the clearance condition is satisfied.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4

<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0270
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Turn Off Stop Bar
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)  [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-STBC.0050
Title	Manually triggered AGL guided take-off
Requirement	In case 'Take-off' is entered via the CWP HMI without previous 'Line-Up' the Surface Guidance Management shall de-activate the stop bar in front of the cleared aircraft, ensuring the well timed stop bar de-activation.
Status	<validated>
Rationale	Entering a ' Take-off' clearance shall start the guidance process to guide the mobile to the line-up position for take-off. This includes the automatic de-activation and re-activation of the stop bar protecting the runway (if available).
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0220
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)

<ALLOCATED_TO>	<Function>	Turn Off Stop Bar
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-STBC.0060
Title	Stop bar regulation - cross
Requirement	In case 'Cross' is entered via the CWP HMI the Surface Guidance Management shall de-activate the runway stop bar in front of the cleared aircraft.
Status	<validated>
Rationale	The Surface Guidance Management shall use the mobile position monitored by surveillance to determine the perfect moment to de-activate the stop bar. De-activating the stop bar too soon might be misinterpreted by another mobile to be cleared to enter the runway. De-activating too late could force the pilot to stop the aircraft.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0230
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Turn Off Stop Bar
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-STBC.0070
Title	Stop bar regulation - enter
Requirement	In case 'Enter' is entered via the CWP HMI the Surface Guidance Management shall de-activate the runway stop bar in front of the cleared aircraft.
Status	<validated>
Rationale	The Surface Guidance Management shall use the mobile position monitored by surveillance to determine the perfect moment to de-activate the stop bar. De-activating the stop bar too soon might be misinterpreted by another mobile to be cleared to enter the runway. De-activating too late could force the pilot to stop the aircraft.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0230
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Turn Off Stop Bar
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-STBC.0080
Title	Automatic switch stop bar on



Requirement	The Surface Guidance Management shall automatically switch on the stop bar if one or more mobile(s) have passed over it by VSP meters or VSP seconds (using VSP as <i>Variable System Parameter</i> ).
Status	<validated>
Rationale	<p>The system may keep track of both parameters and switch on as soon as one condition is satisfied OR there may be a VSP to select distance or time as the monitored criterion.</p> <p>Other detection systems may exist locally that sense when a stop bar has been crossed and switch the stop bar on again since it is the default status.</p>
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0240
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Turn On Stop Bar
<ALLOCATED_TO>	<FunctionView>	<p>[NSV-4] [GUID-02] Guidance of Vehicles (AGL)</p> <p>[NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)</p> <p>[NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)</p>

## [REQ]

Identifier	REQ-02.W2.21.4-TS-STBC.0090
Title	Surveillance Service for Stop bars

Requirement	The Surface Guidance Management shall use the Surveillance Service to calculate when the runway stop bar has to be switched off, ensuring the well timed de-activation, and that no other uncleared mobile is between the cleared mobile and the runway stop bar.
Status	<validated>
Rationale	<p>One of the main inputs of the Stop bar management is the surveillance data. It provides information to the Surface Guidance Management facilitating the avoidance of switching off the runway stop bar too soon or too late.</p> <p>A system parameter should define the distance between the mobile and the stop bar where the Stop bar will be switched off if the mobile have a clearance that crosses the stop bar.</p>
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0260
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0230
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0220
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Turn Off Stop Bar
<ALLOCATED_TO>	<FunctionView>	<p>[NSV-4] [GUID-02] Guidance of Vehicles (AGL)</p> <p>[NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)</p> <p>[NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)</p>

## [REQ]

Identifier	REQ-02.W2.21.4-TS-STBC.0100
------------	-----------------------------

Title	Stop bar regulation - Taxi
Requirement	The Surface Guidance Management shall switch off the taxiway or apron stop bar in front of an aircraft after a 'Taxi' clearance is entered.
Status	<in progress>
Rationale	Entering a 'Taxi' clearance shall start the guidance process to guide the mobile along the cleared taxi route.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0380
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Turn Off Stop Bar
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## 4.2.5 Safety AGL Requirements (SAFE)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-SAFE.0010
Title	Stop bar operational status display
Requirement	The CWP HMI shall display the operational stop bar light status (on, off, failure, maintenance).

Status	<validated>
Rationale	The Controllers need to have information about the operational status of the stop bars.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0310
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL)  [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)  [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-SAFE.0020
Title	Vehicles not considered by conflict detection
Requirement	The Surface Guidance Management shall not consider vehicles operating on service roads adjacent to taxiways/taxi-lines as conflicting traffic.
Status	<validated>
Rationale	Vehicles operating on service roads close to taxiways/taxi-lines should appear on the A-SMGCS ground situation display but shall not be taken into account by the conflict detection.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-SAFE.0030
Title	TCL de-activation on Route Deviation
Requirement	The Surface Guidance Management shall switch off the TCL of a mobile if the CMAC function detects a route deviation until a revised route and Clearance has been input.
Status	<validated>
Rationale	In case a mobile deviates from the cleared route the mobile needs to be stopped, giving the controller the opportunity to create a new route based on the new situation. Switching off the TCL indicates the pilot or driver to stop immediately.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0280
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout

		AERODROME-ATC-07c_ A-SMGCS incorporating the function that provides No FtG CMAC Alert for Controllers
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Manage Alert for Non Conformance to Lit Green Lights
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [CMAC-03] No FtG Alert

## [REQ]

Identifier	REQ-02.W2.21.4-TS-SAFE.0040
Title	CMAC - No FtG Alert triggering
Requirement	The Airport Safety Nets shall trigger an alert if a mobile moves beyond the end of its lit lights, which are constrained by the guidance algorithm
Status	<validated>
Rationale	This CMAC alert is triggered as soon as a mobile overruns the activated TCL.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0290
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-07c_ A-SMGCS incorporating the function that provides No FtG CMAC Alert for Controllers
<ALLOCATED_TO>	<Functional block>	Conformance Monitoring (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Monitor Clearance Conformance Raise No FtG Alert
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [CMAC-03] No FtG Alert

## [REQ]

Identifier	REQ-02.W2.21.4-TS-SAFE.0050
Title	CMAC - No FtG Alert display
Requirement	The CWP HMI shall display a CMAC No FtG Alert when the system detects an overrun of the TCL by a mobile guided by AGL.
Status	<validated>
Rationale	The Controller needs to know when a non-conformance happens. The system may resolve the situation by issuing instructions via ATC (as part as the Full Guidance concept), but it is important that the ATCO is aware of the situation.
Category	<Functional>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0290
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-07c_ A-SMGCS incorporating the function that provides No FtG CMAC Alert for Controllers
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Display No FtG Alert
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [CMAC-03] No FtG Alert

## [REQ]

Identifier	REQ-02.W2.21.4-TS-SAFE.0060
Title	LVP in force display
Requirement	The CWP HMI shall display whether the LVP is in force.
Status	<validated>
Rationale	The HMI must inform the ATCO when the LVP spacing rules are being considered by the system.
Category	<HMI>, <Safety>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0410
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-07c_ A-SMGCS incorporating the function that provides No FtG CMAC Alert for Controllers
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL)  [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)  [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-SAFE.0070
Title	High TCL and stop bar brightness
Requirement	The TCL shall have high brightness so that they can be used in daytime and sunny conditions.
Status	<in progress>
Rationale	TCL brightness must be sufficient for clearly distinguishing whether they are lit or not in sunny conditions.  (requirement derived from OSED Part II - SAR activities)
Category	<Functional>, <Safety>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0010
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the route



<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-SAFE.0080
Title	Adjustable lighting brightness
Requirement	The TCL and stop bars brightness shall be adjustable based on the conditions.
Status	<in progress>
Rationale	TCL and stop bar brightness must be customisable in order to be adapted to the current conditions. (requirement derived from OSED Part II - SAR activities)
Category	<Functional>, <Safety>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0010
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## 4.2.6 Interoperability AGL Requirements (INTEROP)

[REQ]

Identifier	REQ-02.W2.21.4-TS-INTEROP.0010
Title	Guidance information to AGL
Requirement	The Surface Guidance Management shall send to the AGL system guidance information for a single lamp/non-single lamp/block/segment configuration corresponding to a mobile's route.
Status	<validated>
Rationale	This information will be use to switch the TCLs accordingly.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0040
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0010
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

[REQ]

Identifier	REQ-02.W2.21.4-TS-INTEROP.0020
Title	Route reception in Surface Guidance Management

Requirement	The Surface Guidance Management shall receive the route of the mobile from the Routing Function.
Status	<validated>
Rationale	The Surface Guidance Management needs the route for turning on the correct lights.
Category	<Interoperability>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0180
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Turn On TCL Associated to the Cleared Route Turn On TCL Associated to the Cleared Taxi Route
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-INTEROP.0030
Title	Clearance reception in Surface Guidance Management
Requirement	The Surface Guidance Management shall receive clearances from the Electronic Clearance Input (ECI).
Status	<validated>
Rationale	The Surface Guidance Management needs the clearances for turning stop bars on and off.

Category	<Interoperability>
----------	--------------------

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0210
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0010
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-INTEROP.0070
Title	Notification of LVP activation/de-activation
Requirement	The Surface Guidance Management shall receive notifications on the activation and de-activation of LVPs from the Operational Supervision.
Status	<validated>
Rationale	In order to determine the appropriate Holding Point when generating routes for departing aircraft and to compute an accurate taxi time, the SRS needs to know whether LVPs are in place or not. Besides, active LVP will be taken into account by Surface Guidance Management to maintain spacing between aircraft, also when following another aircraft.
Category	<Interoperability>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-RG03.0020
<ALLOCATED_TO>	<Functional block>	Surface Routing (PJ.02-W2-21.4)
<ALLOCATED_TO>	<Function>	Calculate Planned Taxi-out Route in Automatic Mode Calculate Taxi Time Switch On/Off TCL in front of the Mobile
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL) [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL) [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-INTEROP.0080
Title	TCL status to HMI
Requirement	The AGL system shall send the TCL status (on/off/other) to the Controller HMI.
Status	<validated>
Rationale	This information will be used for displaying the TCL status to the controller in the HMI. (requirement derived from OSED Part II - SAR activities)
Category	<Interoperability>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0040
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process

		the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL)  [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)  [NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-INTEROP.0090
Title	Stop bar status to HMI
Requirement	The AGL system shall send the stop bar light status (on/off/failure/maintenance) to the Controller HMI.
Status	<validated>
Rationale	This information will be used for displaying the stop bar status to the controller in the HMI.  (requirement derived from OSED Part II - SAR activities)
Category	<Interoperability>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0310
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)
<ALLOCATED_TO>	<FunctionView>	[NSV-4] [GUID-02] Guidance of Vehicles (AGL)  [NSV-4] [GUID-01b] Plan and Provide Taxi-out Routing for an Outbound Flight (AGL)

		[NSV-4] [GUID-01a] Plan and Provide Taxi-in Guidance for an Inbound Flight (AGL)
--	--	--

## 4.2.7 Security Requirements (SEC1)

[REQ]

Identifier	REQ-02.W2.21.4-TS-SEC1.0001
Title	Network components segregated
Requirement	<p>The systems</p> <ul style="list-style-type: none"> <li>•Aerodrome ATC Aerodrome Surface Guidance Management System,</li> <li>•Aerodrome ATC Ground Lighting Management system,</li> <li>•Aerodrome ATC Surface Routing System,</li> <li>•Aerodrome Conformance Monitoring System,</li> </ul> <p>shall operate within a segregated network.</p>
Status	<in progress>
Rationale	Segregated components will make transmissions more secure as well as protect reducing the likelihood of specific attacks.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4

[REQ]

Identifier	REQ-02.W2.21.4-TS-SEC1.0002
Title	Backup saving

Requirement	For data stored in <ul style="list-style-type: none"> <li>•Aerodrome ATC Aerodrome Surface Guidance Management System,</li> <li>•Aerodrome ATC Ground Lighting Management system,</li> <li>•Aerodrome ATC Surface Routing System,</li> <li>•Aerodrome Conformance Monitoring System,</li> </ul> shall be implemented periodic backup procedures so as to guarantee the possibility of restoring corrupted or lost data.
Status	<in progress>
Rationale	A regularly backup will mitigate effectiveness of specific attacks reducing the amount of lost data. In addition, the use of backup procedures will allow to restore systems very quickly making it more resilient.
Category	<Security>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4

## [REQ]

Identifier	REQ-02.W2.21.4-TS-SEC1.0003
Title	Anti-Malware
Requirement	The systems <ul style="list-style-type: none"> <li>•Aerodrome ATC Aerodrome Surface Guidance Management System,</li> <li>•Aerodrome ATC Ground Lighting Management system,</li> <li>•Aerodrome ATC Surface Routing System,</li> <li>•Aerodrome Conformance Monitoring System,</li> </ul> shall be protected by Anti-Malware software to avoid malicious software installation and to manage any of its operations.
Status	<in progress>
Rationale	Specific anti-malware software will reduce the likelihood of malicious software operations impacting the specified systems.
Category	<Security>



## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4

## [REQ]

Identifier	REQ-02.W2.21.4-TS-SEC1.0004
Title	Data protection
Requirement	<p>Data stored in</p> <ul style="list-style-type: none"> <li>•Aerodrome ATC Aerodrome Surface Guidance Management System,</li> <li>•Aerodrome ATC Ground Lighting Management system,</li> <li>•Aerodrome ATC Surface Routing System,</li> <li>•Aerodrome Conformance Monitoring System,</li> </ul> <p>shall be protected through encryption procedures.</p>
Status	<in progress>
Rationale	Implementation of specific control on the data stored by the listed above systems will prevent hackers from clearly understanding and modifying in a consistent and detrimental way confidential data.
Category	<Security>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4

## 4.2.8 Performance Requirements (PERF)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-PERF.0001
Title	TCL activation latency
Requirement	The Surface Guidance Management shall switch on the TCL with a latency that is within acceptable limits from a Safety perspective.

Status	<validated>
Rationale	The system shall provide a response which is within the defined latency limits, so that the lights are turned on at an appropriate time.  (requirement coming from Safety Assessment Report)
Category	<Performance> <Safety>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0010
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-PERF.0002
Title	TCL status indication latency
Requirement	The Controller HMI shall indicate that TCL are switched on/off with a latency that is within acceptable limits from a Safety perspective.
Status	<validated>
Rationale	The system shall provide a response which is within the latency limits, so that the controller is aware of the TCL switching at an appropriate time.  (requirement derived from OSED Part II – SAR activities)
Category	<Performance> <Safety>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
--------------	---------------------	------------

<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0040
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-PERF.0005
Title	Technical malfunction likelihood
Requirement	The likelihood of technical malfunction shall be operationally acceptable as per regulation applicable to local implementation.
Status	<validated>
Rationale	Safety Requirement at Design level derived from SPR-INTEROP/OSED Part II – SAR activities.
Category	<Performance> <Safety>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0180
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-PERF.0006
Title	Loss of information likelihood

Requirement	The likelihood of total/partial loss of information for conflict management on CWP HMI shall be operationally acceptable as per regulation applicable to local implementation.
Status	<validated>
Rationale	Safety Requirement at Design level derived from SPR-INTEROP/OSED Part II – SAR activities.
Category	<Performance> <Safety>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02-W2-21.4-SPRINTEROP-AL01.0400
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-PERF.0007
Title	Delay of information likelihood
Requirement	The likelihood of delay of information for conflict management on CWP HMI shall be operationally acceptable as per regulation applicable to local implementation.
Status	<validated>
Rationale	Safety Requirement at Design level derived from SPR-INTEROP/OSED Part II – SAR activities.
Category	<Performance> <Safety>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
--------------	---------------------	------------

<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02-W2-21.4-SPRINTEROP-AL01.0400
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-PERF.0008
Title	Inadequate information likelihood
Requirement	The likelihood of inadequate information for conflict management on CWP HMI shall be operationally acceptable as per regulation applicable to local implementation.
Status	<validated>
Rationale	Safety Requirement at Design level derived from SPR-INTEROP/OSED Part II – SAR activities.
Category	<Performance> <Safety>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02-W2-21.4-SPRINTEROP-AL01.0400
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Controller Human Machine Interaction Management Aerodrome ATC (PJ.02-W2-21.4)

## [REQ]

Identifier	REQ-02.W2.21.4-TS-PERF.0009
------------	-----------------------------

Title	Guidance conformance monitoring failure likelihood
Requirement	The likelihood that the solution fails to provide guidance conformance monitoring on manoeuvring area (involving aircraft, vehicles) shall be operationally acceptable as per regulation applicable to local implementation.
Status	<validated>
Rationale	Safety Requirement at Design level derived from SPR-INTEROP/OSED Part II – SAR activities.
Category	<Performance> <Safety>

## [REQ Trace]

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ.02-W2-21.4
<SATISFIES>	< ATMS Requirement>	REQ-02.W2.21.4-SPRINTEROP-AL01.0290
<ALLOCATED_TO>	<Enabler>	AERODROME-ATC-61b_Advanced surface guidance management services to process the automatic triggering of airport ground signs and lighting according to the rout
<ALLOCATED_TO>	<Functional block>	Surface Guidance Management (PJ.02-W2-21.4)

## 5 Recommendation for Implementation

---

For the industrialisation and deployment of the concept, it is recommended to confirm that the current standards for AGL systems, such as EUROCONTROL-SPEC-171 and EUROCAE ED-87E, are sufficient to support the PJ.02-W2-21.4 Solution.

## 6 Assumptions

---

N/A



## 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] D2.5: SESAR 2020 Concept of Operations (edition 01.00.00) [29/10/2020]

#### System and Service Development

---

- [5] 08.01.01 D52: SWIM Foundation v2
- [6] 08.01.01 D49: SWIM Compliance Criteria
- [7] 08.01.03 D47: AIRM v4.1.0
- [8] 08.03.10 D45: ISRM Foundation v00.08.00
- [9] B.04.03 D102 SESAR Working Method on Services
- [10] B.04.03 D128 ADD SESAR1
- [11] B.04.05 Common Service Foundation Method
- [12] SESAR 2020 Process Handbook for ensuring consistency between EATMA and AIRM for Information Elements

#### Performance Management

---

- [13] D4.0.30 S2020 Common Assumptions (edition 01.00.00)
- [14] D4.7: PJ19.04: Performance Framework (2019) (edition 01.00.01) [29/10/2020]
- [15] D110: C.02-D110 Updated D02 after MP Campaign (edition 00.01.01)

#### Validation

---

- [16] 03.00 D16 WP3 Engineering methodology
- [17] D2.6: PJ19: VALS (2019) (edition 00.01.00)
- [18] EUROCONTROL. *E-OCVM Version 3.0 – Volume I - European Operational Concept Validation Methodology*. 2010.

## System Engineering

---

- [19] SESAR 2020 Requirements and Validation Guidelines Wave 2 (edition 00.02.01)  
[29/10/2020]

## Safety

---

- [20] D4.0.060: SESAR Safety Reference Material (edition 00.04.01)  
[21] D4.0.050: Guidance to Apply SESAR Safety Reference Material (edition 00.03.01)  
[22] D04: Resilience Engineering Guidance Final Deliverable (edition 00.00.12)

## Human Performance

---

- [23] 16.006.05 D27 SESAR Human Performance Assessment Process V1 to V3 – including VLDs  
[24] D4.0.070: SESAR Human Performance Assessment Process V1 to V3 – including VLD (edition 00.03.01)

## Environment Assessment

---

- [25] D4.0.080 SESAR Environment Assessment Process (edition 04.00.00)

## Security

---

- [26] SecRAM 2.0 Security Risk Assessment methodology for SESAR 2020 (edition 02.00.00)

## 7.2 Reference Documents

- [27] EUROCAE ED-78A GUIDELINES FOR APPROVAL OF THE PROVISION AND USE OF AIR TRAFFIC SERVICES SUPPORTED BY DATA COMMUNICATIONS.<sup>2</sup>  
[28] D6.4.001 - SESAR Solution PJ.02-W2-21.4 SPR/INTEROP OSED for V3 (00.03.00)  
[29] “Project Handbook”, Edition: 01.00.01 FINAL, 27<sup>th</sup> April 2017.  
[30] EUROCONTROL-SPEC-171 - “EUROCONTROL Specification for Advanced-Surface Movement Guidance and Control System (A-SMGCS) Services” Edition: 2.0, 22 April 2020.  
[31] EUROCAE ED-87E - “Minimum Aviation System Performance Standard (MASPS) for Advanced Surface Movement Guidance and Control Systems (A-SMGCS) including Airport Safety Support Service and Guidance Service”, April 2022.

- [32] EUROCAE ED-228-A – Safety and Performance Requirements Standard for Baseline 2 ATS Data Communications (Baseline 2 SPR Standard). March 2016.
- [33] EUROCAE ED-229A - Interoperability Requirements Standard for Baseline 2 ATS Data Communications (Baseline 2 Interop Standard). March 2016.
- [34] EUROCAE ED-89A - Data Link Application System Document (DLASD) for the “ATIS” Data Link Service. December 2003.
- [35] ICAO Annex 11 - Air Traffic Services. Fifteenth Edition. July 2018.
- [36] ICAO Doc 4444 - Procedures for Air Navigation Services -Air Traffic Management 16<sup>th</sup> Edition, 2016.
- [37] ICAO Annex 14, Volume I. 7<sup>th</sup> Edition, 2016.
- [38] EASA Aerodrome Regulation (COMMISSION REGULATION (EU) No 139/2014)
- [39] EASA Standardised European Rules of the Air (SERA) (EU Regulation 923/2012). Revision March 2022.
- [40] ICAO Advanced Surface Movement Control and Guidance Systems (A-SMGCS) Manual, Doc 9830 AN/452, First Edition 2004.
- [41]

## Appendix A Service Description Document (SDD)

N/A

**-END OF DOCUMENT-**

**indra**

