



# System Requirements for Phase 2

## Document information

|                  |                                                                        |
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## Task contributors

DFS, FREQUENTIS, INDRA, SELEX, THALES

## **Abstract**

The document collects and describes the technical requirements (functional and non-functional) which shall guide, during Phase 2, the development and implementation of Airport Safety Nets and Wind Shear HMI prototypes. Such System Requirements are derived from the Operational Requirements collected by the OSED, SPR and HF coming from P6.7.1, P6.9.2 and P6.5.5, and by ICAO documents.

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| Rational for rejection |
|------------------------|
| None.                  |

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## 8 Intellectual Property Rights (foreground)

- 9 This deliverable consists of SJU foreground.

## Table of Contents

|                                                                            |           |
|----------------------------------------------------------------------------|-----------|
| <b>EXECUTIVE SUMMARY .....</b>                                             | <b>6</b>  |
| <b>1 INTRODUCTION.....</b>                                                 | <b>7</b>  |
| 1.1 PURPOSE OF THE DOCUMENT.....                                           | 7         |
| 1.2 INTENDED READERSHIP.....                                               | 7         |
| 1.3 INPUTS FROM OTHER PROJECTS.....                                        | 8         |
| 1.4 STRUCTURE OF THE DOCUMENT.....                                         | 8         |
| 1.5 REQUIREMENTS DEFINITIONS – GENERAL GUIDANCE.....                       | 8         |
| 1.6 FUNCTIONAL BLOCK PURPOSE .....                                         | 9         |
| 1.7 FUNCTIONAL BLOCK OVERVIEW .....                                        | 10        |
| 1.8 GLOSSARY OF TERMS .....                                                | 10        |
| 1.9 ACRONYMS AND TERMINOLOGY .....                                         | 11        |
| <b>2 GENERAL FUNCTIONAL BLOCK DESCRIPTION .....</b>                        | <b>13</b> |
| 2.1 CONTEXT.....                                                           | 13        |
| 2.2 FUNCTIONAL BLOCK MODES AND STATES.....                                 | 14        |
| 2.2.1 AA HMI states.....                                                   | 14        |
| 2.2.2 AA HMI modes .....                                                   | 14        |
| 2.3 MAJOR FUNCTIONAL BLOCK CAPABILITIES.....                               | 14        |
| 2.4 USER CHARACTERISTICS.....                                              | 15        |
| 2.5 OPERATIONAL SCENARIOS .....                                            | 17        |
| 2.5.1 Conflicting ATC clearances .....                                     | 17        |
| 2.5.2 Non conformance to ATC instructions or procedures.....               | 18        |
| 2.5.3 MET Alert.....                                                       | 18        |
| 2.6 FUNCTIONAL.....                                                        | 19        |
| 2.6.1 Functional decomposition .....                                       | 19        |
| 2.6.2 Functional analysis .....                                            | 19        |
| 2.7 SERVICE VIEW .....                                                     | 21        |
| <b>3 FUNCTIONAL BLOCK FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENTS .....</b> | <b>22</b> |
| 3.1 CAPABILITIES.....                                                      | 22        |
| 3.1.1 Airport Safety Nets alerts display Requirements.....                 | 22        |
| 3.1.2 MET alerts display Requirements.....                                 | 26        |
| 3.1.3 Alerts acknowledgment Requirements .....                             | 27        |
| 3.1.4 Acquisition of SSN alerts Requirements.....                          | 29        |
| 3.1.5 Alert HMI status display Requirements.....                           | 30        |
| 3.1.6 ASN HMI adaptation Requirements .....                                | 30        |
| 3.2 ADAPTABILITY.....                                                      | 30        |
| 3.3 PERFORMANCE CHARACTERISTICS.....                                       | 30        |
| 3.4 SAFETY & SECURITY.....                                                 | 31        |
| 3.5 MAINTAINABILITY .....                                                  | 31        |
| 3.6 RELIABILITY .....                                                      | 31        |
| 3.7 FUNCTIONAL BLOCK INTERNAL DATA REQUIREMENTS .....                      | 32        |
| 3.7.1 Deleted requirements .....                                           | 32        |
| 3.8 DESIGN AND CONSTRUCTION CONSTRAINTS.....                               | 33        |
| 3.9 FUNCTIONAL BLOCK INTERFACE REQUIREMENTS.....                           | 33        |
| 3.9.1 Deleted requirements .....                                           | 34        |
| <b>4 ASSUMPTIONS.....</b>                                                  | <b>36</b> |
| <b>5 REFERENCES.....</b>                                                   | <b>37</b> |
| 5.1 USE OF COPYRIGHT / PATENT MATERIAL /CLASSIFIED MATERIAL .....          | 37        |
| 5.1.1 Classified Material.....                                             | 37        |

## List of tables

|                                                                       |    |
|-----------------------------------------------------------------------|----|
| Table 1 - Interfaces between AA HMI and other functional blocks ..... | 21 |
|-----------------------------------------------------------------------|----|

## List of figures

|                                                                    |    |
|--------------------------------------------------------------------|----|
| Figure 1: Aerodrome ATC Domain System - Functional Breakdown ..... | 19 |
| Figure 2: AA HMI Architecture .....                                | 20 |

## Executive summary

The document is focused on the Technical Requirements (functional and non-functional) which shall guide, during Phase 2, the development and implementation of a prototype for Airport Safety Nets and MET alerts HMI, during this document labelled as Airport Alerts HMI.

The document starts from the results of Phase 1, improving the maturity of project within the SESAR programme.

All the Aerodrome Functional Blocks interacting with the Airport Alerts HMI are also identified, as well as the external conditions and inputs affecting its behaviour and its operations.

Regarding Airport Safety Nets HMI, functional requirements are derived from OSED of Conflicting ATC Clearances and Conformance Monitoring by P6.7.1 and from OSED and HF requirements by P6.9.2.

In this phase the MET alerts working area is addressed, too. The current maturity of this item within the SESAR programme is not very advanced and only a few Operational Requirements are available at time of writing of this document. The functional requirements are derived from OFA 5.1.1, and in particular from P6.5.5 and from ICAO documents regarding Wind Shear.

Requirements are also provided for the external interfaces and to satisfy the installation-related constraints.

A significant section of the document is dedicated to non-functional requirements, focused on System Safety, System Security, Performance Characteristics, HW/SW features.

## 1 Introduction

The Technical Specification document contains descriptions and requirements that define functional and non functional specifications of Airport Alerts HMI.

### 1.1 Purpose of the document

The purpose of this document is to provide information regarding the Specification and the System Requirements of the Airport Alerts HMI (integrating Airport Safety Nets HMI and MET Alerts HMI) which satisfies the needs and expectations of the Tower Controllers within the SESAR programme.

The Technical Specifications provided by this document come from the Operational Projects 6.7.1 and 6.9.2 for Airport Safety Nets and from OFA 5.1.1 (in particular from P6.5.5) for MET alerts.

The information within this document shall enable system engineers to produce a set of Technical Requirements for the development of the Airport Alerts HMI and of its software components. They shall be specified according to the following inputs: operational (coming from previous studies and external studies) and technical aspects (coming from the related technical projects).

Through this document all the actors will be able to map the User Requirements, to analyse the rationale behind each requirement and, in general, to verify and ensure the overall coherence of the project.

### 1.2 Intended readership

According to the scope and dependencies of this project, the following can be interested in this document:

- **P6.7.1 – Airport safety support tools for pilots, vehicle drivers and controllers** as responsible of operational requirements production regarding airport safety nets functions.
- **P6.9.2 – Advanced integrated CWP (A-iCWP)** as responsible of operational requirements production regarding HMI design of A-CWP.
- **P6.5.5 – Integration of MET Data into APOC processes** as responsible of operational requirements regarding meteorological information and forecasts into airport operations.
- **P12.1.7 – Airport system specification drafting and maintenance** is interested in the document to identify and maintain the consolidated list of requirements derived from each WP12 primary projects.
- **P12.3.2 – Enhanced Surface Safety Nets** which has to define the tool that detects all the conflict on the airport and sends the alerts messages to HMI specified in this project.
- **P12.5.4 – Integrated Tower Working Position (iCWP) Design, Specification, Prototyping and Test/Validation** which is responsible of developing technical specifications and related prototype of A-CWP.
- **P12.6.3 – Enhanced MET-systems with CDM** which is responsible of developing technical specifications and related prototype of the system which produces MET alerts to be displayed.
- **P12.7.5 – Improved weather information systems** which is responsible of developing technical specifications and related prototype of the system that manages all MET information, interfacing with SWIM.

## 1.3 Inputs from other projects

The working area, i.e. MET alerts, introduced in this Phase doesn't have at the moment of drafting of this document so many operational requirements. So, for this Phase some external documents coming from ICAO are analysed:

- **ICAO** Special Implementation Workshop - Wind Shear System Acquisition (Bangkok 1-3 Dec 2010) – Summary of discussions
- **ICAO** Annex 3 – Meteorological service for International Air Navigation – 17<sup>th</sup> edition – 07/2010

## 1.4 Structure of the document

This document is divided into four chapters.

Section 1 is the introduction. It describes the purpose and scope of the document and the methodology used to derive the requirements, including the purpose of the system under analysis

Section 2 gives a general description of the Airport Alerts HMI

Section 3 describes the capabilities, conditions and constraints of the Airport Alerts HMI. In particular it contains the functional and non functional requirements.

In the section 4 there are some assumptions used for writing the document.

Section 5 describes the referenced documents

## 1.5 Requirements Definitions – General Guidance

The Requirements are produced to describe both functional and non functional requirements at system level. The purpose of component specification is to transform the operational, functional and non functional requirements and safety recommendation and other requirements that have been identified through requirements analysis of external inputs, into a coherent description of ATM capabilities and conditions that can be used to guide the system designers in the development of system design.

Requirements are structured by Requirement type, and then:

- Functional requirements (further decomposed according to section 2.3)
- Non Functional requirements
  - Adaptability Requirements
  - Performance Characteristics
  - Safety & Security Requirements
  - Maintainability Requirements
  - Reliability Requirements
  - Internal Data Requirements
  - Design and Construction Constraints

158                   ○ Interface Requirements

159       These requirements will address the “what” and not the “how”, therefore they don’t aim at specifying  
160       the physical design of the component, but the functional description and the necessary logical  
161       interfaces with other functional blocks.

162       The technical requirements are written following the document “Requirements and VV Guidelines”  
163       (see [2])

164       In particular, all requirements must contain at least a subject and a statement where the subject is the  
165       object under discussion (e.g. system), and the statement is a condition, action, intended result or  
166       target objective.

167       The generic way to write a requirement is: **<Object> shall OR should OR may <verb> <Statement>**  
168       (standard ISO/IEC 15288)

- 169           • Requirements are marked by the use of the verb "shall".
- 170           • Recommendations are marked by the use of the verb "should".
- 171           • Permissions are marked by the use of the verb "may".

172

173       In order to enable the import of SE Data in the SESAR SE Repository, the description shall use the  
174       layout described in Templates and Toolbox User Manual [3].

175       The Id field contains the System project number, owner of the requirement.

176       The Rationale field may contain:

- 177           • Justification of the allocation
- 178           • Explanation about the requirement formulation

179       The REQ Trace table hereafter contains the down-links to the functional block that receive the  
180       allocated requirement. There can be several down linked functional blocks for a given requirement.

181       This document starts from the mirror one produced in Phase 1 [6], so there are some requirements no  
182       more valid and then tagged as “deleted” in Status field.

## 183   1.6 Functional block Purpose

184       This document addresses the Airport Alerts HMI component whose main scope is the alert  
185       presentation of hazardous situations regarding potential surface conflicts and meteorological events  
186       (such as headwind and wind shear). The HMI that will satisfy the requirements defined in this  
187       document will be then integrated into the Advanced Controller Working Position (project 12.5.4).

188       This Airport Alert HMI will receive real and potential conflicts, risks and dangerous situations from  
189       Surface Safety Nets server and from MET server. This information will be processed by the Airport  
190       Alerts HMI that will define what, when and how the alerts have to be presented to the Controller.

191       Alerts data presented on controller HMI, are mainly about:

- 192           • Conflicts on runways, taxiways, restricted and protected areas.
- 193           • Alerts related to deviations from ATC instructions or procedures.
- 194           • Alerts related to conflicting ATC clearances.

- Alerts related to Head Wind, Wind Shear and Micro Burst.

Each alert is managed to allow:

- Fully understanding of the situation, displaying all the needed information about the hazard.
- Classification of severity (information or alarm).
- Acknowledge and/or mute.

## 1.7 Functional block Overview

This project deals with the Controller HMI part that manages Alerts data.

Airport Alerts: HMI will receive alert reports from both Surface Safety Nets server and MET server. As soon as an alert is generated, it is sent to HMI that will display while it is active. Controller will also have the possibility to acknowledge an alert and/or muting it on his/her HMI. The acknowledgement of an alert is local to the HMI and it is not sent back to both SSN server and MET server.

Visualization of Airport Alerts: HMI will clearly display the reason of the conflict / hazard allowing the controller to easily be aware of what is happening and to take countermeasures.

Main constraints on this project are about:

- Information clearness: Controllers should be presented with a clear 'picture' of the actual traffic situation in their areas of responsibility, and with all the necessary traffic data to assist them in their control tasks. The controller shall be provided with clear and visible indication of conflicts as soon as the alert exists.
- Usability: The HMI should ensure a level of user workload which is consistent with efficient and effective activity. Moreover it should make controllers' work easier and simple.

## 1.8 Glossary of terms

Within the document there are a lot of names and acronyms that refers to different concepts. The following table can help the readability of the document.

| Concept    | HMI sub-function            | HMI sub-functions (integrated in this phase) | Project                      | Component / system / server (physical concept) | Functional block (abstract concept)             | Data flow                     |
|------------|-----------------------------|----------------------------------------------|------------------------------|------------------------------------------------|-------------------------------------------------|-------------------------------|
| Used terms | Airport Alerts HMI / AA HMI | Airport Safety Nets HMI / ASN HMI            | Enhanced Surface Safety Nets | Surface Safety Nets server                     | Conformance monitoring                          | Conformance monitoring alerts |
|            |                             |                                              |                              |                                                | Aerodrome Safety Nets                           | ASN alerts                    |
|            |                             | MET Alerts HMI                               | Enhanced MET Alerts          | MET server                                     | Aerodrome Weather Information Management (AWIM) | MET alerts                    |

## 1.9 Acronyms and Terminology

| Term           | Definition                                            |
|----------------|-------------------------------------------------------|
| <b>A-CWP</b>   | Advanced Controller Working Position                  |
| <b>A-SMGCS</b> | Advanced Surface Movement Guidance and Control System |
| <b>AA</b>      | Airport Alerts                                        |
| <b>AA HMI</b>  | Airport Alerts HMI                                    |
| <b>ADD</b>     | Architecture Definition Document                      |
| <b>ANSP</b>    | Air Navigation Service Provider                       |
| <b>ASN</b>     | Airport Safety Nets                                   |
| <b>ATC</b>     | Air Traffic Control                                   |
| <b>ATCO</b>    | Air Traffic Controller                                |
| <b>ATM</b>     | Air Traffic Management                                |
| <b>AVOL</b>    | Aerodrome Visibility Operational Level                |
| <b>AWIM</b>    | Aerodrome Weather Information Management              |
| <b>CDM</b>     | Collaborative Decision Making                         |
| <b>CWP</b>     | Controller Working Position                           |
| <b>DOD</b>     | Detailed Operational Description                      |
| <b>E-ATMS</b>  | European Air Traffic Management System                |
| <b>HF</b>      | Human Factor                                          |
| <b>HMI</b>     | Human Machine Interface                               |
| <b>HW</b>      | Hardware                                              |
| <b>ICAO</b>    | International Civil Aviation Organisation             |
| <b>IRS</b>     | Interface Requirements Specification                  |
| <b>INTEROP</b> | Interoperability Requirements                         |
| <b>MET</b>     | Meteorological                                        |
| <b>OFA</b>     | Operational Focus Area                                |
| <b>OSD</b>     | Operational Service and Environment Definition        |

| Term                      | Definition                                                                                    |
|---------------------------|-----------------------------------------------------------------------------------------------|
| <b>SESAR</b>              | Single European Sky ATM Research Programme                                                    |
| <b>SSN</b>                | Surface Safety Nets                                                                           |
| <b>SW</b>                 | Software                                                                                      |
| <b>SJU</b>                | SESAR Joint Undertaking (Agency of the European Commission)                                   |
| <b>SJU Work Programme</b> | The programme which addresses all activities of the SESAR Joint Undertaking Agency.           |
| <b>SE</b>                 | System Engineering                                                                            |
| <b>SESAR Programme</b>    | The programme which defines the Research and Development activities and Projects for the SJU. |
| <b>SPR</b>                | Safety and Performance Requirements                                                           |
| <b>TAD</b>                | Technical Architecture Description                                                            |
| <b>TS</b>                 | Technical Specification                                                                       |
| <b>TWR</b>                | Tower                                                                                         |
| <b>VV</b>                 | Verification & Validation                                                                     |

222

## 2 General Functional block Description

### 2.1 Context

Increasing ground traffic on airports, especially on major hubs, demands more and more attention by the ATCOs. To support controllers in maintaining an overall situational awareness Airport Safety Nets are implemented to identify potentially hazardous situations and to notify the controller in time.

Heavy weather events can be serious safety hazards for inbound and outbound traffic. Therefore weather observation at the airport is crucial to safe takeoffs and landings, as well as to continuous traffic throughput with no or minimal delays. Observation of wind conditions, and measurement of general weather parameters support the early identification of critical weather conditions.

The objective of project 12.5.2 is to define and implement the proper HMI for tower controllers to interact with alerts generated by Surface Safety Nets and MET servers (Meteorological Alerting Systems). The AA HMI will clearly display the reason of the conflict/hazard, giving the controller improved situational awareness and, consequently, the ability to immediately take countermeasures or anticipatory adapt the traffic flow and the operational procedures to the changed situation.

Traffic conflicts and weather hazards are obviously of very different nature. However, to gain an additional benefit and support the controller in his workflows, the generated alerts have to be well integrated in the A-CWP. Their display might also depend on the controller's role and the HMI components he is using for his individual tasks, in particular:

- Controllers should be provided with a clear 'picture' of the actual traffic situation in their areas of responsibility, and with all the necessary traffic data to assist them in their control tasks. The controller should be provided with clear and visible indication of conflicts as soon as the alert exists.
- Weather information should be precise, continuous and up to date. The HMI should ensure a level of user workload which is consistent with efficient and effective activity. Moreover it should make controllers' work easier and simple.

Benefits deriving from AA HMI improvements are:

- This integrated alerting platform will help controllers in managing all conflicts on the ground.
- Better situation awareness for controllers. Reducing runway incursions, clearance violations and dangerous operations also with Meteorological hazarding situation.
- Reducing costs to ANSPs by reducing controllers' workload.
- Improving the use of runway and taxiways by giving more accurate situational awareness to controllers that will predict situations causing capacity problems.
- The display of alerts helps the controller to predict and prevent traffic conflicts.
- Detection and anticipation of bad weather and potentially hazardous conditions enable the controller to alert the concerned pilots and adapt traffic flow (e.g. separation) and operational procedures (e.g. de-icing).

## 2.2 Functional block Modes and States

### 2.2.1 AA HMI states

The state is a technical configuration of the system. The system can be in only one state at a time if it is possible to switch from one state to another by a supervision command.

The AA HMI can be configured in two different states to provide operational and test capabilities:

- Operational state identifies the AA HMI running in the operational environment for Tower ATC control purposes.
- Test state identifies the AA HMI running in the Tower ATC test environment.

### 2.2.2 AA HMI modes

The mode characterises the way the system is operating in respect to the availability of its functions.

The AA HMI can be in two different modes:

- Operational: In operational state, the AA HMI is designed to provide continuous operational service despite the failure of a function. This mode is the operational one which is the normal mode of operation of the system.
- Failed: In case of a significant set of functions is necessary for the continuation of the Tower ATC service are not available, the AA HMI is considered in failed mode.

## 2.3 Major Functional block Capabilities

The purpose of this system is to manage in the Controller Working Position the different alerts and warnings related to both Airport Safety Nets and MET hazards.

The nature of this system is a Human Machine Interface, and the capabilities in which the functional requirements can be grouped are:

- Airport Safety Nets alerts display:

These requirements describe the capability of displaying on the A-CWP the alerts detected by the SSN server, managing the way of presentation.

- MET alerts display:

These requirements describe the capability of displaying on the A-CWP the alerts related to hazardous meteorological situations (high wind speed, high headwind, wind shear, microburst), managing the way of presentation.

- Alerts acknowledgments:

These requirements describe the capability of acknowledging the alerts (locally to the A-CWP)

Some capabilities described in System Requirements of Phase 1 [6] are considered no more applicable because they don't come by SESAR Operational Inputs or considered redundant. In particular:

- 293 • Acquisition of SSN alerts: no more applicable because its requirements are redundant with  
294 the Interface ones.
- 295 • Alert HMI status display: this capability doesn't come by any Operational need and in the  
296 analysis performed, all the members of the projects agree that this capability is more related  
297 to be realised by a Technical Supervision function.
- 298 • AA HMI adaptation: this capability doesn't come by any Operational need and moreover this  
299 is more related for the Advanced Controller Working Position
- 300 In section 3.1, the related sub-sections will be included but all the requirements will be tagged as  
301 "deleted".

## 302 2.4 User Characteristics

| Name                                            | Description                                                                                                                                                                                                 | Responsibilities                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Number of users in the group           | Interactions with the System                                                                                                                             |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Human actors interacting with the System</b> |                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                        |                                                                                                                                                          |
| TWR Ground Controller                           | Ensure and monitor the safe and efficient movement of the aircraft over the surface between the stand to runway entry/exit points.                                                                          | <p>Give clearances, instructions and permission to aircraft, vehicles and persons operating on the manoeuvring area with respect to safe and efficient traffic</p> <p>Coordinate with Runway controller runway entry / exit / crossing.</p> <p>Coordinate with TWR Clearance Controller for start-up and push-back process</p> <p>Monitor all aircraft and vehicle movements on the manoeuvring area and issue instructions where appropriate to ensure separation between aircraft and other ground mobiles.</p> | 1 or more (not more than 1 per runway) | <p>Is notified about airport safety nets alerts and information</p> <p>Acknowledges alerts</p> <p>Is notified about the status of safety net servers</p> |
| TWR Runway Controller                           | Ensure and monitor safe landing and take-off of aircrafts with respect of sufficient spacing between aircrafts departures, of avoidance of collision with other traffic (aircrafts, vehicles) and obstacles | <p>Give clearances to flight crew for taking-off or landing</p> <p>Inform flight crew about take-off or landing conditions with respect to the runway condition and weather situation.</p> <p>Coordinate and give authorisation to the Tower Ground Controller for the crossing of runways by surface traffic.</p> <p>Give instructions to taxi to the take-off position for departing flights and operate the stop bars if required</p> <p>Manage ordered sequence of departures and landing.</p>                | 1 or more (not more than 1 per runway) | <p>Is notified about airport safety net alerts and information</p> <p>Acknowledges alerts</p> <p>Is notified about the status of safety net servers</p>  |

| Name                                             | Description                                                                   | Responsibilities                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Number of users in the group | Interactions with the System                                                                                                                            |
|--------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| TWR Supervisor<br>ATS                            | Chief controller of the tower                                                 | <p>Manage runways usage in coordination with all concerned partners.</p> <p>Manage area and taxi closure</p> <p>Update limited visibility operations in coordination with airport authority and ACC/APP supervisor according to weather situation and infrastructure state.</p> <p>Coordinate with the Airport Operator regarding traffic emergencies/incidents on the movement area.</p> <p>Coordinate traffic flow with the ACC/APP Supervisor</p> <p>Organise shift between ATC positions.</p> | 1                            | <p>Is notified about airport safety net alerts and information</p> <p>Acknowledges alerts</p> <p>Is notified about the status of safety net servers</p> |
| <b>System actors interacting with the System</b> |                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                              |                                                                                                                                                         |
| Surface Safety Nets                              | Safety net server                                                             | <p>Compute and distribute unambiguous and in a timely manner safety nets alert, warning or information according to track data (surface and air), clearances and routes.</p> <p>Safety net refers to activities not only linked to the surface but also to take-off and landing paths.</p>                                                                                                                                                                                                        | 1                            | TWR CWP                                                                                                                                                 |
| Conformance Monitoring                           | Functional Blocks related to Surface Management and Monitoring                | Checks the actual movements of vehicles and aircrafts with clearances.                                                                                                                                                                                                                                                                                                                                                                                                                            | 1                            | Informs SSN in case of non-conformance                                                                                                                  |
| Operational Supervision                          | Functional block which disseminates all the aerodrome operational information | Stores operational information of the airport and updates all the functional blocks about the current configuration of the aerodrome.                                                                                                                                                                                                                                                                                                                                                             | 1                            | TWR CWP                                                                                                                                                 |
| Aerodrome Weather Information Management         |                                                                               | Gathers and stores information from different weather sources, e.g., temperature sensors, wind sensors, wind shear detection systems.                                                                                                                                                                                                                                                                                                                                                             | 1                            | Provides information to AA HMI.                                                                                                                         |
| Support function                                 | Recording & playback                                                          | Receive and record data from the CWP (reception and acknowledgment of safety net events)                                                                                                                                                                                                                                                                                                                                                                                                          | 1                            | TWR CWP                                                                                                                                                 |
| Aerodrome Flight Data Processing                 | Airport FPD                                                                   | Functional block responsible to manage and disseminate all the information relative to the flight plans                                                                                                                                                                                                                                                                                                                                                                                           | 1                            | TWR CWP                                                                                                                                                 |

303 All not mentioned functional blocks from Figure 1 do not interact with the AA HMI.

## 304 2.5 Operational Scenarios

305 The Airport Alerts HMI component described here supports the safe execution of the operational  
306 procedures managing the traffic on runways, taxiways and apron. It is displaying warnings and alerts  
307 coming from the Surface Safety Nets server when detecting potential conflicts/incursions involving  
308 mobiles (and stationary traffic) on runways, taxiways and, where surveillance is available, in the  
309 apron/stand/gate area. The HMI also displays alerts to the controller in case of  
310 unauthorized/unidentified traffic or obstacles.

311 AA HMI enables the controller to de-conflict and separate traffic, i.e.

312       • To alert Air Traffic Control Officers (ATCOs) and Flight Crew when mobiles deviate from ATC  
313 instructions or procedures, potentially placing the mobile at risk.

314       • To provide an early detection of situations that if not corrected would end up in hazardous  
315 situations.

316 It provides alerting for the control of aircraft and vehicles in order to maintain the declared surface  
317 movement rate under all weather conditions within the aerodrome visibility operational level (AVOL)  
318 while maintaining the required level of safety.

319 Following Operational Scenarios can be applied;

320       • Conflicting ATC clearances

321       • Non conformance to ATC instructions or procedures

322       • Meteorological alerts

323 These are agreed and shared among related projects 6.7.1 and 12.3.2.

### 324 2.5.1 Conflicting ATC clearances

325 Conflicting ATC clearances provides an early detection of situations that if not corrected would end up  
326 in hazardous situations that would be detected in turn by the A-SMGCS Level 2, if in operation. This  
327 type of alert shall be applied to all mobiles and is a complement to the A-SMGCS level 2 currently in  
328 operation in several European airports.

329 The detection of Conflicting ATC Clearances is a support tool for the Tower Runway Controller and  
330 will be performed by the ATC system based on the knowledge of data such as the clearances given to  
331 aircraft or vehicles by the Tower Runway and Ground Controllers, the assigned runway and holding  
332 point.

333 Working procedures for the Tower Runway and Ground Controllers shall be adapted to ensure that all  
334 clearances given to aircraft or vehicles are input in the system. Tower Runway and Ground Controller  
335 should therefore be provided with a Human Machine Interface (HMI) to inform the system of the  
336 clearances given to aircraft or vehicles. The HMI should also be capable of displaying Alarm  
337 messages to the Tower Runway Controllers for the conflicting clearances detected by the ATC  
338 system.

339 The use cases defined to Conflicting ATC clearances are identified and explained in section 5 of [7]  
340 (6.7.1 Updated OSED for Conflicting ATC Clearances).

## 2.5.2 Non conformance to ATC instructions or procedures

The objective of the Non-Conformance to ATC instructions or procedures is to alert Air Traffic Control Officers (ATCOs) and Flight Crew when mobiles deviate from ATC instructions or procedures, potentially placing the mobile at risk.

A non-conformance to ATC instructions alert is generated by the system when a mobile's behaviour is not conforming to ATC clearances given by the controller. The inputs of the Controller in the system via the Controller Human Machine Interface (out of scope of AA HMI) are compared with the Surveillance data from the A-SMGCS Surveillance. And also the A-SMGCS surveillance and elements of the Flight Plan Data (such as aircraft flight type) are checked against published ATC procedures. Alerts shall be generated for infringements to any explicit ATC procedures.

The use cases defined to Non-Conformance to ATC instructions are identified and explained in section 5 of [8] (6.7.1 Preliminary OSED for Conformance Monitoring).

## 2.5.3 MET Alert

Meteorological data and in particular alerts of weather hazards are important information to support ATM. Such weather situations (e.g. wind shear) often occur on a short term basis disturbing safe airport operations have to be displayed to the ATC immediately. Alerts and warnings to display in an easy to understand text message and additional graphical layers integrated into existing ATC system are the best way of presenting.

Especially, CDM (Collaborative Decision Making) airports must be aware of adverse weather conditions which is a key component in the decision making process. Adverse weather conditions are the situations where airport capacity drops, causing airlines to cancel or delay flights, and the airport operators to introduce special procedures. Therefore the controller should be well informed about MET hazards on an aerodrome to take appropriate measures.

Airport processes depending on adverse conditions for instance are:

- De-Icing (removing of frost, ice, snow or slush from the airplane)
- Local Frost prevention (Precaution procedure against formation of local frost or ice)
- Low Visibility procedure (enhanced the separation process of starting/landing aircrafts due to reduced visibility)
- Information sharing (e. g. Operators/Airlines/ pilots/ ground handler briefings)
- CDM

These procedures must be activated when a certain threshold of meteorological data is exceeded. Hence MET alerts of different kind of MET phenomena shall be highlighted

Operations where safety decreases due to adverse weather are for instance:

- Safe aircraft and vehicle manoeuvring on taxiways and aprons (e.g. due to storm and wind shear)
- Safe aircraft operation on approach (touchdown zone) and departure (e.g. crosswind)
- Ground handling (e.g. due to thunderstorms and lightning)

Therefore the AA HMI shall display all necessary MET alerts to improve the situation awareness of the controllers. Dedicated MET alert text messages will be highlighted, selectable linked to a specialized MET layer/window where more details are available.

## 2.6 Functional

### 2.6.1 Functional decomposition

This section provides an overview of the functional breakdown of the Aerodrome ATC, derived from the TAD for Step 1 document [9] provided by project 12.01.07.

In following figure it is highlighted the HMI function and in particular it is derived the sub-function that deals with this project.

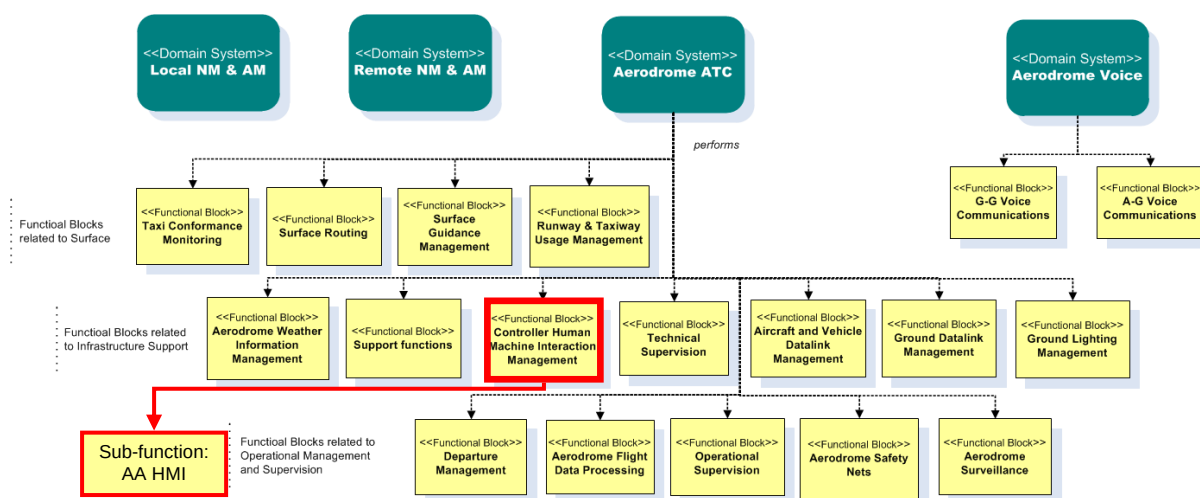


Figure 1: Aerodrome ATC Domain System - Functional Breakdown

The function of interest, as defined from project 12.01.07, is:

**Controller Human Machine Interaction Management:** This functional block provides controllers with a graphical user interface and with the means to interact with the Aerodrome ATC system.

In particular, a sub-function has been identified by this project:

**Airport Alerts HMI:** This sub-function provides controllers with a graphical user interface to visualise alerts from “Aerodrome Safety Nets”, “Conformance Monitoring” and “Aerodrome Weather Information Management” functional blocks, and to acknowledge them.

For a detailed description of each function, please refer to [9].

### 2.6.2 Functional analysis

#### 2.6.2.1 Functional System Architecture

The AA HMI component main scope is the alert presentation of hazardous situations regarding potential surface conflicts concerning mobiles (aircrafts and vehicles) and meteorological conditions. The AA HMI that will satisfy the requirements defined in this document will be then integrated into the Integrated Controller Working Position (project 12.5.4).

Therefore, in this paragraph, we will focus the architecture on the AA HMI functionalities:

- Display and handling of alerts from Surface Safety Nets functional block (Aerodrome Safety Nets and Conformance Monitoring)
- Display and handling of alerts from Aerodrome Weather Information Management functional block

Other functions that are general to the HMI (like Recording, Monitoring...) will not be considered since they are handled at the "Controller Human Machine Interaction Management" level.

The following figure presents the interactions of the sub-function "AA HMI" and the other functional blocks.

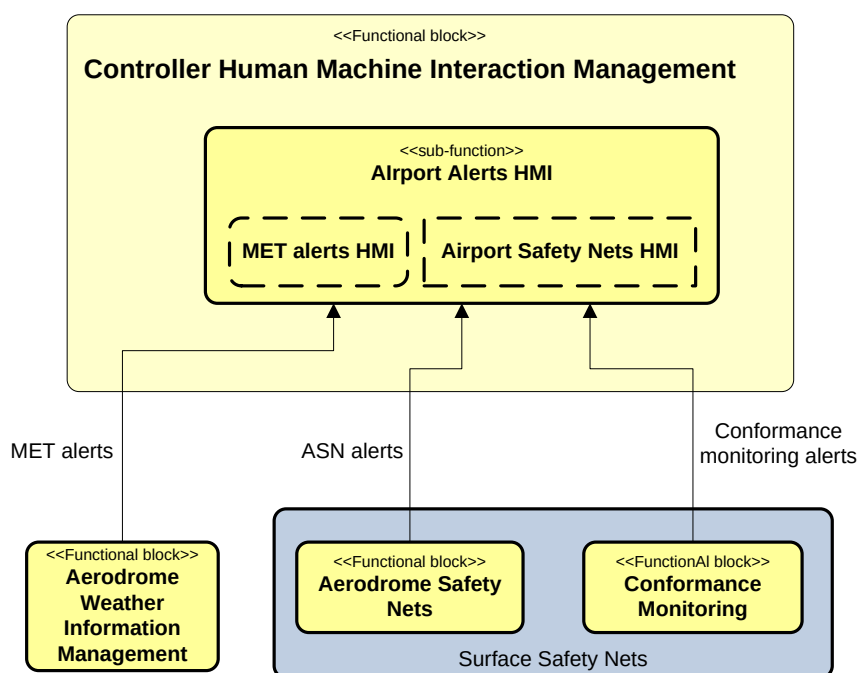


Figure 2: AA HMI Architecture

For the reasons previously explained, the links between the functional block "Controller Human Machine Interaction Management" and other functional blocks are not represented here (refer to SESAR project 12.05.04).

### 2.6.2.2 Definition of the External System Interfaces

The following table presents the interfaces between the AA HMI and the functional blocks external to the HMI.

| Origin                | Destination | Data Flow  | Data Flow Type (Content description)                                                           | Criticality | Periodicity                      |
|-----------------------|-------------|------------|------------------------------------------------------------------------------------------------|-------------|----------------------------------|
| Aerodrome Safety Nets | AA HMI      | ASN Alerts | Aerodrome Safety Nets functional block provides alerts to the HMI when a conflict is detected. | C           | On event or at regular intervals |

| Origin                                   | Destination | Data Flow                     | Data Flow Type (Content description)                                                                                         | Criticality | Periodicity                      |
|------------------------------------------|-------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------------|
| Conformance Monitoring                   | AA HMI      | Conformance Monitoring Alerts | Conformance Monitoring functional block provides alerts to the HMI when a non-conformance issue is detected.                 | C           | On event or at regular intervals |
| Aerodrome Weather Information Management | AA HMI      | MET Alerts                    | Aerodrome Weather Information Management functional block provides alerts to the HMI when a hazardous situation is detected. | C           | On event or at regular intervals |

**Table 1 - Interfaces between AA HMI and other functional blocks**

## 2.7 Service View

N/A.

## 3 Functional block Functional and non-Functional Requirements

### 3.1 Capabilities

In this section there are both requirements coming from Phase 1 of the project and the new ones. Among the requirements of Phase 1 there are several that are no more applicable, because objects of review, and that have been deleted. To ease the readability of the document, all the deleted requirements have been included into separate sections.

#### 3.1.1 Airport Safety Nets alerts display Requirements

|             |                                                                                                         |
|-------------|---------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0010                                                                               |
| Requirement | The AA HMI shall continuously display alerts as long as the related alert reports come from SSN Server. |

|             |                                                                                                            |
|-------------|------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0060                                                                                  |
| Requirement | The AA HMI shall display the alerts related to Airport Safety Nets in the track label and in an alert list |

|             |                                                                                                    |
|-------------|----------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0070                                                                          |
| Requirement | The AA HMI shall display the alerts related to Airport Safety Nets on the electronic flight strips |

|             |                                                                                    |
|-------------|------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0090                                                          |
| Requirement | The AA HMI shall provide a dedicated window to display the list of received alerts |

|             |                                                                                                                                                                                    |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0105                                                                                                                                                          |
| Requirement | The AA HMI shall include, for alerts related to ASN, in the alert list the identification of all the mobiles involved in a conflict, if received in alert reports from SSN Server. |

|             |                                                                                                                            |
|-------------|----------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0120                                                                                                  |
| Requirement | The AA HMI shall provide two stages of alert (INFORMATION and ALARM), according to the severity of received alert reports. |

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|             |                                                                                                                                                          |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0125                                                                                                                                |
| Requirement | When the alert report changes from INFORMATION to ALARM (and vice-versa), the AA HMI shall override the INFORMATION and visualise ALARM (and vice-versa) |

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|             |                                                                                                  |
|-------------|--------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0130                                                                        |
| Requirement | The AA HMI shall display INFORMATION alert using an "INFORMATION colour" (recommendation Yellow) |

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|             |                                                                                   |
|-------------|-----------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0140                                                         |
| Requirement | The AA HMI shall display ALARM alert using an "ALARM colour" (recommendation Red) |

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|             |                                                                                                                    |
|-------------|--------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0150                                                                                          |
| Requirement | The AA HMI shall present the ALARM alerts before the INFORMATION alerts in the window dedicated to the alert list. |

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|             |                                                                         |
|-------------|-------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0160                                               |
| Requirement | The AA HMI shall never hide the ALARM alerts in the list visualisation. |

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|             |                                                                       |
|-------------|-----------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0165                                             |
| Requirement | The AA HMI shall never hide the alerts until the end of the conflict. |

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|             |                                                               |
|-------------|---------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0220                                     |
| Requirement | The AA HMI shall trigger an audio signal for the ALARM alerts |

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|             |                                                                                                                                                         |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0230                                                                                                                               |
| Requirement | The AA HMI shall stop the audio signal when the related alert situation is not received any longer or when the alert is acknowledged/muted by the user. |

|             |                                                                                     |
|-------------|-------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0235                                                           |
| Requirement | The AA HMI may produce an intermittent with a short duration sound for audio signal |

### 3.1.1.1 Deleted requirements

|             |                                                                                                                                                                   |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0020                                                                                                                                         |
| Requirement | After start-up, the AA HMI shall automatically display the existing alerting situation in conformance with the existing alerting status of the Safety Net Server. |

|             |                                                                                                                                                                              |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0030                                                                                                                                                    |
| Requirement | The AA HMI shall visually notify that an event is not valid any longer on every HMI where the event was displayed, as soon as the information is provided by the SSN Server. |

|             |                                                                                                                              |
|-------------|------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0040                                                                                                    |
| Requirement | The AA HMI shall display the alerts at least in the position of controller responsible of area in which the conflict occurs. |

|             |                                                                                                                                                         |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0050                                                                                                                               |
| Requirement | The AA HMI should allow excluding from the controller positions out of responsibility of the area in which the conflict occur, its alert visualisation. |

|            |                           |
|------------|---------------------------|
| Identifier | REQ-12.05.02-TS-0002.0080 |
|------------|---------------------------|

|             |                                                                                                                                                        |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Requirement | The AA HMI should allow excluding from the controller positions out of responsibility of the area in which the conflict occur its alert visualisation. |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|

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|             |                                                                                                         |
|-------------|---------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0100                                                                               |
| Requirement | The AA HMI shall display continuously alerts as long as related alert reports will come from SSN Server |

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|             |                                                                                                                    |
|-------------|--------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0110                                                                                          |
| Requirement | The AA HMI shall include in alerts list of different controller position all the occurred conflicts at the moment. |

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|             |                                                                                                                                            |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0170                                                                                                                  |
| Requirement | The AA HMI shall display alerts with higher priority in such a way as to draw controller's attention more than alerts with lower priority. |

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|             |                                                                                                                                                                                                                         |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0175                                                                                                                                                                                               |
| Requirement | The AA HMI shall differentiate conflict with higher priority from the other ones, using a specific colour for target labels or a specific aural signal or inserting alert information on top of conflict pop-up window. |

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|             |                                                                                                           |
|-------------|-----------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0180                                                                                 |
| Requirement | The AA HMI shall allow to configure the alerts priority based on type of conflicts received by SSN server |

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|             |                                                                                                                           |
|-------------|---------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0190                                                                                                 |
| Requirement | When the display of several alerts overlap, the AA HMI shall always display in priority the alerts with the status ALARM. |

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|             |                                                                          |
|-------------|--------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0200                                                |
| Requirement | The AA HMI may allow to adapt the amount of displayed information in the |

|  |             |
|--|-------------|
|  | alerts list |
|--|-------------|

|             |                                                                                                              |
|-------------|--------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0210                                                                                    |
| Requirement | The AA HMI should display conflicts involving aircrafts in a different way from conflicts involving vehicle. |

|             |                                                                                                                                         |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0240                                                                                                               |
| Requirement | The AA HMI component shall provide the alerts related to runway conflicts always in foreground and never be hidden by other information |

|             |                                                                                      |
|-------------|--------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0002.0250                                                            |
| Requirement | The AA HMI should only allow to filter the display alerts which state is INFORMATION |

### 3.1.2 MET alerts display Requirements

|             |                                                                                                         |
|-------------|---------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0008.0005                                                                               |
| Requirement | The AA HMI shall continuously display alerts as long as the related alert reports come from MET Server. |

|             |                                                                                                           |
|-------------|-----------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0008.0010                                                                                 |
| Requirement | The AA HMI shall visualise a dedicated list containing all MET alerts detected by an external MET system. |

|             |                                                                                                                            |
|-------------|----------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0008.0020                                                                                                  |
| Requirement | The AA HMI shall visualise an alert of "high wind-speed", containing the detection time, the wind direction and its value. |
|             | High Wind Message                                                                                                          |
|             | <In Progress>                                                                                                              |
|             | It is important notify the controller about high wind-speed.                                                               |

|             |                                                                                                                                          |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0008.0030                                                                                                                |
| Requirement | The possible levels of severity for "high wind-speed" alerts are INFORMATION and ALARM, according to those present in the alarm message. |

|             |                                                                                                               |
|-------------|---------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0008.0040                                                                                     |
| Requirement | The AA HMI shall visualise an alert of "high headwind", containing the detection time and the headwind value. |
|             | MET Warning Wind                                                                                              |
|             | <In Progress>                                                                                                 |
|             | It is important notify the controller about high headwind.                                                    |

|             |                                                                                                                                                                                                                                           |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0008.0050                                                                                                                                                                                                                 |
| Requirement | The AA HMI shall visualise an alert of "wind-shear", containing the detection time, the headwind/tailwind change value, the affected runway, the related path (final approach / initial take-off) and the distance from runway threshold. |

|             |                                                                                                                                                                                                                                              |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0008.0060                                                                                                                                                                                                                    |
| Requirement | The AA HMI shall visualise an alert of "microburst", containing the detection time, the headwind/tailwind change value, the affected runway and the related path (final approach / initial take-off) and the distance from runway threshold. |
|             | MET Wind Shear Alerts 2                                                                                                                                                                                                                      |
|             | <In Progress>                                                                                                                                                                                                                                |
|             | It is important notify the controller about microburst events.<br>This requirement is linked to ICAO Annex 3 - Chapter 7.4 Wind Shear Warnings and Alerts.                                                                                   |

### 3.1.3 Alerts acknowledgment Requirements

|             |                                                                             |
|-------------|-----------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0003.0015                                                   |
| Requirement | The AA HMI shall provide means for the controller to acknowledge the alerts |

|             |                                                                      |
|-------------|----------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0003.0032                                            |
| Requirement | The AA HMI shall provide means to mute alerts (without acknowledging |

|  |       |
|--|-------|
|  | them) |
|--|-------|

|             |                                                                  |
|-------------|------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0003.0035                                        |
| Requirement | The AA HMI shall not hide the alerts in action of "MUTE" button. |

|             |                                                                                       |
|-------------|---------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0003.0050                                                             |
| Requirement | The AA HMI shall allow to disable all the alerts related to ASN on individual runways |

### 3.1.3.1 Deleted requirements

|             |                                                                                                                                                 |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0003.0010                                                                                                                       |
| Requirement | The AA HMI shall allow the acknowledgment of alerts, hiding them at least on the controller position in which the acknowledgment has performed. |

|             |                                                                                  |
|-------------|----------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0003.0020                                                        |
| Requirement | The AA HMI shall visualise on the alerts list an "ACK" button to hide the alert. |

|             |                                                                                                                                                   |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0003.0030                                                                                                                         |
| Requirement | The AA HMI shall visualise on the alerts list a "MUTE" button to stop the audio signal of an ALARM.<br>In this case the ALARM will not be hidden. |

|             |                                                                       |
|-------------|-----------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0003.0040                                             |
| Requirement | The AA HMI shall not allow to disable or acknowledge runway conflicts |

### 3.1.4 Acquisition of SSN alerts Requirements

This group of requirements is no more applicable because its requirements are redundant with those related to Interface. So, all the following requirements are tagged as “deleted”.

|             |                                                            |
|-------------|------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0001.0010                                  |
| Requirement | The AA HMI shall acquire from SSN server the alert reports |

|             |                                                                                                                                               |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0001.0020                                                                                                                     |
| Requirement | The AA HMI should assign conflict responsibility to each working position depending on conflict type and the area where the conflict happens. |

|             |                                                                                               |
|-------------|-----------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0001.0030                                                                     |
| Requirement | The AA HMI shall allow the operator to assign conflict priorities depending on conflict type. |

|             |                                                           |
|-------------|-----------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0001.0035                                 |
| Requirement | The possible values of conflict priority should be 1 or 0 |

|             |                                                                                                                                                                                                                                                                                                              |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0001.0037                                                                                                                                                                                                                                                                                    |
| Requirement | The possible types of conflicts should be those received by alert reports, i.e.: <ul style="list-style-type: none"><li>• Runway incursions</li><li>• Area intrusion</li><li>• Conflicting ATC clearances</li><li>• Non conformance to ATC instructions</li><li>• Non conformance to ATC procedures</li></ul> |

|             |                                                                              |
|-------------|------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0001.0040                                                    |
| Requirement | The AA HMI component shall assign higher priority to runway incursion alerts |

|             |                                                                              |
|-------------|------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0001.0050                                                    |
| Requirement | After start-up, the AA HMI shall automatically acquire the existing alerting |

|                                   |
|-----------------------------------|
| situation from Safety Net Server. |
|-----------------------------------|

### 3.1.5 Alert HMI status display Requirements

This capability doesn't come by any Operational Need and in the analysis performed, all the members of the projects agree that this capability is more related to be realised by a Technical Supervisor.

### 3.1.6 ASN HMI adaptation Requirements

This capability doesn't come by any Operational need and moreover this is more related for the integrated Controller Working Position (i.e. P12.5.4). So, all the following requirements are tagged as "deleted".

|             |                                                                                  |
|-------------|----------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0004.0010                                                        |
| Requirement | The AA HMI should provide means to manually change its configuration parameters. |

|             |                                                                                                             |
|-------------|-------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0004.0020                                                                                   |
| Requirement | The AA HMI shall provide means to configure the conflict priorities without changing any software component |

## 3.2 Adaptability

N/A.

## 3.3 Performance Characteristics

The performance requirements wrote during Phase 1 are not considered applicable because they was suggestion only that now don't come by any Operational requirements within SESAR programme.

So all the requirements listed in this section are tagged as "deleted".

|             |                                                                                         |
|-------------|-----------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0005.0010                                                               |
| Requirement | The AA HMI should be capable of sustained operation 24 hours a day throughout the year. |

|             |                                                                                                          |
|-------------|----------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0005.0020                                                                                |
| Requirement | The AA HMI shall respond to controller inputs within 250ms on average and never exceed a delay of 500ms. |

|             |                                                                                               |
|-------------|-----------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0005.0030                                                                     |
| Requirement | The AA HMI shall have a display latency of 250ms on average and never exceed a delay of 500ms |

|             |                                                                                           |
|-------------|-------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0005.0040                                                                 |
| Requirement | The AA HMI shall continuously display alert data while they are received from SSN server. |

### 3.4 Safety & Security

The requirements about safety written during Phase 1 are not considered applicable because they was suggestion only that now don't come by any Operational requirements within SESAR programme.

So all the requirements listed in this section are tagged as “deleted”.

|             |                                                                                                        |
|-------------|--------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0006.0010                                                                              |
| Requirement | The System may create a new log entry as soon as the information is provided by the Safety net Server. |

|             |                                                                                  |
|-------------|----------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0006.0020                                                        |
| Requirement | The alert state may be part of the log entry when an alert occurrence is logged. |

### 3.5 Maintainability

N/A.

### 3.6 Reliability

The requirements about reliability written during Phase 1 are not considered applicable because they were only suggestions that are no longer operational requirements within SESAR programme.

So the requirement listed in this section is tagged as “deleted”.

|             |                                                                           |
|-------------|---------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0007.0010                                                 |
| Requirement | The AA HMI shall implement a self-checking system that alerts on failure. |

## 3.7 Functional block Internal Data Requirements

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0009.0045                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Requirement | An alert item related to Airport Alerts HMI shall contain at least the following information: <ul style="list-style-type: none"> <li>• type of conflict (Runway incursion, Conflicting ATC clearances, Area intrusion, Non-conformance to ATC instructions or procedures)</li> <li>• subtype of conflict (specific reason of conflict, ex. Line-up vs. Line-up)</li> <li>• severity of conflict (INFORMATION/ALARM)</li> <li>• identification of mobile(s) involved in conflict</li> </ul> |
|             | ASN Alert item content                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|             | <In Progress>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|             | This essential information is used to correctly show the alert on the HMI.                                                                                                                                                                                                                                                                                                                                                                                                                 |

|             |                                                                                                                                                                                                                                                                                                                                                             |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0009.0050                                                                                                                                                                                                                                                                                                                                   |
| Requirement | An alert item related to MET hazard shall contain the following information: <ul style="list-style-type: none"> <li>- type of event (wind-shear, micro-bust, high winds-speed, high headwind)</li> <li>- severity of event (INFORMATION/ALARM)</li> <li>- time of detection</li> <li>- value of event</li> <li>- identification of area of event</li> </ul> |
|             | MET Alert content                                                                                                                                                                                                                                                                                                                                           |
|             | <In Progress>                                                                                                                                                                                                                                                                                                                                               |
|             | The external system of MET hazards has to transmit the needed information to correctly display the alert.<br>This requirement can't be linked to any Operational Requirements, but it is necessary to correctly perform its job.                                                                                                                            |

### 3.7.1 Deleted requirements

|             |                                                                                        |
|-------------|----------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0009.0010                                                              |
| Requirement | An alert shall have a status attribute. The possible values are INFORMATION and ALARM. |

|            |                           |
|------------|---------------------------|
| Identifier | REQ-12.05.02-TS-0009.0020 |
|------------|---------------------------|

|             |                                                                      |
|-------------|----------------------------------------------------------------------|
| Requirement | The status attribute of an alert shall support an INFORMATION stage. |
|-------------|----------------------------------------------------------------------|

|             |                                                                |
|-------------|----------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0009.0030                                      |
| Requirement | The status attribute of an alert shall support an ALARM stage. |

|             |                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0009.0040                                                                                                                                                                                                                                                                                                                                                                           |
| Requirement | <p>An alert item shall contain the following information items:</p> <ul style="list-style-type: none"> <li>• type of conflict (Runway incursion, Conflicting ATC clearances, Area intrusion, Non-conformance to ATC instructions, Non-conformance to ATC procedures</li> <li>• type of mobile involved (aircraft, vehicle, unknown)</li> <li>• area of conflict (runway, taxiway, apron)</li> </ul> |

## 3.8 Design and Construction Constraints

Besides a display, AA HMI should be provided with an audio device and input devices (like keyboard and mouse). First one is needed to reproduce sounds when an alert is received from SSN server; second ones are needed to allow the controller to perform HMI input operations.

These input operations should be:

- Zoom and pan to focus on airport area where conflict is happening
- Conflict acknowledgements.

In any case the specific requirement is considered useless by all the members. So it is tagged as "deleted".

|             |                                               |
|-------------|-----------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0010.0010                     |
| Requirement | The AA HMI shall have audio and input devices |

## 3.9 Functional block Interface Requirements

|             |                                                                                                                                                                          |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0011.0012                                                                                                                                                |
| Requirement | The AA HMI shall receive the alert reports from Surface Safety Nets functional block (Aerodrome Safety Nets functional block + Conformance Monitoring functional block). |
|             | Interface with SSN functional block                                                                                                                                      |
|             | <In Progress>                                                                                                                                                            |
|             | This requirement can't be linked to any Operational Requirements, but it is                                                                                              |

|  |                                         |
|--|-----------------------------------------|
|  | necessary to correctly perform its job. |
|--|-----------------------------------------|

|             |                                                                                                                                 |
|-------------|---------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0011.0015                                                                                                       |
| Requirement | The AA HMI shall receive the alert reports related to MET events from Aerodrome Weather Information Management functional block |
|             | This requirement can't be linked to any Operational Requirements, but it is necessary to correctly perform its job.             |

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0011.0020                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Requirement | <p>The alert reports coming from SSN functional block shall have at least following information:</p> <ul style="list-style-type: none"> <li>• Conflict type and subtype</li> <li>• Conflict severity (INFORMATION or ALERT)</li> <li>• Identification of involved mobile(s) (at least one of the following): <ul style="list-style-type: none"> <li>○ Track ID</li> <li>○ Transponder code</li> <li>○ Call sign</li> </ul> </li> <li>• Date and time</li> </ul> |
|             | This requirement can't be linked to any Operational Requirements, but it is necessary to correctly perform its job.                                                                                                                                                                                                                                                                                                                                             |

### 3.9.1 Deleted requirements

|             |                                                             |
|-------------|-------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0011.0010                                   |
| Requirement | The AA HMI shall receive the alert reports from SSN Server. |

|             |                                                                                       |
|-------------|---------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0011.0025                                                             |
| Requirement | The AA HMI may provide target exclusions caused by the acknowledgement to SSN server. |

|             |                                                                                                      |
|-------------|------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0011.0030                                                                            |
| Requirement | The AA HMI should receive the adaptation data and operational settings from Operational Supervision. |

|            |                           |
|------------|---------------------------|
| Identifier | REQ-12.05.02-TS-0011.0040 |
|------------|---------------------------|

|             |                                                                              |
|-------------|------------------------------------------------------------------------------|
| Requirement | The AA HMI should receive the monitoring commands from Technical Supervision |
|-------------|------------------------------------------------------------------------------|

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|             |                                                                       |
|-------------|-----------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0011.0050                                             |
| Requirement | The AA HMI should provide its working status to Technical Supervision |

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|             |                                                                                                                                                       |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0011.0060                                                                                                                             |
| Requirement | The AA HMI may receive from Aerodrome Flight Data Processing controller responsibility of each flight to drive the ability of acknowledging the alert |

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|             |                                                                                     |
|-------------|-------------------------------------------------------------------------------------|
| Identifier  | REQ-12.05.02-TS-0011.0070                                                           |
| Requirement | The AA HMI should send data (log screen) to Recording & Playback (Support Function) |

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## 4 Assumptions

Some requirements described in previous section don't come from SESAR operational requirements, due to a lack of inputs. This gap is mainly regarding MET alert area. To start the activities over this theme, ICAO documents are considered and in some case some inputs are derived from OFA 05.01.01 (in particular from project 06.05.05, even if this project deals more with CDM process).

In Airport Safety Nets area most of requirements came from P6.7.1 and from P6.9.2, but there are some other taken from Phase 1 and considered still valid that are referred to external studies. The traceability is described into "Rationale" field of requirements.

## 5 References

- [1] Template Toolbox 03.00.00  
<https://extranet.sesarju.eu/Programme%20Library/SESAR%20Template%20Toolbox.dot>
- [2] Requirements and V&V Guidelines 03.00.00  
<https://extranet.sesarju.eu/Programme%20Library/Requirements%20and%20VV%20Guidelines.doc>
- [3] Templates and Toolbox User Manual 03.00.00  
<https://extranet.sesarju.eu/Programme%20Library/Templates%20and%20Toolbox%20User%20Manual.doc>
- [4] EUROCONTROL ATM Lexicon  
<https://extranet.eurocontrol.int/http://atmlexicon.eurocontrol.int/en/index.php/SESAR>
- [5] SESAR Definition Phase – Task 2.4.x Milestone 3 – System Architecture (DLT-0612-244-00-10), September 2007
- [6] 12.05.02 – D01 – System Requirements for Phase 1, edition 00.02.00, 27/09/2011
- [7] 06.07.01 – D16 – Updated OSED for "Conflicting ATC Clearances", edition 00.01.01, 08/03/2012
- [8] 06.07.01 – D22 – Preliminary OSED for "Conformance Monitoring", edition 00.01.01, 09/01/2012
- [9] 12.01.07 – D17 – Technical Architecture Description (TAD) of Tower CC and APOC CC, edition 00.00.03, 01/02/2012
- [10] 06.09.02 – D08 – V2 HF and safety requirements (step 1), edition 00.01.00, 28/04/2012
- [11] OFA 05.01.01 – OSED related to "Airport Operations Management", edition 00.00.01, 10/04/2012
- [12] EMMA2 A-SMGCS Services, Procedures and Operational Requirements (SPOR). 2-D111 SPOR V1.0, 02/12/2008

### 5.1 Use of copyright / patent material /classified material

N/A

#### 5.1.1 Classified Material

N/A

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