Operational Concept and Requirements for A-SMGCS Implementation Level 1
DOCUMENT CHARACTERISTICS

TITLE
Operational Concept and Requirements for A-SMGCS Implementation Level 1

Abstract
This document is the Eurocontrol specification of the operational requirements for A-SMGCS Level 1 implementation.

In 2006 the EUROCONTROL A-SMGCS project published the latest version of this document that has been agreed by WG41 of EUROCAE. Further developments as well as the integration of the specifications into a European Norm and updated references consequently required an update of this document.

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<tr>
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<th>NAME AND SIGNATURE</th>
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</tbody>
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<th>EDITION NUMBER</th>
<th>EDITION DATE</th>
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</thead>
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Contents

DOCUMENT CHARACTERISTICS...............................................................................................1

DOCUMENT APPROVAL........................................................................................................2

DOCUMENT CHANGE RECORD..........................................................................................3

EXECUTIVE SUMMARY.....................................................................................................6

CHAPTER 1 – Introduction .................................................................................................7
  1.1 Scope of the document...............................................................................................7
  1.2 Structure of the document........................................................................................7
  1.3 Performance parameters............................................................................................8

CHAPTER 2 – Operational Concept .................................................................................11
  2.1 Objectives................................................................................................................11
  2.2 Services....................................................................................................................11
  2.3 Operations................................................................................................................11
  2.4 Benefits.....................................................................................................................12
  2.5 Implementation Consideration................................................................................12

CHAPTER 3 – Services.......................................................................................................13
  3.1 Overview..................................................................................................................13
  3.2 Traffic context..........................................................................................................13
  3.3 Position of mobiles...................................................................................................14
  3.4 Identity of mobiles....................................................................................................14

CHAPTER 4 – Roles of Actors..........................................................................................15
  4.1 ATC Controllers.......................................................................................................15
  4.2 Pilot..........................................................................................................................17
  4.3 Vehicle Driver..........................................................................................................17
  4.4 Other operators.........................................................................................................17

CHAPTER 5 – Operational Procedures............................................................................19
  5.1 ATC Controller.........................................................................................................19
  5.2 Pilot..........................................................................................................................19
  5.3 Vehicle Drivers.........................................................................................................20
  5.4 Other procedures.....................................................................................................20

CHAPTER 6 – Equipment..................................................................................................21

CHAPTER 7 – Operational Requirements........................................................................22
  7.1 Methodology............................................................................................................22
  7.1.1 Service level.......................................................................................................22
  7.1.2 Functional level.................................................................................................23
  7.1.3 Architectural level..............................................................................................23
EXECUTIVE SUMMARY

This document describes the Eurocontrol specification of the operational concept and requirements for the A-SMGCS Implementation Level 1.

Based on the results of validation projects, an update of the initial requirements had been prepared and agreed with EUROCAE WG41 for A-SMGCS and was published in 2006.

The EUROCONTROL and EUROCAE specifications have been incorporated in the creation of a European Norm (EN) for A-SMGCS Level 1 and Level 2 by the European Telecommunications Standardisation Institute (ETSI) based on Mandate 390 of the European Commission to a significant extend. This European Norm is planned to be converted into a European Community Specification (CS) by end of 2010. Both forms are intended as means of compliance to the European Regulation on Interoperability (EC) No 552/2004 being amended by Regulation (EC) No 1070/2009.
CHAPTER 1 – Introduction

1.1 Scope of the document

This document aims at defining the operational concept and the requirements for A-SMGCS implementation Level 1, i.e. how ATS is expected to evolve through the introduction of the A-SMGCS Level 1 (surveillance).

The Eurocontrol A-SMGCS Definition of Implementation Levels are included in Ref. 1.

Note - The present document contains a revised version of the requirements following the results of validation activities.

1.2 Structure of the document

Introduction

CHAPTER 1 – describes the purpose of this document, its structure, the reference documents and gives an explanation of terms used throughout the document.

Operational Concept

CHAPTER 2 – introduces the operational concept and principles associated to A-SMGCS Level 1. Further definition of the concept is provided through the following three chapters:

Services Description

CHAPTER 3 – presents the automated surveillance service for A-SMGCS Level 1.

Roles of Actors

CHAPTER 4 – presents the role of Level 1 actors in light of the surveillance service.

Operational Procedures

CHAPTER 5 – introduces the operational procedures that are associated to Level 1 and being developed by EUROCONTROL in close coordination with ICAO.

Equipment

CHAPTER 6 – presents equipment required for A-SMGCS Level 1.

Operational Requirements

CHAPTER 7 – contains the operational requirements associated to Level 1, i.e. from an A-SMGCS user point of view, the general requirements attached to Level-I surveillance service, the functionalities and interfaces needed
(functional requirements) and the corresponding non-functional requirements (performances). Both normal and exceptional conditions (failure) are covered.

1.3 **Performance parameters**

This section provides the explanation of terms required for a correct understanding of the present document. Most of the following explanations are drawn from the A-SMGCS manual Ref. 3, the ICAO Annex 14 Ref. 4, or the EUROCAE MASPS for A-SMGCS Ref. 6, in that case it is indicated in the definition. Ref. 3 definitions are used as a first option. In general, other definitions are only used where there is no ICAO definition. If not, it is explained why another definition is preferred to the ICAO one.

**Alert Response Time (ART)**

Ref. 6 *definition*

The time delay between an alert situation occurring at the input to the Alert Situation Detection Element and the corresponding alert report being generated at its output.

**Coverage Volume (CV)**

Ref. 6 *definition*

That volume of space which encompasses all parts of the aerodrome surface where aircraft movements take place together with those parts of the surrounding airspace which affect surface operations.

**Display Resolution (DR)**

Ref. 6 *definition*

The number of individually addressed picture elements (pixels) along each axis of the display screen. (For a raster-scan display, the resolution is normally expressed in terms of the number of raster lines and the number of pixels per line.)

**Information Display Latency (IDL)**

Ref. 6 *definition*

The maximum time delay between a report, other than a target report, being received by the A-SMGCS HMI and the corresponding presentation on the HMI display of the information contained in the report.

**Position Registration Accuracy (PRA)**

Ref. 6 *definition*

The difference between the co-ordinates contained in the dynamic input data to the HMI and the corresponding geographical position represented on the HMI display.

**Probability of Detection (PD)**

Ref. 6 *definition*

The probability that an actual target is reported at the output of the Surveillance Element of an A-SMGCS.

**Probability of Detection of an Alert Situation (PDAS)**

Ref. 6 *definition*
The probability that the Monitoring/Alerting Element correctly reports an alert situation.

**Probability of False Alert (PFA)**

Ref. 6 definition

The probability that the Control service reports anything other than actual alert situations.

**Probability of False Detection (PFD)**

Ref. 6 definition

The probability that the Surveillance Element of an A-SMGCS reports anything other than actual targets.

**Probability of False Identification (PFID)**

Ref. 6 definition

The probability that the identity reported at the output of the Surveillance Element of an A-SMGCS is not the correct identity of the actual target.

**Probability of Identification (PID)**

Ref. 6 definition

The probability that the correct identity of a co-operative target is reported at the output of the Surveillance Element.

**Reported Position Accuracy (RPA)**

Ref. 6 definition

The difference, at a specified confidence level, between the reported position of the target and the actual position of the target at the time of the report.

**Reported Velocity Accuracy (RVA)**

Ref. 6 definition

The difference, at a specified confidence level, between the reported target velocity and the actual target velocity at the time of the report.

**Response Time to Operator Input (RTOI)**

Ref. 6 definition

The maximum time delay between the operator making an input on a data entry device of an A-SMGCS HMI and the corresponding action being completed or acknowledged on the HMI display.

**Surveillance Capacity**

Ref. 6 definition

The number of target reports in a given period which the Surveillance Element is able to process and output without degradation below the minimum performance requirements.

**System accuracy**

Ref. 6 definition

The term accuracy generally describes the degree of conformance between a platform's true position and/or velocity and its estimated position and/or velocity.

**System availability**

Ref. 3 definition
Availability is the ability of an A-SMGCS to perform a required function at the initiation of the intended operation within an A-SMGCS area.

**System Capacity**
Ref. 3 and Ref. 6 definition

The maximum number of simultaneous movements of aircraft and vehicles that the system can safely support within an acceptable delay commensurate with the runway and taxiway capacity at a particular airport.

**System continuity**
Ref. 3 definition

Continuity is the ability of an A-SMGCS to perform its required function without non-scheduled interruption during the intended operation in an A-SMGCS area.

**System integrity**
Ref. 3 definition

Integrity relates to the trust which can be placed in the correctness of the information provided by an A-SMGCS. Integrity includes the ability of an A-SMGCS to provide timely and valid alerts to the user(s) when an A-SMGCS must not be used for the intended operation.

**System reliability**
Ref. 3 definition

Reliability is defined as the ability of an A-SMGCS to perform a required function under given conditions for a given time interval.

**Target Display Latency (TDL)**
Ref. 6 definition

The maximum time delay between a target report being received by the A-SMGCS HMI and the corresponding presentation on the HMI display of the target position contained in the report.

**Target Report Update Rate (TRUR)**
Ref. 6 definition

The frequency with which target reports are output from the Surveillance Element.
CHAPTER 2 –Operational Concept

2.1 Objectives

The A-SMGCS level 1 intends primarily to enhance safety and efficiency of ground surface operations through the introduction of the surveillance service.

The main objective is to enhance ATM operations, in particular visual surveillance (performed in SMGCS) by an automated system capable of providing the same level of service in all-weather operations.

Level 1 surveillance forms a pragmatic first step in A-SMGCS implementation, allowing the progressive introduction of other A-SMGCS services such as Control and Guidance.

2.2 Services

At level 1, A-SMGCS consists in the introduction of an automated system capable of providing airport traffic situational awareness through the identification and position of aircraft and vehicles within a predefined area of interest.

The area of interest considered at Level 1 is defined as follows:

- Manoeuvring area for vehicles;
- Movement area for aircraft.

At level 1, situational awareness is provided only to ATCOs.

A-SMGCS level 1 will differ from an SMGCS in that it provides a surveillance service that is effective over a much wider range of weather conditions, traffic density, and aerodrome layout.

In particular, an A-SMGCS Level 1 should be able to assist the controller in preventing collisions between all moving aircraft and vehicles especially in conditions when visual contact cannot be maintained.

The application of A-SMGCS Level 1 will lead to reallocation of responsibilities for positioning the mobiles when the controller cannot establish visual contact. Less reliance is placed on the ability of the pilot or control authority to provide a visual surveillance function.

2.3 Operations

Aircraft will operate on different aerodromes, not equipped with the same kind of A-SMGCS. Therefore, to facilitate aircrew operations, A-SMGCS categories need to be defined corresponding to the implementation levels (1 / 2 / 3 / 4), as well as potentially required aircraft equipment. A formal agreement that
a aircraft will be equipped to provide cooperative surveillance (e.g. carriage of mode S transponder) may be needed.

Airport A-SMGCS category will be notified to airspace users in order to allow aircrews to anticipate provided services and applicable procedures.

2.4 Benefits

Within the Eurocontrol Cost-Benefit Analysis (CBA) study, the results of operational trials and simulations indicated that, by maintaining throughput in reduced visibility thanks to A-SMGCS Level 1, weather delays as a result of reduced visibility could be reduced by 25%. For the two scenarios in this study, it was assumed that 40% of weather delay was as a result of reduced visibility. For many airports, this is likely to be an underestimate as in addition to weather delays resulting from poor visibility, A-SMGCS Level 1 can assist in maintaining throughput during twilight and at night.

For airports experiencing at least one serious (Category A) runway incursion per annum, this study indicates there is likely to be a clear safety benefit from the implementation (in addition to A-SMGCS Level 1) of A-SMGCS Level 2.

2.5 Implementation Consideration

A-SMGCS Level 1 has to be modular to adapt to the needs of different aerodromes and to allow implementation of further A-SMGCS levels.

Design of interfaces and subsystems will be specific to individual airports, for instance to airport configuration information or exchange of flight related data with adjacent Air Traffic Service Units (ATSU).
CHAPTER 3 –Services

This section further describes the (automated) services identified at A-SMGCS Level 1.

3.1 Overview

A-SMGCS Level 1 consists in the provision of a surveillance service to ATC Controllers (ATCO) intended to assist them by providing:

- A confirmation on a display of actual airport traffic visible or not by the controller;
- The position, and the identity if available, of all mobiles, in particular non visible ones (reduced visibility conditions, building hiding a mobile etc).

This service will display a synthetic representation of the ground traffic situation:

- Traffic context (airport configuration);
- Position of all vehicles on the manoeuvring area and of all relevant aircraft on the movement area;
- Identity of all cooperative vehicles on the manoeuvring area and of all relevant aircraft on the movement area.

Moreover, the controller needs to assess the speed of each mobile as he/she can do visually today. For instance, it is possible to display the history of the mobiles position (e.g. the 3 last positions displayed) to give him/her an idea of the mobile speed and its movement direction.

The controller should be able to confirm the identity of all participating mobiles through the application of identification procedures.

Traffic data should be provided, with an adequate accuracy and update rate, in order to support ATCO decision making process.

3.2 Traffic context

Traffic context contains all data, except traffic information (mobiles position and identity), which is necessary for the ATCO in its surveillance task, this includes:

- Airport layout : geographical representation of various airport areas (TWY, RWY, etc), their status (open / closed), the reason a runway or taxiway is closed;
- Reference points: holding points, stop bars (and other airfield lighting), RWY thresholds;
- Fixed Obstacles;
- Status of ATS systems (optional: local issue): landing systems aids, ATIS;
- Other data (optional: local issue): meteorological conditions, etc.

To complement surveillance data provided to the ATC controller, traffic information is displayed in the traffic context. It means traffic mobiles should be seen in the correct position with respect to the aerodrome layout and other traffic. For instance, if a mobile is on the runway, it must be seen on the runway and not outside the runway.

### 3.3 Position of mobiles

Position of all mobiles is necessary for the Controller in order to monitor the traffic and in particular to detect the intruders.

As controllers are responsible for the manoeuvring area, the surveillance service must provide the position of all mobiles on the manoeuvring area.

In addition, ICAO aerodrome control functions (Ref. 5, paragraph 7.1.1.3 (b), and 12.3.4.4) recognise local delegation to ATC for ‘push-back’ control, therefore aircraft that are of concern for ATC (“relevant” aircraft) need to be identified as well on the apron prior to push-back.

Consequently, the surveillance service requires covering the vehicles on the manoeuvring area and the relevant aircraft on the movement area (or relevant part of the movement area).

Detection and positioning of potential intruders is required, which implies the use of a non-cooperative sensor.

### 3.4 Identity of mobiles

The identity of mobiles is necessary for the controller to communicate with the pilots or vehicle drivers in particular to issue clearances. The surveillance service will display the identity of all mobiles in a label attached to the corresponding target.

The automatic labelling of a mobile implies the use of on-board cooperative surveillance equipment that provides mobile identity to A-SMGCS. Mode S or VDL-4 transponders are examples of such equipment.

Provided with the mobile identity, the A-SMGCS is then able to attach the identity label to the mobile target. In case a same mobile transponder is used for several vehicles, ATC should have the ability to manually put the right call sign in the associated label. This manual labelling shall remain exceptional.

In A-SMGCS level 1, most of the mobiles “known” by the ATC authorities, called “participating mobiles”, are expected to be cooperative. Therefore, participating traffic will be automatically labelled with its identity, which will then be confirmed by ATC through the application of identification procedures.

As for position information, the identity labels are attached to relevant aircraft in the movement area and to vehicles in the manoeuvring area.
CHAPTER 4 –Roles of Actors

A-SMGCS actors take part in A-SMGCS operations as a user or contributor. This section describes the current respective role of the actors in SMGCS and their evolution through A-SMGCS level 1 implementation.

4.1 ATC Controllers

In the SMGCS current situation, the role of ATCO is to manage aircraft and vehicles movements in the manoeuvring area with respect to safety requirements and planning constraints. The main tasks in relation with SMGCS are the following:

- Identification of mobiles;
- Issuance of clearances and instructions to all participating mobiles;
- Monitoring the execution of the clearances;
- Monitoring traffic situation on the manoeuvring area;
- Information of pilots / drivers about traffic surrounding their aircraft / vehicle by R/T;
- Guidance of the participating mobiles by R/T;
- Alerting the participating mobiles by R/T.

The role of the controller will not really change with the implementation of A-SMGCS level 1, but the above tasks will evolve in the sense that the surveillance service will provide to the controller a new source of data about the traffic situation in all visibility conditions. This new source of data will complement and could even replace the usual sources of traffic data. This is summarised in the following table:

<table>
<thead>
<tr>
<th>Visibility Conditions</th>
<th>Sources of Traffic Data with SMGCS</th>
<th>Sources of Traffic Data with A-SMGCS</th>
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</thead>
<tbody>
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<td>1</td>
<td>Visual means Mobiles R/T reports</td>
<td>A-SMGCS Surveillance Service (see CHAPTER 3 –) Visual means Mobiles R/T reports</td>
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<td>2, 3</td>
<td>Mobiles R/T reports</td>
<td>A-SMGCS Surveillance Service (see CHAPTER 3 –) Mobiles R/T reports</td>
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Table 1: Sources of data for the Controller
As illustrated in Figure 1, the traffic situation picture, containing traffic context, position, and identity of the mobiles, is provided by A-SMGCS to the controller to help him performing its Control task by actions on the traffic via R/T. The controller uses this surveillance information as following:

- The controller analyses the global view of the traffic situation;
- The controller focuses on particular airport areas (runway for instance) or mobiles (landing aircraft for instance) requiring his attention;
- The position of all the mobiles allows the controller to detect intruders, or participating mobiles without authorisation;
- The identification of the mobile through its label allows the controller to communicate with the mobile by R/T;
- The mobiles positions with respect to airport layout help the controller to set up a traffic planning and provide guidance to the pilots / drivers;
- The controller monitors on the display that mobiles apply the clearances he issued;
- Mobile position compared with airport layout allows the controller to check the mobile is on the right way and to provide guidance to the pilot / driver;
- Mobile position compared with airport areas status allows the controller to anticipate incursions in restricted areas and to alert the mobile;
- Mobile position compared with other mobiles position allows the controller to inform the mobile on its surrounding traffic and to anticipate collisions with other mobiles and to alert the mobile;
- Information on A-SMGCS status (failures), which could affect safety allows the controller to apply the appropriate procedure.
4.2 Pilot

In the SMGCS current situation, the role of the pilot is to navigate his aircraft following ATCO instructions and clearances provided through R/T, and with the help of visual aids and ATCO. The main tasks related to SMGCS are the following:

- Report its position to ATCO by R/T;
- Monitor surrounding traffic to prevent collision by visual means and traffic information provided by ATCO.

The role of the Pilot will not change with the implementation of A-SMGCS level 1. Contrary to the Controller, the above tasks will not evolve as the pilot will not have access to the surveillance service.

However, the use of an A-SMGCS level 1 will have the following impact on the pilot work:

Reduction of R/T report

Since the controller knows the position and identity of aircraft provided by A-SMGCS, it is possible that some aircraft position reports be not necessary anymore. This statement has to be confirmed by the definition of the procedures related to the use of A-SMGCS.

Cooperative sensor checking

Since aircraft are supposed to provide their identity through cooperative surveillance sensors, aircrew should check that this piece of equipment operates satisfactorily on board and should use it in the correct manner.

4.3 Vehicle Driver

In the SMGCS current situation, the role of the driver is to drive his vehicle following ATCO instructions and clearances provided by R/T, and with the help of visual aids and ATCO. The main tasks related to SMGCS are the following:

- Report its position to ATCO by R/T;
- Monitor surrounding traffic to prevent collision by visual means and traffic information provided by ATCO.

As for the pilot, the role of the driver will not change with the implementation of A-SMGCS level 1. However, when the controller knows the position and identity of vehicle provided by A-SMGCS, it is possible that some vehicle position reports are not necessary anymore. This has to be confirmed in the procedures related to the use of A-SMGCS.

Moreover, if the vehicle is equipped for A-SMGCS, for instance with a transponder, the driver should check the equipment is activated and should use it in the correct manner.

4.4 Other operators

If not automatic, one or more operators are needed to update the traffic context required by A-SMGCS, this includes:

- MET data, visibility conditions (including transition between visibility 1, 2, 3 and 4);
• Airport Configuration: runway in use, open taxiways;
• List of participating mobiles, etc,
CHAPTER 5 – Operational Procedures

The implementation of A-SMGCS level 1 requires the review of SMGCS procedures and the definition of a new set of operational procedures to be applied by ATC controllers, pilots, and vehicle drivers.

In addition, procedures benefiting from A-SMGCS surveillance service are being harmonised at European and international level. The activities on procedures are carried out by EUROCONTROL in close cooperation with ICAO. The purpose of the following section is to present the categories of procedures associated to A-SMGCS Level 1.

5.1 ATC Controller

For the controller, it is necessary to define the procedures for the use of A-SMGCS as a surveillance means for positioning and identification of the mobiles, like those already defined for the use of radar.

For each procedure, conditions under which they can be applied must be defined. Examples of application conditions are the status of the A-SMGCS and the visibility conditions. The A-SMGCS status may be nominal mode, failure mode or OFF. For instance, when a surveillance sensor breaks down, A-SMGCS status switches into failure mode. When A-SMGCS will not function correctly enough to be used as a surveillance means, its status should be OFF. The limits between the different system statuses will be accurately defined with their associated procedures.

As in the current SMGCS situation where specific procedures (LVP) apply when the visibility is reduced, procedures will also differ according to the visibility conditions when A-SMGCS level 1 is implemented. The procedures to be applied under each visibility condition have to be defined.

The surveillance service provided by A-SMGCS level 1 is automatic, but may exceptionally require manual actions from the controller or other operator. In particular, when the identity of a participating mobile is not automatically provided by A-SMGCS, the procedures must define how the controller can perform the identification of such a mobile (i.e. the use of identification procedures). This manual labelling shall remain exceptional.

5.2 Pilot

In A-SMGCS level 1, there will be limited changes to pilot responsibilities. As explained in section 4.2, the pilot must check if the equipment operates correctly. A-SMGCS category of each airport, defining its A-SMGCS level, and
the aircraft equipment required to interoperate, is expected to be determined in, for example, the aeronautical publications. Procedures will be written to describe the use of the A-SMGCS equipment in the aircraft.

5.3 **Vehicle Drivers**

In A-SMGCS level 1, there will be limited changes to vehicle drivers' responsibilities. As explained in section 4.3, the driver must check if the A-SMGCS equipment of its vehicle operates correctly in case it is equipped. Procedures will be written to describe the use of the A-SMGCS equipment in the vehicle.

5.4 **Other procedures**

- Procedures to determine the A-SMGCS category of each airport (A-SMGCS level, cooperative sensors).
- Procedures to provide A-SMGCS surveillance data to other users. Even if Collaborative Decision Making (CDM) is not expected to be implemented at level 1, surveillance data can be provided to other users such as airport operators, airlines, handling agencies to support them in managing their fleets.
- Procedures for users licensing.
CHAPTER 6 –Equipment

The aim of this section is to present the equipment required by A-SMGCS level 1 without favouring any technology.

Firstly, to display the traffic situation picture to the controller, an HMI is needed. On the HMI screen, the traffic context and traffic information (position and identity) should be provided, with an adequate update rate to give a continuous flow of traffic information.

To provide the position of any mobile, it is essential that some means of surveillance be available to enable the system to detect non-cooperative targets including intruders and obstacles. An example of non-cooperative surveillance sensor is the Surface Movement Radar.

Non-cooperative surveillance sensors are not able to provide the identity of the mobiles; therefore a system providing cooperative surveillance is likely to be required. For cooperative surveillance, targets need to be equipped with a means of communicating position and identity information to the A-SMGCS. An example of cooperative surveillance sensor is Mode-S Multilateration. The sensor may also be dependant of the mobile for instance when using ADS-B to broadcast the position and the identity of the mobile.

The Surveillance element for an A-SMGCS will therefore comprise several sensor systems. As shown on Figure 2, the information from these systems sensors will be combined by a data fusion process to provide a comprehensive surveillance package displayed on the controller HMI.

![Figure 2: Surveillance Service](image_url)
CHAPTER 7 – Operational Requirements

7.1 Methodology

From a methodological point of view, it is proposed to define 3 levels of requirements for an A-SMGCS system:

- Service level (7.1.1);
- Functional level (7.1.2);
- Architectural level (7.1.3).

7.1.1 Service level

At the service level, the A-SMGCS system is seen as a black box providing services to users. This black box interacts with the users but also with its environment and other external systems. At this level, the requirement analysis allows to define the operational requirements from a user point of view and to identify the environmental constraints and the interfaces with external systems.

Figure 3: Service level
7.1.2 Functional level

At the functional level, the requirement analysis interacts with the A-SMGCS system which is seen as an interaction of different functions.

![Functional level diagram](image)

Figure 4: Functional level

7.1.3 Architectural level

At the architectural level, the requirement analysis defines the physical components of the A-SMGCS system which executes the different functions defined previously. The functions are mapped onto the physical architecture.

![Architectural level diagram](image)

Figure 5: Architectural level
This document does not aim to identify all the above requirements, but focuses only on the first level: operational requirements. These operational requirements are presented in the following sections. Most of them are drawn from ICAO requirements Ref. 3. In that case, the ICAO requirement number is given in the last column.

7.1.4 Conventions used

The following categories have been identified to decompose the statements included in the requirement specification:

- **Assumptions**: an assertion about some characteristics that underlies the A-SMGCS operations or systems.
- **Recommendations**: designates general design principles applicable to A-SMGCS.
- **Requirements**: designates formal requirements about what must be delivered from an A-SMGCS operations or A-SMGCS system/sub-system perspective and that is verifiable through analysis, inspection or test.

The following conventions are used in the formal requirement statements of this document:

- The word “shall” denotes a mandatory requirement.
- The word “should” denotes a preferred requirement.
- The word “may” denotes an option.
- The word “will” denotes a statement of intent.

7.2 General Principles

The section contains a number of general principles that are applicable to A-SMGCS Level 1, either as assumptions, recommendations, or generic requirements to support A-SMGCS services.

7.2.1 Assumptions

All participating mobiles shall be cooperative.

**Sensors and Data Fusion**

It is expected that more than one type of sensor and a data fusion unit may be needed to meet the following requirements.

Source: Ref. 3 3.4.1.3

7.2.2 Recommendation

**Op_Ds-1-Modularity to fit aerodrome needs**

An A-SMGCS shall be composed of different modules required for particular user needs or technological choices.

**Note 1** - Each aerodrome has its own operational needs and technological constraints. So each aerodrome will only implement the A-SMGCS modules fitting its needs and its technological choices in order to minimize the cost of its A-SMGCS. Consequently, A-SMGCS consists of many elements which, when integrated, are designed to meet the specific operational requirements of an aerodrome.
**Op_Ds-2-HMI design**

The A-SMGCS design concept must be built upon the integration of the fundamental and principal system elements and facilitate the upgrading of those elements whilst maintaining, where possible, the same HMI and references. This is important when considering harmonisation, familiarisation, and training requirements, and will allow the evolution of the system design through to a full A-SMGCS with the minimum negative impact on the users' ability to interface with the system.

Source: Ref. 6 2.5.2

**Op_Ds-3-Interoperability**

Standards like Standards and Recommended Practices (SARPS) shall be written and used to permit interoperability between the A-SMGCS elements developed by different manufacturers.

**Note** - Such interoperability will help to maximise commercial and economic benefits for the manufacturer, service provider and user. It should also encourage timely implementation by avoiding a proliferation of different specifications.

Source: Ref. 6 1.8.4

**Op_Env-1-Aerodrome**

An A-SMGCS should be capable of being installed at any aerodrome.

Source: Ref. 3 3.5.12.1

**Op_Evo-3-HMI impact**

A-SMGCS evolution shall have a minimum negative impact on the users' ability to interface with the system. This is important when considering harmonisation, familiarisation and training requirements.

Source: Ref. 6 2.5.2

**Op_Evo-4-Modularity for A-SMGCS levels**

The design principle of an A-SMGCS shall permit modular enhancements such as implementation of further A-SMGCS levels.

**Note** - A-SMGCS will evolve from a SMGCS by progressive enhancements to match the desired level of operations. The competent authority will determine, in consultation with the users, whether existing SMGCS needs to be upgraded to A-SMGCS. A-SMGCS for each aerodrome will comprise a different mix of modular components dependent upon operational factors.

Source: Ref. 3 3.4.1, Ref. 6 1.8.2

**Op_Evo-5-Cost of evolutions**

The design principle of an A-SMGCS shall permit system enhancements at minimal cost.

Source: Ref. 6 1.8.3

**Data recording**

Data should be stored to reconstruct the video rendering of each HMI unit.
7.2.3 Requirement

**Op_Ds-4-Standardized Data Format**

The data interchange between systems should be performed in a standardized format in order to ensure an adequate exchange of information.

**Note** - ASTERIX will be the European standard to be used for surveillance data.

Source: Ref. 3 2.6.16.2

**Op_Ds-5-Self-checking system**

A self-checking system with failure alerts shall be in the system design.

Source: Ref. 3 2.7.5.1

**Op_Ds-6-System status**

Equipment which shows control data shall both be fail-safe and fail-soft.

**Note** - The term "fail-safe" in this context means that sufficient redundancy is provided to carry data to the display equipment to permit some components of the equipment to fail without any resultant loss of data displayed.

The term "fail-soft" means that the system is so designed that, even if equipment fails to the extent that loss of some data occurs, sufficient data remain on the display to enable the controller to continue operation without assistance of the computer.

Source: Ref. 3 2.6.9.1

**Op_Ds-7-Failure effect**

In case of a failure of an element of an A-SMGCS, the failure effect shall be such that the element status is always in the "safe" condition.

**Note** - For instance, the element shall not provide wrong data which could impact on safety.

Source: Ref. 3 2.6.9.2

**Op_Ds-8-Self-restartable**

An A-SMGCS shall be self-restartable.

Source: Ref. 3 2.6.9.4

**Op_Ds-9-Restart**

The restart of an A-SMGCS shall include the restoration of pertinent information on actual traffic and system performance.

Source: Ref. 3 2.6.9.4

**Op_Env-2-Flight operations**

The ground elements of the system shall be sited so as not to affect flight operations.

Source: Ref. 15

**Op_Env-3-Equipment**

Any A-SMGCS equipment sited close to the movement areas should be:

a) Lightweight;

b) Frangible where appropriate, and;

c) Capable of withstanding the effects of jet blast.
Note - It is understood that any A-SMGCS equipment installed in the movement area will comply with obstacle limitations requirements in Annex 14, Volume I.

Source: Ref. 15

Op_Env-4-Adverse effects
The system shall have adequate immunity to adverse effects such as:

a) Radio interference, including that produced by standard navigation, telecommunications and radar facilities (including airborne equipment);

b) Signal reflections and shadowing caused by aircraft in flight, vehicles or aircraft on the ground, buildings, snow banks or other raised obstacles (fixed or temporary) in or near the aerodrome environment, and;

c) Meteorological conditions or any state of the aerodrome resulting from adverse weather in which operations would otherwise be possible.

Source: Ref. 3 2.6.5

Op_Env-5-Radio Spectrum
Those elements of A-SMGCS which require the use of radio spectrum should operate in properly allocated frequency bands in accordance with appropriate national and international radio regulations.

Source: Ref. 16

Op_Env-6-Interference to Other Systems
A-SMGCS equipment shall not cause interference to standard radio navigation, surveillance, and communication systems.

Source: Ref. 16

Op_Evo-1-Operational Change
An A-SMGCS shall be capable of accommodating any operational change of the aerodrome after being installed, for instance a physical change in layout (runways, taxiways and aprons), or a change in the aerodrome procedures, rules.

Source: Ref. 3 3.5.12.2, Ref. 6 1.8.3

Op_If-1-User interface
A-SMGCS shall enable users to interface efficiently.

Source: Ref. 3 2.6.16.3

Op_If-2-Operator interface
A-SMGCS shall enable operators updating traffic context or configuring the system to interface efficiently.

Op_If-3-Interface with mobiles
A-SMGCS shall be capable of interfacing with all cooperative mobiles in order to collect the required traffic data. In addition it should interface with existing and future embedded systems.

Source: Ref. 3 2.6.2, and Ref. 14

Op_If-4-Interface with ground systems
In order to fully benefit from an A-SMGCS by all parties concerned, the system should be capable of interfacing with the following ground systems:

- Air traffic management (ATM), including Integrated Initial Flight Plan Processing System (IFPS), departure management, etc.
- Approach surveillance system to take into account airborne aircraft;
- Stand management systems;
- Existing and future ATS systems;
- MET systems;
- Visual aids;
- Any other system as part of the Collaborative Decision Making Process (CDM).

Source: Ref. 3 2.6.16.1

**Op_If-5-Interference with ATC**

The operation of A-SMGCS interfaces should not interfere with other ATC responsibilities, such as the observation of aerodrome activity and the requirements to provide alerting service.

Source: Ref. 3 3.5.18.6

**Op_Range-1-Visibility conditions**

A-SMGCS shall be capable of operating in all visibility conditions.

Source: Ref. 3 2.5.4.1 (l)

**Op_Range-2-Capacity**

A-SMGCS shall be able to handle all traffic movements on their area of interest at any instant time.

*Note* - Since capacity is a site-specific parameter, the determination of the maximum number of aircraft on the manoeuvring area should be based on the assumed peak traffic at the aerodrome. Aerodromes continually strive to increase capacity and therefore the number of movements, and hence aircraft and vehicles will probably increase over time. The A-SMGCS capacity figure should be sufficient to cater for expansion of this nature and reviewed on a regular basis to ensure that it is sufficient.

Source: Ref. 3 4.1.1.6

**Op_Range-3-Mobile types 1**

An A-SMGCS shall support operations involving all aircraft types and all vehicles types within the coverage area.

Source: Ref. 3 2.6.2 and Ref. 14

**Op_Range-4-Mobile types 2**

An A-SMGCS shall be capable of adaptation to cater for future aircraft types and vehicles types within the coverage area.

Source: Ref. 3 2.6.2

**Op_Range-5-Speeds and Orientation**

The system shall be capable of supporting operations of mobiles within the following parameters:

- Minimum and maximum speeds for aircraft on final approach, and runways;
- Minimum and maximum speeds for aircraft on taxiways;
- Minimum and maximum speeds for vehicles, and;
- Any heading.

Source: **Ref. 3 2.6.4**

**Op_Range-6-Velocity**

The A-SMGCS should cover the following speeds:

- 0 to 93 km/h (50 kt) for aircraft on straight taxiways;
- 0 to 36 km/h (20 kt) for aircraft on taxiway curves;
- 0 to 150 km/h (80 kt) for aircraft on runway exits;
- 0 to 460 km/h (250 kt) for aircraft on final approach, missed approach and runways;
- 0 to 150 km/h (80 kt) for vehicles on the movement area, and;
- 0 to 20 km/h (10 kt) for aircraft and vehicles on stands and stand taxi lanes.

Source: **Ref. 3 4.1.1.8**

**Op_Resp-1-Users**

Although the responsibilities and functions may vary, they shall be clearly defined for all users of A-SMGCS.

Source: **Ref. 3 2.3**

**Op_Resp-2-Assignment**

An A-SMGCS shall be designed so that the responsibilities and functions may be assigned to the following:

a) The automated system;

b) Controllers;

c) Pilots;

d) Vehicle drivers;

e) Airport authorities;

f) System operators.

**Note 1** - The allocation of functions and/or responsibilities might differ depending on visibility condition, level of automation and level of implementation of an A-SMGCS. A different division of functions among the control personnel (e.g. between authorities responsible for aerodrome movement control and apron management services) may also be necessary as a result of possible changes in procedures caused by automation.

**Note 2** - ATC will be responsible for the management and overall operation of the system. When certain functions will be delegated to automated elements of the system, responsibilities for the integrity and reliability of those functions lie with the service providers, certification authorities, manufacturers and software suppliers.

**Note 3** - When A-SMGCS is in operation, pilots remain responsible for the safety and control of aircraft.

**Note 4** - At level I and II ATC controllers and pilots are the only critical decision makers. Their decisions are based on surveillance data which have a specify integrity.
Op_Resp-3-A-SMGCS category

The responsible authority shall be in charge of notifying the application of Mode-S transponder operating procedures in the Aeronautical Information Publication (AIP).

Source: Ref. 13 and Ref. 14

7.3 Surveillance Service

7.3.1 Service Requirements

Op_Serv-1-Service
A-SMGCS shall provide the surveillance service to the users.

Op_Serv-2-User
The users of the surveillance service shall be all control authorities concerned in the manoeuvring area of the aerodrome.

Op_Serv-3-Airport Traffic Situation
The surveillance service shall continuously provide the following airport traffic situation:

- Traffic Information;
- Traffic context.

Op_Serv-4-Traffic information 1
The surveillance service shall continuously provide the following traffic information:

- Position of all vehicles on the area of interest for vehicles, including intruders;
- Identity of all cooperative vehicles on the area of interest for vehicles;
- Position of all relevant aircraft on the area of interest for aircraft, including intruders;
- Identity of all relevant aircraft on the area of interest for aircraft;
- History of the mobiles position (e.g. the 3 last positions displayed).

Op_Serv-5-Traffic information 2
The traffic information may optionally include other information about traffic, such as:

- Vehicle type;
- Aircraft type and registration number;
- Aircraft’s identification (ICAO 3 letter code and flight number);
- Mode A code and Mode S code;
- Departure / destination Airport;
- Estimated Time of Arrival / Departure;
- Allocated Stand, and current stand status (occupied/free);
- Wake Vortex Category;
- CFMU Slot time (if applicable);
- Assigned runway and SID/STAR/Approach Procedure;
- Estimated and actual off-block times.

The provision of such information shall be made compliant with an integrity level that is to be determined locally.

**Op_Serv-6-Area of interest for vehicles**

The area of interest for vehicles shall be the manoeuvring area.

**Op_Serv-7-Area of interest for aircraft**

The area of interest for aircraft shall be the movement area, plus a volume around the runways for aircraft on approach to each landing runway direction, at such a distance that inbound aircraft can be integrated into an A-SMGCS operation and that aerodrome movements, including aircraft departures, relevant missed approaches or aircraft crossing the relevant active runways, can be managed.

Source: Ref. 3 2.5.1.2, 2.5.1.4, 2.5.1.5, and 2.7.3.2

**Op_Serv-8-Traffic context1**

Traffic context provided by the surveillance service shall contain all data, except traffic information (mobiles position and identity), which is necessary for the ATCO in its surveillance task.

**Op_Serv-9-Traffic context2**

The traffic context shall at least include:

- Airport layout: geographical representation of various airport areas (TWY, RWY);
- Reference points: holding positions, stop bars (and other airfield lighting), RWY thresholds;
- Fixed obstacles.

Source: Ref. 3 3.3.3.7

**Op_Serv-10-Traffic context3**

The traffic context may optionally include (local issue):

- Status of runways and taxiways (open / closed);
- An indication of the duration of the runway/taxiway closure (temporary, long term);
- Status of ATS systems: landing systems aids, ATIS;
- Other data: meteorological conditions

Source: Ref. 3 3.3.3.7

**Op_Serv-11-Position**

Each mobile shall be seen in the correct position with respect to the aerodrome layout and other traffic.

**Note** - It means for instance, if a mobile is on the runway, it must be seen on the runway and not outside the runway. The position accuracy is given in another requirement.

**Op_Serv-12-Label**
The surveillance service shall provide to the user the ability to manually put the right callsign in the label associated to a vehicle equipped with a mobile cooperative equipment used for different vehicles.

**Op_Serv-13-Transition**

A seamless transition should be provided between the surveillance for an A-SMGCS and the surveillance of traffic in the vicinity of an aerodrome.

Source: Ref. 3 2.5.1.6

**Op_Mon-1-Equipment Status**

The operational status of all A-SMGCS equipment shall be monitored by the system, and alerts shall be provided when the system must not be used for the intended operation.

Source: Ref. 3 2.5.1.2 and 2.7.3.2

**Op_Mon-2-Performance**

Monitoring of the performance of an A-SMGCS should be provided such that operationally significant failures are detected and appropriate remedial action is initiated to restore the service or provide a reduced level of service.

Source: Ref. 3 2.7.4.3

**Op_Mon-3-Data**

The A-SMGCS shall perform a continuous validation of data provided to the user and timely alert the user when the system must not be used for the intended operation.

*Note* - As an example, when a mobile is still on the area of interest the system shall continuously detect the mobile, otherwise the user shall be timely alerted.

Source: Ref. 3 2.7.3.2

**Op_Mon-4-Back-up**

The system shall allow for a reversion to adequate back-up procedures if failures in excess of the operationally significant period occur.

Source: Ref. 3 2.7.5.3

**Op_Mon-5-System Failures**

Operationally significant failures in the system shall be clearly indicated to the control authority and any affected user.

Source: Ref. 3 2.7.5.3 and 2.7.4.4

**Op_Mon-6-Failure Alerts**

All critical elements of the system should be provided with audio and visual indication of failure given in a timely manner.

Source: Ref. 3 2.6.9.3

### 7.3.2 Quality of Service Requirements

**Op_Perf-1-Probability of Detection**

The probability that an actual aircraft, vehicle, or object is detected and reported at the output of the surveillance element of the A-SMGCS shall be:

- 99.9% minimum on the manoeuvring area;
- 98% minimum on the apron for moving aircraft only;
• Exceptions for well-identified areas on the airport surface are acceptable (to be defined locally).

**Note** - The output of the surveillance element means at the output of the process which builds a comprehensive surveillance package after fusion of data provided by the different surveillance sensors.

Source: Ref. 3 3.4.1.4 (a), Ref. 6 3.2.3, 3.2.4, Ref. 13, and Ref. 14

**Op_Perf-2-Probability of False Detection**

The probability that anything other than an actual aircraft, vehicle, or object is detected and reported by the surveillance element of the A-SMGCS shall not exceed 0.1%.

**Note 1** - The surveillance element means at the output of the process which builds a comprehensive surveillance package after fusion of data provided by the different surveillance sensors.

**Note 2** - Some ATS Providers request a Probability of False Detection less than 1%.

Source: Ref. 3 3.4.1.4 (a), Ref. 6 3.2.3 and 3.2.4

**Op_Perf-3-Probability of Identification**

The probability that the correct identity of cooperative aircraft and vehicles, broadcasting their identification correctly, is reported at the output of the surveillance element shall be:

• 99.9% minimum on manoeuvring area;

• 98% minimum on apron.

**Note 1** - The output of the surveillance element means at the output of the process which builds a comprehensive surveillance package after fusion of data provided by the different surveillance sensors.

**Note 2** - Some ATS providers request a Probability of Identification of at least 99% while the Probability of Identification required for Mode S radars is 99.9%.

**Note 3** - The requirement only intends to specify the performance of the ground system. E.g. pilot deviations for operating Mode-S transponder are not taken into account.

Source: Ref. 3 3.4.1.4 (a), Ref. 6 3.2.3, 3.2.4, Ref. 13, and Ref. 14

**Op_Perf-4-Probability of False Identification**

The probability that the identity reported at the output of the surveillance element is not the correct identity of the actual aircraft, vehicle or object shall not exceed 0.1%.

**Note 1** - The output of the surveillance element means at the output of the process which builds a comprehensive surveillance package after fusion of data provided by the different surveillance sensors.

**Note 2** - The value of 0.1% for Probability of False Identification is already requested by some ATS providers and accepted by manufacturers.

**Note 3** - The requirement only intends to specify the performance of the ground system. E.g. pilot deviations for operating Mode-S transponder are not taken into account.
Operational Concept and Requirements for A-SMGCS Implementation Level 1

Op_Perf-5-Position Accuracy
For the surveillance service, the allowable error in reported position shall be consistent with the requirements set by the control task of the controller:

- 7.5 m on manoeuvring area at a confidence level of 95%;
- 12 m on apron at a confidence level of 95%.

Note - For Reported Position Accuracy (RPA), ICAO specification recommends a value of 7.5 m (Ref. 3 2.7.1.2 and 4.2.3).
For Ref. 7 3.4.12, a value of 7.5m (95% level of confidence) is recommended.
For Ref. 6 3.2.3.1 and 3.2.4, a value of 12m would be reasonable for the surveillance service.

Source: Ref. 3 2.7.1.2, 4.2.3, Ref. 6 3.2.3.1, 3.2.4, Ref. 13, and Ref. 14

Op_Perf-6-Position Resolution
The mobile position resolution shall be at least 1 m.

Source: Ref. 6 3.2.3 and 3.2.4

Op_Perf-7-Altitude Accuracy
Where airborne traffic participates in the A-SMGCS, the level of an aircraft when airborne shall be determined within ±10m.

Note - Justification has not been provided for the need of aircraft altitude for A-SMGCS and for the value of its accuracy. However, it has been decided to keep this requirement as such in the document because it is provided by ICAO. If no more information about this requirement is provided so far, the validation activity will determine the status of this requirement.

Source: Ref. 3 4.2.3

Op_Perf-8-Update rate
Where appropriate, the update rate of an A-SMGCS shall be consistent with the requirements set by the control task of the controller: 1 per second.

Note - [EUROCAE MASPS] 3.2.3 and [ICAO-A-SMGCS] 4.3.5 require the update rate should be at least 1 per second. For example, in one second, an aircraft rolling at 10 kts covers a distance of 5 meters. A vehicle at 35 km/h, will move of 10 metres. In that case, the position displayed to the controller can differ of 10 metres from the actual position before being updated with the new reported value. If we take the maximum speed of 50kts for aircraft on straight taxiways ([ICAO-A-SMGCS] 4.2.4.2), the displayed position can differ by 25 metres.

Source: Ref. 3 4.2.4, Ref. 6 3.2.3 and 3.2.4

Op_Perf-10-Availability
The availability of an A-SMGCS shall be sufficient to support the safe, orderly, and expeditious flow of traffic on the movement area of an aerodrome.

Source: Ref. 3 2.7.4.1, Ref. 6 3.1.1.2

Op_Perf-11-Reliability
A failure of equipment shall not cause:

- An unacceptable reduction in safety (fail soft), and;
- The loss of basic functions.

**Note** - this requirement is achieved using backup and/or redundancy systems.

Source: Ref. 3 2.7.5.2, Ref. 6 3.1.1, Ref. 14

**Op_Perf-12-Continuity of Service 1**

An A-SMGCS shall provide a continuous service.

Source: Ref. 3 2.7.4.2

**Op_Perf-13**

Not applicable

**Op_Perf-14-Recovery time**

For a cold restart, the recovery time of an A-SMGCS shall be acceptable and the maximum value shall be specified locally. (Recommendation)

**Note** – During the validation activity the requirement of ICAO guidance for recovery within a few seconds could not be met. Technology might evolve over time and requirements should be reviewed regularly.

Source: Ref. 3, 2.6.9.4 and Ref. 14
REFERENCES

Ref. 1 EUROCONTROL definition of A-SMGCS Implementation Levels, Edition 1.2, 30/06/2010
Ref. 2 ICAO Manual of Surface Movement Control and Guidance Systems (SMGCS) 
Doc 9476-AN/927 First Edition 1986
Ref. 3 ICAO Manual on Advanced Surface Movement Control and Guidance Systems 
(A-SMGCS), Doc 9830, First Edition 2004
Ref. 5 ICAO Doc 4444 – Procedures for Air Navigation Services (PANS) Air Traffic 
Management (ATM), Fifteenth Edition 2007
Ref. 6 EUROCAE Minimum Aviation System Performance Specifications (MASPS) for A- 
SMGCS (Level 1 and 2), Edition ED-87B, January 2008, including ED-87B 
amendment No 1 of January 2009
Ref. 7 EUROCAE Minimum Operational System Performance Specifications (MOPS) for 
Surface Movement Radar sensor systems for use in A-SMGCS, Edition ED-116, 
January 2004
Ref. 8 ICAO Doc 7030 - European Supplementary Procedures, Fifth Edition 2008
Ref. 9 ICAO – Approval of a Proposal for Amendment of Regional Supplementary 
Procedures – Doc 7030/5 (Serial No.: EUR/NAT-S 08/08 – EUR 6-5) of 
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Open Proposal for Amendment to the Regional Supplementary Procedures – Doc 7030/5 (SUPPs) (Serial No: EUR/NAT-S 08/09 – EUR 6-5) related to low visibility procedures.
Ref. 10 EUROCONTROL Airport Operations Team, A-SMGCS Concept Justification and 
User Requirements, AOT/10 WP3, June 2002
Ref. 11 EUROCONTROL Preliminary Safety Case for A-SMGCS Levels 1 and 2, Edition 
2.1, 30/06/2010
Ref. 12 EUROCONTROL Human Factor Case for A-SMGCS Levels 1 and 2, Edition 1.2, 
30/06/2010
Ref. 13 EVA Project Final Validation Report for A-SMGCS Levels 1 and 2, version 1.0,
27/11/2006


GLOSSARY

This section provides the explanation of terms required for a correct understanding of the present document. Most of the following explanations are drawn from the A-SMGCS manual Ref. 3, the ICAO Annex 14 Ref. 4, or the EUROCAE MASPS for A-SMGCS Ref. 6, in that case it is indicated in the definition. A-SMGCS, Ref. 3 definitions are used as a first option. In general, other definitions are only used where there is no ICAO definition. If not, it is explained why another definition is preferred to the ICAO one.

Advanced Surface Movement Guidance and Control Systems (A-SMGCS)

Ref. 3 definition

Systems providing routing, guidance, surveillance and control to aircraft and affected vehicles in order to maintain movement rates under all local weather conditions within the Aerodrome Visibility Operational Level (AVOL) whilst maintaining the required level of safety.

Aerodrome

Ref. 3 and Ref. 4 definition

A defined area on land or water (including any buildings, installations, and equipment) intended to be used either wholly or in part for arrival, departure and surface movement of aircraft.

Aerodrome movement

Ref. 3 definition addresses only aircraft movement, the definition is extended to all mobiles.

The movement of a mobile (aircraft or vehicle) on the movement area.

Aerodrome Visibility Operational Level (AVOL)

Ref. 3 definition

The minimum visibility at or above which the declared movement rate can be sustained.

Airport authority

Ref. 3 definition

The person(s) responsible for the operational management of the airport.

Alert

Ref. 3 definition

An indication of an existing or pending situation during aerodrome operations, or an indication of abnormal A-SMGCS operation, that requires attention/action.

Alert Situation

Ref. 6 definition

Any situation relating to aerodrome operations which has been defined as requiring particular attention or action.

Apron

Ref. 3 and Ref. 4 definition

A defined area on a land aerodrome, intended to accommodate aircraft for purposes of loading or unloading passengers, mail or cargo, fuelling, parking or maintenance.

A-SMGCS capacity
Ref. 3 definition

The maximum number of simultaneous movements of aircraft and vehicles that the system can safely support within an acceptable delay commensurate with the runway and taxiway capacity at a particular aerodrome.

Conflict

Ref. 3 definition

A situation when there is a possibility of a collision between aircraft and/or vehicles.

Control

Ref. 3 definition

Application of measures to prevent collisions, runway incursions and to ensure safe, expeditious and efficient movement.

Cooperative mobile

“Cooperative target” Ref. 6 definition in which “target” is replaced by “mobile” (see mobile definition)

A mobile being equipped with systems capable of providing information automatically and continuously to the A-SMGCS, including its identity.

Note - as several cooperative surveillance technologies exist, a mobile is cooperative on an aerodrome only if the mobile and the aerodrome are equipped with cooperative surveillance technologies which are interoperable.

Cooperative surveillance

The surveillance of mobiles is cooperative when a sensor, named cooperative surveillance sensor, collects information about the mobiles from an active element of the transponder type which equips the mobiles. This technique allows collecting more mobile parameters than the non-cooperative surveillance, for instance the mobiles identity.

The cooperative surveillance may be:

- Either dependant on the cooperative mobile, when the mobile automatically generates the information and transmits it to the surveillance sensor, for instance via ADS-B;
- Or Non-dependant on the cooperative mobile, when the mobile is interrogated by the surveillance sensor, for instance Mode S Multilateration.

Data Fusion

Ref. 6 definition

A generic term used to describe the process of combining surveillance information from two or more sensor systems or sources.

False Alert

Ref. 6 definition

Alert which does not correspond to an actual alert situation.

Note - It is important to understand that it refers only to false alerts and does not address nuisance alerts (i.e. alerts which are correctly generated according to the rule set but are inappropriate to the desired outcome).

Guidance

Ref. 3 definition

Facilities, information, and advice necessary to provide continuous, unambiguous, and reliable information to pilots of aircraft and drivers of vehicles to keep their aircraft or vehicles
on the surfaces and assigned routes intended for their use.

**Identification**

**Ref. 3 definition**

The correlation of a known aerodrome movement callsign with the displayed target of that mobile on the display of the surveillance system.

**Identity**

“Aircraft identification” **Ref. 5 definition** extended to all mobiles.

A group of letters, figures or a combination thereof which is either identical to, or the coded equivalent of, the mobile call sign to be used in air-ground communications, and which is used to identify the mobile in ground-ground air traffic services communications.

**Incursion**

**Ref. 3 definition**

The unauthorized entry by an aircraft, vehicle, or obstacle into the defined protected areas surrounding an active runway, taxiway, or apron.

**Intruder**

Any mobile which is detected in a specific airport area into which it is not allowed to enter.

**Manoeuvring area**

**Ref. 3 and Ref. 4 definition**

That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, excluding aprons.

**Mobile**

A mobile is either an aircraft or a vehicle.

**Note** - when referring to an aircraft or a vehicle, and not another obstacle, the term “Mobile” will be preferred to “Target”. The term “Target” will only be used when considering an image of a mobile or other obstacle displayed on a surveillance screen.

**Modularity**

**Ref. 3 definition**

Capability of a system to be enhanced by the addition of one or more modules to improve its technical or functional performance.

**Movement area**

**Ref. 3, Ref. 4 and Ref. 5 definition**

That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, consisting of the manoeuvring area and apron(s).

**Non-Cooperative mobile**

“Non-cooperative target” **Ref. 6 definition** in which “target” is replaced by “mobile” (see mobile definition)

Mobile which is not equipped with systems capable of automatically and continuously providing information including its Identity to the A-SMGCS.

**Non-Cooperative surveillance**

The surveillance of mobiles is non-cooperative when a sensor, named non-cooperative surveillance sensor, detects the mobiles, without any action on their behalf. This technique allows determining the position of any mobile in the surveillance area and in particular to detect intruders. Examples of non-cooperative surveillance sensors are the Primary Surveillance Radars.
Normal Visibility
Visibility conditions sufficient for personnel of control units to exercise control over all traffic on the basis of visual surveillance (correspond to visibility condition 1 defined by ICAO Ref. 3).

Nuisance Alert
Ref. 6 definition
Alert which is correctly generated according to the rule set but are inappropriate to the desired outcome.

Obstacle
Ref. 3 and Ref. 4 definition extended to all mobiles.
All fixed (whether temporary or permanent) and mobile obstacles, or parts thereof, that are located on an area intended for the surface movement of mobiles or that extend above a defined surface intended to protect aircraft in flight.

Participating mobile
Mobile whose identity is known by the aerodrome authority and likely to move on airport movement areas. As illustrated below, a participating mobile is either cooperative or non-cooperative.

Protection area
A protection area is a virtual volume around a runway, a restricted area or a mobile. This protection area is used to detect an alert situation. For instance, an alert situation is detected when a mobile is on a runway and one or more mobiles enter the runway protection area.

Reduced Visibility
Visibility conditions insufficient for personnel of control units to exercise control over all traffic on the basis of visual surveillance (correspond to visibility conditions 2, 3, and 4 defined by ICAO Ref. 3).

Restricted Area
Aerodrome areas where the presence of an aircraft or a vehicle is permanently or temporarily forbidden.

Route
Ref. 3 definition
A track from a defined start point to a defined endpoint on the movement area.
Routing
Ref. 3 definition
The planning and assignment of a route to individual aircraft and vehicles to provide safe, expeditious, and efficient movement from its current position to its intended position.

Runway Incursion
Ref. 17 definition
Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take-off of aircraft.

Stand
Ref. 3 definition
A stand is a designated area on an apron intended to be used for the parking of an aircraft.

Surveillance
Ref. 3 definition
A function of the system which provides identification and accurate positional information on aircraft, vehicles, and obstacles within the required area.

Target
Ref. 3 definition (this definition has been preferred to the Ref. 6 definition)
An aircraft, vehicle, or other obstacle, which image is displayed on a surveillance display.

Note - when referring to an aircraft or a vehicle, and not another obstacle, the term "Mobile" will be preferred to "Target". The term "Target" will only be used when considering an image of a mobile or other obstacle displayed on a surveillance screen.
## ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ADS</td>
<td>Automatic Dependent Surveillance</td>
</tr>
<tr>
<td>ADS-B</td>
<td>Automatic Dependent Surveillance Broadcast</td>
</tr>
<tr>
<td>ANSPs</td>
<td>Air Navigation Service Provider</td>
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<tr>
<td>AMAN</td>
<td>Arrival Manager</td>
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<tr>
<td>AOP</td>
<td>Airport Operations Programme</td>
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<tr>
<td>AOPG</td>
<td>ICAO Aerodrome Operations Group</td>
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<tr>
<td>AOT</td>
<td>Airport Operations Team</td>
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<tr>
<td>A-SMGCS</td>
<td>Advanced Surface Movement Guidance and Control Systems</td>
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<tr>
<td>ATC</td>
<td>Air Traffic Control</td>
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<tr>
<td>ATCO</td>
<td>ATC Controller</td>
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<tr>
<td>ATM</td>
<td>Air Traffic Management</td>
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<tr>
<td>ATS</td>
<td>Air Traffic Services</td>
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<tr>
<td>ATSU</td>
<td>Air Traffic Service Unit</td>
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<tr>
<td>AVOL</td>
<td>Aerodrome Visibility Operational Level</td>
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<tr>
<td>CDM</td>
<td>Collaborative Decision Making</td>
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<tr>
<td>CFMU</td>
<td>Central Flow Management Unit</td>
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<tr>
<td>CNS</td>
<td>Communication Navigation Surveillance</td>
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<tr>
<td>CS</td>
<td>Community Specification</td>
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<tr>
<td>DMAN</td>
<td>Departure Manager</td>
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<tr>
<td>EC</td>
<td>European Commission</td>
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<tr>
<td>ECAC</td>
<td>European Civil Aviation Conference</td>
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<tr>
<td>EN</td>
<td>European Norm</td>
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<tr>
<td>ESARR</td>
<td>Eurocontrol Safety Regulatory Requirements</td>
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<td>ETSI</td>
<td>European Telecommunication Standardisation Institute</td>
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<td>EUROCAE</td>
<td>European Organisation for Civil Aviation Equipment</td>
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<tr>
<td>FAA</td>
<td>Federal Aviation Administration</td>
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<tr>
<td>GBAS</td>
<td>Ground based Augmentation System</td>
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<tr>
<td>GNSS</td>
<td>Global Navigation Satellite System</td>
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<tr>
<td>GPS</td>
<td>Global Positioning System</td>
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<tr>
<td>HMI</td>
<td>Human Machine Interface</td>
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<tr>
<td>ICAO</td>
<td>International Civil Aviation Organisation</td>
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<tr>
<td>LVO</td>
<td>Low Visibility Operations</td>
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<td>LVP</td>
<td>Low Visibility Procedures</td>
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<tr>
<td>MASPS</td>
<td>Minimum Aviation System Performance Specification</td>
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<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>MLS</td>
<td>Microwave Landing System</td>
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<td>MOPS</td>
<td>Minimum Operational Performance Specification</td>
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<tr>
<td>R/T</td>
<td>Radio Telephony</td>
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<tr>
<td>RVR</td>
<td>Runway Visual Range</td>
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<tr>
<td>SMGCS</td>
<td>Surface Movement Guidance and Control Systems</td>
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<tr>
<td>SMR</td>
<td>Surface Movement Radar</td>
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<tr>
<td>SRC</td>
<td>Safety Regulation Commission</td>
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<tr>
<td>TMA</td>
<td>Terminal Manoeuvring Area</td>
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