



The European Organisation for Civil Aviation Equipment
L'Organisation Européenne pour l'Équipement de l'Aviation Civile

**MINIMUM AVIATION SYSTEM PERFORMANCE SPECIFICATION
FOR ADVANCED SURFACE MOVEMENT GUIDANCE
AND CONTROL SYSTEMS (A-SMGCS)
Levels 1 and 2**

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ED-87C

January 2015

Supersedes ED-87B

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FOREWORD

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3. The findings of EUROCAE are resolved after discussion amongst Members of EUROCAE and in collaboration with RTCA Inc, Washington D.C., and/or the Society of Automotive Engineers (SAE), Warrendale PA, U.S.A., through their appropriate committees.
4. This document supersedes the earlier documents ED-87A and ED-87B "MASPS for Advanced Surface Movement Guidance and Control Systems (A-SMGCS)". In addition to a considerable revision of the text to consolidate the Level 1 and 2 technical requirements for A-SMGCS, all references to Levels 3 and 4 have been removed, pending the definition of the operational requirements for further implementation levels.
5. During the preparation of this document, coordination took place with the EUROCONTROL A-SMGCS Project. Further revision of the document may be appropriate when definitive documents on higher-level operational requirements for A-SMGCS are published.
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TABLE OF CONTENTS

FOREWORD		I
TABLE OF CONTENTS		II
CHAPTER 1	GENERAL	1
1.1	INTRODUCTION	1
1.2	PURPOSE AND SCOPE	1
1.3	GLOSSARY OF DEFINED TERMS	2
1.4	ABBREVIATIONS	5
1.5	REFERENCE DOCUMENTS	6
1.5.1	Normative references	6
1.5.2	Informative references	6
1.6	OPERATIONAL CONTEXT OF A-SMGCS	6
1.6.1	Operational Objectives	6
1.6.2	The A-SMGCS relationship with other systems within the ATM	7
1.7	FUNDAMENTAL SYSTEM DESIGN CONCEPTS	7
1.7.1	Categorisation	7
1.7.2	Modularity	8
1.7.3	Evolution	8
1.7.4	Interoperability	8
CHAPTER 2	SYSTEM DESCRIPTION	9
2.1	BASIC FUNCTIONAL ELEMENTS OF AN A-SMGCS LEVELS 1 AND 2	9
2.1.1	Surveillance	10
2.1.2	Surface Safety Net	10
2.2	SUPPORTING FUNCTIONS	11
2.2.1	Communications	11
2.2.2	HMI	11
2.2.3	Recording and Playback	11
2.2.4	System Status and Quality Monitor	11
2.3	INTERFACES	12
2.3.1	Machine-Machine Interface	12
2.3.2	Human-Machine Interface	13
CHAPTER 3	SYSTEM PERFORMANCE	15
3.1	GENERAL	15
3.1.1	System Capacity	15
3.2	SURVEILLANCE	16
3.2.1	Coverage Volume (CV)	16
3.2.2	Target Position Description	17
3.2.3	Detection of Targets	18
3.2.4	Identification of Targets	19
3.2.5	Classification of Targets	19
3.2.6	Reported Position Accuracy (RPA)	20
3.2.7	Target Report Update Rate (TRUR)	20
3.2.8	Reported Velocity Accuracy (RVA)	20
3.2.9	Surveillance Latency	21
3.2.10	Sensor Data Time-out	21
3.2.11	Track Continuity / Gaps (TC)	22

3.2.12	Target Report Initiation Time (TRIT)	22
3.2.13	Target Report Position Resolution (TRPR)	22
3.2.14	Target Report Velocity Resolution (TRVR)	23
3.2.15	Target Report Time Resolution (TRTR)	23
3.3	OPERATIONAL IMPLICATIONS.....	23
3.3.1	Level 1 Systems	23
3.3.2	Level 2 Systems	24
3.3.3	Surveillance Element Performance Requirements	24
3.4	SURFACE SAFETY NETS	26
3.4.1	Alert Situation	26
3.4.3	Definition of Surface Safety Net Parameters	27
3.4.4	Accuracy and Resolution.....	27
3.4.5	Alert Response Time (ART)	28
3.4.6	Surface Safety Nets Element Performance Requirements.....	28
3.5	HUMAN-MACHINE INTERFACE	29
3.5.1	Information Display Latency (IDL)	29
3.5.2	Response Time to Operator Input (RTOI).....	29
3.5.3	Map Registration Accuracy (MRA)	29
3.5.4	HMI Performance Requirements.....	30
CHAPTER 4	INTEROPERABILITY REQUIREMENTS.....	31
4.1	SYSTEM DEPENDABILITY AND INTEROPERABILITY	31
4.1.1	System Integrity.....	31
4.1.2	System Availability and Continuity of Service	32
4.1.3	Synchronisation	33
4.1.4	Dependability and Interoperability Requirements	33
CHAPTER 5	TEST AND VERIFICATION	34
5.1	INTRODUCTION	34
5.2	PERFORMANCE REQUIREMENTS.....	34
5.3	A-SMGCS TEST METHODOLOGY	34
5.4	TEST EQUIPMENT PRECAUTIONS	36
5.5	TEST DESCRIPTIONS.....	36
5.6	GENERAL TESTS	37
5.6.1	System Capacity Test	37
5.7	SYSTEM DEPENDABILITY AND INTEROPERABILITY TESTS.....	37
5.7.1	Integrity Monitor Response Time Test	39
5.7.2	MTBCF Test	39
5.7.3	MTTR Test	40
5.7.4	Synchronisation Test.....	40
5.8	SURVEILLANCE ELEMENT TESTS.....	41
5.8.1	Coverage Volume Test.....	41
5.8.2	Probability of Target Report (PTR).....	42
5.8.3	Probability of False Target Report (PFTR).....	43
5.8.4	Probability of Identification (PID) Test.....	43
5.8.5	Probability of False Identification (PFID) Test.....	44
5.8.6	Reported Position Accuracy (RPA) Test	45
5.8.7	Target Report Update Rate (TRUR)	46
5.8.8	Reported Velocity Accuracy (RVA) Test	46
5.8.9	Target Display Latency (TDL) Test	47

5.8.10	Position Renewal Time-Out Period (PRTOP) Test	48
5.8.11	Identification Renewal Time-Out Period (IRTOP) Test	48
5.8.12	Track Continuity (TC) Test	49
5.8.13	Target Report Initiation Time (TRIT) Test	49
5.9	SURFACE SAFETY NETS ELEMENT TESTS	50
5.9.1	Probability of Detection of an Alert Situation (PDAS) Test	51
5.9.2	Probability of False Alert Situation (PFAS) Test	51
5.9.3	Alert Response Time (ART) Test	52
5.10	HUMAN-MACHINE INTERFACE TESTS	53
5.10.1	Map Registration Accuracy Test	53
APPENDIX 1 REQUIREMENT / TEST CASE CORRESPONDENCE MATRIX		55
APPENDIX 2 WG-41 MEMBERSHIP		56
IMPROVEMENT SUGGESTION FORM		57

CHAPTER 1

GENERAL

1.1 INTRODUCTION

Advanced Surface Movement Guidance and Control System (A-SMGCS) is the adopted term for the concept of an integrated aerodrome surface movement management system. ICAO and other bodies, such as ECAC and the European Commission, recognise that the development of such a conceptual system is required to improve ground movement safety and efficiency in line with the projected aviation growth.

In certain circumstances, current Surface Movement Guidance and Control Systems (SMGCS) are unable to maintain the runway throughput of aerodromes and may result in a reduction of aerodrome arrival and departure rate particularly during Low Visibility Conditions (LVC).

An Advanced SMGCS (A-SMGCS) is required to maintain an acceptable level of traffic and assure adequate safety where justified by traffic density, aerodrome layout or weather conditions through improvements of functions such as Surveillance, Safety Nets, Route Planning and Guidance.

In compiling this document, it has been recognised that the development of A-SMGCS is an evolutionary process, with aerodrome operators building on their existing investments in systems. There are also inter-relationships with other developing international standards relating to systems and concepts such as Data Link and Automatic Dependent Surveillance (ADS) which will impact on system development.

Since publication of the Document ED-87A (December 2000) and ED-87B (January 2008), further work has been carried out by various international bodies and research establishments. Where available, the results of this work have been reflected in this version of the document.

The document deals, necessarily, with the A-SMGCS as viewed from the technical aspect. In order to avoid any confusion, some of the terminology used in the document has been revised to emphasise its technical nature or to align it with other documents as appropriate and to keep up to date.

1.2 PURPOSE AND SCOPE

This document contains the Minimum Aviation System Performance Specification (MASPS) for A-SMGCS at the current level of maturity. This document specifies system and equipment characteristics that should be useful to designers, installers, manufacturers, service providers and users of systems intended for operational use at aerodromes. Functional requirements are used wherever possible to allow flexibility in the design of sub-system equipment.

This specification was produced with the knowledge of existing and proven installations and in accordance with the latest results from research projects such as SESAR. Adherence to this specification is intended to enable early operational implementation of a system at an aerodrome in accordance with the aerodrome's operational requirements.

Chapter 1 of this document outlines the A-SMGCS role within the future air traffic management system. It describes the rationale for the system concept, the expected operational goals of the A-SMGCS and outlines the fundamental design concepts. It provides definitions of terms used in the document, lists of abbreviations and references to other documents.

Chapter 2 outlines the enabling functions of an A-SMGCS and defines an evolutionary approach to configuration levels which have been identified by EUROCAE as the steps for building the A-SMGCS. Advice on interfaces is provided.

Chapter 3 specifies performance requirements for the principal enabling functions of an A-SMGCS.

Chapter 4 introduces Dependability and Interoperability Requirements applicable to an A-SMGCS to provide assurance that the sub-systems are compatible with each other and will perform their intended functions.

Chapter 5 describes methodologies for the verification of A-SMGCS performance requirements specified in Chapter 3 and contains descriptions of the recommended generic test procedures needed to verify compliance at both functional element and overall system level.

Chapter 6 is an appendix with a requirements cross-reference matrix.

1.3

GLOSSARY OF DEFINED TERMS

NOTE: *Some terms provided below are taken from existing ICAO documents, either SARPS ANNEX 14 or Doc 9830 A-SMGCS Manual. The sources are referenced in brackets.*

The following defined terms are used within the context of this document:

Advanced Surface Movement Guidance and Control System

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

Accuracy

Defines the discrepancy between a measured/displayed value and a real/reference value.

Aerodrome (ICAO SARPS ANNEX 14)

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

Air Traffic Management

A generic term comprising the functions of air traffic services, airspace management and air traffic flow management, together with the necessary airborne capability, which are necessary to ensure the safe and efficient movement of aircraft in all phases of operation.

Aircraft Movement

The positions of an aircraft in its entirety between landing and arriving at a stand or between leaving the stand until take-off.

Air Traffic Services

A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).

Aircraft Stand Taxilane (ICAO SARPS ANNEX 14)

A portion of an apron designated as a taxiway and intended to provide access to aircraft stands only.

Alert Report

A data record containing all relevant information pertaining to each target involved in an alert situation detected by the Surface Safety Net element.

Alert Situation

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

Apron (ICAO SARPS ANNEX 14)

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

Apron Taxiway (ICAO SARPS ANNEX 14)

A portion of a taxiway system located on an apron and intended to provide a through taxi route across the apron.

Availability

The probability that a system or an item is in a functioning state at a given point in time.

Classification

A function which groups Targets into various types (e.g. large aircraft, small aircraft, vehicle).

Continuity of Service

The ability of a system or an item to perform its required function without unscheduled interruption throughout the duration of the intended operation.

Control

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

Cooperative Target

A Target which is equipped with systems capable of automatically and continuously providing information including its Identity to the A-SMGCS.

Data Fusion

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

Dependability

Describes the availability performance with regard to its influencing performance factors reliability, maintainability and maintenance support.

False Alert

Alert which does not correspond to an actual Alert Situation.

Guidance

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.

Integrity

An attribute of a system or an item indicating that it can be relied upon to perform correctly on demand. (It includes the ability of the system to inform the user in a timely manner of any performance degradation.)

Manoeuvring Area (ICAO SARPS ANNEX 14)

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

Modularity

Characteristic of a system that describes its capability to be enhanced by the addition of one or more modules to improve its technical or functional performance.

Movement Area (ICAO SARPS ANNEX 14)

That part of an aerodrome to be used for take-off, landing and taxiing of aircraft, consisting of the Manoeuvring Area and Aprons.

Non-cooperative Target

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

Obstacle (ICAO SARPS ANNEX 14)

All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

Reliability

The ability of a system or an item to perform a required function under specified conditions, without failure, for a specified period of time.

Requirement

An identifiable element of a function specification that can be validated and against which an implementation can be verified.

Route Planning

A function of A-SMGCS which provides strategic and tactical allocation of routes and times to aircraft and / or vehicles to provide safe, expeditious and efficient movement from the current position to the intended position.

Runway Incursion (ICAO DOC 9830)

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 (ICAO DOC 9830)

A designated area on an apron intended to be used for the parking of an aircraft.

Stands can be classified as :

- a) active stand - a stand that is occupied by a stationary aircraft with engines operating, or on which an aircraft is moving, or that is being approached by an aircraft.
- b) passive stand - a stand that is occupied by a stationary aircraft with engines not operating.
- c) empty stand - a stand that is vacant and not being approached by an aircraft.

Surface Safety Nets

A function of the system that provides detection and alerting of conflicts and other hazards.

Surveillance

A function of the system that provides identification and accurate positional information on aircraft, vehicles and objects within the required area.

Target

Any aircraft, vehicle or obstacle, whether stationary or moving, which is located within the Coverage Volume of the A-SMGCS and which is operationally significant in the scope of A-SMGCS use.

Aircraft and vehicles are collectively referred to as mobiles.

Target Identification

The association of a known aircraft or vehicle call-sign or other appropriate identity to Target data.

Target Report

A data record of a Track at the output of the Surveillance element.

Time of Report

The exact time at which the position of the Target was determined by the Surveillance element. It is contained in an information field in the Target Report.

Track

A progressive series of estimates of a Target position.

Update

A renewal of Target Reports relating to all Targets under Surveillance

Validation

The determination that the requirements for a product are sufficiently correct and complete from an operational point of view.

Verification

The evaluation of an implementation of requirements to determine that they have been met.

1.4**ABBREVIATIONS**

The following abbreviations are used in this document. Their meanings are as shown below.

A-SMGCS	Advanced Surface Movement Guidance and Control System
ASTERIX	All Purpose Structured EUROCONTROL Surveillance Information Exchange
ART	Alert Response Time
ATC	Air Traffic Control
ATM	Air Traffic Management
BITE	Built-in Test Equipment
CV	Coverage Volume
EUROCAE	European Organisation for Civil Aviation Equipment
GNSS	Global Navigation Satellite System
HMI	Human Machine Interface
ICAO	International Civil Aviation Organisation
IDL	Information Display Latency
IMRT	Integrity Monitor Response Time
IRTOP	Identification Renewal Time Out Period
MASPS	Minimum Aviation System Performance Specification
MODE S	Selective Address SSR
MOPS	Minimum Operational Performance Specification
MRA	Map Registration Accuracy
MTBCF	Mean Time Between Critical Failures
PD	Probability of Detection
PDAS	Probability of Detection of Alert Situation
PFAS	Probability of False Alert Situation
PFID	Probability of False Identification
PFTR	Probability of False Target Report
PID	Probability of Identification
PRTOP	Position Renewal Time Out Period
PTR	Probability of Target Report
RPA	Reported Position Accuracy
R/T	Radiotelephony
RTOI	Response Time to Operator Input

RVA	Reported Velocity Accuracy
SARPS	Standards and Recommended Practices
SMGCS	Surface Movement Guidance and Control System
SMR	Surface Movement Radar
SSR	Secondary Surveillance Radar
TC	Track Continuity
TDL	Target Display Latency
TOO	Target of Opportunity
TPCR	Target Position Containment Radius
TPRP	Target Position Reference Point
TRIT	Target Report Initiation Time
TRPR	Target Report Position Resolution
TRTR	Target Report Time Resolution
TRUR	Target Report Update Rate
TRVR	Target Report Velocity Resolution
WGS-84	World Geodetic Survey (1984)

1.5 REFERENCE DOCUMENTS

1.5.1 Normative references

1. EUROCAE ED-128: Guidelines for Surveillance Data Fusion in A-SMGCS (September 2007)
2. EUROCONTROL: Operational Concept and Requirements for A-SMGCS Implementation Level 2 (Edition 2.1, June 2010)
3. ICAO: Doc 9830 A-SMGCS Manual (2004)
4. EUROCAE ED-116: Minimum Operational Performance Specification for Surface Movement Radar Sensor Systems for use in A-SMGCS (January 2004)
5. EUROCAE ED-117: Minimum Operational Performance Specification for Mode S Multilateration Systems for use in Advanced Surface Movement Guidance and Control Systems (A-SMGCS) (November 2003)

1.5.2 Informative references

- i.1 EUROCONTROL, IfEN: WGS 84 IMPLEMENTATION MANUAL (1998)
- i.2 ICAO: SARPS ANNEX 14 Aerodromes (2003)
- i.3 EUROCAE ED-99C: User Requirements For Aerodrome Mapping Information (September 2011)
- i.4 EUROCAE ED-119B: Interchange Standards For Terrain, Obstacle and Aerodrome Mapping Data (September 2011)

1.6 OPERATIONAL CONTEXT OF A-SMGCS

1.6.1 Operational Objectives

The air traffic management concept envisages an air traffic service that works at optimum efficiency, capacity and safety. This could be achieved through the integration and harmonisation of all the systems, services and procedures required for the air traffic services.

The objective of the A-SMGCS is to optimise the efficiency, capacity and safety of operations at an aerodrome. The surface movement infrastructure existing at many aerodromes today can be enhanced by providing positive Identification of traffic, improving all weather situational awareness, improving communications and navigation aids, and by providing route planning tools.

In order to achieve this aim the A-SMGCS has to attain levels of integrity, accuracy and dependability that exceed those that exist today. The A-SMGCS will also introduce the need to address the human factor considerations in the use of new working methods and procedures that result from the deployment of new technologies.

1.6.2

The A-SMGCS relationship with other systems within the ATM

The A-SMGCS must be fully consistent with the ATM concept. The A-SMGCS is designed to be an integral part of the ATM and it is assumed in this document that all relevant ATM systems are operational and performing within their designed performance specifications.

The environment of an A-SMGCS system is described in [FIGURE 1.1](#). The context of the system is influenced by various interfacing data sources, systems, parameters, infrastructure and users.

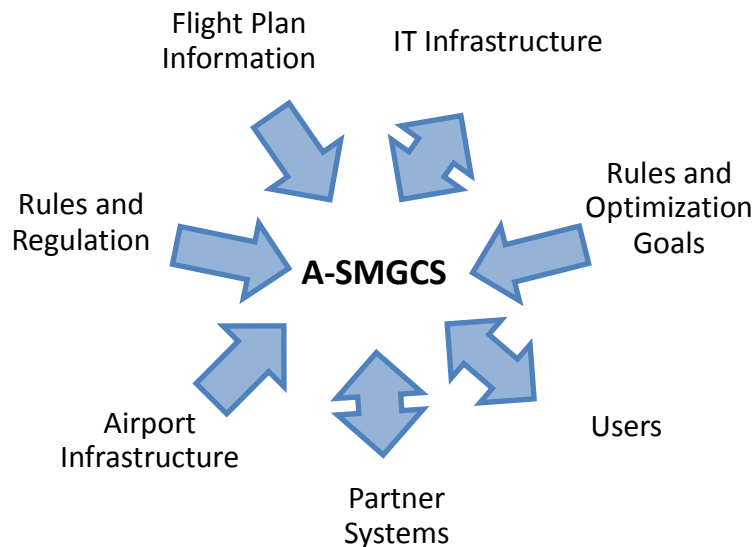


FIGURE 1.1: THE A-SMGCS ENVIRONMENT

The A-SMGCS concept may include the use of new and existing technologies within the aircraft. Some on board communication, navigation and surveillance equipment is able to provide or exchange useful information with the A-SMGCS. The A-SMGCS will also provide surface situation information to other areas of the ATM as well as airline and aerodrome management systems.

1.7

FUNDAMENTAL SYSTEM DESIGN CONCEPTS

1.7.1

Categorisation

In order to provide guidance on the various implementation aspects of an A-SMGCS, categorisations are used to illustrate the likely system configuration for several levels of service. They range from the basic requirement of providing improved surveillance for controllers and other users to more sophisticated systems with a high level of automation.

A-SMGCS can be considered in several configuration levels, which recognise the evolutionary nature of these systems and allow appropriate performance requirements to be specified.

Level 1 provides for the necessary surveillance and display systems to permit comprehensive situational awareness. This level recognises that aerodromes which plan to implement an A-SMGCS may have existing investments in systems such as Surface Movement Radar. They will have identified the need to add further surveillance capability to their system to include identification, and improved coverage and accuracy. Having provided a suitable surveillance system, the A-SMGCS can use the derived information to monitor the situation on the aerodrome surface and provide alerts when particular situations are detected.

Level 2 introduces automated monitoring and alerting of the situation, made possible by comprehensive automated surveillance. It includes runway incursion monitoring at a minimum, but may include other forms of incident prediction, dependent on the operational needs of the particular airport.

Other levels of A-SMGCS are not considered within this document.

1.7.2 Modularity

No two aerodromes are the same, yet many encounter similar problems with maintaining the safety and efficiency of operations in the ground movement environment. The A-SMGCS consists of many elements which, when integrated, are designed to meet the specific operational requirements of an aerodrome. In order to cover a wide range of requirements, any element design must comply with the modularity concept.

1.7.3 Evolution

The A-SMGCS concept will incorporate the ability to accept technological and operational changes which will allow service providers to update, change or add to the A-SMGCS capability at reasonable cost.

1.7.4 Interoperability

This document, in conjunction with any appropriate and available Standards and Recommended Practices (SARPS), gives guidance on providing interoperability between the A-SMGCS elements developed by different manufacturers. 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.

CHAPTER 2

SYSTEM DESCRIPTION

2.1 BASIC FUNCTIONAL ELEMENTS OF AN A-SMGCS LEVELS 1 AND 2

In order to analyse the requirements of an A-SMGCS and provide an evolutionary modular concept, it is necessary to split the system into its logical functional elements. The proposed basic elements are Surveillance, Surface Safety Nets together with the necessary communications and HMI.

It should be noted that while these basic technical functions do not align directly with the functions Surveillance, Routing, Guidance and Control as described in the ICAO Manual of A-SMGCS [reference 3], they are nevertheless consistent with the provision of systems to meet the operational requirements therein defined.

The Surface Safety Net element, which has no direct counterpart in the ICAO functions, comprises the processing of the information gathered by the Surveillance element against a set of rules which characterise the particular requirements of A-SMGCS at the aerodrome concerned.

The interaction between these functional elements of a Level 2 A-SMGCS is illustrated in the diagram below. Surface Safety Net functions exceeding A-SMGCS Level 2 are not covered within this document.

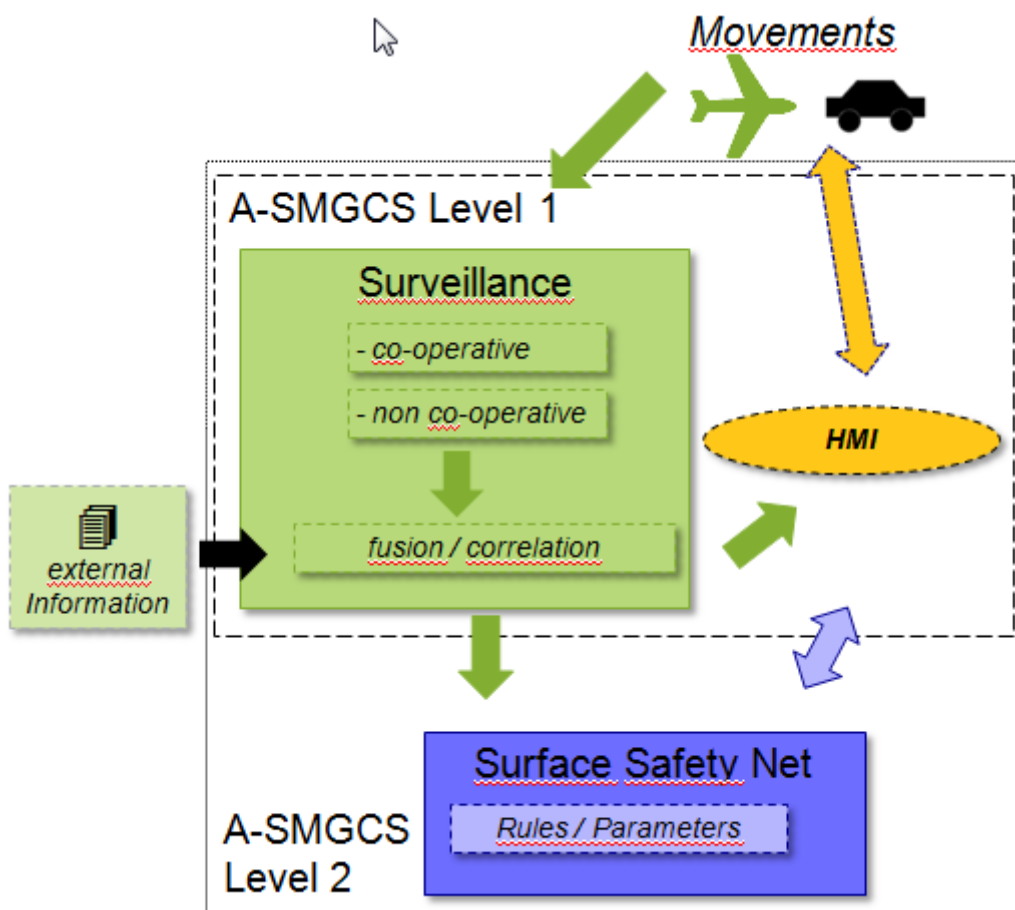


FIGURE 2.1: CONCEPTUAL BLOCK DIAGRAM FOR A-SMGCS LEVEL 2

2.1.1 Surveillance

The most fundamental function for any A-SMGCS is the surveillance of the defined Coverage Volume as defined in Chapter 3.3. The objective is that both identity and position of all traffic should be provided, with an adequate update rate to give a continuous flow of traffic information and to derive speed and direction, if required. To achieve this objective a system providing cooperative surveillance is likely to be required. In non-critical areas of the aerodrome surface, operation of vehicles without cooperative surveillance may still be on the basis of local or airport specific regulations.

For cooperative surveillance, mobiles need to be equipped with a means of communication to allow the determination of position and identity by the A-SMGCS. It is also essential that some means of surveillance is available to enable the system to detect Non-cooperative Targets, including obstacles.

The Surveillance element for an A-SMGCS will therefore comprise several sensor systems. The information from these systems together with some means of identification will be combined by a Data Fusion process to provide a comprehensive surveillance package.

The system at this level would therefore provide for:

- Situational awareness

to users of the system. Users may include pilots and vehicle drivers, where suitable equipment is provided, and other third parties.

The performance of the Surveillance element at this system level should be consistent with the situational awareness role of the system and may in some respects be less demanding than at higher A-SMGCS levels.

The minimum functionalities of a Level 1 system contain:

- Fusion of target reports from input sensors to create a comprehensive Track,
- Flight plan information correlation to fused Track.

2.1.2 Surface Safety Net

At this level, the A-SMGCS will use the comprehensive surveillance data available to monitor the situation in the area of interest within the defined Coverage Volume against a set of rules which will enable the system to alert the user to hazardous situations.

The system at this level would therefore provide for:

- Situational awareness, and
- Situation interpretation and alerting (Surface Safety net)

to users of the system.

The minimum functionalities of a Level 2 system contain in addition to Level 1:

- Detect and report Alert Situations and present the alert information on the controller HMI.

The term “Alert Situation” is a generic term used to cover all situations which, according to the operational requirements, should be brought to the attention of the user of the A-SMGCS. What constitutes an Alert Situation for a particular A-SMGCS implementation will be determined by a predefined set of rules and parameters with which the Surface Safety Net element operates.

The set of rules will define Alert Situations which are likely to include the following categories at a minimum:

- Incursion onto runway or Restricted Area, and
- Violation of predefined separation parameters.

Typical Alert Situations could be, for example, that two mobiles approach one another within a pre-defined time/distance minimum, or that one mobile enters a restricted area.

In all cases the Surface Safety Net element will analyse the information contained in the Target Reports from the Surveillance element and compare them to the rules, generating an alert whenever appropriate.

2.2 SUPPORTING FUNCTIONS

2.2.1 Communications

At all levels of A-SMGCS, some degree of communication is necessary.

The types of communication used can be considered in the following groups:

- Communication used uniquely by a system element as part of its functionality (examples of this would be basic Mode S squitter transmissions, ADS broadcasts, or vehicle tracking systems);
- Communications used to interconnect the various functional elements of the A-SMGCS;
- Communication used to pass information relating to the surveillance function between A-SMGCS participants (examples of this might be the broadcast of differential GNSS reference data, the down linking of aircraft or vehicle position, speed, intention);
- Communication used to provide advice or instructions to A-SMGCS participants (examples here range from R/T communications between pilot and controller, through the transmission of explicit instructions on a suitable data link, to the transmission of a situation display for use by the pilot.

NOTE: *Data link communications are beyond the scope of the present document.*

- Interfaces to external systems may include meteorological information, runway status information, airfield lighting, flight plan system, electronic flight strip systems, etc. Those interfaces may be uni-directional or bi-directional.

Within these groups, there will be certain information, which is time critical, e.g. position reports, situation display data and alert reports. Such information may require a dedicated link for some aspects of A-SMGCS.

2.2.2 HMI

All elements of an A-SMGCS require an HMI to present information and permit the users to interact with the system.

The HMI will include input devices and displays providing situational awareness together with the necessary information to support the appropriate level of A-SMGCS.

2.2.3 Recording and Playback

Recording and playback facilities are extremely useful in both testing of the system and for accident investigation. Some authorities will require recording and the ability to reconstruct the video rendering of each HMI.

Recording for accident investigation purposes should be done at the A-SMGCS system level.

Testing and analysis of system performance may also require recording at individual sensor systems level.

2.2.4 System Status and Quality Monitor

It is essential for any system to have a high reliability and to meet all the required performance goals.

For that reason online system quality and integrity monitoring will be needed as well as possibilities for offline post analysis of quality and integrity. Therefore, means to monitor and log the status of the following is recommended:

- Interfaces,
- Components,
- Quality indicators,
- Integrity indicators.

2.3 INTERFACES

2.3.1 Machine-Machine Interface

2.3.1.1 Surveillance Input

The interfaces between cooperative and non-cooperative surveillance sensors and the Data Fusion process should be standardised to allow sensors from different equipment providers to be integrated into an A-SMGCS. The use of the ASTERIX data format is recommended for the surveillance sensors. Information passed on this interface should include, but not be limited to:

- Data source identifier,
- Target Report descriptor,
- Unique Target Identification (if available),
- Measured position of Target referred to WGS-84 coordinates (irrespective of the coordinate system used),
- Target Report time stamp (Time of Report).

The surveillance Data Fusion process will combine the information from all surveillance sensors together with other relevant information which may be supplied from external systems.

2.3.1.2 Fusion Output

For ease of interoperability, surveillance data outputs from the Data Fusion process should use the ASTERIX data format or any open format.

Target Reports should include, but not be limited to:

- Data source identifier,
- Target Report descriptor,
- Unique Target Identification,
- Track number,
- Track status,
- Track position referred to WGS-84 coordinates (irrespective of the coordinate system used),
- Track velocity,
- Time stamp of Track information (Time of Report),
- Identification of contributing sensors.

Optional fusion output information may be:

- Age of last position measurement,
- Age of last identification renewal.

2.3.1.3 Surface Safety Net

The inputs to this element will be the output of the Data Fusion process together with Surface Safety Net parameters and rules. For ease of interoperability, the output of Alert Reports of the Surface Safety net should use the ASTERIX data format or any open format.

The output of Alert Reports which may be utilised by the HMI might include but is not limited to:

- Data source identifier,
- Alert Report identifier,
- Type of alert,
- Alert severity level,
- Time of alert (Time of Report),
- Identification of Target(s) in Alert Situation.

2.3.1.4 Interfaces to external partner systems

The system may have input interfaces to the following systems:

- Approach Surveillance Radar
- Flight plan data system,
- Airport database,
- Time source,
- Airfield Ground Lighting (AGL) System (e.g. stopbar status),
- Meteorological System.

The system may have output interfaces to the following systems:

- Airport database,
- Airfield Ground Lighting (AGL) System (e.g. stopbar control),
- Other systems using fused Track data.

2.3.2 Human-Machine Interface

The A-SMGCS HMI 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.

The basic A-SMGCS HMI will concentrate on the ATC workstation. It is envisaged that the ATC workstation will include an input device and display(s) providing situational awareness together with the necessary information to support the appropriate level of A-SMGCS.

The A-SMGCS HMI design must take into account the working environment of the user under various operational conditions. In this respect, the HMI will be required to be adaptable to the various circumstances of the user. As an example, low visibility operations may require a different A-SMGCS set-up than operations in good visibility conditions. The A-SMGCS functions must be designed to have a satisfactory performance during operations based on both visual and non-visual surveillance.

The HMI design must ensure that the extended A-SMGCS functions of higher-level systems do not have a detrimental effect on the performance of the lower level A-SMGCS functions. The HMI design of a higher-level A-SMGCS must be conducted as a whole. As an example, the HMI of the Surface Safety Net element must not negatively interfere with the quality of the supporting Surveillance element.

It is expected that A-SMGCS HMI will evolve through the following stages:

- Basic situational awareness (Level 1),
- Alerts of situations requiring appropriate user action (Level 2),
- Prompts to users with suggested actions for their approval and the eventual presentation of decisions already made by the system (higher levels of implementation, not covered by the present document).

The following section provides more detailed requirements for the ATC Workstation HMI aspects of A-SMGCS.