



Third Iteration - Baseline Report/Matrix

Document information

Project Title	Surveillance Ground System Enhancements for ADS-B (Prototype Development)
Project Number	15.04.05b
Project Manager	Thales
Deliverable Name	Third Iteration – Baseline Report/Matrix
Deliverable ID	Del 17
Edition	00.01.00
Template Version	03.00.00

Task contributors

EUROCONTROL;INDRA;NATS;NORACON;SELEX;THALES

Abstract

The present document describes the third iteration requirement baseline for the ADS-B GS Prototyping. The baseline report/matrix, which can be found inside, is based on the selection per Prototype Provider of the different requirements derived from Project's 15.4.5a deliverables D20, D13, D14 and D15. This baseline includes the following key information:

- The allocation and compliance of the different requirements of the three ADS-B GS to be provided for project Iteration 3.
- The allocation and compliance of the different requirements of the SDPD to be provided for project Iteration 3.

The document serves as input to the subsequent project tasks which will deal with the development and verification of the prototypes. This specification will be revisited as appropriate in the course of the project work on iteration 3.

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

Authoring & Approval

Prepared By		
Name & Company	Position & Title	Date
██████████ SELEX	██████████	28/02/2014
██████████ INDRA		28/02/2014
██████████ EUROCONTROL		28/02/2014
██████████ THALES		28/02/2014

Reviewed By		
Name & Company	Position & Title	Date
██████████ INDRA	██████████	11/03/2014
██████████ THALES		11/03/2014
██████████ NATS		11/03/2014
██████████ NORACON		11/03/2014
██████████ EUROCONTROL		11/03/2014
██████████ EUROCONTROL		11/03/2014

Reviewed By – Other SESAR projects, Airspace Users, staff association, military, Industrial Support, other organisations.		
Name & Company	Position & Title	Date

Approved for submission to the SJU		
Name & Company	Position & Title	Date
██████████ INDRA	██████████	14/03/2014
██████████ NATS		14/03/2014
██████████ EUROCONTROL		14/03/2014
██████████ SELEX		14/03/2014
██████████ THALES		14/03/2014

Rejected By		
Name & Company	Position & Title	Date

Rational for rejection
None.

Document History

Edition	Date	Status	Author	Justification
00.00.01	28/02/2014	Draft	██████████	First Draft
00.00.02	11/03/2014	Updated Version		Updates after Project Review

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

00.01.00	14/03/2014	Issued		Submission to SJU
----------	------------	--------	--	-------------------

Intellectual Property Rights (foreground)

This deliverable consists of SJU foreground.

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

Table of Contents

EXECUTIVE SUMMARY	6
1 INTRODUCTION.....	7
1.1 PURPOSE OF THE DOCUMENT.....	7
1.2 INTENDED READERSHIP.....	7
1.3 INPUTS FROM OTHER PROJECTS.....	7
1.4 STRUCTURE OF THE DOCUMENT.....	8
1.5 REQUIREMENTS DEFINITIONS – GENERAL GUIDANCE.....	9
1.6 FUNCTIONAL BLOCK PURPOSE	10
1.7 FUNCTIONAL BLOCK OVERVIEW	11
1.8 GLOSSARY OF TERMS	11
1.9 ACRONYMS AND TERMINOLOGY	12
2 GENERAL FUNCTIONAL BLOCK DESCRIPTION	15
2.1 CONTEXT	15
2.2 FUNCTIONAL BLOCK MODES AND STATES.....	16
2.3 MAJOR FUNCTIONAL BLOCK CAPABILITIES.....	16
2.4 USER CHARACTERISTICS.....	16
2.5 OPERATIONAL SCENARIOS	16
2.6 FUNCTIONAL.....	17
2.6.1 <i>Functional decomposition</i>	17
2.6.2 <i>Functional analysis</i>	17
2.7 SERVICE VIEW	17
3 ADS-B GROUND SYSTEM DOMAIN BASELINE MATRIX.....	18
3.1 DESIGN AND CONSTRUCTION CONSTRAINTS.....	18
3.1.1 <i>ADS-B target report data update by WAM system</i>	20
3.1.2 <i>Range measurement from active interrogation</i>	23
3.2 BASELINE MATRIX OVERALL OVERVIEW – THIRD ITERATION.....	26
3.3 ASSUMPTIONS.....	27
4 REFERENCES.....	28
4.1 USE OF COPYRIGHT / PATENT MATERIAL /CLASSIFIED MATERIAL.....	28

List of tables

Table 1 Requirement Identifier Allocation	9
Table 2 Enhancements for Iteration 3	18
Table 3 ADS-B target report data update by WAM system	22
Table 4 Range measurement from active interrogation.....	25
Table 6 Baseline Matrix: Overall Overview for Iteration 3.....	26

List of figures

Figure 1 ADS-B Ground Surveillance Domain Context	10
Figure 2 Component Context	15

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

Executive summary

The present document describes the baseline for the third iteration (ultimate) of the ADS-B related Prototypes (i.e. ADS-B Ground Station and Surveillance Data Processing and Distribution (SDPD)). The selection of the requirements upon which these specifications are based are derived from the preceding deliverable D20 – Third Iteration of ADS-B Surveillance System Specifications [1] coming from the third Project 15.4.5a specification iteration as an input.

The baseline includes the following key information:

- Mandatory and Optional Requirements classification.
- Compliance of each of the partners' prototypes with Project 15.4.5a D20 [1] requirements.
- Compliance of each of the partners' prototypes with Project 15.4.5a D13 – Third Iteration of Ground Station Specification [3], D14 – Third Iteration of SDPDS Specification [4] and D15 – Third Iteration of Interface Specification [5] requirements.

The document serves as input to the subsequent project tasks which will deal with the development and verification of the prototypes (GS and SDPD). This specification will be revisited as appropriate in the course of the 15.04.05.b project work on iteration 3.

The Project covers different enhancements of the baseline by a number of drivers (applications and technological enhancements) which can be clustered as follows:

- Initial ADS-B applications
- Applications defined in SESAR projects (including future separation modes such as spacing, separation etc.)
- Integration of ADS-B with WAM
- Security and Civil-Military Interoperability
- 1090 ES MHz data-link technology enhancements
- Other enhancements

More specifically, in accordance with the set of enhancements defined in the Third Iteration in Project 15.4.5a Deliverable D20 Ref [1], high level requirements are described in order to support:

- Advanced enhancements from integration with WAM
 - ADS-B target report update by WAM system
- Advanced security enhancements
 - Range measurement from active interrogation

This baseline will be used as a guideline to identify which of the functionalities (requirements) will be covered by each prototype provider. The requirements have been split into Mandatory or Optional, and allocated to the different elements comprising the system.

Prototype Providers will implement all mandatory requirements affecting their prototype, as well as the selected optional ones.

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

1 Introduction

1.1 Purpose of the document

The present document describes the baseline for the third iteration of the ADS-B related Prototypes.

It is to be used as the input document and guideline for the related project tasks producing the third prototype of the ADS-B Ground Station and Surveillance Data Processing and Distribution systems as well as for the enhancements to the baseline interfaces.

The baseline matrix is defined at a high level (as provided by document – Third Iteration of ADS-B Surveillance System Specification [1]) and shall be allocated to one or more of the above mentioned systems. All mandatory requirements will be covered by all prototypes while optional requirements will be covered by at least one prototype.

1.2 Intended readership

The audience of this document includes

- Projects 15.04.05.a and b,
- any other SJU projects that may require ADS-B Surveillance Systems for their validation activities

1.3 Inputs from other projects

Project 15.4.5b inputs are directly taken from Project 15.4.5a (i.e. 15.4.5a Deliverables).

- SJU 15.04.05a ADS-B Ground Surveillance Specifications for Third Iteration D20, Ed. 00.01.00, 27 August 2012 (Reference: [1])
- SJU 15.04.05a Specification Baseline Document, D17, Ed. 00.01.00, 01 October 2010 (Reference: [2])
- SJU 15.04.05a ADS-B 1090 MHz Ext. Squitter Ground Station Specifications – Iteration 3, D13, Ed. 00.01.00, 07 September 2012 (Reference: [3])
- SJU 15.04.05a SDPD Specification – Iteration 3, D14, Ed. 00.01.00, 03 September 2012 (Reference: [4])
- SJU 15.04.05a Interface Specifications for Third Iteration, D15, Ed. 00.01.00, 31 August 2012 (Reference: [5])
- SJU 15.04.05b First Iteration - Baseline Report/Matrix, D02, Ed. 00.01.02, Nov 2012 (Reference: [21])
- SJU 15.04.05b Second Iteration - Baseline Report/Matrix, D10, Ed. 00.01.00, 04 April 2013 (Reference: [22])

These Deliverables inter alia address:

- EUROCONTROL CASCADE Program
- Requirements Focus Group (RFG) and associated EUROCAE/RTCA standardisation activities for ADS-B Surveillance Applications (Ref [11], Ref [12])
- ADS-B Avionics equipment standardisation by EUROCAE/RTCA(Ref [8], [9] and [10])

1.4 Structure of the document

This document is organised as follows:

Chapter 1: Purpose and scope; Requirements definition; Component purpose and high level overview

Chapter 2: General component description;

Chapter 3: ADS-B Ground System Domain Baseline Matrix; Baseline Matrix Overall Overview;

Chapter 4: Assumptions;

Chapter 5: Referenced documents; Use of copyright/classified material;

1.5 Requirements Definitions – General Guidance

Requirements were developed according to the SESAR Requirements and V&V Guidelines [6].

They are broken down according to the source of the requirements, derived from the allocation which was done in Reference: [1].

The layout follows the description in Ref [7].

In accordance with the guidelines in Ref [7], requirement identifiers follow the scheme:

REQ-15.04.05.a-D20-00xx.yyyy, where

xx	Meaning
10	ADS-B RAD Functional req.
12	ADS-B APT Functional req.
13	ADS-B ADD Functional req.
14	Reserved for SESAR
19	applications Functional req.
20	ADS-B RAD Performance req.
22	ADS-B APT Performance req.
23	ADS-B ADD Performance req.
24	Reserved for SESAR
29	applications Performance req.
30	WAM integration req.
40	Security req.
50	Civil/Military req.
60	1090ES Technology req.
00	Other

Table 1 Requirement Identifier Allocation

1.6 Functional block Purpose

The figure below depicts a functional context diagram of the future Ground Surveillance System, as defined in input Project 15.4.5.a, where the impacted system elements are marked in Blue.

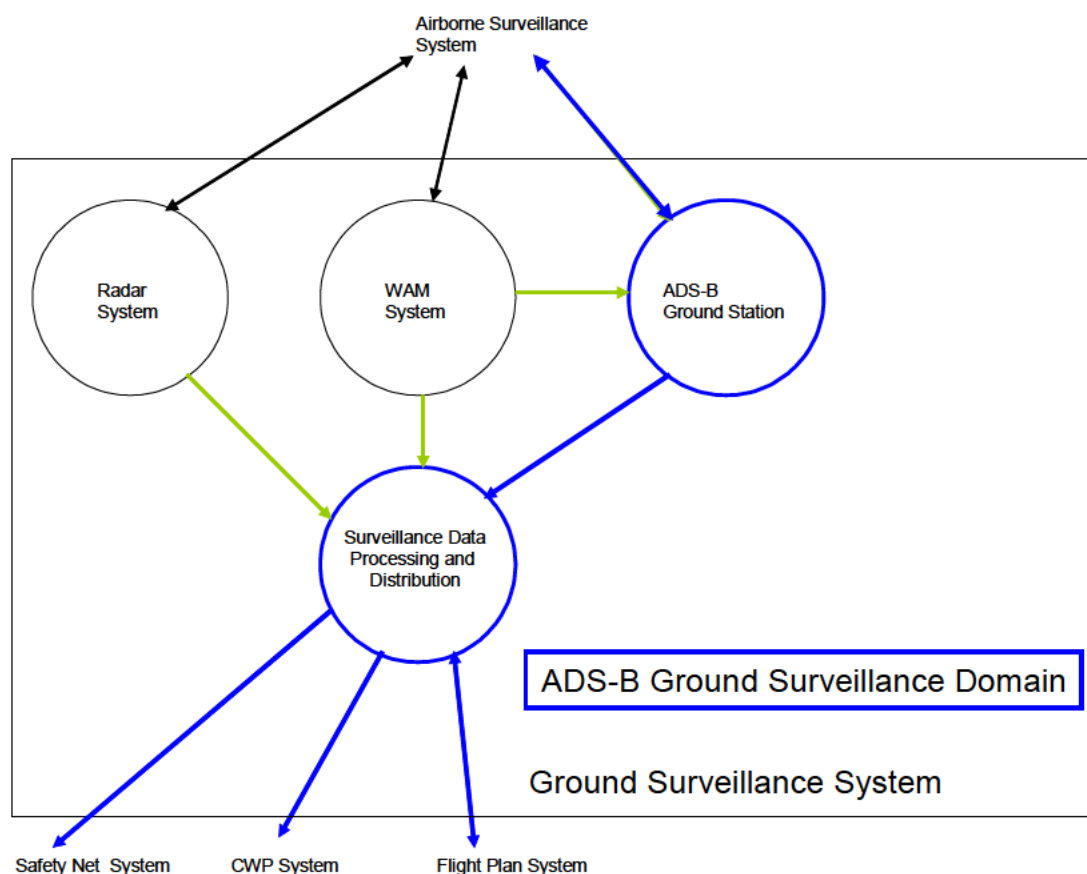


Figure 1 ADS-B Ground Surveillance Domain Context

- = Existing standardised interfaces, already processed by Baseline, not modified by P15.4.5a
- = Existing standardised interfaces, already processed by Baseline, modified by P15.4.5a
- = Existing standardised interfaces, out of scope of P15.4.5a

In the context of this project, the following functional components are addressed:

- ADS-B Ground Station

The term 'ADS-B Ground Station' in this document refers to a 1090ES Ground Station. The primary function of the ADS-B Ground Station is to receive 1090 MHz RF input on the Air Interface, extract data from the 1090 MHz ES messages, assemble the data into ASTERIX Category 21 ADS-B Reports and send these reports over the Ground Interface.

- Surveillance Data Processing and Distribution (SDPD)

The baseline for the SDPD is the ARTAS multi-sensor tracking system enhancement based on the third iteration specifications. This system associates surveillance reports originating from different surveillance technologies (radar, WAM, ADS-B, and ADS-C) and fuses the associated reports into a unique system track. The system tracks are assembled into ASTERIX CAT 62 System Track Messages and these messages are sent over the Ground Interface.

- Interfaces

The Interfaces subject to modification by the project refer to:

- ASTERIX CAT21, Ed. 2.81, September 2012 (Reference: [14])
- ASTERIX CAT 23, Ed. 2.73, September 2012 (Reference: [15])
- ASTERIX CAT 62, Ed. 2.75, September 2012 (Reference: [16])
- ASTERIX CAT 63, Ed. 1.3, July 2007 (Reference: [17])
- ASTERIX CAT 32, ARTAS V8B1, Edition 2.0, 24 August 2012 (Reference: [18])

1.7 Functional block Overview

Please refer to document SJU 15.04.05a ADS-B Ground Surveillance Specifications for Third Iteration, D20, Ed. 00.01.00, 27 August 2012.

1.8 Glossary of terms

N/A

1.9 Acronyms and Terminology

Term	Definition
ACC	Accuracy
ADD	Aircraft Derived Data
ADS-B	Automatic Dependent Surveillance - Broadcast
ADS-B ADD	Aircraft Derived Data for ATC tools ("ADS-B out" application)
ADS-B APT	Enhanced ATS at the airport surface ("ADS-B out" application)
ADS-B NRA	Enhanced ATS in Non Radar Areas ("ADS-B out" application)
ADS-B RAD	Enhanced ATS in Radar Areas ("ADS-B out" application)
ARTAS	ATM suRveillance Tracker And Server
ASAS	Airborne Separation
ASPA	Airborne Spacing Application
ASPA-FIM	Flight-deck Interval Management ("ADS-B in" Airborne Spacing Application)
ASSUMP	Assumption
ASTERIX	All-purpose Structured EUROCONTROL Surveillance Information Exchange
ATC	Air Traffic Control
ATCO	Air Traffic Controller
ATM	Air Traffic Management
ATS	Air Traffic Services
ATSA-AIRB	Enhanced Traffic Situational Awareness during Flight Operations ("ADS-B in" ATSAW application)
ATSA-ITP	In-Trail Procedure in procedural airspace ("ADS-B in" ATSAW application)
ATSA-SURF	Enhanced Traffic Situational Awareness on the Airport Surface ("ADS-B in" ATSAW application)
ATSA-VSA	Enhanced Visual Separation on Approach ("ADS-B in" ATSAW application)
ATSAW	Air Traffic Situation Awareness
ATX	ASTERIX
CAT	Data Category

Term	Definition
DO	RTCA Document
ED	EUROCAE Document
ES	Extended Squitter
EUROCAE	European Organisation for Civil Aviation Equipment
FDPS	Flight Data Processing System
FIM	Flight-deck Interval Management
GS	Ground Station
INTEROP	Interoperability
IP1	Implementation Package 1
ITP	In-Trail Procedure
Mode S	MODE Select
MOPS	Minimum Operational Performance Standards
NACp	Navigation Accuracy for Position
NM	Nautical Mile
NRA	Non Radar Airspace
OPA	Operational Performance Assessment
OPA-ASSUMP	Assumption made during the OPA
OR	Operational Requirement
OSD	Operational Services and Environment Description
PIR	Project Initiation Report
PR	Performance Requirement
REQ	Requirement
RF	Radio Frequency
RFG	Requirement Focus Group
RMK	Remark
RTCA	Radio Technical Commission for Aeronautics
SDPD	Surveillance Data Processing and Distribution

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

Term	Definition
SESAR	Single European Sky ATM Research (Programme)
SG 4	Sub Group 4
SJU	SESAR Joint Undertaking
SMGCS	Surface Movement Guidance and Control System
SMR	Surface Movement Radar
SPI IR	Surveillance Performance and Interoperability Implementing Rule
SPR	Safety and Performance Requirements
SPR-INTEROP	Safety, Performance and Interoperability Requirements
SSR	Secondary Surveillance Radar
SWP	Sub Work Package
TMA	Terminal Manoeuvring Area
TOA	Time Of Arrival
Tx	Transmission
VSA	Visual Separation on Approach
WAM	Wide Area Multilateration
WG 51	Working Group 51
WP	Work Package

2 General Functional block Description

2.1 Context

A high level context of the ADS-B Ground Surveillance Domain is shown in Section 1.6 - Functional block Purpose. The following Figure gives a more detailed overview of the component boundaries and interfaces.

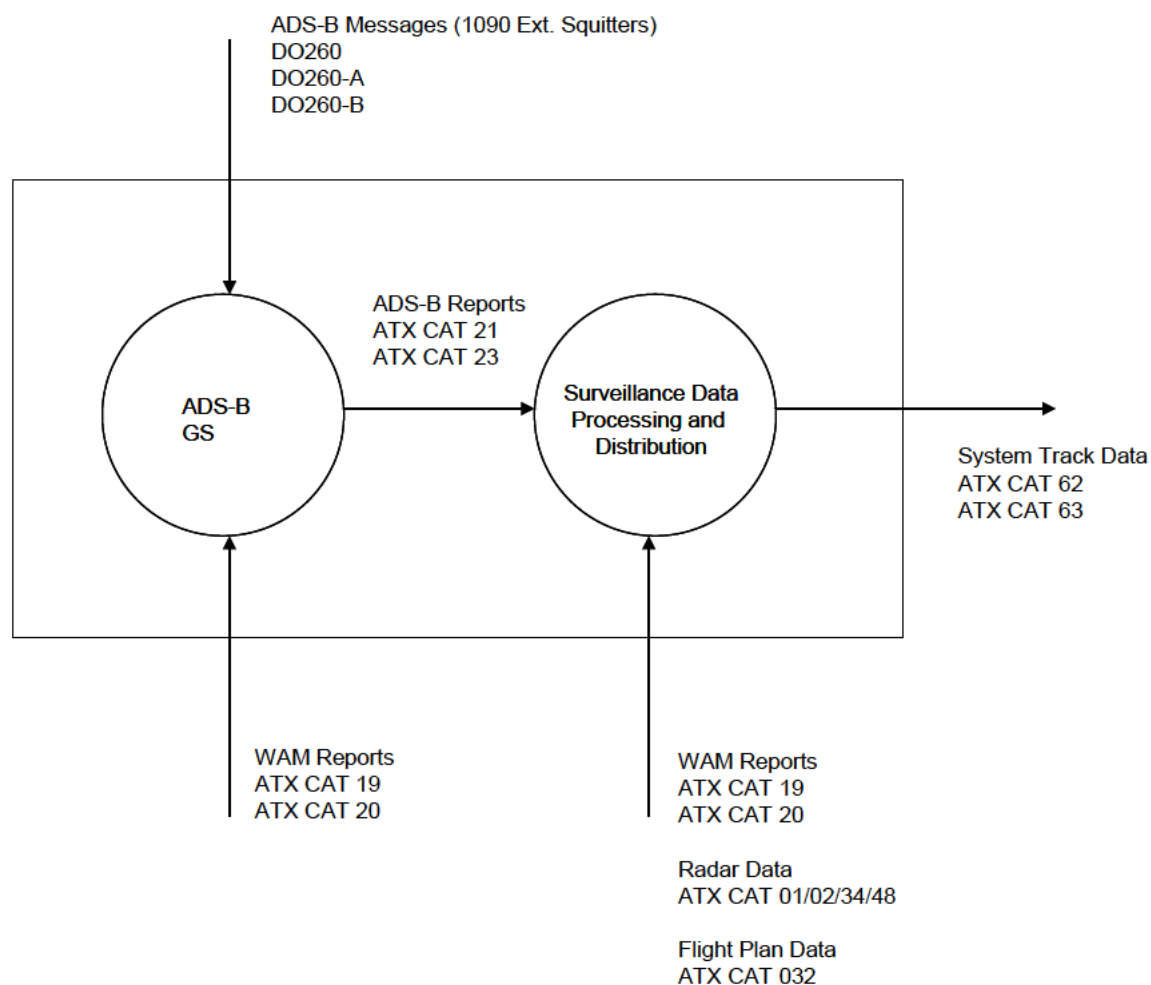


Figure 2 Component Context

2.2 Functional block Modes and States

Detailed Modes and States of the sub-components are described in the baseline documents Reference: [13] and [18].

Any change towards these Modes and States has been detailed in Project 15.4.5a deliverables Reference: D13 - Third Iteration of ADS-B Ground Station Specifications [3], D14 – Third Iteration of SDPD Specifications [4] and D15 – Third Iteration of Interface Specifications [5].

2.3 Major Functional block Capabilities

The major components and capabilities are as described in section: 1.6.

2.4 User Characteristics

The ADS-B Ground Surveillance System is designed to be used in a high-density traffic environment (en-route and/or TMA and/or Airport), including multiple surveillance techniques. High quality aircraft position data and other aircraft derived data will contribute to accurate Flight Plan updates and conformity monitoring.

Nevertheless due to its scalability, such a system could also be deployed in non-core European airspace.

2.5 Operational Scenarios

The ADS-B Ground Surveillance System shall be capable to be integrated into a multi-sensor surveillance environment as an additional means of surveillance. This usage targets the core European airspace.

The ADS-B Ground Surveillance System shall also be able to be deployed in lower density non-core European airspace. This type of airspace could be Non-Radar Airspace (NRA) in which the ADS-B Ground Surveillance System will be the sole means of surveillance.

The ADS-B Ground Surveillance System shall also be able to be deployed in high density core European airspace. This type of airspace could be Radar Airspace (RAD) in which the ADS-B Ground Surveillance System will be one of more means of surveillance (e.g. including radar and/or WAM).

The ADS-B Ground Surveillance System shall also be able to be deployed at simple to complex airports (as defined in ADS-B APT) with medium traffic complexity where a conventional SMR-only solution would be sufficient for the provision of Aerodrome Control Services supported by Surveillance (SMGCS).

The scalability and various potential physical architectures of this system will allow for a surveillance solution adaptable to the local traffic and local ATM system environment.

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

2.6 Functional

Due to the bottom-up approach adopted for this third iteration of specifications, a functional decomposition or analysis linking to modelling performed by X.1.7 and/or B.4.3 projects is not applicable to this document.

2.6.1 Functional decomposition

N/A

2.6.2 Functional analysis

N/A

2.7 Service View

N/A

3 ADS-B Ground System Domain Baseline Matrix

3.1 Design and Construction Constraints

The Project covers enhancements to the baseline by a number of drivers (applications and technological enhancements) which can be clustered as follows:

- Initial ADS-B applications
- Applications defined in SESAR projects (including future separation modes such as spacing, separation etc.)
- Integration of ADS-B with WAM
- Security and Civil-Military Interoperability
- 1090 ES MHz data-link technology enhancements
- Other enhancements

The Baseline Definition document (Project deliverable D17) has established enhancements to be taken into account for the third iteration which are listed in the first four columns of the Table hereafter. In addition one more enhancement is proposed related to the use of the Flight Plan for indication of approval of aircraft for ADS-B operations. The latter enhancement is driven by relevant work within the EUROCONTROL CASCADE Programme.

ADS-B applications	Integration with WAM	Security and civil-military interop	1090 ES Technology	Other enhancements
	ADS-B target report data update by WAM system	Range measurement from active interrogation		

Table 2 Enhancements for Iteration 3

The baselines for the requirements are the enhancements (ADS-B target report data update by WAM system) as specified for Iteration 2. This means that the baselines for Iterations 2 as specified in Reference: [22] are implicitly included in the baseline of Iteration 3.

Iteration 3 will thus build on the results of Iteration 2 and relevant IP1 work (such as EUROCONTROL CASCADE Programme regarding ADS-B & WAM, the Surveillance Products & Services regarding ARTAS and Directorate Single Sky regarding ASTERIX) as well as industry standardisation (such as EUROCAE).

The baseline matrix including the requirements related with these enhancements per Prototype Provider (GS's and SDPD) is indicated below. The requirements will be as provided by document Reference: [1] and shall be allocated to one or more of the above mentioned components. All mandatory requirements will be covered by all prototypes while optional requirements will be covered by at least one prototype.

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

This table shows which functionality will be covered per Prototype Implementer.

Note that Interface Requirements, though addressed to one or more Prototypes, may be used also by other systems out of the Scope of Project 15.4.5b (i.e. Control and Monitoring Systems...).

3.1.1 ADS-B target report data update by WAM system

REQ-15.04.05.a-D20- Req. ID	D20 Requirement	REQ-15.04.05.a-D13- Req. ID	GS Requirement for 3 rd Iteration
0030.0001	In case of missing ADS-B target report updates, the ADS-B system shall use available WAM system target report updates (position) as target position report.	0030.0010	The 1090 GS shall include a "WAM Target Report Substitution" function permitting the use of WAM ATX020 target reports as input for the generation of ATX021 reports when 1090ES data are not available.
		0030.0015	The 1090 GS "WAM Target Report Substitution" function shall be activated/deactivated via a configurable parameter.
		0030.0020	WAM Target Report substitution shall only apply when the 1090 GS operates in periodic reporting mode.
		0030.0030	WAM Target Report substitution shall start with the first missing periodic ADS-B target report.
		0030.0040	It shall be possible to configure a maximum duration during which the 1090 GS may apply WAM Target Report substitution.
		0030.0050	WAM Target Report substitution shall be applicable only when the track status (ATX020: I020/170 Track Status, CNF subfield) of the candidate WAM target report shows "Confirmed Track".

REQ- 15.04.05.a- D20- Req. ID	D20 Requirement	REQ- 15.04.05.a- D13- Req. ID	GS Requirement for 3 rd Iteration
		0030.0060	The 1090 GS shall use the following information from WAM target report updates in case of WAM Target Report substitution: <ul style="list-style-type: none"> • Time of Applicability for position ; • Target position in WGS 84 latitude and longitude ; • Target barometric altitude (Flight Level) ; • Ground Bit Set (GBS) information, if available.
		0030.0080	In case of WAM Target Report substitution the 1090 GS shall use in the ADS-B report WAM target position data as is, i.e. without any extrapolation or smoothing.
		0030.0100	The 1090 GS shall use WAM target reports in substitution of missing 1090ES data only if their accuracy is better than a user configurable threshold.
		0030.0110	The 1090 GS shall set the position quality indicators (NIC, NUCp and NACp - item I021/090) in ATX021 reports generated with WAM target position information to their lowest possible level, i.e. to the value "invalid" or "not applicable" as appropriate.
		0030.0120	ATX021 fields, which are not replaced by data from WAM system updates, shall be reported according to their validity times per ED-129.
		0030.0130	The 1090 GS shall indicate WAM target report substitutions through an appropriate error condition field to be added in I021/040.
		0030.0140	The 1090 GS shall report the activations and deactivations of the WAM Target Report update function in an appropriate ATX023 status report

Table 3 ADS-B target report data update by WAM system

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

3.1.2 Range measurement from active interrogation

REQ-15.04.05.a-D20- Req. ID	D20 Requirement	REQ-15.04.05.a-D13- Req. ID	GS Requirement for 3 rd Iteration
0040.0001	The ADS-B Ground Surveillance Domain should be equipped with a 1030 MHz interrogator, capable of interrogating ADS-B targets according to all relevant ICAO Annex 10 requirements.	0130.0015	The 1090 GS shall be able to interrogate ADS-B targets according to ICAO Annex 10, using at least selective UF5 interrogations.
		0130.0030	The 1090 GS interrogator transmission power shall be configurable according to the requested surveillance coverage.
		0130.0040	The interrogation rate of the 1090 GS interrogator shall be configurable.
0040.0002	If REQ-15.04.05.a-D20-0040.0001 is implemented, the ADS-B Ground Surveillance Domain shall have the capability to determine the Round Trip Delay (RTD) of every received 1090 MHz reply elicited by its own interrogations (registered as <i>Real RTD</i>).	0130.0050	The 1090 GS shall be able to time stamp and store the Time Of Interrogation (TOI) of each transmitted interrogation.
		0130.0060	The 1090 GS shall be able to receive and decode the Mode S replies to its own interrogations.
		0130.0070	The 1090 GS shall be able to receive Mode S replies and time stamp and store their Time Of Arrival (TOA).
		0130.0080	For each pair interrogation/reply, the 1090 GS (intended to be equipped with a single receiving station) shall be able to calculate the Round Trip Delay (RTD). Where the RTD is calculated as the difference between Time identified as TOI and time identified as TOA.
0040.0003	If REQ-15.04.05.a-D20-0040.0002 is implemented, the ADS-B Ground Surveillance Domain shall register the last RTD of each of the received ES and its time stamp.	0130.0090	The 1090 GS shall be able to associate each calculated RTD to an ADS-B target in coverage.

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

REQ-15.04.05.a-D20- Req. ID	D20 Requirement	REQ-15.04.05.a-D13- Req. ID	GS Requirement for 3 rd Iteration
0040.0004	If REQ-15.04.05.a-D20-0040.0003 is implemented, each calculated RTD shall be considered applicable to RTD Validation for a configurable time period.	0130.0110	The 1090 GS shall discard any RTD higher than a present maximum validity period.
		0130.0120	The RTD maximum validity period shall be a configurable parameter.
0040.0005	If REQ-15.04.05.a-D20-0040.0003 and REQ-15.04.05.a-D20-0040.0004 are implemented, each time a valid position message is received for a target in "target data maintenance" mode (see ED-129 chapter 3) and the associated RTD applicability is elapsed, the ADS-B position report shall be marked as NOT VALIDATED.	0130.0140	The 1090 GS shall mark as "NOT VALIDATED" any ADS-B target position update for which the validity of the associated RTD has expired, or if there is no associated RTD.
0040.0006	If REQ-15.04.05.a-D20-0040.0003 and REQ-15.04.05.a-D20-0040.0004 are implemented, each time a valid position message is received for a target in "target data maintenance" mode (see ED-129 chapter 3), the ADS-B Ground Surveillance Domain shall validate the ADS-B report comparing the ADS-B position data with the computed applicable RTD.	0130.0150	At each ADS-B target position update, if the RTD of the corresponding target is valid, the 1090 GS shall calculate the sphere of radius R , centered on the 1090 GS; where $R=c*RTD/2$
		0130.0170	The 1090 GS shall mark the ADS-B position as : <ul style="list-style-type: none"> • "VALID" if the distance between the ADS-B 3D position and the RTD sphere generated per REQ-15.04.05.a-D13-0130.0150 is lower than a present threshold; • "NOT VALID" otherwise.
		0130.0180	The threshold of the Range Measurement from Active Interrogation in REQ-15.04.05.a-D13-0130.0170 shall be a configurable parameter.

REQ-15.04.05.a-D20- Req. ID	D20 Requirement	REQ-15.04.05.a-D13- Req. ID	GS Requirement for 3 rd Iteration
0040.0007	If REQ-15.04.05.a-D20-0040.0006 is implemented, the ADS-B Ground Surveillance Domain shall be able to report the validation result in the ASTERIX CAT021 ADS-B report.	0130.0190	If the ADS-B position is considered "VALID" per REQ-15.04.05.a-D13-0130.0170, the 1090 GS shall mark the corresponding ATX021 report as "Range Measurement from Active Interrogation Valid".
		0130.0200	If the ADS-B position is considered "NOT VALID" per REQ-15.04.05.a-D13-0130.0170, the 1090 GS shall mark the corresponding ATX021 report as "Range Measurement from Active Interrogation Not Valid".
		0130.0210	If the ADS-B position is considered "NOT Validated" per REQ-15.04.05.a-D13-0130.0140, the 1090 GS shall mark the ATX021 reports as "Range Measurement from Active Interrogation Not Validated".
0040.0008	If REQ-15.04.05.a-D20-0040.0007 is implemented, the SDPD shall be able to use the validation result		NOT APPLICABLE.
0040.0009	If REQ-15.04.05.a-D20-0040.0008 is implemented, the validation result (positive/negative) should be reported to the end user of the surveillance data		NOT APPLICABLE.
0040.0010	It shall be possible to activate/deactivate the function of range measurement from active interrogation	0130.0220	The 1090 GS Range Measurement from Active Interrogation function shall be activated/ deactivated via a configurable parameter.
		0130.0230	The 1090 GS shall report the activations and deactivations of the Range Measurement from Active Interrogation function in an appropriate ATX023 status report.

Table 4 Range measurement from active interrogation

3.2 Baseline Matrix Overall Overview – Third Iteration

Due to the different functionalities and enhancements proposed for the Component, an Overall Baseline Matrix addressing the implementation for the different sub-systems as a whole is deemed as necessary. The following table addresses the different implementations which will be covered per Partner contributor in the Project. Additionally this table allows easy to check if all the requirements are currently covered by the Project.

		Covered by				Overall fulfillment
Functionality	Mandatory / Optional	Thales	Selex	Indra	Eurocontrol	
ADS-B target data update by WAM system	O	N	N	N	N/A	N
Range measurement from active interrogation	O	Y	Y	Y	Y	Y

Table 5 Baseline Matrix: Overall Overview for Iteration 3

Remark:

The Project team analysed during the opening of the 3rd Project Phase the related outstanding prototype requirements of Project 15.04.05.A specifications. In particular, the real use of a WAM target position as a compensation of a missing ADS-B position was highlighted as a critical point. (Different position update rate, different position calculation and different position quality indicators).

The project team comes to the conclusion not to mix such kind of base sensor data on ADS-B GS sensor level. For this reason, the ADS-B target data update by WAM system is removed from the 3rd Project baseline.

3.3 Assumptions

N/A

4 References

- [1] SJU 15.04.05a ADS-B Ground Surveillance Specifications for Third Iteration, D20, Ed. 00.01.00, 27 August 2012
- [2] SJU 15.04.05a Specification Baseline Document, D17, Ed. 00.01.00, 01 October 2010
- [3] SJU 15.04.05a ADS-B 1090 MHz Ext. Squitter Ground Station Specification - Iteration 3, D13, Ed. 00.01.00, 07 September 2012
- [4] SJU 15.04.05a SDPD Specification – Iteration 3, D14, Ed. 00.01.00, 03 September 2012
- [5] SJU 15.04.05a Interface Specifications for Third Iteration, D15, Ed. 00.01.00, 31 August 2012
- [6] SESAR Requirements and V&V Guidelines Latest version
- [7] SESAR Toolbox User Manual Latest version
- [8] EUROCAE/RTCA MOPS for 1090 MHz ADS-B, ED-102/DO-260, Sept. 2000
- [9] RTCA MOPS for 1090ES ADS-B and TIS-B, DO-260A, Dec. 2006 (includes Changes 1 and 2)
- [10] EUROCAE/RTCA MOPS for 1090ES ADS-B and TIS-B, ED-102A/DO-260B, Dec. 2009
- [11] EUROCAE/RTCA SPIR Document for ADS-B NRA Application, ED-126/DO-303, Dec. 2006
- [12] EUROCAE/RTCA SPIR Document for ADS-B RAD Application, ED-161/DO-318, Sept. 2009
- [13] EUROCAE ED129: Technical Specification for a 1090 MHz Extended Squitter ADS-B Ground Station, June 2010
- [14] EUROCONTROL ASTERIX Standards CAT21, Ed. 2.81, September 2012
- [15] EUROCONTROL ASTERIX Standards CAT 23, Ed 2.73, September 2012
- [16] EUROCONTROL ASTERIX Standards CAT 62, Ed 2.75, September 2012
- [17] EUROCONTROL ASTERIX Standards CAT 63, Ed 1.3, July 2007
- [18] EUROCONTROL ARTAS V8B1, System/Segment Specifications, Doc. 46 127 300 – 305
- [19] EUROCAE ED161: Safety, Performance and Interoperability Requirements Document for ADS-B-RAD Application, September 2009
- [20] EUROCAE/RTCA SPIR Document for ADS-B APT Application, ED-163/DO-321, Nov. 2010
- [21] SJU 15.04.05b First Iteration - Baseline Report/Matrix, D02, Ed. 00.01.02, Nov 2012
- [22] SJU 15.04.05b Second Iteration - Baseline Report/Matrix, D10, Ed. 00.01.00, 04 April 2013
- [23] EUROCAE ED129A: Technical Specification for a 1090 MHz Extended Squitter ADS-B Ground Station, June 2010

4.1 Use of copyright / patent material /classified material

No copyright/patent/classified material is included in this report.

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

28 of 29

-END OF DOCUMENT-

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu