



Interface Specifications for Third Iteration

Document information

Project title	Surveillance Ground System Enhancements for ADS-B
Project N°	15.04.05a
Project Manager	EUROCONTROL
Deliverable Name	Interface Specifications for Third Iteration
Deliverable ID	D15
Edition	00.01.00
Template Version	02.00.00

Task contributors

EUROCONTROL, INDRA, NORACON, SELEX, THALES

Abstract

The present document describes the enhancements to the ASTERIX interface documents, impacted by the specifications for the third iteration of specifications for the ADS-B Surveillance System.

The document serves as an input to Project 15.4.5.b for the development of the prototypes for 1090 ES ADS-B ground Stations and the ARTAS Surveillance Data Processing System.

If considered necessary, the document could be enhanced during the prototype development.

Authoring & Approval

Prepared By		
Name & company	Position / Title	Date
██████████ EUROCONTROL	██████████	24/08/2012

Reviewed By		
Name & company	Position / Title	Date
██████████ EUROCONTROL	██████████	31/08/2012
██████████ EUROCONTROL		31/08/2012
██████████ THALES		31/08/2012
██████████ NORACON		31/08/2012
██████████ INDRA		31/08/2012
██████████ SELEX		31/08/2012
██████████ INDRA		31/08/2012

Approved By		
Name & company	Position / Title	Date
██████████ EUROCONTROL	██████████	31/08/2012
██████████ INDRA		31/08/2012
██████████ NORACON		31/08/2012
██████████ SELEX		31/08/2012
██████████ THALES		31/08/2012
██████████ AENA		31/08/2012

Document History

Edition	Date	Status	Author	Justification
00.00.01	24/08/2012	Draft	██████████	New Document
00.00.02	30/08/2012	Draft		Update after review
00.01.00	31/08/2012	Final		For upload

Intellectual Property Rights (foreground)

This deliverable consists of SJU foreground.

Table of Contents

EXECUTIVE SUMMARY	4
1 INTRODUCTION.....	5
1.1 PURPOSE OF THE DOCUMENT	5
1.2 INTENDED READERSHIP	5
1.3 INPUTS FROM OTHER PROJECTS	5
1.4 STRUCTURE OF THE DOCUMENT	5
1.5 REQUIREMENTS DEFINITIONS – GENERAL GUIDANCE	6
1.6 FUNCTIONAL BLOCK PURPOSE.....	7
1.7 FUNCTIONAL BLOCK OVERVIEW	7
1.8 ACRONYMS AND TERMINOLOGY.....	9
2 GENERAL FUNCTIONAL BLOCK DESCRIPTION	12
3 COMPONENT FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENTS.....	13
3.1 ASTERIX CAT 021 REQUIREMENTS.....	13
3.1.1 <i>DO260B Compliancy</i>	13
3.1.2 <i>Integration of ADS-B with WAM</i>	17
3.1.2.1 <i>Iteration 3</i>	18
3.1.3 <i>Security Requirements</i>	18
3.1.3.1 <i>Range Measurement from Active Interrogation</i>	20
3.2 ASTERIX CAT 023 REQUIREMENTS.....	22
3.3 ASTERIX CAT 062 REQUIREMENTS.....	24
3.3.1 <i>ADS-B RAD Requirements</i>	24
3.3.2 <i>Integration of ADS-B with WAM</i>	24
3.3.3 <i>Security Requirements</i>	24
3.3.4 <i>Range Measurement from Active Interrogation</i>	26
3.4 ASTERIX CAT032 REQUIREMENTS.....	26
4 REFERENCES	28
4.1 USE OF COPYRIGHT / PATENT MATERIAL /CLASSIFIED MATERIAL.....	28
APPENDIX A TRACEABILITY	29

List of tables

Table 1 Requirement Identifier Allocation	6
---	---

List of figures

Figure 1 ADS-B Ground Surveillance Domain Context	7
---	---

Executive summary

The present document describes the enhancements to the ASTERIX interface documents, impacted by the specifications for the third iteration of specifications for the ADS-B Surveillance System.

The document serves as an input to Project 15.4.5.b for the development of the prototypes for 1090 ES ADS-B ground Stations and the ARTAS Surveillance Data Processing System.

If considered necessary, the document could be enhanced during the prototype development.

The following three interfaces form part of this document:

- The interface between the ADS-B Ground Station and the Surveillance Data Processing System. It consists of ADS-B reports and ADS-B GS Status messages. This interface is realised by ASTERIX Categories 21 and 23.
- The interface between the Surveillance Data processing System and the end users of the surveillance data. It consists of System Track Messages and SDPD Status messages. This interface is realised by ASTERIX Categories 62 and 63. Please note that ASTERIX CAT 063 remains unchanged compared to the baseline as described in [1].
- The interface between the Flight Data Processing System (FDPS) and the SDPS. This interface is realised by ASTERIX Category 032.

1 Introduction

1.1 Purpose of the document

This document describes the interface requirements for the third iteration of specifications for the ADS-B Ground Surveillance System.

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

The ADS-B Surveillance System Interfaces use the EUROCONTROL ASTERIX standard.

ASTERIX is the EUROCONTROL Standard for the exchange of Surveillance related data.

ASTERIX provides a structured approach to a message format to be applied in the exchange of surveillance related information for various applications. Developed by the SuRveillance Data Exchange Task Force (RDE-TF) with its multinational participation, it ensures a common data representation, thereby facilitating the exchange of surveillance data in an international context.

Having started as a EUROCONTROL development ASTERIX is now applied worldwide.

ASTERIX defines a structured approach to the encoding of surveillance data. Categories group the information related to a specific application. They consist of a number of data items which are defined in the ASTERIX documents down to the bit-level.

More information on ASTERIX can be found on the EUROCONTROL web site:
<http://www.eurocontrol.int/asterix.html>

1.4 Structure of the document

The ASTERIX standard is a well established world-wide surveillance standard maintained by EUROCONTROL. The format and contents of the ASTERIX documents follows a fixed structure, which cannot be adapted to another interface document template.

For this reason, Project 15.4.5.a has decided to use the Technical Specification template to 'wrap' the enhanced ASTERIX specifications.

The use of this template guarantees an SJU compliant document delivery and above all a means of coherence and traceability to the other project deliverables.

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

Chapter 2: General component description; Due to the special use of this template, this Chapter is marked as Not Applicable for this document.

Chapter 3: ADS-B Ground Surveillance Functional and Non-Functional Requirements.

Chapter 4: Referenced documents

Attachment 1: ASTERIX CAT021 Definition ed. 2.81, September 2012

Attachment 2: ASTERIX CAT021 Reserved Expansion Field definition as described in [11] which remained unchanged but forms an integral part of the CAT021 specification.

Attachment 3: ASTERIX CAT023 Definition ed. 2.73, September 2012

Attachment 4: ASTERIX CAT062 Definition ed. 2.75, September 2012

Attachment 5: ASTERIX CAT062 Reserved Expansion Field definition which remained unchanged but forms an integral part of the CAT062 specification.

Attachment 6: ASTERIX CAT032 Definition ed. 2.0, September 2012

Chapter 3 provides the traceability to the originating requirements as defined in [18] and the <ALLOCATED_TO> objects contain a reference to the relevant ASTERIX data item implementing the requirement.

1.5 Requirements Definitions – General Guidance

All requirements retained from [16] keep their requirements number REQ-15.04.05.a-D07-00xx.yyyy

All requirements retained from [19] keep their requirements number REQ-15.04.05.a-D11-00xx.yyyy

Requirements have been developed according to the SESAR Requirements and V&V Guidelines Ref [2].

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

The layout follows the description in Ref [3].

In accordance with the guidelines in Ref [3], requirement identifiers follow the scheme:

REQ-15.04.05.a-D15-00xx.yyyy, where

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

Table 1 Requirement Identifier Allocation

1.6 Functional block Purpose

The ADS-B Ground Surveillance Domain is a subset of the overall Ground Surveillance System, and adds the reception, processing and integration of ADS-B data into the surveillance data provided to the ATM System.

The ADS-B Ground Surveillance Domain consists of sets of networked ground stations plus data distribution and filtering functions, as well as tracking/fusion capabilities with other surveillance sources.

1.7 Functional block Overview

The figure below depicts a functional context diagram of the future Ground Surveillance System, where the impacted system elements are marked in blue.

Please note that the inclusion of Radar Systems and/or WAM systems depends on the operational environment and associated ADS-B applications which are to be deployed.

In case of ADS-B NRA or ADS-B APT deployment, ADS-B will be the only surveillance source.

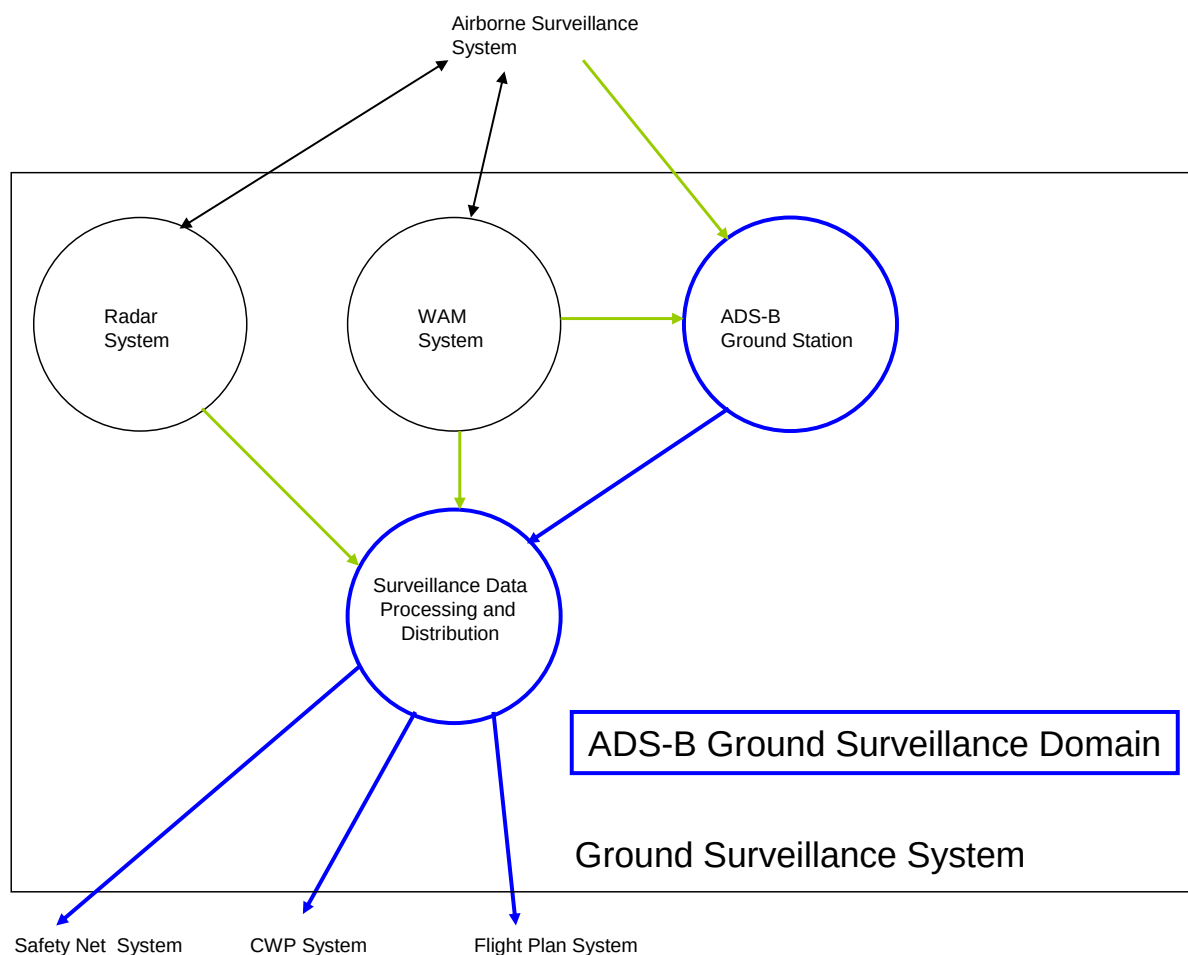


Figure 1 ADS-B Ground Surveillance Domain Context

- = 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.

This specification is not intended to dictate the physical architecture of the equipment. In alignment with the chosen baseline specifications for ADS-B Ground Stations (Ref [9]), the definition of an ADS-B Ground Station is intended to include a distributed architecture where 1090 ES reception functionality is located remotely and the report assembly for one or more sites is hosted centrally in a common server. This distributed architecture allows for the integration of WAM systems and ADS-B Ground Stations. It allows also for physical implementations where SDPD functionality is implemented in the common server of the ADS-B Ground Stations.

- Surveillance Data Processing and Distribution (SDPD)

The baseline for the SDPD is the ARTAS multi-sensor tracking system enhancement based on the first 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.

Despite the fact that an existing physical implementation of an SDPD has been chosen as the baseline, the allocation (or non-allocation) of specific requirements to the SDPD should be interpreted as a functional allocation. This specification should not prevent different physical ADS-B Ground Domain implementations. For example, ADS-B Ground Station functionality hosted in a server common to remote 1090ES reception functionality could be implemented in a physical SDPD system.

- Interfaces

The Interfaces subject to modification by the project refer to:

- ASTERIX CAT 021, Ed. 2. 80, November 2011 (ref [10])
- ASTERIX CAT 023, Ed 2.72, October 2011 (ref [12])
- ASTERIX CAT 062, Ed 2.74, October 2011 (ref [13])
- ASTERIX CAT 063, Ed 1.3, July 2007 (ref [14])
- ASTERIX CAT 032, ARTAS V8B1, edition 1.0, February 2011 (ref [17])

After the latest update of ASTERIX Categories for project 15.4.5a, a renumbering of the ASTERIX Categories was agreed by the ASTERIX Community. Following this renumbering, the following conversion Tables apply:

Category 021	
old	new
2.0a	2.70
2.0b	2.71
2.0c	2.72
2.0d	2.73
2.0e	2.74
2.0f	2.75
2.0g	2.76
2.0h	2.77
2.0i	2.78
2.0j	2.79
2.0k	2.80

Category 023	
old	new
2.0a	2.70
2.0b	2.71
2.0c	2.72

category 062	
old	new
2.0a	2.70
2.0b	2.71
2.0c	2.72
2.0d	2.73
2.0e	2.74

1.8 Acronyms and Terminology

Term	Definition
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 Assurance System
ASEP	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
ATM	Air Traffic Management
ATS	Air Traffic Services
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)
ATSAW	Air Traffic Situation Awareness
ATX	ASTERIX
CAT	Data Category
DO	RTCA Document
ED	EUROCAE Document
ES	Extended Squitter
EUROCAE	European Organisation for Civil Aviation Equipment

Term	Definition
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
NRA	Non Radar Airspace
PIR	Project Initiation Report
PR	Performance Requirement
REQ	Requirement
RF	Radio Frequency
RFG	Requirement Focus Group
RTCA	Radio Technical Commission for Aeronautics
SDPD	Surveillance Data Processing and Distribution
SESAR	Single European Sky ATM Research (Programme)
SG4	Sub Group 4
SJU	SESAR Joint Undertaking
SMGCS	Surface Movement Guidance and Control System
SMR	Surface Movement Radar
SPR	Safety and Performance Requirements
SPR-INTEROP	Safety, Performance and Interoperability Requirements
SSR	Secondary Surveillance Radar
TDOA	Time Difference Of Arrival
TMA	Terminal Manoeuvring Area
WAM	Wide Area Multilateration

2 General Functional block Description

N/A

3 Component Functional and non-Functional Requirements

3.1 ASTERIX CAT 021 Requirements

3.1.1 DO260B Compliancy

[REQ]

Identifier	REQ-15.04.05.a-D07-0010.0001
Requirement	An ADS-B Report shall indicate if the aircraft has a single antenna or antenna diversity for the transmission of ADS-B messages.
Title	Single Antenna Flag
Status	<In Progress>
Importance	<Essential>
Rationale	SPI/IR
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0060.0063	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/008	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0010.0002
Requirement	An ADS-B Report shall contain the Airborne Horizontal Position Quality Indicator (NIC), including supplements.
Title	Airborne Horizontal Position Quality (NIC)
Status	<In Progress>
Importance	<Essential>
Rationale	SPI/IR
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0060.0063	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/090 – Third Extension Field	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0010.0003
Requirement	An ADS-B Report shall contain the Airborne Horizontal Position Quality Indicator (SDA),
Title	Airborne Horizontal Position Quality (SDA)
Status	<In Progress>
Importance	<Essential>
Rationale	SPI/IR
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0060.0063	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/090 – Second Extension Field	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0010.0004
Requirement	An ADS-B Report shall contain the Airborne Horizontal Position Quality Indicator (SIL Supplement),
Title	Airborne Horizontal Position Quality (SIL Supplement)
Status	<In Progress>
Importance	<Essential>
Rationale	SPI/IR
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0060.0063	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/090 – Second Extension Field	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0010.0005
Requirement	An ADS-B Report shall contain the Geometric Altitude Quality Indicator (GVA)
Title	Geometric Altitude Quality (GVA)
Status	<In Progress>
Importance	<Essential>
Rationale	SPI/IR
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0060.0063	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/090 – Second Extension Field	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0010.0006
Requirement	An ADS-B Report shall contain an encoding of the “Intent Change” Flag to indicate that new information is available in the Mode S GICB registers 40,41 or 42.
Title	Intent Change Flag
Status	<In Progress>
Importance	<Essential>
Rationale	DO260B
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0060.0063	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/200	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0010.0007
Requirement	An ADS-B Report shall contain an encoding of the “LNAV Mode engaged” Flag
Title	LNAV Mode engaged
Status	<In Progress>
Importance	<Essential>
Rationale	DO260B
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0060.0063	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/200	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0010.0008
Requirement	An ADS-B Report shall contain the 1090 ES Version Number
Title	1090 ES Version Number
Status	<In Progress>
Importance	<Essential>
Rationale	SPI IR
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0060.0063	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/210	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0010.0009
Requirement	An ADS-B Report shall contain an ACAS Resolution Advisory Report
Title	ACAS Resolution Advisory (RA)
Status	<In Progress>
Importance	<Essential>
Rationale	SPI IR
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0060.0063	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/260	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0010.0010
Requirement	An ADS-B Report shall contain the length/width of aircraft information
Title	Length / Width of Aircraft
Status	<In Progress>
Importance	<Essential>
Rationale	SPI IR
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0060.0063	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/271 First Extension	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0010.0011
Requirement	An ADS-B Report shall contain the possibility to differentiate between airborne ground vector and surface ground vector.
Title	Ground Vector
Status	<In Progress>
Importance	<Essential>
Rationale	SPI IR

Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0060.0063	<Partial>
<ALLOCATED_TO>	<Subsystem element>	Reserved Expansion Field subfield SGV	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0010.0012
Requirement	An ADS-B Report shall contain the GPS Antenna Offset.
Title	GPS Antenna Offset
Status	<In Progress>
Importance	<Essential>
Rationale	SPI IR
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0060.0063	<Partial>
<ALLOCATED_TO>	<Subsystem element>	Reserved Expansion Field subfield GAO	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0010.0013
Requirement	An ADS-B Report shall contain the Barometric Pressure Setting.
Title	Barometric Pressure Setting
Status	<In Progress>
Importance	<Essential>
Rationale	SPI IR
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0060.0063	<Partial>
<ALLOCATED_TO>	<Subsystem element>	Reserved Expansion Field subfield BPS	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0010.0014
Requirement	An ADS-B Report shall contain the Selected Heading.
Title	Selected Heading
Status	<In Progress>
Importance	<Essential>
Rationale	DO260B
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0060.0063	<Partial>
<ALLOCATED_TO>	<Subsystem element>	Reserved Expansion Field subfield SelH	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0010.0015
------------	------------------------------

Requirement	An ADS-B Report shall contain the Aircraft ADS-B In Capability
Title	1090 ES IN & UAT IN
Status	<In Progress>
Importance	<Essential>
Rationale	DO260B
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0060.0063	<Partial>
<ALLOCATED_TO>	<Subsystem element>	Reserved Expansion Field subfield STA	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0010.0016
Requirement	An ADS-B Report shall contain the True North Heading
Title	True North Heading
Status	<In Progress>
Importance	<Essential>
Rationale	DO260B
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0060.0063	<Partial>
<ALLOCATED_TO>	<Subsystem element>	Reserved Expansion Field subfield TNH	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0010.0017
Requirement	An ADS-B Report shall indicate the status of TCAS following the DO-260B implementation.
Title	TCAS System Status
Status	<In Progress>
Importance	<Essential>
Rationale	SPI/IR
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0060.0063	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/008	<Full>

3.1.2 Integration of ADS-B with WAM

[REQ]

Identifier	REQ-15.04.05.a-D11-0030.0001
Requirement	An ADS-B report shall contain the result of the validation of the ADS-B target data with data received from a WAM system in ASTERIX category 020 providing the following information: • Target report validated and valid • Target report validated and not valid • Target report not validated • Target report valid except for Mode S data
Title	ADS-B/WAM Consistency Reporting

Status	<In Progress>
Rationale	ADS-B/WAM Shared Infrastructure Opportunity
Category	<Functional>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0030.0004	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/040 3rd ext - WAI	<Full>

3.1.2.1 Iteration 3

Identifier	REQ-15.04.05.a-D15-0030.0001
Requirement	An ADS-B report shall contain an error indication in I021/040 informing about the WAM target report substitution

<ALLOCATED_TO>	<Subsystem element>	<Full>
----------------	---------------------	--------

3.1.3 Security Requirements

[REQ]

Identifier	REQ-15.04.05.a-D07-0020.0001
Requirement	An ADS-B Report shall indicate if the report has been validated by using an independent validation check
Title	Independent Validation Checks
Status	<In Progress>
Importance	<Essential>
Rationale	Various Independent Security Checks
Category	<Security>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0047	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0033	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0007	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0050	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0030.0008	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/0040 Second Extension field	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0020.0002
Requirement	An ADS-B Report shall indicate if the Power/Range Validation has been performed and its result.
Title	Power/Range Validation Result
Status	<In Progress>
Importance	<Essential>
Rationale	Various Independent Security Checks
Category	<Security>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0047	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/0040 Fourth Extension field "PRV"	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0020.0003
------------	------------------------------

Requirement	An ADS-B Report shall indicate if the Angle of Arrival Validation has been performed and its result.
Title	Angle of Arrival Validation Result
Status	<In Progress>
Importance	<Essential>
Rationale	Various Independent Security Checks
Category	<Security>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0007	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/0040 Fourth Extension field "AoA"	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0020.0004
Requirement	An ADS-B Report shall indicate if the WAM Integration Validation has been performed and its result.
Title	WAM Validation Result
Status	<In Progress>
Importance	<Essential>
Rationale	Various Independent Security Checks
Category	<Security>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0030.0008	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/0040 Third Extension field "WAI"	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0020.0005
Requirement	An ADS-B Report shall indicate if the Position change versus Velocity Validation has been performed and its result.
Title	Track Consistency Validation Result
Status	<In Progress>
Importance	<Essential>
Rationale	Various Independent Security Checks
Category	<Security>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0050	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/0040 Third Extension field "PVC"	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0020.0006
Requirement	An ADS-B Report shall indicate if the Time of Arrival Validation has been performed and its result.
Title	TOA/Distance Validation Result
Status	<In Progress>
Importance	<Essential>
Rationale	Various Independent Security Checks
Category	<Security>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0033	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/0040 Third Extension field "ToA"	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D11-0040.0001
Requirement	An ADS-B Report shall indicate the result of the TDOA Validation providing the following information: - Target report validated and valid - Target report validated and not valid - Target report not validated
Title	TDOA Techniques Reporting
Status	<In Progress>
Importance	<Essential>
Rationale	Security Enhancement
Category	<Security>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0040.0044	<Full>
<ALLOCATED_TO>	<Subsystem element>	I021/0040 4th Ext - TDoA	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D11-0040.0002
Requirement	An ADS-B Report shall indicate the result of the Behavioral Analysis Validation providing the following information: - Target report validated and valid - Target report validated and not valid - Target report not validated - Target report partly validated and valid
Title	Behavioral Analysis Validation Result
Status	<In Progress>
Importance	<Essential>
Rationale	Security Enhancement
Category	<Security>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0040.0048	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0040.0086	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I021/0040 3rd Ext. "BAR"	<Full>

3.1.3.1 Range Measurement from Active Interrogation

Identifier	REQ-15.04.05.a-D15-0130.0001
Requirement	An ADS-B Report shall indicate the result of the "range measurement from active interrogation" providing the following information: - Target report validated and valid - Target report validated and not valid - Target report not validated

<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D13-0130.0190	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D13-0130.0200	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D13-0130.0210	<Full>

<ALLOCATED_TO>	<Subsystem element>		<Full>
----------------	---------------------	--	--------

3.2 ASTERIX CAT 023 Requirements

[REQ]

Identifier	REQ-15.04.05.a-D07-0030.0001
Requirement	An ASTERIX category 023 Report shall indicate if the WAM Validation function is activated or not.
Title	WAM Validation Function inactive
Status	<In Progress>
Importance	<Essential>
Rationale	SPI/IR
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0030.0001	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I023/101	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0030.0002
Requirement	An ASTERIX category 023 Report shall indicate if the Time of Arrival versus Distance Validation function is activated or not.
Title	TOA/Distance Validation inactive
Status	<In Progress>
Importance	<Essential>
Rationale	SPI/IR
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0030	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I023/101	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0030.0003
Requirement	An ASTERIX category 023 Report shall indicate if the Power versus Range Validation function is activated or not.
Title	Power/Range Validation inactive
Status	<In Progress>
Importance	<Essential>
Rationale	SPI/IR
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0040	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I023/101	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0030.0004
Requirement	An ASTERIX category 023 Report shall indicate if the Position change versus Velocity Validation function is activated or not.
Title	Track Consistency Validation inactive
Status	<In Progress>
Importance	<Essential>

Rationale	SPI/IR
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0050	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I023/101	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0030.0005
Requirement	An ASTERIX category 023 Report shall indicate if the Angle of Arrival Validation function is activated or not.
Title	AOA/Distance Validation inactive
Status	<In Progress>
Importance	<Essential>
Rationale	SPI/IR
Category	<Interoperability>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0001	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I023/101	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D11-0000.0001
Requirement	An ASTERIX category 023 Report shall indicate the currently active load reduction level for automatic network bandwidth optimization.
Title	Bandwidth Mode Status
Status	<In Progress>
Rationale	Potential performance improvement
Category	<Performance>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0000.0042	<Full>
<ALLOCATED_TO>	<Subsystem element>	I023/101 2 nd ext. - LAL	<Full>
Identifier	REQ-15.04.05.a-D15-0030.0002		
Requirement	An ASTERIX category 023 Report shall indicate if the WAM Target Report Update function is activated or not.		
	WAM Target Report Update active		
	<In Progress>		
	<Interoperability>		

<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D13-0030.0140	
<ALLOCATED_TO>	<Subsystem element>		
Identifier	REQ-15.04.05.a-D15-0130.0002		
Requirement	An ASTERIX category 023 Report shall indicate if the Range Measurement from Active Interrogation function is activated or not.		
	Range measurement from active interrogation active		
	<In Progress>		
	Range measurement from active interrogation		
	<Interoperability>		

<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D13-0130.0230	
<ALLOCATED_TO>	<Subsystem element>		

3.3 ASTERIX CAT 062 Requirements

3.3.1 ADS-B RAD Requirements

[REQ]

Identifier	REQ-15.04.05.a-D07-0070.0001
Requirement	A System Track Message shall indicate if an inconsistency in emergency code values from different surveillance technologies has been detected.
Title	Emergency Codes discrepancy
Status	<In Progress>
Importance	<Essential>
Rationale	ED-161 Requirement
Category	<Safety>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0020.0010	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I062/080 Fourth extension Field	<Full>

3.3.2 Integration of ADS-B with WAM

[REQ]

Identifier	REQ-15.04.05.a-D11-0030.0001
Requirement	A System Track Message shall indicate the result of the validation of the ADS-B target data with data received from a WAM system in ASTERIX category 020.
Title	ADS-B/WAM Consistency Forwarding
Status	<In Progress>
Importance	<Essential>
Rationale	ADS-B/WAM Shared Infrastructure Opportunity
Category	<Functional>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0030.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0030.0010	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0030.0014	<Full>
<ALLOCATED_TO>	<Subsystem element>	I062/080 5th ext. - WAI	<Full>

3.3.3 Security Requirements

[REQ]

Identifier	REQ-15.04.05.a-D07-0080.0001
Requirement	A System Track Message shall indicate if a possible Power/Range Validation check performed by one or more ADS-B GS has failed and no reliable data from other sensors can overrule this check.
Title	Power/Range Validation Result to end user
Status	<In Progress>
Importance	<Essential>
Rationale	Various Independent Security Checks
Category	<Security>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0049	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I062/080 Fourth extension Field	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0080.0002
Requirement	A System Track Message shall indicate if a possible Angle of Arrival check performed by one or more ADS-B GS has failed and no reliable data from other sensors can overrule this check.
Title	Angle of Arrival Validation Result to end user.
Status	<In Progress>
Importance	<Essential>
Rationale	Various Independent Security Checks
Category	<Security>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0009	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I062/080 Fourth extension Field	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0080.0003
Requirement	A System Track Message shall indicate if a possible check with WAM data performed by one or more ADS-B GS has failed and no reliable data from other sensors can overrule this check.
Title	WAM Validation Result to end user.
Status	<In Progress>
Importance	<Essential>
Rationale	Various Independent Security Checks
Category	<Security>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0030.0010	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I062/080 Fourth extension Field	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0080.0004
Requirement	A System Track Message shall indicate if a possible position change versus velocity check performed by one or more ADS-B GS has failed and no reliable data from other sensors can overrule this check.
Title	Track Consistency Validation Result to end user.
Status	<In Progress>
Importance	<Essential>
Rationale	Various Independent Security Checks
Category	<Security>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0050	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I062/080 Fourth extension Field	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D07-0080.0005
Requirement	A System Track Message shall indicate if a possible Time of Arrival versus distance validation performed by one or more ADS-B GS has failed and no

	reliable data from other sensors can overrule this check.
Title	TOA/Distance Validation Result to end user.
Status	<In Progress>
Importance	<Essential>
Rationale	Various Independent Security Checks
Category	<Security>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0035	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I062/080 Fourth extension Field	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D11-0040.0003
Requirement	A System Track Message shall indicate the result of the TDOA Validation.
Title	TDOA Techniques Result to end user
Status	<In Progress>
Importance	<Essential>
Rationale	Security Enhancement
Category	<Security>
V&V Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0040.0048	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I062/080 6th extension - TDoA	<Full>

Identifier	REQ-15.04.05.a-D11-0040.0004
Requirement	A System Track Message shall indicate the result of the Behavioral Analysis Validation.
	<In Progress>
	<Essential>
	Security Enhancement
	<Security>
	<Test>

<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0040.0090	<Partial>
<ALLOCATED_TO>	<Subsystem element>	I062/080 5th extension - BAR	<Full>

3.3.4 Range Measurement from Active Interrogation

Identifier	REQ-15.04.05.a-D15-0130.0003
Requirement	A System Track Message shall indicate the result of the RTD Validation.
	<In Progress>
	Various Independent Security Checks
	<Security>
	<Test>

<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D14-0040.0009	<Full>
<ALLOCATED_TO>	<Subsystem element>		<Full>

3.4 ASTERIX CAT032 Requirements

Identifier	REQ-15.04.05.a-D15-0000.0001
Requirement	A Category 032 message shall contain a field to communicate flight status with respect to ADS-B approval

<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D14-0000.0001	
-------------	--------------------	------------------------------	--

<ALLOCATED_TO>	<Subsystem element>		
----------------	---------------------	--	--

4 References

- [1] SJU 15.04.05a Specification Baseline Document, D17, Ed. 00.01.00, Oct 2010
- [2] SESAR Requirements and V&V Guidelines Latest version
- [3] SESAR Toolbox User Manual Latest version
- [4] EUROCAE/RTCA MOPS for 1090 MHz ADS-B, ED-102/DO-260, Sept. 2000
- [5] RTCA MOPS for 1090ES ADS-B and TIS-B, DO-260A, Dec. 2006 (includes Changes 1 and 2)
- [6] EUROCAE/RTCA MOPS for 1090ES ADS-B and TIS-B, ED-102A/DO-260B, Dec. 2009
- [7] EUROCAE/RTCA SPIR Document for ADS-B NRA Application, ED-126/DO-303, Dec. 2006
- [8] EUROCAE/RTCA SPIR Document for ADS-B RAD Application, ED-161/DO-318, Sept. 2009
- [9] EUROCAE ED129: Technical Specification for a 1090 MHz Extended Squitter ADS-B Ground Station, June 2010
- [10] EUROCONTROL ASTERIX Standards CAT 21, Ed 2.80, November 2011,
- [11] EUROCONTROL ASTERIX Standards CAT 21 Reserved Expansion Field, Ed 1.1, May 2011
- [12] EUROCONTROL ASTERIX Standards CAT 23, Ed 2.72, October 2011
- [13] EUROCONTROL ASTERIX Standards CAT 62, ED 2.74, October 2011
- [14] EUROCONTROL ASTERIX Standards CAT 63, Ed 1.3, July 2007
- [15] SJU 15.04.05a ADS-B Surveillance System Spec. for It 2,D19, Ed. 00.02.00, September 2011
- [16] SJU 15.04.05a Interface Spec. for It.1 , D07, Ed 00.01.00, March 2011
- [17] EUROCONTROL ASTERIX Specification CAT 032, Application of ASTERIX to ARTAS V8B1, Edition 1.0, February 2011
- [18] SJU 15.04.05a ADS-B Surveillance System Spec. for It 3,D20, Ed. 00.00.02, August 2012
- [19] SJU 15.04.05a Interface Spec. for It.2 , D11, Ed 00.01.00, October 2011

4.1 Use of copyright / patent material /classified material

No copyright/patent material is included in this specification.

Appendix A Traceability

The project intends to import all requirements defined in this document as well as the lower level derived requirements as specified in Deliverables D13, D14 and D15, into a requirements management tool (like DOORS).

Such a tool will then generate an overall traceability matrix which could be included in this document at a later stage.

-END OF DOCUMENT -