



SDPD Specification - Iteration 3

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Abstract

The Surveillance Data Processing & Distribution (SDPD) is part of a ground based surveillance system that provides airspace situational awareness to air traffic controllers. The SDPD receives aircraft data from individual surveillance sensors, including ADS-B Ground Stations broadcasted from appropriately equipped aircraft, and serves fused surveillance updates to client systems, such as Controller Work Positions.

This specification addresses the scope and context of the SDPD requirements within the functional ADS-B Ground Surveillance Domain as defined in the SESAR WP 15.4.5.a:

- D18: ADS-B Surveillance System Specifications for Iteration 1
- D19: ADS-B Surveillance System Specifications for Iteration 2
- D20: ADS-B Surveillance System Specifications for Iteration 3

Although no particular physical implementation or architecture is assumed, the specification builds on the EUROCONTROL ARTAS System/Segment Specification, which is a baseline document of the project.

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Intellectual Property Rights (foreground)

This deliverable consists of SJU foreground, comprising enhancement requirements of the EUROCONTROL ARTAS system and should therefore be regarded as User's Requirements. ARTAS acts as the SDPD baseline for P15.4.5.a project. The document will also derive requirements relevant to the ARTAS System Segment and Software Requirement Specifications for which the IPRs belong exclusively to EUROCONTROL. Any further tangible and/or intangible assets resulting from the implementation of these User's Requirements in the frame of ARTAS activities shall remain exclusively the IPRs of EUROCONTROL.

Table of Contents

EXECUTIVE SUMMARY	7
1 INTRODUCTION.....	8
1.1 PURPOSE OF THE DOCUMENT	8
1.2 INTENDED READERSHIP	9
1.3 INPUTS FROM OTHER PROJECTS	9
1.4 STRUCTURE OF THE DOCUMENT	10
1.5 REQUIREMENTS DEFINITIONS – GENERAL GUIDANCE	10
1.6 SDPD PURPOSE	11
1.7 SDPD (ARTAS) OVERVIEW.....	11
1.8 ACRONYMS AND TERMINOLOGY.....	12
2 GENERAL SDPD (ARTAS) DESCRIPTION.....	15
2.1 CONTEXT	15
2.2 SDPD (ARTAS) MODES AND STATES.....	15
2.3 MAJOR SDPD (ARTAS) CAPABILITIES.....	17
2.4 USER CHARACTERISTICS	17
2.5 OPERATIONAL SCENARIOS.....	17
2.6 FUNCTIONAL	17
2.6.1 Functional decomposition.....	17
2.6.2 Functional Analysis.....	18
2.7 SERVICE VIEW	19
3 SDPD FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENTS	20
3.1 FUNCTIONS	20
3.1.1 ADS-B APT APPLICATION CAPABILITIES	20
3.2 ADAPTABILITY	21
3.2.1 NETWORK LOAD MONITORING	21
3.3 PERFORMANCE CHARACTERISTICS	24
3.3.1 INCONSISTENCY OF EMERGENCY CODE	24
3.4 SAFETY & SECURITY	26
3.4.1 WAM Integration Requirements.....	26
3.4.2 ToA Versus Distance Requirements.....	28
3.4.3 Power versus Range Requirements.....	29
3.4.4 Angle of Arrival Requirements	30
3.4.5 Track Consistency Check.....	31
3.4.6 ADS-B Only Track Requirements.....	32
3.4.7 Behavioural Analysis of Target Requirements.....	32
3.4.8 Application of TDoA Technique	34
3.4.9 Range Measurement from Active Interrogation.....	34
3.5 MAINTAINABILITY	36
3.6 RELIABILITY.....	37
3.6.1 SYSTEM INTEGRITY	37
3.7 SDPD (ARTAS) INTERNAL DATA REQUIREMENTS.....	38
3.8 DESIGN AND CONSTRUCTION CONSTRAINTS.....	39
3.9 SDPD (ARTAS) INTERFACE REQUIREMENTS	40
3.9.1 ASTERIX CATEGORY 021	40
3.10 OTHER ENHANCEMENTS	40
3.10.1 USE OF FLIGHT PLAN TO INDICATE THE APPROVAL OF AIRCRAFT FOR ADS-B OPERATIONS.....	40
4 ASSUMPTIONS.....	42
5 REFERENCES.....	43
5.1 USE OF COPYRIGHT / PATENT MATERIAL /CLASSIFIED MATERIAL.....	43
5.1.1 Classified Material.....	43
APPENDIX A TRACEABILITY	44

List of tables

Table 1 Requirement Identifier Allocation	11
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List of figures

Figure 1 ADS-B Ground Surveillance Domain Context	8
Figure 2 ARTAS External Network Interfaces.....	12
Figure 3 ARTAS Functional Overview	16
Figure 4 ARTAS Functional Relationship	18
Figure 5 ARTAS Relation to Other Components	19

Executive summary

The Surveillance Data Processing & Distribution system (SDPD) is part of a ground surveillance system that provides airspace situational awareness to air traffic controllers (and potentially other users within ATM). The SDPD receives aircraft data from individual surveillance sensors, including ADS-B 1090 MHz Extended Squitter Ground Station, and serves fused surveillance track updates to client systems such as Controller Working Positions. Such updates from aircraft data contain position, velocity, status and other information obtained from onboard systems and surveillance ground sensors.

The primary function of the SDPD is to present an accurate and complete air situation picture in ASTERIX Category 062 to client systems based on fusing together the input surveillance data received in ASTERIX Categories 001 (radar), 020 (WAM), 021 (ADS-B) & 048 (radar) messages and messages of ADS-C service.

This Technical Specification presents the functional, non functional and interface requirements applicable to the SDPD as derived from the requirements stated in the Project 15.4.5.a ADS-B Ground Surveillance System Specification for Iteration 1, 2 and 3, Ref. [1], [19] & [20]. This document is intended to be used by Project 15.4.5.b in order to develop the third iteration of the SDPD prototype compliant with the ADS-B Surveillance Domain enhancements specified in Ref. [1], [19] & [20].

This requirement specification is not intended to dictate the physical architecture of the system however the specification does build upon the ARTAS System/Segment Specification, which was accepted as a baseline for the SDPD component. Importantly, while the requirements presented here are viewed as at a system level in the context of the ADS-B Surveillance Domain, they are viewed as User Requirements in the context of the SDPD. Therefore, these requirements shall be further decomposed and developed to create ARTAS System/Segment Specification Ref. [18] requirements and thereafter software requirements.

While this specification covers only ADS-B related requirements it does not exclude physical implementations where SDPD functionality is implemented within the ADS-B Ground Station. No requirements are however, specified for any such integrated SDPD functionality.

1 Introduction

The Technical Specification contains the functional, non-functional and interface requirements applicable to the Surveillance Data Processing & Distribution system (SDPD) as derived from the requirements stated in the ADS-B Surveillance System Specification, Ref. [1], [19] & [20].

Importantly, while the requirements presented here are viewed as at a system level in the context of the ADS-B Surveillance Domain, they are viewed as User Requirements in the context of the SDPD. Therefore, these requirements shall be further decomposed and developed to create ARTAS System/Segment Specification Ref. [18] requirements and thereafter software requirements.

1.1 Purpose of the document

This document constitutes the third iteration of the requirements specification for the SDPD, which is the component "Surveillance Data Processing and Distribution" system of the ground surveillance system shown in Figure 1.

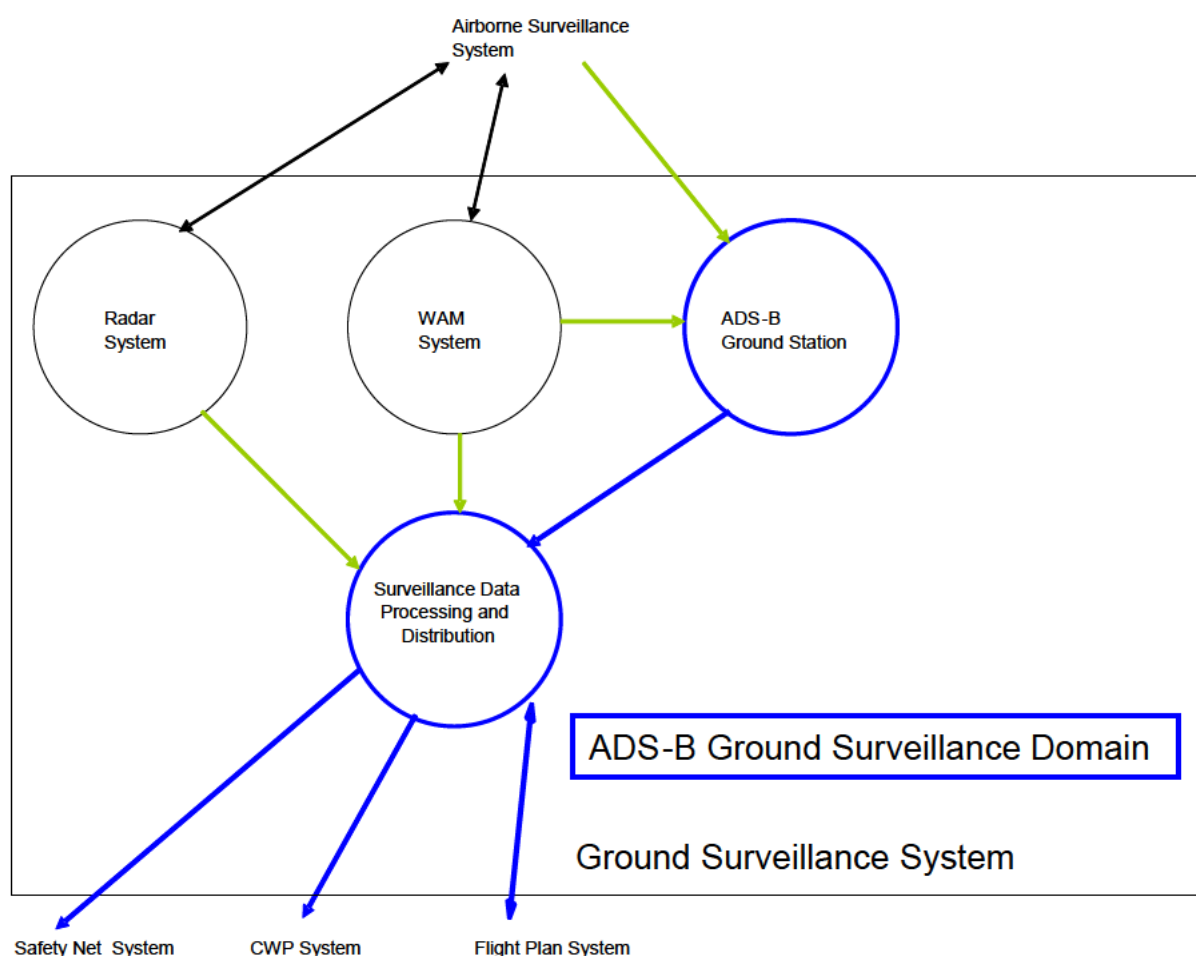


Figure 1 ADS-B Ground Surveillance Domain Context

- = 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

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

This technical specification is intended to be used by Project 15.4.5.b in order to develop the third iteration of the SDPD prototype compliant with the ADS-B Surveillance Domain enhancements specified in Ref. [1], [19] & [20].

1.2 Intended readership

The audience of this document includes:

- Projects 15.04.05.a and b,
- Any other SJU projects that may require SDPD for their validation activities

1.3 Inputs from other projects

ADS-B surveillance has been standardised by RTCA and EUROCAE (see Ref. [2], [3], [4], [5], [6] for avionics equipment and [7] for ADS-B surveillance in Non Radar and Radar airspaces). Additionally EUROCAE has published a standard for 1090 GS (ED-129 [9]) which would meet the requirements of ADS-B surveillance in Non Radar Airspaces (ED-126 [7]), and is interoperable with DO-260 [4] or DO-260A [5] compliant aircraft.

Furthermore, EUROCONTROL has developed ASTERIX standards (Category 021 [10] and Category 023 [11]) for ADS-B data and station status reporting between ground systems. The EUROCAE 1090 GS specification, ED-129 [9], is compliant with these ASTERIX standards.

Despite this, and though the track messages should be served in compliance with ASTERIX Category 062 messages Ref. [17] no such standards have been developed for the SDPD system. Therefore, the ARTAS System/Segment Specification Ref. [18] has been used as a baseline document for the functional performance of the SDPD in the context of the project.

SJU Project 15.04.05a is developing the SDPD specification in order to meet with the following enhancements:

Iteration 1

- Compliance to ADS-RAD (ED-161 [7]),
- Interoperability with DO-260B [6] equipped aircraft,
- Use of WAM data for ADS-B position validation,
- Time of Arrival versus distance check for ADS-B report validation,
- Power versus distance check for ADS-B report validation,
- Angle of arrival check for ADS-B report validation,

- Consistency Check (Position versus Velocity).

Iteration 2

- The ADS-B APT Application.
- ADS-B ADD (After analysis, not retained for Iteration 2.)
- ATSA SURF (After analysis, not retained for Iteration 2.)
- ASPA-Flight Deck Interval Management (FIM) (After analysis, not retained for Iteration 2.)
- Applications based on SESAR project deliveries (After analysis, not retained for Iteration 2.)
- Advanced enhancements from integration with WAM
 - Enhanced ADS-B target report validation
 - Enhancements from CASCADE process (to reflect any requirements stemming from the safety, performance and interoperability work on ADS-B integration with WAM) (After analysis not retained for Iteration 2)

Iteration 3

- Applications based on SESAR project deliveries (e.g. separation applications)
- ADS-B target report data update by WAM system
- Range measurement from active interrogation
- ADS-B Report validation using FDPS or other relevant inputs (such as 4D)
- Enhancements for impact from SESAR project 9.21, if available
- Use of the Flight Plan to indicate the approval of the aircraft for ADS-B operations and the corresponding approval reference (e.g. AMC 20-24, SPI IR etc.) based on an updated ASTERIX Cat032 [21]

1.4 Structure of the document

This document is organised as follows:

- Chapter 1: Purpose and scope; Requirements structure; Component purpose and high level overview
- Chapter 2: General SDPD description
- Chapter 3: SDPD Functional and Non-Functional Requirements
- Chapter 4: Referenced documents
- Appendix A: Traceability to the SDPD relevant requirements of [1], [19] & [20].

1.5 Requirements Definitions – General Guidance

Requirements have been developed according to the SESAR Requirements and V&V Guidelines [13].

They are broken down into the following categories:

- *Functional Requirements;*
- *Performance;*
- *Interoperability;*
- *Security.*

The layout follows the description in [14].

In accordance with the guidelines in [14], requirement identifiers follow the scheme:

All requirements retained from [1] keep their original identifiers (REQ-15.04.05.a-D06-0xxx.yyyy)

REQ-15.04.05.a-D06/10/14-00xx.yyyy, where

xx	Meaning
10	ED-161 requirement
20	DO-260B requirement
30	WAM integration req.
40	ToA versus Distance req.
50	Power versus Distance req.
60	Angle of Arrival req.
70	Track Consistency Check (Velocity versus Position Change)
00	Other
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.
45	Security req.
55	Civil/Military req.
65	1090ES Technology req.
00	Other

Table 1 Requirement Identifier Allocation

1.6 SDPD Purpose

The term 'SDPD' refers to a system whose primary function is to take as input the messages sent by individual surveillance sensors for detected target and to fuse them into a system target track and serve such tracks to subscribed Users in assembled ASTERIX Category 62 messages Ref. [17].

This requirements specification is not intended to dictate the physical architecture of the system.

While this specification covers only ADS-B requirements it does not exclude physical implementations where SDPD functionality is implemented within the ADS-B Ground Station. No requirements are however specified for any such integrated SDPD functionality.

The SDPD baseline for P15.4.5a is the ARTAS System/Segment Specification

1.7 SDPD (ARTAS) Overview

The ATM Surveillance Tracker and Server (ARTAS) is the joint European SDPD, developed by the Agency to promote the ATM harmonisation and integration in the ECAC area. The objective is to combine all types of surveillance data from sensors into a seamless, accurate and continuous air situation picture that is distributed to a variety of users (e.g. CWP, FPPS, STCA, etc).

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Following more than 15 years of development, the current operational version of ARTAS processes plots from classical sensors; Primary and Secondary Radar (including M-SSR and Mode S), Aircraft Derived Data (ADD) from Mode-S Enhanced and ADS, and Wide Area Multilateration into the multi-sensor tracking algorithms and environment assessment functions.

Figure 2 is a general diagram of the external connections of ARTAS to the networks with respect to the interfaces.

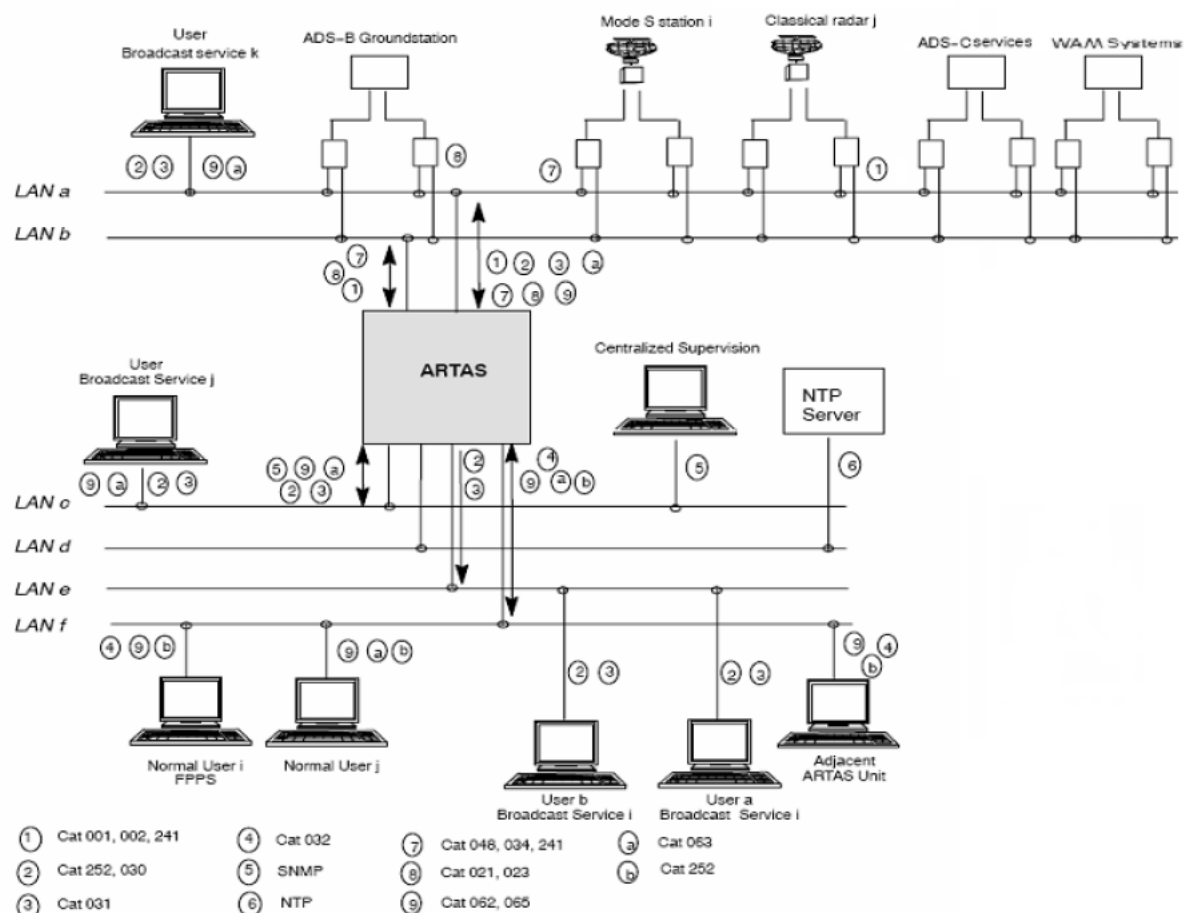


Figure 2 ARTAS External Network Interfaces

1.8 Acronyms and Terminology

Term	Definition
1090 ES	1090 MHz Mode S Extended Squitter
1090 GS	ADS-B 1090 MHz Extended Squitter Ground Station
ADD	Aircraft Derived Data
ADS-B (C)	Automatic Dependent Surveillance – Broadcast (Contract)
ARTAS	ATM SuRveillance Tracker And Server
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management

Term	Definition
ATXnnn	ASTERIX Category nnn
BITE	Built In Test Equipment
CSCI	Computer Software Configuration Item
CWP	Controller Working Position
DAF	Data Analysis Facility
DAPs	Downlink Aircraft Parameters
DF	Downlink Format
DOD	Detailed Operational Description
ECAC	European Civil Aviation Conference
E-ATMS	European Air Traffic Management System
ES	Extended Squitter
FDPS	Flight Data Processing System
GS	Ground Station
ID	Identifier
IRS	Interface Requirements Specification
INTEROP	Interoperability Requirements
LAN	Local Area Network
Mhz	Megahertz
MMS-DM	Man-Machine interface Supervision Database Management
M-SSR	Monopulse Secondary Surveillance Radar
NACp	Navigation Accuracy Category for Position
NIC	Navigation Integrity Category
NLR	Nationaal Lucht-en Ruimtevaartlaboratorium
NTP	Network Time Protocol
OSA	Operational Safety Analysis
OSD	Operational Service and Environment Definition
PR	Performance Requirement
RAD	Radar
RF	Radio Frequency
RFK	Radio Frequency Group
RMK	Remark
RMCD	SuRveillance Message Conversion and Distribution Equipment
RTCA	Radio Technical Commission for Aeronautics
RTD	Round Trip Delay

Term	Definition
SDPD	Surveillance Data Processing and Distribution
SESAR	Single European Sky ATM Research Programme
SIMARTAS	ARTAS CSCI Simulator of an ARTAS User
SJU	SESAR Joint Undertaking (Agency of the European Commission)
SJU Work Programme	The programme which addresses all activities of the SJU Agency.
SESAR Programme	The programme which defines the Research and Development activities and Projects for the SJU.
SMGCS	Surface Movement Guidance and Control Systems
SMR	Surface Movement Radar
SNMP	Simple Network Management Protocol
SPR	Safety and Performance Requirements
SSE	Surveillance Separation Error
STCA	Short-Term Conflict Alert
TS	Technical Specification
TAD	Technical Architecture Description
TBD	To Be Defined
TDOA	Time Difference of Arrival
TMA	Terminal Manoeuvring Area
ToA	Time of Arrival
UTC	Coordinated Universal Time
WAM	Wide Area Multilateration
WAN	Wide Area Network

2 General SDPD (ARTAS) Description

2.1 Context

The SDPD is part of a ground surveillance system (see Figure 1) that provides airspace situational awareness to air traffic controllers (and potentially other users in ATM). The system provides services that are used by higher-level applications as described in Ref [1], [19] & [20]. It makes use of the aircraft ADS-B service, which collects position, velocity and status information from systems and sensors on the aircraft and broadcasts this information to other targets and Ground Stations. It should be noted however that ARTAS was neither specified nor designed to perform surface (airport ground) movement tracking and as such may not fuse correctly airport radar and ADS-B data.

The SDPD baseline for P15.4.5.a is the ARTAS System/Segment Specification Ref [18].

2.2 SDPD (ARTAS) Modes and States

An ARTAS is in one and only one of the following two modes of usage: live or simulation.

1. ARTAS in live mode of use receives live information from real radars, carries out cooperation with real adjacent ARTAS Units, and communicates with real Users.
2. ARTAS in simulation mode of use is isolated from operational environment. It receives radar information from a simulation environment, and cannot output data for adjacent ARTAS Units or Users.

NOTE: The role of an ARTAS (operational, evaluation or development) defines the way this ARTAS is used. The mode of use of an ARTAS enables to classify the functional capabilities of the system following its configuration (mainly use of live input data). Therefore the mode of use of an ARTAS is independent from its role.

Figure 3 gives an overview of the ARTAS live functional capabilities.

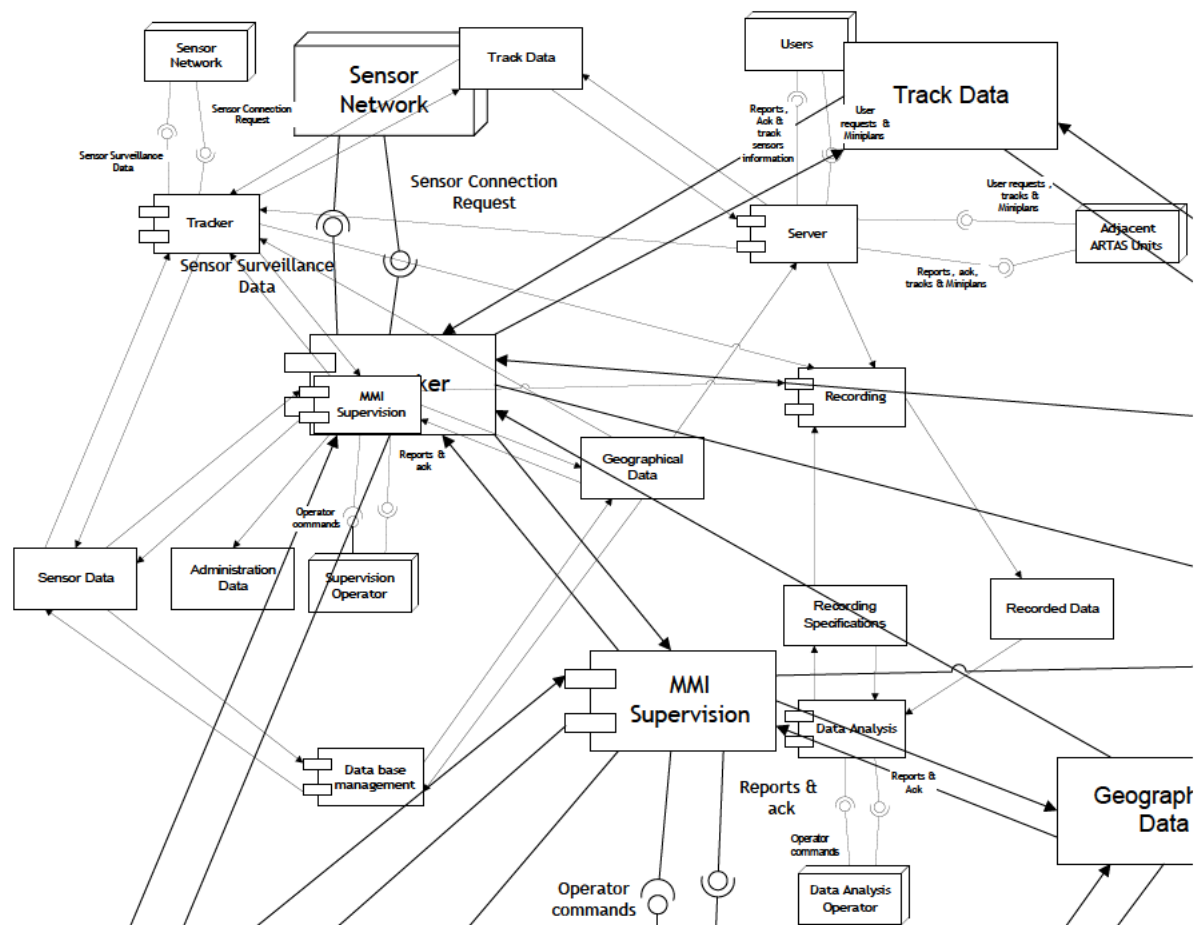


Figure 3 ARTAS Functional Overview

2.3 Major SDPD (ARTAS) Capabilities

In live mode, ARTAS performs:

- the processing of data received from the surveillance data sources networks, in cooperation with other ARTAS UNITS in order to serve multi-sensor tracks via networks to various ATC subsystems (e.g. Flight Data Processing Subsystems, Short Term Conflict Alert Processing Subsystems, etc...),
- the processing of sensor information.

In order to reach this purpose, the ARTAS UNIT will interface with its external environment, which is constituted by:

- the subsystems providing information to ARTAS, surveillance data sources (as radars, ADS-B providers), Flight Data Processing Subsystems,
- the subsystems using this air picture or the sensor information (ATC users, Flight Data Processing Subsystems, ATFM, Conflict Alert Function, ...),
- adjacent ARTAS UNITS in order in to carry out cooperation with these units to provide Users with a consistent air picture in their whole domain of interest.

2.4 User Characteristics

Users in the ARTAS specification include Controller Work Positions for En-Route & Approach, Short Term Conflict Alert, Flight Plan Correlation, Military/Civil Coordination, Flow-Control etc.

2.5 Operational Scenarios

ARTAS presents an accurate and continuous picture of the air situation in the domain of interest to the users. It provides to the controllers and ATC subsystems making use of aircraft derived data all required information with the required level of availability and accuracy. Also in favour of a harmonised system are the possibilities of central configuration management, joint elaboration of improvements commonly organised support, contingency and the potential for an enhanced Military/Civil coordination.

ARTAS also relates information related to the sensors used by ARTAS in order to allow another ATC system to use this information for local data processing (e.g. the fallback SDPD or direct display of mono-radar data).

2.6 Functional

2.6.1 Functional decomposition

ARTAS is designed around four main functions:

- The TRACKER processes the input surveillance information (from the surveillance sensors) and maintains the Track Data Base,
- The SERVER performs the Track Information Service itself, i.e. the management of all requests from Users and the transmission of the relevant sets of track data to these Users. It will also execute the so-called inter-ARTAS cooperation functions.
- The SYSTEM MANAGER performs the functions related to the supervision and management of the ARTAS Unit,
- The RECORDING function will record selected data related to the operational use of ARTAS.
- Several supporting facilities are also available:
- MMS-DM performs the functions related to the data base management,
- SIMARTAS simulates the communications made with the SERVER by the ARTAS Users,
- DAF performs the functions related to the analysis of data selected for recording.

2.6.2 Functional Analysis

Figure 4 depicts how the SDPD (ARTAS) functions relate to one another (Note: “radar” means any sensor, including ADS-B).

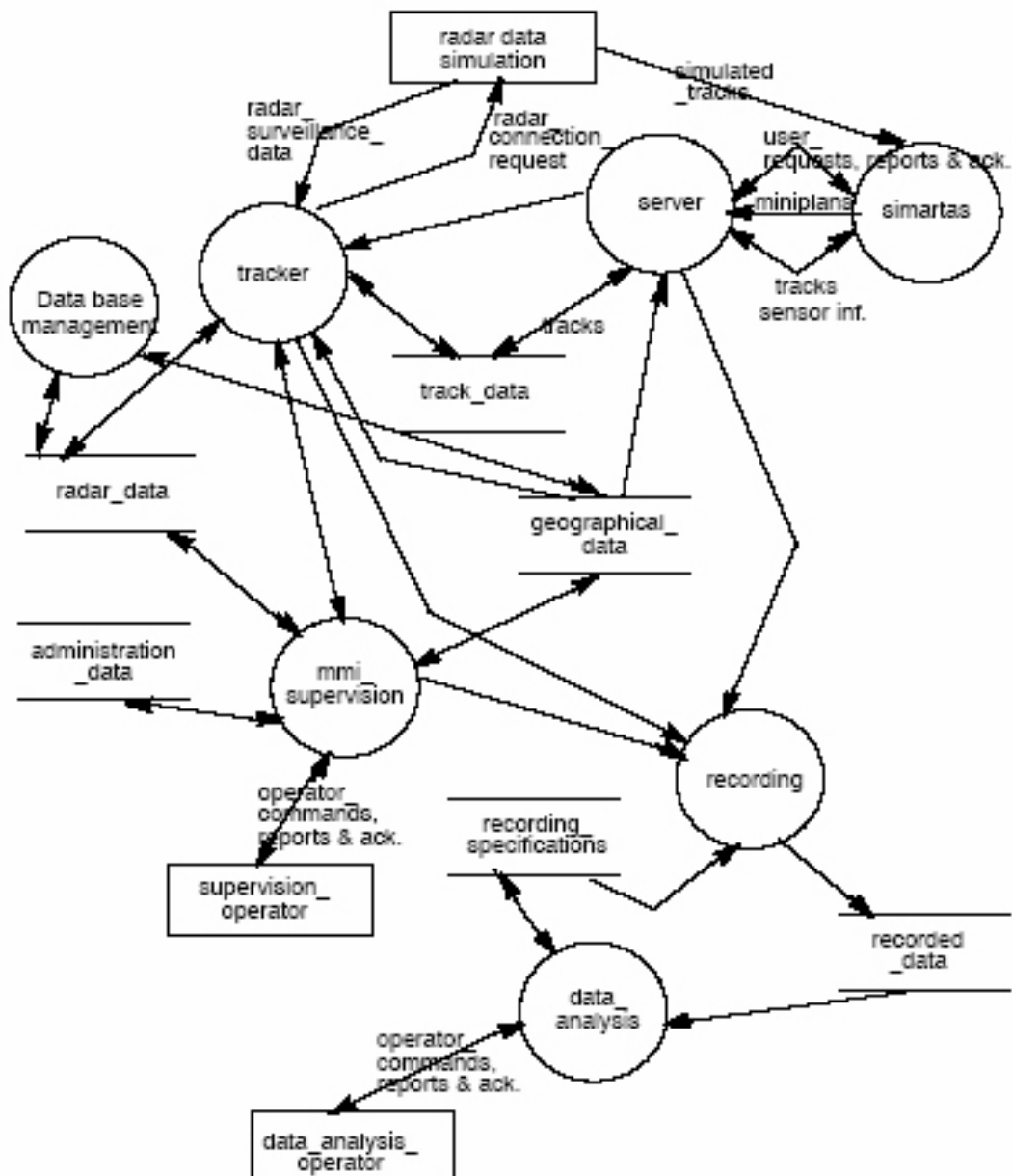


Figure 4 ARTAS Functional Relationship

Figure 5 presents how the SDPD (ARTAS) relates to the functions of other components.

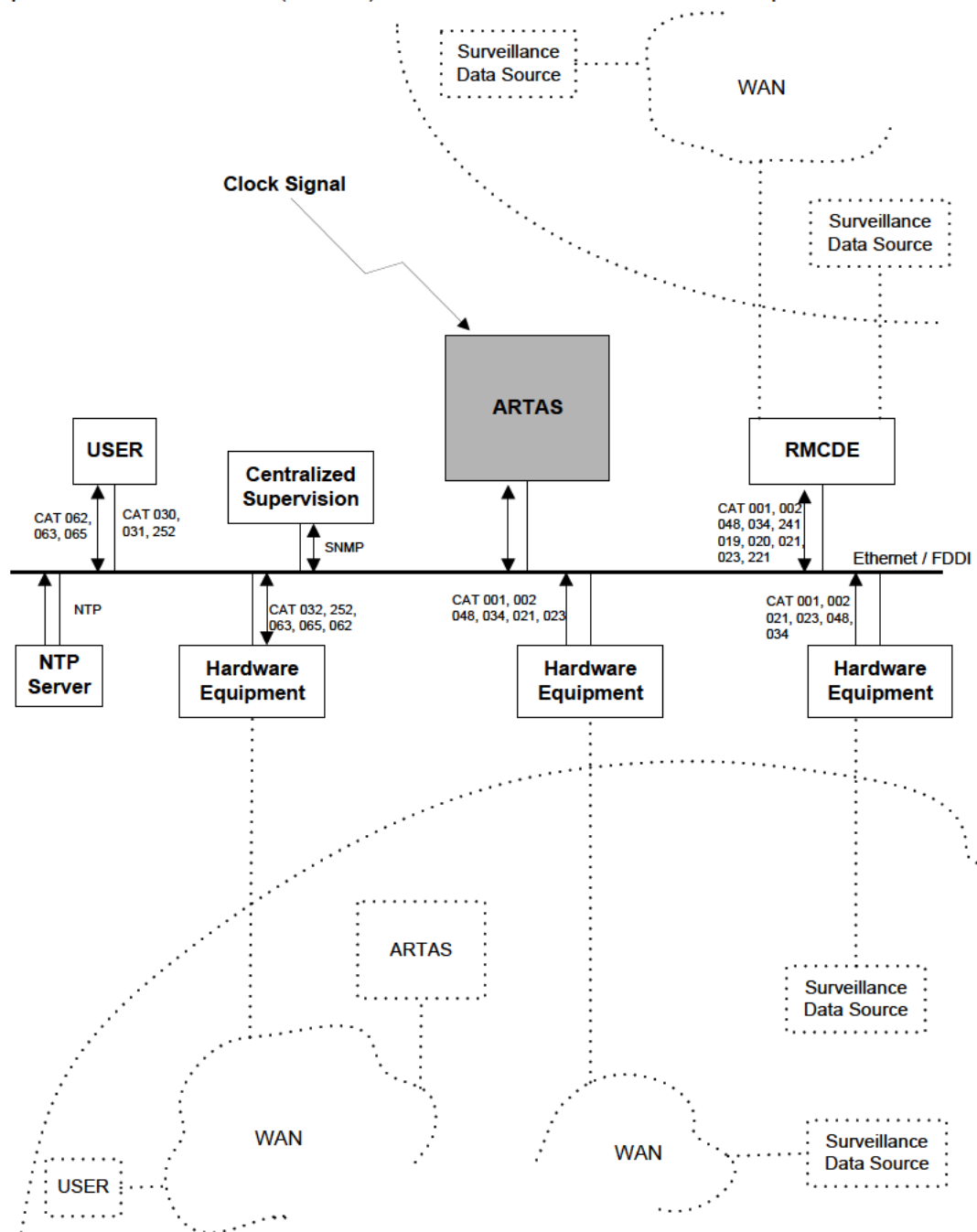


Figure 5 ARTAS Relation to Other Components

2.7 Service View

N/A.

3 SDPD Functional and non-Functional Requirements

3.1 Functions

3.1.1 ADS-B APT Application Capabilities

ARTAS was neither specified nor designed to perform surface (airport ground) movement tracking. ADS-B APT is an application which uses ADS-B as the sole surveillance means, so there is no issue related to the fusion of different airport surveillance sensor technologies, but it should be noted that even surface tracking by ARTAS using ADS-B only has not yet been proven to work.

[REQ]

Identifier	REQ-15.04.05.a-D10-0012.0001
Requirement	ARTAS shall increase an age when a track is not updated in position by any sensor technology to mean that the position data is stale and therefore could be unreliable.
Title	SURVEILLANCE UPDATE TIME-OUT
Status	<In Progress>
Rationale	ED-163 Ground Domain Requirement
Category	<Functional>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0012.0001	<Full>

[REQ]

Identifier	REQ-15.04.05.a-D10-0012.0002
Requirement	For all mobiles on the Manoeuvring Area, ARTAS shall be capable of receiving and processing the following surveillance parameters: <ul style="list-style-type: none"> • Emitter Category • Geometric Altitude • Velocity Vector (heading/track and ground speed) • Mobile Size (length/width codes) • GPS antenna offset information
Title	SURVEILLANCE PARAMETER FORWARDING
Status	<In Progress>
Rationale	ED-163 Ground Domain Requirement
Category	<Functional>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0012.0002	<Partial>

3.2 Adaptability

3.2.1 Network Load Monitoring

[REQ]

Identifier	REQ-15.04.05.a-D10-0000.0030
Requirement	ARTAS shall have the capability to monitor the load of the network.
Title	ARTAS NETWORK LOAD CALCULATION
Status	<In Progress>
Rationale	Potential performance improvement
Category	<Performance>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0000.0030	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D10-0000.0032
Requirement	ARTAS shall have the capability to detect the overload of the network.
Title	ARTAS NETWORK OVERLOAD CALCULATION
Status	<In Progress>
Rationale	Potential performance improvement
Category	<Performance>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0000.0032	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D10-0000.0034
Requirement	ARTAS shall have the capability to automatically reduce the load of the network in case of a detected overload, switching to the next level down of degraded data mode..
Title	ARTAS AUTOMATIC SWITCH-OVER STATUS TO DEGRADED MODE
Status	<In Progress>
Rationale	Potential performance improvement
Category	<Performance>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0000.0034	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D10-0000.0036
Requirement	ARTAS shall have the capability to automatically switch back to the next level up of degraded mode or to the normal mode related to the load of the network in the case the detected network load has improved and passed a threshold over a configurable period of time.
Title	ARTAS AUTOMATIC SWITCH-OVER STATUS TO NORMAL MODE
Status	<In Progress>
Rationale	Potential performance improvement
Category	<Performance>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0000.0036	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D10-0000.0038
Requirement	ARTAS shall have degraded data mode that could imply: <ul style="list-style-type: none"> • omission of optional items (several subsets could be configured); • reduced data update rate; • geographical filtering
Title	ARTAS DEGRADED DATA MODE ACTIONS
Status	<In Progress>
Rationale	Potential performance improvement
Category	<Performance>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0000.0038	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D10-0000.0040
Requirement	ARTAS shall have a configurable adaptation strategy (including parameters and switching decisions).
Title	ARTAS CONFIGURABLE ADAPTATION STRATEGY
Status	<In Progress>
Rationale	Potential performance improvement
Category	<Performance>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0000.0040	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D10-0000.0042
Requirement	ARTAS shall have means to indicate to external users the currently used mode level (normal, or level of degradation).
Title	ARTAS BANDWIDTH MODE STATUS SIGNAL
Status	<In Progress>
Rationale	Potential performance improvement
Category	<Performance>
Validation Method	<Real Time Simulation>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0000.0042	<Partial>

3.3 Performance Characteristics

3.3.1 Inconsistency of Emergency Code

[REQ]

Identifier	REQ-15.04.05.a-D06-0010.0010
Requirement	The probability that the “ADS-B to Radar Association” function detects an inconsistency between an ADS-B and radar-reported emergency code, and provides an indication of such to the existing ATC Processing System shall be at least 99%.
Title	INCONSISTENT EMERGENCY CODE
Status	<In Progress>
Rationale	ED-161 Compliance
Category	<Safety>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0020-0010	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D06-0020-0011
Requirement	ARTAS shall detect a Mode A or aircraft identification inconsistency between any sensor technology and its system track and provide an indication to the existing ATC Processing System with a probability of least 99%.
Title	A/C IDENTIFICATION INCONSISTENCY DETECTION
Status	<In Progress>
Rationale	ED-161 Ground Domain Requirement
Category	<Safety>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0020.0011	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D06-0020.0013
Requirement	The probability that ARTAS detects duplicate Aircraft Identities (i.e., discrete Mode A or aircraft identification) within the same sector, and provides an indication of such to the existing ATC Processing System shall be at least 99%.
Title	DUPLICATE A/C IDENTITY DETECTION
Status	<In Progress>
Rationale	ED-161 Ground Domain Requirement
Category	<Safety>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0020.0013	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D06-0020.0020
Requirement	For a defined polygon, to support 5NM separation minima in En-Route, if no position accuracy quality indicator (NACp) is received for a period of 24 seconds, ARTAS shall apply a position accuracy requirement for subsequent position messages without NACp using a NIC encoding that corresponds to 926 metres as a substitute for the NACp requirement until the next NACp arrives.
Title	NACp RECEPTION TIME-OUT EN-ROUTE
Status	<In Progress>
Rationale	ED-161 Ground Domain Requirement
Category	<Safety>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0020.0020	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D06-0020.0024
Requirement	For a defined polygon, to support 3, 2.5, 2NM separation minima in TMA, if no position accuracy quality indicator (NACp) is received for a period of 15 seconds, ARTAS shall apply a position accuracy requirement for subsequent position messages without NACp using a NIC encoding that corresponds to 513 metres as a substitute for the NACp requirement until the next NACp arrives.
Title	NACp RECEPTION TIME-OUT TMA
Status	<In Progress>
Rationale	ED-161 Ground Domain Requirement
Category	<Safety>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0020.0024	<Partial>

3.4 Safety & Security

3.4.1 WAM Integration Requirements

[REQ]

Identifier	REQ-15.04.05.a-D06-0030.0010
Requirement	ARTAS shall perform tracker processing taking into consideration the WAM validation result of the ADS-B report.
Title	WAM VALIDATION RESULT PROCESSING
Status	<In Progress>
Rationale	ADS-B/WAM Shared infrastructure opportunity
Category	<Functional>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0030-0009	<Partial>

REQ]

Identifier	REQ-15.04.05.a-D10-0030.0010			
Requirement	Building on the processing already considered in Iteration 1 (D06-0030.0010), ARTAS shall perform tracker processing taking into consideration the WAM (WAI) validation result of the ADS-B report.			
	Position Test Result	Velocity Test Result	Altitude Test Result	Mode S Test Result
	Consistent	Consistent	Consistent	Consistent
	Not performed	Not performed	Not performed	Not performed
	Consistent	Consistent	Consistent	Suspicious
	All other possible combinations			01
	Note: ARTAS takes into account the four different validation results:			
	<ul style="list-style-type: none"> 00 the report is VALID 01 the report is NOT VALID 10 the report is NOT VALIDATED 11 the report is VALID EXCLUDING MODE S DATA" (result of validation, which does not include all checks –Mode S data are not available and therefore not used/checked) 			
Title	WAM VALIDATION RESULT PROCESSING			
Status	<In Progress>			
Rationale	ADS-B/WAM Shared infrastructure opportunity			
Category	<Security>			
Validation Method	<Live Trial>			
Verification Method	<Test>			

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0030.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0030.0009	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0030.0013	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D06-0030.0015
Requirement	ARTAS shall identify and report potential spoofing when the WAM validation result is not positive and the ADS-B reports cannot be associated with an existing track.
Title	WAM VALIDATION RESULT SPOOFING
Status	<In Progress>
Rationale	Security Requirement
Category	<Security>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0030-0009	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0030.0005	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0030.0009	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0030.0013	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D06-0030.0020
Requirement	ARTAS shall encode and serve per track the WAM validation result in the WAI bits of ASTERIX Cat062.
Title	WAM VALIDATION RESULT REPORTING
Status	<In Progress>
Rationale	ADS-B/WAM Shared infrastructure opportunity
Category	<Interface>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0030-0010	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0030.0006	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0030.0010	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0030.0014	<Partial>

3.4.2 ToA Versus Distance Requirements

[REQ]

Identifier	REQ-15.04.05.a-D06-0040.0010
Requirement	ARTAS shall perform tracker processing taking into consideration the ToA/Distance consistency result of the ADS-B report.
Title	ToA/DISTANCE CONSISTENCY CHECK PROCESSING
Status	<In Progress>
Rationale	Security Requirement
Category	<Security>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040-0034	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D06-0040.0015
Requirement	ARTAS shall identify and report potential spoofing tracks when TOA/Distance consistency check is not positive and the ADS-B reports cannot be associated with an existing track.
Title	ToA/DISTANCE CONSISTENCY CHECK SPOOFING
Status	<In Progress>
Rationale	Security Requirement
Category	<Security>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040-0034	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D06-0040.0020
Requirement	ARTAS shall encode and serve per track the ToA/Distance consistency check result in the ToA bits of ASTERIX Cat062.
Title	ToA/DISTANCE CONSISTENCY CHECK REPORTING
Status	<In Progress>
Rationale	Security Requirement
Category	<Interface>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040-0035	<Partial>

3.4.3 Power versus Range Requirements

[REQ]

Identifier	REQ-15.04.05.a-D06-0050.0010
Requirement	ARTAS shall perform tracker processing taking into consideration the Power/Range validation result of the ADS-B report.
Title	POWER/RANGE VALIDATION PROCESSING
Status	<In Progress>
Rationale	Security Requirement
Category	<Security>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040-0048	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D06-0050.0015
Requirement	ARTAS shall identify and report potential spoofing when the Power/Range validation result is not positive and the ADS-B reports cannot be associated with an existing track.
Title	POWER/RANGE POTENTIAL SPOOFING
Status	<In Progress>
Rationale	Security Requirement
Category	<Security>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040-0048	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D06-0050.0020
Requirement	ARTAS shall encode and serve per track the Power/Range validation result in the PRV bits of ASTERIX Cat062.
Title	POWER/RANGE VALIDATION RESULT FORWARDING
Status	<In Progress>
Rationale	Security Requirement
Category	<Interface>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040-0049	<Partial>

3.4.4 Angle of Arrival Requirements

[REQ]

Identifier	REQ-15.04.05.a-D06-0060.0010
Requirement	ARTAS shall perform tracker processing taking into consideration the Angle of Arrival validation result of the ADS-B report.
Title	ANGLE OF ARRIVAL VALIDATION PROCESSING
Status	<In Progress>
Rationale	Security Requirement
Category	<Security>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040-0008	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D06-0060.0015
Requirement	ARTAS shall identify and report potential spoofing when the Angle of Arrival validation result is not positive and the ADS-B reports cannot be associated with an existing track.
Title	ANGLE OF ARRIVAL POTENTIAL SPOOFING
Status	<In Progress>
Rationale	Security Requirement
Category	<Security>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040-0008	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D06-0060.0020
Requirement	ARTAS shall encode and serve per track the Angle of Arrival validation result in the AoA bits of ASTERIX Cat062.
Title	ANGLE OF ARRIVAL VALIDATION RESULT FORWARDING
Status	<In Progress>
Rationale	Security Requirement
Category	<Interface>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040-0009	<Partial>

3.4.5 Track Consistency Check

[REQ]

Identifier	REQ-15.04.05.a-D06-0070.0010
Requirement	ARTAS shall perform tracker processing taking into consideration the "Position vs Velocity" check result of the ADS-B report.
Title	VELOCITY VERSUS POSITION PROCESSING
Status	<In Progress>
Rationale	Security Requirement
Category	<Security>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0050	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D06-0070.0015
Requirement	ARTAS shall identify and report potential spoofing tracks when "Position vs Velocity" check is not positive and the ADS-B reports cannot be associated with an existing track.
Title	VELOCITY VERSUS POSITION SPOOFING
Status	<In Progress>
Rationale	Security Requirement
Category	<Security>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0050	

[REQ]

Identifier	REQ-15.04.05.a-D06-0070.0020
Requirement	ARTAS shall encode and serve per track the "Position vs Velocity" check result in the relevant item of ASTERIX.
Title	VELOCITY VERSUS POSITION VALIDATION RESULT FORWARDING
Status	<In Progress>
Rationale	Security Requirement
Category	<Security>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040.0050	<Partial>

3.4.6 ADS-B Only Track Requirements

[REQ]

Identifier	REQ-15.04.05.a-D06-0010.0015
Requirement	In a RAD environment, ARTAS shall identify and report as potential spoofing, an ADS-B only track whose system track is not updated by other overlapping surveillance technologies
Title	ADS-B ONLY TRACK SPOOFING
Status	<In Progress>
Rationale	Security Requirement
Category	<Security>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040-0015	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D06-0010.0020
Requirement	In a RAD environment, ARTAS shall encode and serve as potential spoofing, in the MSV bits of ASTERIX Cat62, an ADS-B only track whose system track is not updated by other overlapping surveillance technologies.
Title	ADS-B ONLY TRACK FORWARDING
Status	<In Progress>
Rationale	Security Requirement
Category	<Interface>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0040-0015	<Partial>

3.4.7 Behavioural Analysis of Target Requirements

[REQ]

Identifier	REQ-15.04.05.a-D10-0045.0060
Requirement	Superseding REQ-15.04.05.a-D06-0070.0010 of Iteration 1, ARTAS shall perform tracker processing taking into consideration the Behaviour Analysis (BAR) validation result extracted from the message of the ADS-B report.
Title	BEHAVIOUR ANALYSIS PROCESSING
Status	<In Progress>
Rationale	Security Requirement

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Category	<Security>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0040.0088	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D10-0045.0065
Requirement	Superseding REQ-15.04.05.a-D06-0070.0015 of Iteration 1, ARTAS shall identify and report potential spoofing when the Behaviour Analysis (BAR) validation result is not positive.
Title	BEHAVIOUR ANALYSIS SPOOFING
Status	<In Progress>
Rationale	Security Requirement
Category	<Security>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0040.0088	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D10-0045.0070
Requirement	Superseding REQ-15.04.05.a-D06-0070.0020 of Iteration 1, ARTAS shall encode and serve per track the Behaviour Analysis validation result in the BAR bits of ASTERIX Cat062.
Title	BEHAVIOUR ANALYSIS FORWARDING
Status	<In Progress>
Rationale	Security Requirement
Category	<Security>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0040.0090	<Partial>

3.4.8 Application of TDoA Technique

[REQ]

Identifier	REQ-15.04.05.a-D10-0045.0030
Requirement	ARTAS shall perform tracker processing taking into consideration the TDoA validation result versus the position information extracted from the position message of the ADS-B report.
Title	TDOA TECHNIQUE PROCESSING
Status	<In Progress>
Rationale	TDOA Techniques
Category	<Security>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0040.0046	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D10-0045.0035
Requirement	ARTAS shall identify and report potential spoofing when the TDoA validation result is not positive.
Title	TDOA TECHNIQUE SPOOFING
Status	<In Progress>
Rationale	TDOA Techniques
Category	<Security>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0040.0046	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D10-0045.0040
Requirement	ARTAS shall encode and serve per track the TDoA validation result in the TDoA bits of ASTERIX Cat062.
Title	TDOA TECHNIQUE FORWARDING
Status	<In Progress>
Rationale	TDOA Techniques
Category	<Interface>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0040.0048	<Partial>

3.4.9 Range Measurement from Active Interrogation

[REQ]

Identifier	REQ-15.04.05.a-D14-0040.0007
Requirement	ARTAS shall perform tracker processing taking into consideration the RTD validation result extracted from the message of the ADS-B report.
Title	RTD PROCESSING
Status	<In Progress>
Rationale	Proposed Security Enhancement
Category	<Security>

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Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D20-0040.0008	<Partial>
<SATISFIES>	<ATMS Requirement>		<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D14-0040.0008
Requirement	ARTAS shall identify and report potential spoofing when the RTD validation result is not positive.
Title	RTD SPOOFING
Status	<In Progress>
Rationale	Proposed Security Enhancement
Category	<Security>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D20-0040.0008	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D14-0040.0009
Requirement	ARTAS shall encode and serve per track the RTD validation result in the RTD bits of ASTERIX Cat062.
Title	RTD FORWARDING
Status	<In Progress>
Rationale	Proposed Security Enhancement
Category	<Security>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D20-0040.0009	<Partial>

3.5 Maintainability

N/A

3.6 Reliability

3.6.1 System Integrity

Given the plan is for the SDPD to operate Gate-to-Gate i.e. En-Route, Approach and, eventually, Airport applications, if the strictest of the two D19 system requirements is assigned to the SDPD then, as a consequence, the SDPD will satisfy the less strict requirement.

[REQ]

Identifier	REQ-15.04.05.a-D06-0010.0005
Requirement	The probability of an ARTAS integrity failure shall be 1E-05 or less per hour.
Title	SYSTEM INTEGRITY
Status	<In Progress>
Rationale	ED-161 Ground Domain Requirement
Category	<Reliability>
Validation Method	<Analytical Modelling>
Verification Method	<Analysis>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0020-0001	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0022.0005	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D10-0022.0006
Requirement	The probability of an ARTAS continuity failure shall be 5.00E-04 or less per hour.
Title	CONTINUITY FAILURE
Status	<In Progress>
Rationale	ED-163 Ground Domain Requirement
Category	<Reliability>
Validation Method	<Analytical Modelling>
Verification Method	<Analysis>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D19-0022.0006	<Partial>

3.7 SDPD (ARTAS) Internal Data Requirements

N/A

3.8 Design and Construction Constraints

N/A

3.9 SDPD (ARTAS) Interface Requirements

3.9.1 ASTERIX Category 021

[REQ]

Identifier	REQ-15.04.05.a-D06-0020.0010
Requirement	In additional to ASTERIX Category 021 Edition 0.23, ARTAS shall decode all relevant items of the newest applicable ASTERIX Category 021 Edition 2.0, process the information and serve all derived data.
Title	ASTERIX MESSAGES PROCESSING
Status	<In Progress>
Rationale	DO-260B Compliance
Category	<Interface>
Validation Method	<Live Trial>
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D18-0060-0064	<Partial>

3.10 Other Enhancements

3.10.1 Use of Flight Plan to indicate the approval of aircraft for ADS-B operations

[REQ]

Identifier	REQ-15.04.05.a-D14-0000.0001
Requirement	ARTAS shall decode Flight plan information of ADS-B aircraft equipage and approval reference based on ASTERIX Category 032.
Title	DECODING OF INFORMATION FOR ADS-B APPROVED AIRCRAFT
Status	<In Progress>
Rationale	Indication of ADS-B approval status
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D20-0000.0001	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D20-0000.0002	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D14-0000.0003
Requirement	ARTAS shall decode Flight plan information of ADS-B aircraft equipage and approval reference based on ASTERIX Category 032.
Title	PROCESSING OF INFORMATION FOR ADS-B APPROVED AIRCRAFT
Status	<In Progress>
Rationale	Indication of ADS-B approval status
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D20-0000.0003	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D20-0000.0004	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D20-0000.0005	<Partial>

[REQ]

Identifier	REQ-15.04.05.a-D14-0000.0006
Requirement	ARTAS shall provide information for the approved aircraft to its Users.
Title	PROVISION OF INFORMATION FOR ADS-B APPROVED AIRCRAFT
Status	<In Progress>
Rationale	Indication of ADS-B approval status
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-15.04.05.a-D20-0000.0006	<Partial>

4 Assumptions

There is a lack of rigorous surface movement operational requirements, which might mean that the technical requirements are not adequate.

5 References

- [1] SJU 15.04.05a ADS-B Surveillance System Specifications for first Iteration, D18, Ed. 00.01.00, 2010
- [2] RTCA DO-242A: Minimum Aviation System Performance Standards for ADS-B, June 2002
- [3] EUROCAE/RTCA MOPS for SSR Mode S Transponders, ED-73B/DO-181C, Oct. 2002
- [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 CAT021, Ed 1.8, Jan 2011
- [11] EUROCONTROL ASTERIX Standards CAT023, Ed 1.2, March 2009
- [12] EUROCONTROL ASTERIX Standards CAT247, Ed.1.2, Feb 2008
- [13] SESAR Requirements and V&V Guidelines, Latest Version
- [14] SESAR Toolbox User Manual, Latest Version
- [15] SJU 15.04.05.a , Interface Specifications for Iteration 1, D07
- [16] EUROCONTROL, 1090 MHz RAD FRUIT Study, V1.0, July 2010
- [17] EUROCONTROL ASTERIX Standards CAT062, Ed 1.10 December 2009
- [18] ARTAS System/Segment Specification, ARTAS-SSS-V8B¹, V1.00
- [19] SJU 15.04.05a ADS-B Surveillance System Specifications for second Iteration, D19, Ed. 00.01.00, 2010
- [20] SJU 15.04.05a ADS-B Ground Surveillance Specifications for Third Iteration, D20, Ed. 00.00.02, 2012
- [21] EUROCONTROL ASTERIX Specification CAT 032, ARTAS V8B1, Edition 1.0, February 2011

5.1 Use of copyright / patent material /classified material

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

5.1.1 Classified Material

N/A.

¹ The D18 baseline refers to ARTAS V8A, which was the applicable system at that time of writing. However, as ARTAS is evolving, the applicable system of D19 and D20 is now the ARTAS V8B, whose main enhancement was not additional functionality but the replacement of the middleware to enable an ARTAS chain to run on 1 (one) hardware instead of 5 (five).

founding members

Appendix A Traceability

Table A-1: New ARTAS Users Requirements of Iteration 1

System ID	System Requirement	SDPD ID	SDPD Requirement	Notes
REQ-15.04.05.a-D18-0020-0001	The likelihood of an ADS-B Ground Domain system integrity failure shall be 2E-05 or less per hour.	REQ-15.04.05.a-D06-0010.0005	The probability of an ARTAS integrity failure shall be 1E-05 or less per hour.	An assumption is made that 1E-05 is allocated to the SDPD. The ARTAS "Safety Assessment Report" states more stringent requirements of 1E-06 for two undetected hazards. Based on this, the report concluded that ARTAS must be compliant to SWAL3 safety level.
REQ-15.04.05.a-D18-0020-0010	The probability that the "ADS-B to Radar Association" function detects an inconsistency between an ADS-B and radar-reported emergency code, and provides an indication of such to the existing ATC Processing System shall be at least 99%.	REQ-15.04.05.a-D06-0010.0010	The probability that the "ADS-B to Radar Association" function detects an inconsistency between an ADS-B and radar-reported emergency code, and provides an indication of such to the existing ATC Processing System shall be at least 99%.	ARTAS-SSS-T-BMST-1152: ARTAS shall process emergency indication, SPI indication and Mode A codes provided by ADS-B reports.
REQ-15.04.05.a-D18-0030-0009	If REQ-15.04.05.a-D18-0030-0008 is implemented, the validation result (positive/negative) should be used by the SDPD to determine if the ADS-B report shall be used.	REQ-15.04.05.a-D06-0030.0010	ARTAS shall perform tracker processing taking into consideration the WAM validation result of the ADS-B report.	<u>Note:</u> The ARTAS behaviour takes into account the three different test results (VALID, NOT_VALID, NOT_VALIDATED).
		REQ-15.04.05.a-D06-0030.0015	ARTAS shall identify and report potential spoofing when the WAM validation result is not positive and the ADS-B reports cannot be associated with an existing track.	

System ID	System Requirement	SDPD ID	SDPD Requirement	Notes
REQ-15.04.05.a-D18-0030-0010	If REQ-15.04.05.a-D18-0030-0009 is implemented, the validation result (positive/negative) should be reported to the end user of the surveillance data	REQ-15.04.05.a-D06-0030.0020	ARTAS shall encode and serve per track the WAM validation result in the WAI bits of ASTERIX Cat062.	Store and forward the validation result.
REQ-15.04.05.a-D18-0040-0008	If REQ-15.04.05.a-D18-0040-0007 is implemented, the angle of arrival validation result (positive/negative) should be used by the SDPD to determine if the ADS-B report shall be used.	REQ-15.04.05.a-D06-0060.0010	ARTAS shall perform tracker processing taking into consideration the Angle of Arrival validation result of the ADS-B report.	<u>Note:</u> The ARTAS behaviour takes into account the three different test results (VALID, NOT VALID, NOT_VALIDATED).
		REQ-15.04.05.a-D06-0060.0015	ARTAS shall identify and report potential spoofing when the Angle of Arrival validation result is not positive and the ADS-B reports cannot be associated with an existing track.	
REQ-15.04.05.a-D18-0040-0009	If REQ-15.04.05.a-D18-0040-0008 is implemented, the angle of arrival validation result (positive/negative) should be reported to the end user of the surveillance data	REQ-15.04.05.a-D06-0060.0020	ARTAS shall encode and serve per track the Angle of Arrival validation result in the AoA bits of ASTERIX Cat062.	Store and forward the angle of arrival validation result.
REQ-15.04.05.a-D18-0040-0048	If REQ-15.04.05.a-D18-0040-0047 is implemented, the power/range validation result (positive/negative) should be used by the SDPD to determine if the ADS-B report shall be used.	REQ-15.04.05.a-D06-0050.0010	ARTAS shall perform tracker processing taking into consideration the Power/Range validation result of the ADS-B report.	<u>Note:</u> The ARTAS behaviour takes into account the three different test results (VALID, NOT VALID, NOT_VALIDATED).
		REQ-15.04.05.a-D06-0050.0015	ARTAS shall identify and report potential spoofing when the Power/Range validation result is not positive and the ADS-B reports cannot be associated with an existing track.	

System ID	System Requirement	SDPD ID	SDPD Requirement	Notes
REQ-15.04.05.a-D18-0040-0049	If REQ-15.04.05.a-D18-0040-0048 is implemented, the power/range validation result (positive/negative) should be reported to the end user of the surveillance data.	REQ-15.04.05.a-D06-0050.0020	ARTAS shall encode and serve per track the Power/Range validation result in the PRV bits of ASTERIX Cat062.	Store and forward the Power / Range Validation result.
REQ-15.04.05.a-D18-0040-0015	In a multi-sensor environment, in addition to the above functionality, another mitigation means for spoofing could be implemented i.e. the validity check of the ADS-B message to detect incompatible positions w.r.t. the Independent Surveillance sensors, such as SSR Mode-S and/or WAM or the system track.	REQ-15.04.05.a-D06-0010.0015	In a RAD environment, ARTAS shall identify and report as potential spoofing, an ADS-B only track whose system track is not updated by other overlapping surveillance technologies	A possible SDPD mitigation could be to flag as suspicious in Cat062 ADS-B only tracks in a RAD environment i.e. when a track is expected to be seen by overlapping radar and hence an ADS-B only track could indicate spoofing.
		REQ-15.04.05.a-D06-0010.0020	In a RAD environment, ARTAS shall encode and serve as potential spoofing, in the MSV bits of ASTERIX Cat62, an ADS-B only track whose system track is not updated by other overlapping surveillance technologies.	
REQ-15.04.05.a-D18-0040-0034	The TOA/distance consistency check result (positive/negative) should be used by the SDPD to determine if the ADS-B report shall be used.	REQ-15.04.05.a-D06-0040.0010	ARTAS shall perform tracker processing taking into consideration the ToA/Distance consistency result of the ADS-B report.	<u>Note:</u> The ARTAS behaviour takes into account the three different test results (VALID, NOT_VALID, NOT_VALIDATED).
		REQ-15.04.05.a-D06-0040.0015	ARTAS shall identify and report potential spoofing tracks when TOA/Distance consistency check is not positive and the ADS-B reports cannot be associated with an existing track.	

System ID	System Requirement	SDPD ID	SDPD Requirement	Notes
REQ-15.04.05.a-D18-0040-0035	If REQ-15.04.05.a-D18-0040.0034 is implemented, the TOA/distance consistency check result (positive/negative) should be reported to the end user of the surveillance data	REQ-15.04.05.a-D06-0040.0020	ARTAS shall encode and serve per track the ToA/Distance consistency check result in the ToA bits of ASTERIX Cat062.	Store and forward the TOA/Distance consistency check.
REQ-15.04.05.a-D18-0040.0050	The ADS-B Ground Surveillance Domain should validate ADS-B report consistency by evaluating the ADS-B received target velocity against the ADS-B received target position change.	REQ-15.04.05.a-D06-0070.0010	ARTAS shall perform tracker processing taking into consideration the "Position vs Velocity" check result of the ADS-B report.	<u>Superseded in Iteration 2 by the Behaviour Analysis function REQ-15.04.05.a-D19-0040.0088.</u> Note: The ARTAS behaviour takes into account the three different test results (VALID, NOT_VALID, NOT_VALIDATED).
		REQ-15.04.05.a-D06-0070.0015	ARTAS shall identify and report potential spoofing tracks when "Position vs Velocity" check is not positive and the ADS-B reports cannot be associated with an existing track.	
		REQ-15.04.05.a-D06-0070.0020	ARTAS shall encode and serve per track the "Position vs Velocity" check result in the relevant item of ASTERIX.	
REQ-15.04.05.a-D18-0060-0064	The ADS-B Ground Surveillance shall be able to output the DO-260B changes via Standard ASTERIX Category 21 data reports.	REQ-15.04.05.a-D06-0020.0010	In addition to ASTERIX Category 021 Edition 0.23, ARTAS shall decode all relevant items of the newest applicable ASTERIX Category 021 Edition 2.0, process the information and serve all derived data.	Decoding and processing.

System ID	System Requirement	SDPD ID	SDPD Requirement	Notes
REQ-15.04.05.a-D18-0020.0011	The probability that the "ADS-B to Radar Association" function detects an inconsistency between ADS-B and SSR aircraft identity data (i.e., Mode A or aircraft identification), and provides an indication of such to the existing ATC Processing System shall be at least 99%.	REQ-15.04.05.a-D06-0020-0011	ARTAS shall detect a Mode A or aircraft identification inconsistency between any sensor technology and its system track and provide an indication to the existing ATC Processing System with a probability of least 99%.	There is no time associated with when the Ground Domain should declare an inconsistency. A difference in Mode-A can occur for short periods between technologies during a deliberate change. Hence, SDPD is required to detect a sustained inconsistency between a sensor's reported Mode-A code and that of the track's Mode-A code.
REQ-15.04.05.a-D18-0020.0013	The probability that the ADS-B Ground Domain detects duplicate ADS-B Aircraft Identities (i.e., discrete Mode A or aircraft identification) within the same sector), and provides an indication of such to the existing ATC Processing System shall be at least 99%.	REQ-15.04.05.a-D06-0020.0013	The probability that ARTAS detects duplicate Aircraft Identities (i.e., discrete Mode A or aircraft identification) within the same sector, and provides an indication of such to the existing ATC Processing System shall be at least 99%.	There is no time associated with when the Ground Domain should declare an inconsistency. The User would be responsible for entering the non-discrete Mode-A codes, on which this test would not be applied. "... within the same sector..." indicates that there needs to be geographic filtering i.e. polygons. Possible CAT062 update.

System ID	System Requirement	SDPD ID	SDPD Requirement	Notes
REQ-15.04.05.a-D18-0020.0020	For En Route aircraft, if the position accuracy quality indicator (NACp) is not received within 24 seconds of a position message, then the ADS-B Ground Domain shall determine the position accuracy requirement has been met using a NIC encoding that corresponds to 926 meters (or less) as a substitute for the NACp requirement.	REQ-15.04.05.a-D06-0020.0020	For a defined polygon, to support 5NM separation minima in En-Route, if no position accuracy quality indicator (NACp) is received for a period of 24 seconds, ARTAS shall apply a position accuracy requirement for subsequent position messages without NACp using a NIC encoding that corresponds to 926 metres as a substitute for the NACp requirement until the next NACp arrives.	This En-route requirement prevents the last (perhaps too 'good') NACp continuing to be applied to new position messages that have no NACp indication and therefore imposes a default after a certain time-out period.
REQ-15.04.05.a-D18-0020.0024	For TMA, if the position accuracy quality indicator (NACp) is not received within 15 seconds of a position message, then the ADS-B Ground Domain shall determine the position accuracy requirement has been met using a NIC encoding that corresponds to 513 meters (or less) as a substitute for the NACp requirement.	REQ-15.04.05.a-D06-0020.0024	For a defined polygon, to support 3, 2.5, 2NM separation minima in TMA, if no position accuracy quality indicator (NACp) is received for a period of 15 seconds, ARTAS shall apply a position accuracy requirement for subsequent position messages without NACp using a NIC encoding that corresponds to 513 metres as a substitute for the NACp requirement until the next NACp arrives.	This TMA requirement prevents the last (perhaps too 'good') NACp continuing to be applied to new position messages that have no NACp indication and therefore imposes a default after a certain time-out period,

Table A-2: New ARTAS Users Requirements of Iteration 2

System ID	System Requirement	SDPD ID	SDPD Requirement	Notes
REQ-15.04.05.a-D19-0040.0088	The SDPD should be able to use the validation result.	REQ-15.04.05.a-D10-0045.0060	Superseding REQ-15.04.05.a-D06-0070.0010 of Iteration 1, ARTAS shall perform tracker processing taking into consideration the Behaviour Analysis (BAR) validation result extracted from the message of the ADS-B report.	Iteration 2 takes into account the BAR flag of Cat021 Ed2.0j which was the PVC flag of Cat021 Ed2.0h in Iteration 1
		REQ-15.04.05.a-D10-0045.0065	Superseding REQ-15.04.05.a-D06-0070.0015 of Iteration 1, ARTAS shall identify and report potential spoofing when the Behaviour Analysis (BAR) validation result is not positive.	
REQ-15.04.05.a-D19-0040.0090	The validation result should be reported to the end user of the surveillance data	REQ-15.04.05.a-D10-0045.0070	Superseding REQ-15.04.05.a-D06-0070.0020 of Iteration 1, ARTAS shall encode and serve per track the Behaviour Analysis validation result in the BAR bits of ASTERIX Cat062.	Iteration 2 takes into account the BAR flag of Cat021 Ed2.0j which was the PVC flag of Cat021 Ed2.0h in Iteration 1
REQ-15.04.05.a-D19-0022.0005	The likelihood of the Ground Domain system integrity failure shall be 1.00E-03 or less per hour.		Covered by REQ-15.04.05.a-D06-0010.0005	Given the plan is for the SDPD to operate Gate-to-Gate i.e. En-Route, Approach and, eventually, Airport applications, if the strictest of the two D19 system requirements is assigned to the SDPD then, as a consequence, the SDPD will satisfy the less strict requirement.
REQ-15.04.05.a-D19-0022.0006	The likelihood of the Ground Domain system continuity failure shall be 1.00E-03 or less per hour.	REQ-15.04.05.a-D10-0022.0006	The probability of an ARTAS continuity failure shall be 5.00E-04 or less per hour.	An assumption is made that 1E-05 is allocated to the SDPD. What is the definition and how much is apportioned to the SDPD?

System ID	System Requirement	SDPD ID	SDPD Requirement	Notes
REQ-15.04.05.a-D19-0012.0001	If the age of the position information is beyond a time limit, the Target shall be displayed with an indication (e.g. 'coasting' symbol) that the position data is stale and therefore could be unreliable.	REQ-15.04.05.a-D10-0012.0001	ARTAS shall increase an age when a track is not updated in position by any sensor technology to mean that the position data is stale and therefore could be unreliable.	ARTAS currently coasts on the basis of any updates (ARTAS-SSS-T-BMST-630) and so not necessarily position. Hence, logic needs to be added and a new sensor position update age e.g. Cat062 Item 290 bit 5 (2 octets to accommodate ADS-C technology).
REQ-15.04.05.a-D19-0012.0002	For all mobiles on the Manoeuvring Area, the Ground Domain should be capable of receiving and processing the following list of ADS-B surveillance parameters: <ul style="list-style-type: none"> · Emitter Category · Geometric Altitude · Velocity Vector (heading/track and ground speed) · Mobile Size (length/width codes) · GPS antenna offset information 	REQ-15.04.05.a-D10-0012.0002	For all mobiles on the Manoeuvring Area, ARTAS shall be capable of receiving and processing the following surveillance parameters: <ul style="list-style-type: none"> • Emitter Category • Geometric Altitude • Velocity Vector (heading/track and ground speed) • Mobile Size (length/width codes) • GPS antenna offset information 	ARTAS already processes Emitter Category, Geometric Altitude and Velocity Vector (ARTAS-SSS-S-EIRSS-372) so Mobile Size and GPS Antenna Offset need to be added.
REQ-15.04.05.a-D19-0030.0005	If REQ-15.04.05.a-D19-0030.0004 is implemented, the SDPD shall be able to use the validation result.	REQ-15.04.05.a-D10-0030.0010	Building on the processing already considered in Iteration 1 (D06-0030.0010), ARTAS shall perform tracker processing taking into consideration the WAM (WAI) validation result of the ADS-B report.	ARTAS takes into account the four different validation results of Cat021 Ed. 2.0j in Iteration 2.
			Covered by REQ-15.04.05.a-D06-0030.0015	

System ID	System Requirement	SDPD ID	SDPD Requirement	Notes
REQ-15.04.05.a-D19-0030.0006	If REQ-15.04.05.a-D19-0030.0005 is implemented, the validation result shall be reported to the end user of the surveillance data.		Covered by REQ-15.04.05.a-D06-0030.0020	Store & Forward
REQ-15.04.05.a-D19-0030.0009	If REQ-15.04.05.a-D19-0030.0008 is implemented, the SDPD shall be able to use the validation result in order to determine whether the ADS-B report shall be used		Covered by REQ-15.04.05.a-D10-0030.0010	ARTAS takes into account the four different validation results of Cat021 Ed. 2.0j in Iteration 2.
			Covered by REQ-15.04.05.a-D06-0030.0015	
REQ-15.04.05.a-D19-0030.0010	If REQ-15.04.05.a-D19-0030.0009 is implemented, the validation result shall be reported to the end user of the surveillance data.		Covered by REQ-15.04.05.a-D06-0030.0020	Store & Forward
REQ-15.04.05.a-D19-0030.0013	If REQ-15.04.05.a-D19-0030.0012 is implemented, the SDPD shall be able to use the validation result.		Covered by REQ-15.04.05.a-D10-0030.0010	ARTAS takes into account the four different validation results of Cat021 Ed. 2.0j in Iteration 2.
			Covered by REQ-15.04.05.a-D06-0030.0015	
REQ-15.04.05.a-D19-0030.0014	If REQ-15.04.05.a-D19-0030.0013 is implemented, the validation result shall be reported to the end user of the surveillance data.		Covered by REQ-15.04.05.a-D06-0030.0020	Store & Forward
REQ-15.04.05.a-D19-0040.0046	The SDPD shall be able to use the validation result.	REQ-15.04.05.a-D10-0045.0030	ARTAS shall perform tracker processing taking into consideration the TDoA validation result versus the position information extracted from the position message of the ADS-B report.	
		REQ-15.04.05.a-D10-0045.0035	ARTAS shall identify and report potential spoofing when the TDoA validation result is not positive.	

System ID	System Requirement	SDPD ID	SDPD Requirement	Notes
REQ-15.04.05.a-D19-0040.0048	The validation result shall be reported to the end user of the surveillance data	REQ-15.04.05.a-D10-0045.0040	ARTAS shall encode and serve per track the TDoA validation result in the TDoA bits of ASTERIX Cat062.	Store & Forward
REQ-15.04.05.a-D19-0000.0030	The ADS-B Ground Surveillance Domain should have the capability to monitor the load of the network.	REQ-15.04.05.a-D10-0000.0030	ARTAS shall have the capability to monitor the load of the network.	
REQ-15.04.05.a-D19-0000.0032	The ADS-B Ground Surveillance Domain should have the capability to detect the overload of the network.	REQ-15.04.05.a-D10-0000.0032	ARTAS shall have the capability to detect the overload of the network.	
REQ-15.04.05.a-D19-0000.0034	The ADS-B Ground Surveillance Domain should have the capability to automatically reduce the load of the network in case of a detected overload, switching to the next level down of degraded data mode.	REQ-15.04.05.a-D10-0000.0034	ARTAS shall have the capability to automatically reduce the load of the network in case of a detected overload, switching to the next level down of degraded data mode.	We assume this refers to the data that ARTAS sends out on the network.
REQ-15.04.05.a-D19-0000.0036	The ADS-B Ground Surveillance Domain should have the capability to automatically switch back to the next level up of degraded mode or to the normal mode related to the load of the network in the case the detected network load has improved and passed a threshold over a configurable period of time.	REQ-15.04.05.a-D10-0000.0036	ARTAS shall have the capability to automatically switch back to the next level up of degraded mode or to the normal mode related to the load of the network in the case the detected network load has improved and passed a threshold over a configurable period of time.	We assume this refers to the data that ARTAS sends out on the network.
REQ-15.04.05.a-D19-0000.0038	The ADS-B Ground Surveillance Domain should have degraded data mode that could imply: · omission of optional items (several subsets could be configured); · reduced data update rate; · geographical filtering	REQ-15.04.05.a-D10-0000.0038	ARTAS shall have degraded data mode that could imply: <ul style="list-style-type: none"> · omission of optional items (several subsets could be configured); · reduced data update rate; · geographical filtering 	We assume this refers to the data that ARTAS sends out on the network.

System ID	System Requirement	SDPD ID	SDPD Requirement	Notes
REQ-15.04.05.a-D19-0000.0040	The ADS-B Ground Surveillance Domain should have a configurable adaptation strategy (including parameters and switching decisions).	REQ-15.04.05.a-D10-0000.0040	ARTAS shall have a configurable adaptation strategy (including parameters and switching decisions).	
REQ-15.04.05.a-D19-0000.0042	The ADS-B Ground Surveillance Domain should have means to indicate to external users the currently used mode level (normal, or level of degradation).	REQ-15.04.05.a-D10-0000.0042	ARTAS shall have means to indicate to external users the currently used mode level (normal, or level of degradation).	

Table A-2: New ARTAS Users Requirements of Iteration 3

System ID	System Requirement	SDPD ID	SDPD Requirement	Notes
REQ-15.04.05.a-D18-0020.0008	The probability that the ADS-B Ground Domain detects a loss of ADS-B position, and provides an indication of such to the existing ATC Processing System shall be at least 99.99%.	REQ-15.04.05.a-D14-0040.0004	ARTAS shall detect a loss of ADS-B position and provide an indication of such to the existing ATCo with a probability of at least 99.99%.	
REQ-15.04.05.a-D20-0040.0008	If REQ-15.04.05.a-D20-0040.0007 is implemented, the SDPD shall be able to use the validation result	REQ-15.04.05.a-D14-0040.0007	ARTAS shall perform tracker processing taking into consideration the RTD validation result extracted from the message of the ADS-B report.	
		REQ-15.04.05.a-D14-0040.0008	ARTAS shall identify and report potential spoofing when the RTD validation result is not positive.	
REQ-15.04.05.a-D20-0040.0009	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	REQ-15.04.05.a-D14-0040.0009	ARTAS shall encode and serve per track the RTD validation result in the RTD bits of ASTERIX Cat062.	
REQ-15.04.05.a-D20-0000.0001	The ADS-B Ground Surveillance Domain shall be capable of receiving Flight plan information on ADS-B equipage and capabilities (Item 10b).	REQ-15.04.05.a-D14-0000.0001	ARTAS shall decode Flight plan information of ADS-B aircraft equipage and approval reference based on ASTERIX Category 032.	
REQ-15.04.05.a-D20-0000.0002	The ADS-B Ground Surveillance Domain shall be capable of receiving Flight plan information on ADS-B approval reference (Item 18).			

System ID	System Requirement	SDPD ID	SDPD Requirement	Notes
REQ-15.04.05.a-D20-0000.0003	The ADS-B Ground Surveillance Domain shall process the information on the ADS-B approval of aircraft in order to confirm approval status of aircraft.	REQ-15.04.05.a-D14-0000.0003	ARTAS shall only process information from approved ADS-B aircraft based on the received Flight plan information on their ADS-B equipage and capabilities (Item 10b) and approval reference (Item 18).	
REQ-15.04.05.a-D20-0000.0004	The ADS-B Ground Surveillance Domain shall discard ADS-B information from the aircraft which are non-approved for ADS-B operations.			
REQ-15.04.05.a-D20-0000.0005	The ADS-B Ground Surveillance Domain shall process information from the approved aircraft only.			
REQ-15.04.05.a-D20-0000.0006	The ADS-B Ground Surveillance Domain shall provide information for the approved aircraft to its Users.	REQ-15.04.05.a-D14-0000.0006	ARTAS shall provide information for the approved aircraft to its Users.	

Table A-3: Requirements Covered by the Baseline [18] – Iteration 1

System ID	System Requirements	SDPD Requirement
REQ-15.04.05.a-D18-0010.0003	When direct recognition procedures are used by the ATCO for identification, the ADS-B Ground Domain shall contain a function to ensure the aircraft identity data that is broadcast is retained and correctly associated with the position information for display, (OR 5§A.5.6.2.4, §A.7).	<p>ARTAS-SRS-TRK-ADD-SF-020: The Store and Forward capability shall store and forward the following list of DAPs : ...- Target Identification.</p> <p>ARTAS-SSS-T-BMST-1050: The value of each stored and forwarded Downlink Aircraft Parameter shall not be modified by ARTAS.</p> <p>ARTAS-SSS-S-EIRSU-471: ARTAS shall serve each available ASTERIX CAT062 item (ref. ARTAS-SSS-S-EIRSU-130) selected by the service definition in the ARTAS database.</p> <p>ARTAS-SSS-T-BMST-830: ARTAS shall store and forward all relevant DAPs received via ASTERIX category 048 (refer to ARTAS-SSS-S-EIRSS-210) and ASTERIX category 021 (refer to ARTAS-SSS-S-EIRSS-430).</p> <p>ARTAS-SRS-TRK-ADD-SF-090: For each DAP that is simply stored and forwarded, the Store and Forward capability shall no longer serve the DAP when the age exceeds a parameter threshold.</p> <p>ARTAS-SSS-T-RTA-ADD-020: The ADS-B report-to-track association shall be able to integrate different combinations of ADD items (i.e. partial measurement).</p>

System ID	System Requirements	SDPD Requirement
REQ-15.04.05.a-D18-0010.0006	The "Ground ADS-B Surveillance Processing" function shall time-register the asynchronously received ADS-B position updates from ADS-B-equipped aircraft (OPA-ASSUMP.07 §B.2.2).	<p>ARTAS-SSS-T-RIPP-290: ARTAS shall time-stamp every plot with reference to a universal time in order to assure data coherency between the different radars.</p> <p>ARTAS-SSS-S-EIRSS-372: ADS-B Messages are only processed if the following items are present: b. I021/071 Time of Applicability For Position or I021/073 Time of Message Reception For Position, but not both, in case position is present, c. I021/072 Time of Applicability For Velocity or I021/075 Time of Message Reception For Velocity, but not both, in case velocity is present</p> <p>ARTAS-SRS-RBR-FIPL-434 It is assumed that the Ground Station time-stamps the asynchronously received reports. ARTAS rejects any report no consistent with the UTC time of the HWCI accommodating this function.</p> <p>ARTAS-SRS-SRV-SC-EXTR-011: The server shall perform extrapolation on all tracks that are served for periodical and a_periodical synchronized services.</p>

System ID	System Requirements	SDPD Requirement
REQ-15.04.05.a-D18-0010.0007	<p>The “ADS-B to Radar Association” function shall enable the switching between ADS-B and radar surveillance sources (e.g., as a backup during a failure) without requiring the ATCO to perform a</p> <ul style="list-style-type: none"> • Re-verification of altitude data, (OR 12); and • Re-identification of aircraft identity, (OR 2, OR 13). 	<p>ED-161 states that :“The operation of ADS-B with multiple layers of radar surveillance, advanced multi-sensor processing or other forms of surveillance (such as Wide Area Multi-lateration) are beyond the scope of the analysis”. ARTAS is an advanced SDPD as described in Annex H.4 of the ED-161. The re-verification of altitude data and re-identification of aircraft identity by the ATCO are not needed as due to the design of a fusion tracker; the system track will continue to maintain the altitude (ARTAS-SSS-T-BMST-380) and aircraft identity (ARTAS-SSS-T-RTA-ADD-020) even if one of the overlapping surveillance technologies fails.</p>
REQ-15.04.05.a-D18-0020.0005	<p>The ADS-B Ground Domain shall not introduce any additional horizontal position error greater than that which might otherwise be introduced by a linear extrapolation using the instantaneous velocity for the target.</p> <p><i>Note: Linear extrapolation assumes uniform motion is continued along the latest velocity estimate to the time of synchronization. Consequently, additional errors will be introduced into the extrapolated position by uncertainties in the velocity estimate and aircraft accelerations that occur during the extrapolation period.</i></p>	<p>By design, in uniform motion, the ARTAS IMM-EKF-PDA algorithm (ARTAS-SRS-TRK-TRCONT-300) cannot introduce such horizontal position errors however, tests could be performed under pre-defined conditions to confirm this during the prototyping phase.</p>

System ID	System Requirements	SDPD Requirement
REQ-15.04.05.a-D18-0020.0006	The ADS-B Ground Domain (including data link) shall not degrade altitude resolution to worse than 100 feet.	ARTAS forwards in Cat062 the last valid Mode-C using a Z-state filter, which is received in either 100 or 25 ft resolution, see ARTAS-SSS-T-BMST-380: The Vertical Tracking shall, using the associated plot, assess and extrapolate the various system track vertical state vector elements (such as height, rate of climb/descent and respective accuracy). ...the benefit of 25-ft Mode-C resolution is realised by using 2 different parameter sets in the Kalman filter: one for 100-ft Mode-C resolution and one for 25-ft Mode-C resolution. Hence, the output resolution is according to the LSB of Cat062, meaning ARTAS cannot degrade the resolution.
REQ-15.04.05.a-D18-0020.0007	The ADS-B Ground Domain shall have capacity to handle the reports from the maximum load of aircraft in the environment as described in the OSED without degradation.	ARTAS-SSS-T-PERFO-090: The ARTAS tracker shall be capable of tracking up to 2000 system tracks and associated data simultaneously.

System ID	System Requirements	SDPD Requirement
REQ-15.04.05.a-D18-0020.0017	<p>The probability of providing a Surveillance Report containing newly received ADS-B Position data of sufficient quality associated with any aircraft in En Route airspace within 8 seconds shall be 97%.</p> <p><i>Notes:</i></p> <p>1. Additional requirements are subject to local implementation. Other considerations may apply (see OSA: §C.5.1.5 - "Loss of track information").</p> <p>2. Data continuity for a single aircraft is inherently encompassed by this requirement for position update, i.e. in terms of the number of consecutive misses of receiving a position update ultimately leading to a track drop. The required position update probability takes account of normal environmental factors that are experienced during this flight phase, such as coverage variations in received signals (including received satellite signals), that affect the production and receipt of ADS-B positions of sufficient quality on a single aircraft basis. Multiple aircraft data continuity is addressed in ASSUMP 24.</p>	<p>ARTAS-SRS-TRK-TRCONT-877: The track state shall be extrapolated to the reported time of position for report-to-track association (PNNA) and position updates (IMM-PDA-EKF) in case horizontal position information is available.</p> <p>ARTAS-SRS-TRK-TRCONT-878: The track state shall be extrapolated to the reported time of velocity for velocity updates (IMMPDA- EKF) in case velocity information is available.</p> <p>ARTAS-SSS-S-CAPA-340: The SERVER shall be able to execute a periodical transmission of Sensor Information with a period from 4 seconds up to 3600 seconds with a 1 second step.</p>

System ID	System Requirements	SDPD Requirement
REQ-15.04.05.a-D18-0020.0021	<p>The probability of providing a Surveillance Report containing newly received ADS-B Position data of sufficient quality associated with any aircraft in TMA airspace within 5 seconds shall be 97%.</p> <p><i>Notes:</i></p> <p>1. Additional requirements are subject to local implementation. Other considerations may apply (see OSA: C.5.1.5 - "Loss of track information").</p> <p>2. Data continuity for a single aircraft is inherently encompassed by the requirements for position update, i.e. in terms of the number of consecutive misses of receiving a position update ultimately leading to a track drop. The required position update probability takes account of normal environmental factors that are experienced during this flight phase, such as coverage variations in received signals (including received satellite signals), that affect the production and receipt of ADS-B positions of sufficient quality on a single aircraft basis. Multiple aircraft data continuity is addressed in ASSUMP 24.</p>	<p>The main responsibility for Pd is allocated to the ADS-B GSs, as without any Cat021 reports, ARTAS cannot initiate and maintain tracks. However, in pipeline mode, ARTAS can additionally use the velocity reports as well as the position reports to increase the system Pd.</p> <p>ARTAS-SSS-T-BMST-1720: The system shall use ADD information received from supported sensor technologies for track initiation and track continuation, if so instructed per parameter.</p> <p>ARTAS-SSS-S-CAPA-340: The SERVER shall be able to execute a periodical transmission of Sensor Information with a period from 4 seconds up to 3600 seconds with a 1 second step.</p>
REQ-15.04.05.a-D18-0040.0010	<p>In short, the "ADS-B to Radar Association" is an essential operational requirement to support the display in the mixed ADS-B and radar environment. This top-down operational requirement has been further substantiated by the safety assessment. As the function had already been identified for operational needs, it was also considered for its safety benefits in the OSA. Clearly, because the function inherently compares the positions and identities of different surveillance sources for the same aircraft, it also offers some useful safety benefits in a multi-sensor environment, in particular to detect inconsistencies between ADS-B and radar information. Hence, the "ADS-B to Radar Association" function is included in the barriers of the OSA event trees and provides useful gains towards achieving the safety targets.</p>	<p>ARTAS is compliant by its fusion tracker design.</p>

System ID	System Requirements	SDPD Requirement
REQ-15.04.05.a-D18-0040.0011	If an automation system does not currently have a bias compensation function, one should be implemented and must also be considered in determining requirements for ADS-B, as it is an additional error component (residual bias).	<p>ARTAS-SSS-T-MSEA-410: The tracker shall, in a multi-sensor environment providing that the conditions of observability are met, assess on-line the following systematic errors per radar (if relevant for that particular radar):</p> <ul style="list-style-type: none"> · azimuth bias, · range bias, · range gain, · time-stamping bias, · squint error, · radar verticality error, · elevation bias (in case of full 3D-radars). <p>ARTAS-SSS-T-MSEA-540: Provided that the conditions of observability are met, the ARTAS WAM tracker shall calculate the time stamping bias for each WAM system in a multi-sensor environment and periodically store it in the Dynamic Radar Database.</p> <p>ARTAS-SSS-T-EEA-ADD-080: The ARTAS ADD tracker shall, in a multi-sensor environment providing that the conditions of observability are met, assess on-line the following ADD systematic errors per track (if relevant for that particular track)</p> <ul style="list-style-type: none"> · X position bias (ADS-B and ADS-C only), · Y position bias (ADS-B and ADS-C only), · Ground speed bias, · Track angle bias, · Track angle rate bias, · Time stamping bias (ADS-B and ADS-C only).

System ID	System Requirements	SDPD Requirement
REQ-15.04.05.a-D18-0040.0012	It is assumed that the ATC processing system has a multisensory registration function to detect and compensate for systematic biases between radar and ADS-B.	<p>ARTAS-SSS-T-RIPP-060: Every plot shall be corrected taking into account the systematic radar errors present in the Dynamic Radar Data for the relevant radar.</p> <p>ARTAS-SSS-T-RIPP-072: Every WAM target report shall be corrected taking into account the current time stamping bias present in the Dynamic Radar Database for the relevant WAM system.</p> <p>ARTAS-SSS-T-EEA-ADD-020: ARTAS shall include the data received from Mode S radars and ADS-B ground stations in the calculation of the ADD systematic and stochastic errors.</p>

System ID	System Requirements	SDPD Requirement
REQ-15.04.05.a-D18-0040.0014	In addition to providing enhanced tracker accuracy, sensor fusion can provide a supplementary means of integrity monitoring for En Route airspace that enhances the position integrity available from radar and/or ADS-B measurement data. This is achieved by monitoring radar and ADS-B position measurements versus the best available aircraft position estimate, to discriminate against large position errors.	<p>ARTAS-SRS-TRK-TRCONT-914: All measured ADD components shall be checked against abnormal values taking into count the dynamic accuracies of the measurement and the track state and discarded if exceeding the configured confidence intervals.</p> <p>ARTAS-SRS-TRK-TRCONT-913: All ADD horizontal position components shall be checked against a static deviation from the system track position below which the measurement will be accepted in any case (i.e. ignoring the dynamic threshold).</p> <p>ARTAS-SRS-TRK-TRCONT-920 The Continue Tracks capability shall be capable of detecting situations in which consistent position information is systematically discarded because classified as blunder. In order to make this detection possible, the classified position blunders are stored with the track during a certain period.</p>

Table A-4: Requirements Covered by the Baseline [18] – Iteration 2

System ID	System Requirement	SDPD Requirement
REQ-15.04.05.a-D19-0012.0004	<p>For all Mobiles on the Manoeuvring Area, the Ground Domain shall be capable of receiving, processing and displaying to the controller the following list of ADSB surveillance parameters:</p> <ul style="list-style-type: none"> ┆ Horizontal Position ┆ Identity Information ┆ Pressure Altitude (for airborne aircraft) ┆ Discrete Emergency Code(s) (not required for vehicles) - as a minimum: <p>general emergency, communications failure, unlawful interference.</p>	<p>ARTAS-SSS-T-BMST-1152 ADS-B STATUS AND EMERGENCY CODE HANDLING ARTAS shall process emergency indication, SPI indication and Mode A codes provided by ADS-B reports.</p> <p>ARTAS-SSS-T-PERFO-ADD-030 ADD TRACKING PERFORMANCE REQUIREMENTS The ARTAS ADD tracker shall use all data present in the ADS-B report and Enhanced Mode S data to update a track.</p> <p>ARTAS-SSS-S-EIRSS-372 DATA AND MESSAGES TRANSFERRED, CAT 021 EDITION 1.2 The ADS-B messages received from ADS-B ground stations shall be either compliant with the User Application Profile as defined in [8] or compliant with the User Application Profile as defined in [35].</p> <ul style="list-style-type: none"> · Mode 3A Code · Position in WGS-84 Coordinates · High Resolution Position in WGS-84 Coordinates · Flight Level · Target Identification · Target Status <p>ARTAS-SSS-S-EIRSU-470 DATA AND MESSAGES TRANSFERRED For broadcast service including CAT 062, 063, 065, track information messages shall be composed of data items in the form of ASTERIX CAT 62.</p>

System ID	System Requirement	SDPD Requirement
REQ-15.04.05.a-D18-0020.0008	<p>The probability that the ADS-B Ground Domain detects a loss of ADS-B position, and provides an indication of such to the existing ATC Processing System shall be at least 99.99%.</p> <p><i>Notes:</i></p> <p>1. Alternatively, the requirement might be fulfilled by the existing ATC Processing System, i.e., beyond interface F2*.</p> <p>2. This requirement, taken together with ASSUMP 44, will ensure that the appropriate safety objectives are met.</p>	<p>The purpose of this requirement is to alert an Operator to switch to the overlapping radar service however this occurs automatically by a fusion tracker and so the requirement is satisfied.</p>
REQ-15.04.05.a-D18-0020.0012	<p>The probability that the “ADS-B to Radar Association” function detects an inconsistency between ADS-B and SSR aircraft pressure altitude data, and provides an indication of such to the existing ATC Processing System shall be at least 99%.</p> <p><i>Note: This requirement, taken together with ASSUMP 48 will ensure that the appropriate safety objectives are met.</i></p>	<p>ARTAS-SRS-TRK-TRCONT-935 “The Tracker shall indicate via a flag (ADF in I062/200) in the system track when a sequence, configured by a TRK offline parameter per technology, of barometric altitude blunders, not older than configured by a TRK offline parameter, is detected in at least one of the three barometric altitudes provided by the supported technologies (ADS, WAM or radar)”. Note that as a fusion tracker, ARTAS always compares the technology barometric altitude with the system track barometric altitude.</p> <p>Testing cannot demonstrate the Performance Requirement of 99%.</p>

System ID	System Requirement	SDPD Requirement
REQ-15.04.05.a-D18-0020.0016	The probability that the "ADS-B to Radar Association" function detects an error of more than 500 ft between ADS-B and SSR pressure altitudes shall be at least 99%.	ARTAS-SRS-TRK-TRCONT-915 "If enabled by a TRK offline parameter, the TRACKER shall discard any barometric or geometric height measurement from ADD as altitude blunder when the deviation to the corresponding system track altitude is greater than a static TRK offline parameter (i.e. ignoring the dynamic threshold)." ARTAS-SRS-TRK-TRCONT-916 "If enabled by a TRK offline parameter, the TRACKER shall accept any barometric or geometric height measurement from ADD when the deviation to the corresponding system track altitude is less than a static TRK offline parameter (i.e. ignoring the dynamic threshold)." The indication would be covered by REQ-15.04.05.a-D18-0020.0012. Testing cannot demonstrate the Performance Requirement of 99%.
REQ-15.04.05.a-D18-0040.0013	It is recommended the ATC processing system performs a multi-sensor registration function to detect and compensate for systematic biases between radar and ADS-B such that the residual biases are limited to a maximum of 0.05 degrees (azimuth) and 40 meters (range) (see SSE analysis results discussed in §D.5 and §D.6).	ARTAS-SRS-TRK-EASYSE-010 "The Estimate Macro Systematic Errors capability shall , in a multi-radar environment or mixed radar/ADS-B/WAM environment with sufficient radar overlap (radar overlap factor for "average" traffic in the order of 2.5), assess on-line the following systematic errors per radar (if relevant for that particular radar): - azimuth bias, - range bias, - range gain, - time-stamping bias, - squint error, - radar verticality error, - elevation bias (in case of full 3D-radars)." ARTAS-SRS-TRK-EASYSE-041 "The combined effect of range bias and range gain

System ID	System Requirement	SDPD Requirement
		<p>shall be less than 11 m, up to a distance of 400 km from the radar.”</p> <p>The performance values are written in polar style for reference to radar, whereas the ARTAS track accuracy errors are presented in Cartesian.</p> <p>ARTAS performance depends on the ANSP’s OSED.</p>

Table A-5: Requirements to be Considered during Generic Surveillance Preliminary Safety Case GEN-SUR SPR (Fusion Tracker).

System ID	System Requirement	SDPD Requirement
REQ-15.04.05.a-D18-0020.0009	<p>The probability that the ADS-B Ground Domain detects a loss of ADS-B-reported altitude, and provides an indication of such to the existing ATC Processing System shall be at least 99%.</p> <p><i>Notes:</i></p> <ol style="list-style-type: none"> 1. Alternatively, the requirement might be fulfilled by the existing ATC Processing System, i.e., beyond interface F2*. 2. This requirement, taken together with ASSUMP 46, will ensure that the appropriate safety objectives are met. 	<p>The GEN SUR-SPR Fusion modified this requirement to OR.0010 "The ATCo SUR interface shall inform the controller when pressure-altitude information cannot be used."</p> <p>In a RAD environment, ARTAS would maintain the barometric altitude assuming it was still provided by other overlapping technology i.e. radar or WAM.</p> <p>If no barometric altitude is provided from any technology then the item I062/136 eventually becomes empty, thus making it obvious to the ATCo.</p> <p>ARTAS-SRS-TRK-TRCONT-785 "The measured mode C code associated to a track shall be updated considering the SSR information provided by the radars detecting the track and by ADS and WAM reports." based on the Z State Filter algorithm.</p> <p>Testing cannot demonstrate the Performance Requirement of 99%.</p>

System ID	System Requirement	SDPD Requirement
REQ-15.04.05.a-D18-0020.0014	<p>The probability that the “ADS-B to Radar Association” function detects a large ADS-B position error, and provides an indication of such to the existing ATC Processing System shall be at least 99%, where a large error is at least 40% of the separation minima for the ADS-B-RAD environment.</p> <p><i>Notes:</i></p> <ol style="list-style-type: none"> <i>1. This requirement, taken together with ASSUMP 43, will ensure that the appropriate safety objectives are met.</i> <i>2. This requirement is conditional on the sustained corruption of the horizontal position information itself or its quality indicators. Very conservative assumptions have been made on the nature of the resulting horizontal position errors (and their probability distribution) as well as the detection capability of the “ADS-B to Radar Association” function (see Appendix C-1.1 for a detailed discussion). Local safety assessments should take this into due account.</i> <i>3. It is assumed that corresponding ADS-B horizontal position errors greater than 10 NM are always detected,</i> 	<p>The GEN-SUR SPR modified this requirement to OR.009 “The controller shall be notified on the ATCo SUR interface, in the event of inconsistent horizontal position information between various surveillance sources for the same aircraft.”</p> <p>ARTAS-SRS-TRK-TRCONT-912 “If enabled by a TRK offline parameter, the ADD horizontal position components shall be checked against a static deviation from the system track position above which the measurement will be discarded in any case (i.e. ignoring the dynamic threshold).”</p> <p>ARTAS-SRS-TRK-TRCONT-913 “If enabled by a TRK offline parameter, the ADD horizontal position components shall be checked against a static deviation from the system track position below which the measurement will be accepted in any case (i.e. ignoring the dynamic threshold).”</p> <p>There is however a new requirement to notify the ATCo of this position error and therefore an update is required to Cat063</p> <p>The notification is currently not performed by ARTAS.</p> <p>Testing cannot demonstrate the Performance Requirement of 90%.</p>

System ID	System Requirement	SDPD Requirement
REQ-15.04.05.a-D18-0020.0015	<p>The probability that the “ADS-B to Radar Association” function detects a significant ADS-B horizontal position error, and provides an indication of such to the existing ATC Processing System, shall be at least 90%, where a significant error is at least equal to the NIC boundary but less than 40% of the separation minima for the ADS-B-RAD environment.</p> <p><i>Note 1: This requirement, taken together with ASSUMP 43, will ensure that the appropriate safety objectives are met.</i></p> <p><i>Note 2: This requirement is closely linked to SPR 46 (refer also to Note 2 thereof).</i></p>	<p>The GEN-SUR SPR modified this requirement to OR.009 “The controller shall be notified on the ATCo SUR interface, in the event of inconsistent horizontal position information between various surveillance sources for the same aircraft.”</p> <p>ARTAS-SRS-TRK-TRCONT-912 “If enabled by a TRK offline parameter, the ADD horizontal position components shall be checked against a static deviation from the system track position above which the measurement will be discarded in any case (i.e. ignoring the dynamic threshold).”</p> <p>ARTAS-SRS-TRK-TRCONT-913 “If enabled by a TRK offline parameter, the ADD horizontal position components shall be checked against a static deviation from the system track position below which the measurement will be accepted in any case (i.e. ignoring the dynamic threshold).”</p> <p>There is however a new requirement to notify the ATCo of this position error and therefore an update is required to Cat063</p> <p>The notification is currently not performed by ARTAS.</p> <p>Testing cannot demonstrate the Performance Requirement of 90%.</p>

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