# EUROCONTROL Guidelines for Civil Military Coordination Information Exchanges

Edition number: 1.0
Edition date: 27/10/2020
Document reference: EUROCONTROL-GUID-183

EUROCONTROL

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**DOCUMENT IDENTIFIER : EUROCONTROL-GUID-183**

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|---|---|---|
| **Edition Number** | **:** | **1.0** |
| **Edition Date** | **:** | **27/10/2020** |
| **Status** | **:** | **Released Issue** |
| **Intended for** | **:** | **General Public** |
| **Category** | **:** | **EUROCONTROL Guidelines** |

# DOCUMENT CHARACTERISTICS

| TITLE | | |
|---|---|---|
| **EUROCONTROL Guidelines for Civil Military Coordination Information Exchanges** | | |
| | **Publications Reference:** | GUID-183 |
| | **ISBN Number:** | 978-2-87497-110-5 |
| **Document Identifier** | **Edition Number:** | 1.0 |
| EUROCONTROL-GUID-183 | **Edition Date:** | 27/10/2020 |


**Abstract**

This EUROCONTROL Guideline document provides technical guidance to Military Authorities, ATM/CNS planners and experts in the civil-military voice and data exchanges in charge of defining, developing, implementing and maintaining adequate information exchanges between civil and military ATM/CNS systems.

This document provides an overview of ground-to-ground and air-to-ground information exchanges supporting the civil and military ATM/CNS system interoperability. It describes the operational environment, technical constraints, applicable standards and other relevant information supporting these information exchanges.

A summary of recommendations is inserted at the end of the document.

The present document was endorsed at the 27th meeting of the Military ATM Board (MAB) on 7th October 2020.



| **Keywords** | | | |
|---|---|---|---|
| Information Exchanges | Airspace Management | Flight Plan | Aeronautical Information |
| Air-ground communications | Ground-ground communications | Navigation | Surveillance |
| Quality of Service | Interoperability | Civil Military | Security |



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| STATUS, AUDIENCE AND ACCESSIBILITY | | | | | |
|---|---|---|---|---|---|
| **Status** | | **Intended for** | | **Accessible via** | |
| Working Draft | ☐ | General Public | ☑ | Intranet | ☐ |
| Draft | ☐ | EUROCONTROL | ☐ | Extranet | ☐ |
| Proposed Issue | ☐ | Restricted | ☐ | Internet (www.eurocontrol.int) | ☑ |
| Released Issue | ☑ | | | | |

# DOCUMENT APPROVAL

| AUTHORITY | NAME AND SIGNATURE | DATE |
|---|---|---|
| Director General | Eamonn BRENNAN | 27/10/20 |

# DOCUMENT CHANGE RECORD

The following table records the complete history of the successive editions of the present document.

| EDITION NUMBER | EDITION DATE | REASON FOR CHANGE | PAGES AFFECTED |
|---|---|---|---|
| 1.0 | 27 October 2020 | First edition | All |

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# EXECUTIVE SUMMARY

Measures to improve civil-military ATM/CNS system interoperability need to be justified by the recognised need to exchange information between civil and military units or systems.

Civil-military ATM/CNS system interoperability measures must be decided by the National Authorities inter alia on the basis of identified/recognised Information Exchanges (IEs). The present document captures civil-military IEs relevant for CNS system interoperability. It comprises multiple information exchanges identified in the current operational ATM/CNS environment and emerging concepts involving civil and military systems/units.

Civil-military co-ordination supporting safety, continuity of service, security and identification of flights as well as air-picture compilation, call for a permanent exchange of information between civil and military ATM and Air Defence units. Emerging concepts and automation rely very strongly on a real-time information-rich environment where aircraft become nodes of the network-enabled infrastructure (SWIM) supporting the European ATM network (EATMN).

Improvement of data quality and contents are recognised as enablers for performance and efficiency gains in ATM. The provision of required information to all relevant parties at the right time has been identified as a major area of improvement in the Airspace Management (ASM) process.

The scope extends to all information that is of potential interest to ATM including trajectories / flight data, surveillance data, aeronautical information of all types, meteorological data, etc.

IEs derived from operational scenarios reflect the role of military organisations as airspace user, ATS service provider, airport operator and command and control (C2) entity. Those IEs justify civil-military interoperability measures and contribute to military-military interoperability.

The present document considers systems presently in operation.

The document aims at identifying information flows between civil and military (ATM and Air Defence/Command and Control - AD/C2) entities/systems as well as the associated performance/quality of service (QoS) and security attributes, when known.

The document provides guidance to Military Authorities, ATM/CNS planners and experts in the civil-military voice and data exchanges. It supports Member States to define the information exchanges required to sustain certain operational needs; and to deploy the adequate underlying infrastructure and systems meeting the required performance and security levels.

# 1 Introduction

## 1.1 Background

The permanent exchange of information between civil and military ATM units and externally with Air Defence/Command and Control (AD/C2) is a fundamental element of extended levels of automation and communication supporting ATM for which military inputs have to be considered. In general, military entities need comprehensive, accurate and timely flight/trajectory data on all flights currently within their area of responsibility (AoR). Military operations are, to some extent, dependent of data relating to airspace and aerodromes.

Civil ATM entities need military planning information in advance, to improve collaborative decision-making and situational awareness. Access to military surveillance capabilities is, in some local implementations, essential in order to maintain coverage and to enable infrastructure rationalisation. Those synergies are established on the basis of specific requirements and covered by local agreements, typically between military and civil ANSPs.

A more flexible and dynamic airspace management will also require automated information exchange between civil and military ANSPs.

Data used in the civil ATM context is migrating to standardised service and information (digital) formats and models. Global/ICAO data models comprise standards like the Aeronautical Information Exchange Model (AIXM), Weather Information Exchange Model (WXXM), Flight Information Exchange Model (FIXM). SWIM will introduce harmonised ATM services, data reference models and technical infrastructure as defined in EUROCONTROL Specification for SWIM Service Description [RD 18], EUROCONTROL Specification for SWIM Information Definition [RD 19] and EUROCONTROL Specification for SWIM Technical Infrastructure (TI) Yellow Profile [RD 20].

Global interoperability is a key issue in respect to the current and future ATM/CNS infrastructure. In this context, civil-military interoperability should be the basis to enable military capabilities to respond to increased automation and to be integrated as much as possible in the underlying ATM infrastructure.

Military organisations are required to exchange information with civil ATM. Information Exchange Elements (IEEs) are captured in the tables included in the present document.

## 1.2 Purpose of the document

The purpose of this document is to describe known system-related civil-military information exchanges supporting Air Traffic Management (ATM) and to provide recommendations on how to improve such information context. It aims at identifying information flows between civil and military (ATM and Air Defence/Command and Control - AD/C2) entities/systems, and when known, the associated performance/quality of service (QoS) and security attributes.

## 1.3 Scope of the document

This document is intended to be used in the context of any civil/military ATM/CNS planning and deployment activities.

This document is complemented by other publications:

- EUROCONTROL Roadmap on Enhanced Civil-Military CNS Interoperability and Technology Convergence [RD 1],

- Civil-Military Coordination Considerations for SWIM Deployment - Interoperability – 06/08/2019 [RD 17].

This document has a non-binding nature and contains only reference information and guidance that Military Organisations, ATM/CNS planners and experts may decide to consider when taking decisions on planning and deployment initiatives. It is a support tool for civil-military CNS interoperability objectives.

The identified information exchanges have a system nature and were defined in the context of ATM/CNS in respect to relevant ATM concepts and architecture. It is understood that the European ATM Network (EATMN) infrastructure has a level of fragmentation evidencing local specific configurations. For that reason the information exchanges have a generic nature and may not match certain local or regional implementations.

## 1.4 Organisational Context

The civil ATM system is organised and operated according to ICAO provisions, mainly to support civil aviation operations. The Military have developed their own ATM organisation with the primary objective to support military services, however they also provide services to civil aviation in specific situations or locations.

Some of the roles of Military Organisations are described below.

**Aerodrome Operators**:

The Military operate both aerodromes with exclusively military activity and aerodromes with mixed civil-military aviation operations. As such, these aerodromes are to be considered part of the civil ATM network and need to be connected to civil organisations for the coordination and exchange of information.

**Air Navigation Services Providers**:

Designated Military ATS units provide services within assigned portions of airspace where the operating traffic may be exclusively military or mixed civil-military (OAT – GAT). When authorized by competent national authorities; the Military act as AIS providers by publishing both military aeronautical information as well as providing AIS which are of interest to the GAT community which are then published by the national civil AIS providers. In many cases, the military are also search and rescue (SAR) providers and meteorology service providers for the benefit of the civil aviation.

**Airspace Managers**:

In coordination with the civil counterparts, the Military designated bodies and ATS units actively participate in all phases of airspace management (ASM) processes, from the formulation of the national airspace policy, the strategic decision making regarding airspace utilisation arrangements and procedures, to airspace design; from the pre-tactical airspace allocation to the real time activation-deactivation and reallocation of designated airspace reservations.

**Aircraft Operators - Airspace Users**:

Military aerial activities may be significantly different from those performed by the civil aviation. The following lists typical military air operations which are routinely conducted in peacetime:

- Operational training flights,
- Air transport (passengers and freight),
- Air drop (staff and freight),
- Maritime patrol and surveillance,
- Instruction flights,

- Air Defence flights,
- Transit flights,
- Search and Rescue flights,
- Patrol flights,
- Special flights,
- Functional check flights,
- Test flights,
- Air-to-air refuelling flights,
- Air shows and demonstrations.

In addition, the Remote Piloted Aerial Systems (RPAS) represent an emerging category of aerial vehicles which raises challenges to the overall air transport system.

**Air Defence / Command and Control (AD/C2) centres**:

Air Defence Missions require unrestricted access to airspace at any time for National Security and Defence purposes. In case of live air policy flights, real time coordination with affected ATS units for the conduct of such operations and the necessary exchange of information should be ensured. Moreover, Air Defence units need to be connected to the ATM network to access relevant ATM information such as the flight plans and data concerning all fights conducted within their area of responsibility. There are almost as many Air Defence / Command and Control (AD/C2) organisational set-ups as there are member states in the ECAC area.

Air Defence missions are, to a large extent, supported by C2 military entities which are dependent of appropriate identification of all flights and data related with ongoing operations and the status of airspace and infrastructure. This implies the need to access (civil) ATM information to fulfil their national defence and security tasks.

**Military ATC units:**

There are essentially three types of military ATC organisational set-ups that characterise the nature of the information to be exchanged:

- Separated organisations,
- Co-located organisations,
- Integrated organisations.

Both the “separated organisations” and “co-located organisations” consist in having a Military ATC unit that provides ATS to Operational Air Traffic, on one side, and a Civil ATC unit that provides ATS to General Air Traffic on the other side. These ATC units have identical or at least overlapping Areas of Responsibility (AoR), which implies that coordination between them is needed.

The “Separated organisation” is characterised by the fact that the Military ATC unit and the Civil ATC unit are located in different places. Direct personal coordination is not possible.

Conversely, Civil and Military ATC units are working in the same control room in the “Co-located organisation”.

The “Integrated organisation” consists of having one single ATC unit that provides ATS to all traffic (GAT and OAT) in its AoR; either a Civil ATC unit or a Military ATC unit supports the “Integrated organisation” in a given AoR.

## 1.5 Operational Context of Information Exchanges

Information exchanges can vary in accordance with the military roles and organisational set

up described above.

Military ATM organisational structures depend on the defined missions and related procurement and deployment decisions, mainly taken at a national level. As a consequence organisational structures diverge considerably between States which explains the current lack of harmonisation and interoperability of military systems.

While military and civil ATM may work closely together, exchange of information and collaborative decision making is in some cases still based on voice communications and paper based processes.

Effective and efficient defence of European airspace is dependent on the fusion of dynamic flight and surveillance information to enable the compilation of a Recognised Air Picture (RAP). Most military AD/C2 systems may import radar data from civil ATM providers to provide inputs to the RAP production process. Currently, the point-to-point exchange of surveillance data between some States allows the creation of a local RAP extending to adjacent airspace.

The information requirements for each scenario that emerge from this analysis are broadly similar. However, the criticality and performance requirements for each information exchange requirement vary. Furthermore, while most military ATM and AD/C2 entities have a role in each of the scenarios, some are more involved in some scenarios than others which will have an impact on the flow of information between civil and military entities.

The scope of the civil-military information exchanges covers any information that is of potential interest to ATM including trajectories / flight data, surveillance data, aeronautical information of all types, meteorological data, etc. (see Figure 1).

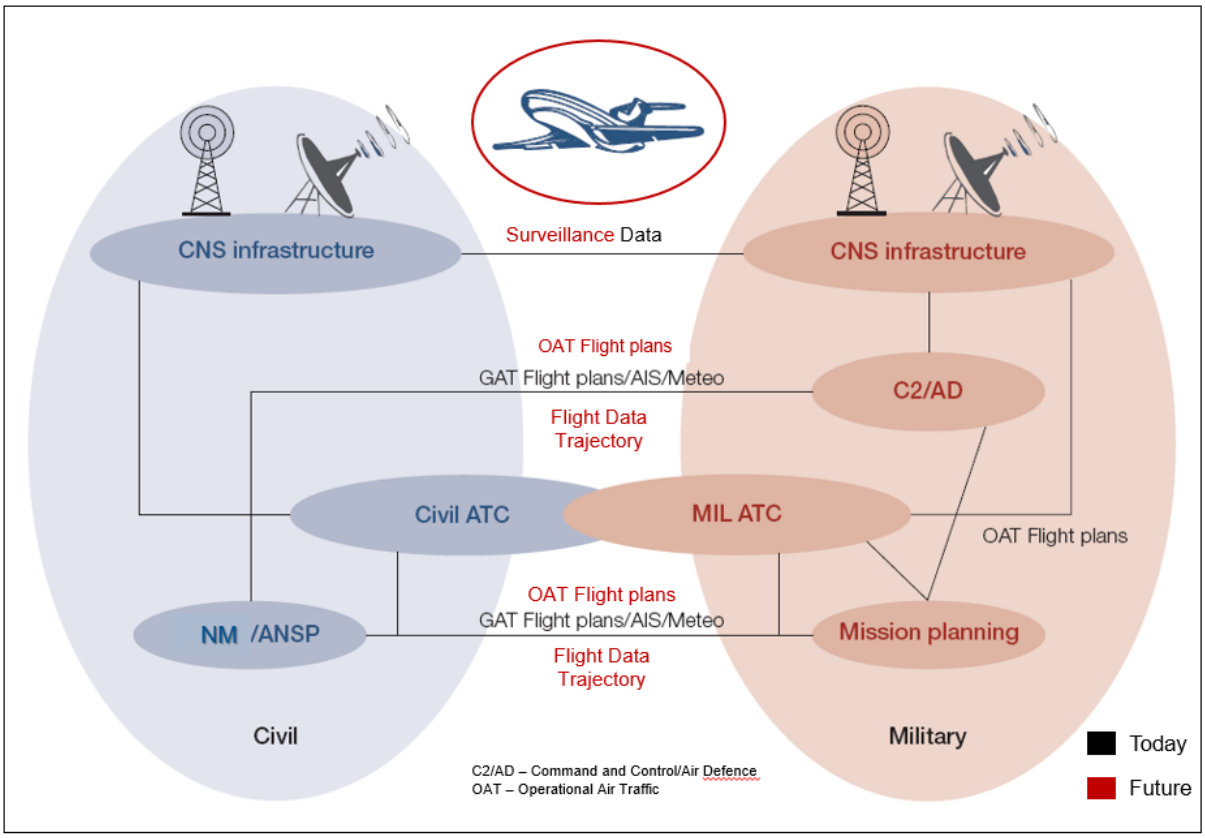


Figure 1: Civil-military information context

## 1.6 Conventions

Throughout this document, squared brackets are used to indicate a referenced document listed in Annex B. For example, [RD 1] indicates referenced document number 1.

Squared brackets are also used to indicate key guidelines. For example [GUID-01] indicates the first key guideline in this document.

For the purpose of drafting key guidelines, the following applies:

1) Guidelines using the operative verb **shall** indicate that they **must be** implemented to achieve the minimum objectives of this guidance material. Typically these refer to obligations prescribed in regulations, ICAO material, standards or working practices (e.g. flight plan submission).
2) Guidelines using the operative verb **should** indicate that they are **recommended** to achieve the best possible implementation of this guidance material.
3) Guidelines using the operative verb **may** indicate **options**.

## 1.7 Abbreviations

A full list of abbreviation can be found in Annex A.

## 1.8 Definitions and Terms

**State aircraft**

In accordance with the ICAO Convention Article 3 (3), a State aircraft means "*aircraft used in military, customs and police services shall be deemed to be State aircraft"*. This definition is used in various EU regulations.

**Military aircraft**

A military aircraft is a State aircraft in the inventory of Military Organisations used to support military operational requirements.

**Wing Operations Centre ("WOC")**

A Wing Operations Centre has to be understood in the wider sense of any military operations centre in charge of planning, tasking and monitoring of air operations. Depending on the specific national organisations and on the type of military operations performed (e.g. daily training activities, large exercises, combined operations), the "WOC" functions can be performed in various types of military centres. Examples of such centres are: Squadron Operations Centres, Wing Operations Centres, Airbase Operation Centres, National or Combined Air Operations Centres.

## 1.9 Reference material

A full list of the reference material used by this document can be found in Annex B.

## 1.10 Document structure

This document comprises four sections:

- Section 1 provides the introduction,

- Section 2 provides the tables that describe the IEs with the associated interface Quality-of-Service attributes,
- Section 3 provides a number of attributes contributing to identify the required performance, quality of service and security levels to consider when validating, specifying or implementing civil-military interoperability solutions,
- Section 4 provides a number of guidelines ([GUID]) in order to facilitate the implementation of IEs when required.

The information exchange (IE) tables in section 2 are presented as follows:

1. Identifier:
   represents a unique identifier of the interface supporting the information exchange (IE). The first two characters represents the domain (AI for Aeronautical Information, AS for Airspace Management, FD for Flight Data, SU for Surveillance, AG for Air Ground) and are followed by a numeric identifier. Example: FD-07 represents the seventh information exchange element for the domain “Flight Data”.
2. Information Exchange identifier:
   represents a unique identifier of the information exchange (IE) item itself, which consists of 2-4 characters followed by a numeric identifier. Example: OLDI-01 represents the first information element for the “OLDI” information exchange.
3. Information Element Description:
   a. Interface Name:
      provides the name of information, mainly the name of messages, exchanged over the interface. Example: BFD (Basic Flight Data) and CFD (Change to Flight Data), which are exchanges over FD-07,
   b. Content:
      provides a very short description of the contents of the exchanged information name of information, mainly the name of messages, exchanged over the interface. Example: Air situational awareness for FD-07,
   c. Format:
      mentions the formats used to exchange the information. Example: OLDI over FMTP for FD-07.
4. Producer:
   a. Sending Operational Unit,
   b. Sending Technical System,
5. Consumer:
   a. Receiving Operational Unit,
   b. Receiving Technical System,
6. Interface Quality of Service:
   a. Availability,
   b. Reliability,
   c. Data Integrity,
   d. Communications Class of Service (for the Air-Ground IEs).

## 1.11 Maintenance of the document

These EUROCONTROL Guidelines have been prepared by EUROCONTROL in cooperation with civil and military stakeholders. They have been published under the EUROCONTROL Regulatory and Advisory Framework (ERAF) and are maintained by EUROCONTROL in accordance with this Framework.

The maintenance procedures for these guidelines are described in detail in Annex C.

# 2 Information Exchange Matrices

## 2.1 Aeronautical Information IEs

### 2.1.1 Military as Provider/Consumer

#### 2.1.1.1 Context

The goal for AIM is "the right digital AI, at the right place, at the right time". The use of the word "digital" is critically significant as it illustrates the definite move away from paper-based AI primarily used for the pre-flight phase of planning towards fully digital, interoperable, data processes across all flight phases. AIM is one enabler for the development of future Collaborative Decision Making (CDM) tools that will make available relevant, context based AI to all ATM actors. Existing military systems supporting ATM processes will need to support the exchange of data necessary for effective CDM processes.

To accommodate military aviation within the SES environment, relevant national OAT rules need to be harmonised at European level. Specifications for harmonised rules for OAT under IFR inside controlled airspace in the European Civil Aviation Conference (ECAC) area (EUROAT)[1] were developed to provide this harmonisation. Alongside this, the development of an ECAC-wide Mission Trajectory structure will offer a viable solution to maintain military operational flexibility within the future SES environment whilst also creating benefits for ATM and civil air transport. Mission Trajectory will form a flexible system connecting national structures and arrangements facilitating, not only GAT but also OAT IFR flights across Europe. One of the elements judged to be key for the establishment of Mission Trajectory is the provision of all OAT-IFR flight data and Aeronautical Information (AI) required for ATM systems to effectively support strategic, pre-tactical and tactical ATM. Considerable effort is now being put into Aeronautical Information Management (AIM) aimed at ensuring the quality, integrity and timeliness of AI through the use of fully digital interoperable systems and enabling dynamic context based retrieval/delivery of information.

The introduction of the Flexible Use of Airspace (FUA) concept was intended to make best use of Europe's increasingly congested skies, increasing safety and efficiency of all aircraft operations by ensuring the best use of the available airspace. Flexible airspace structures have been established to be suited to temporary use allowing maximum sharing of that airspace through enhanced civil/military co-ordination. FUA is continually being enhanced to exploit the airspace in a more dynamic manner by enabling late airspace (re-)allocation as close as practical to the time of operations in order to accommodate short-term changes in traffic situation and/or users requirements. In order to achieve the ultimate flexibility to the benefit of all parties, the provision of timely, accurate and quality-assured AI in digital format is a must.

AIS entities in Europe provide and manage aeronautical data and aeronautical information in a very complex data chain where aeronautical ‘service provision’ is still primarily focused on paper data management practices. These practices contribute to errors and inconsistencies in published aeronautical information. AIM introduces new methods of distribution of aeronautical information and digital products and relies on the data-centric nature (as opposed to the product-centric nature of AIS) mainly based on the management of digital aeronautical information.

[1] https://www.eurocontrol.int/publication/eurocontrol-specifications-harmonized-rules-oat-under-ifr-inside-controlled-airspace

A key enabler of the ATM system is interoperability; so it is essential that aeronautical data and aeronautical information are provided in a format that ensures consistency, authenticity and appropriate coverage of the user needs.

In summary, ATM is dependent on the provision of timely, relevant, accurate, and quality-assured information that allows the ATM community to ensure an efficient distribution method of aeronautical data and aeronautical information.

#### 2.1.1.2 European Aeronautical Data Base (EAD)

In order to maintain operational flexibility, it is imperative that the military community is able to interoperate with its civilian partners. The full and free sharing of Aeronautical Information (AI) is a fundamental building block for interoperability and its importance will become increasingly significant as more technological advancements are made with regard to AIM and ATM. Two areas which are likely to influence the military's future AIM are:

- The European AIS Database (EAD). The EAD is a centralised reference database of quality-assured AI provided by the EUROCONTROL Member States,
- Aeronautical Information Exchange Model (AIXM). The Aeronautical Information Exchange Model (AIXM) is designed to enable the management and distribution of AIS data in digital format.

Currently, some AIS data continues to be paper-based and largely manually processed and transition to an automated and fully digital environment is urgently required. Any future systems will need to strike a compromise between the capability of computers to avoid transactional mistakes and the cognitive processes of humans to resolve problems intuitively and intelligently. The core problem appears when tasks are performed by multiple actors based on manual processes involving numerous transaction points. At each of these points data may leave an electronic or manual environment and be transferred in paper form, running the risk of repeated re-entry and checking and involving a high risk of error.

As a EUROCONTROL service, the European Aeronautical Database (EAD) is the world’s largest AI system. It is a centralised reference database of quality-assured AIS data providing a fully integrated, state-of-the-art AIS solution. The EAD became fully operational in 2003 and to date around 80 percent of civilian aviation-related organisations have migrated their AIS to the EAD in some form or other. Some military organisations have also migrated to EAD in recent years.

The EAD provides digital data through the EAD system capabilities which will drive a broad range of future technological concepts feeding the evolving needs of the aviation industry. The aim is to achieve this in harmonisation with military systems, capabilities and airspace security requirements.

The following is a summary of the EAD key service facilities as being of potential benefit to the military:

- **INO - International NOTAM Operations.** To create and retrieve NOTAM, SNOWTAM and ASHTAM,
- **PIB - Pre-Flight Information Bulletins.** The following briefing types are available:
    - Aerodrome,
    - Area and Special Area, based on airspace or centre point radius,

  - Route, based on aerodrome of departure/destination and overflown FIRs,
  - Narrow Route, based on either:
    - A pre-defined route available in the system,
    - A FPL (initial),
    - A route described by the operator.

- **SDO - Static Data Operations.** The SDO service allows subscribers to maintain static data for their area of responsibility. Users can also generate pre-defined reports and create their own, user-defined reports based on the data contained in the database. The database can be replicated within the EAD to enable operators to take advantage of other functional areas such as AIP and CHP. Following aeronautical information data are available in SDO:
  - Aerodrome information, including Procedures and Obstacles,
  - En-route information such as Airspaces, Routes, Navaids and Waypoints,
  - General information such as Organisation, Authority and Units.
- **PAMS - Published AIP Management System.** PAMS provides a complete library of:
  - Aeronautical Information Publications (AIPs),
  - AIP Amendments,
  - AIP Supplements and Aeronautical Information Circulars (AICs),
  - Aeronautical charts for ECAC States.
- **BF - Briefing Facility.** The BF is a recent addition to the INO DU function, providing the functionality to process all incoming and outgoing AFTN messages in one single application. It requires the installation of a separate piece of hardware, the Briefing Facility Box (BF Box), acting as a mini-AFTN server and the associated software at the INO DU terminal. Users are able to:
  - Aeronautical charts for ECAC States,
  - Create, submit and validate FPLs,
  - Manage repetitive FPLs,
  - Manage client information and AFTN addresses,
  - Monitor real traffic situations,
  - Monitor status of FPLs,
  - Manage all incoming and outgoing messages.

The EAD PAMS facility could be an immediately useful addition to support military operations, flight planning sections and flying squadrons, providing the ability to extract the latest airfield information and national procedures.

PAMS currently contains mainly civil AIP data but some military AIP data is already integrated. For PAMS to be of real added value for military organisations all military AIPs should be uploaded to the EAD. This can be managed either in PDF format or as eAIP. The benefits of electronic publications in terms of availability and reduced workload on the user side are evident.

AIXM comprises two components: the AIXM Conceptual Model (AICM) and an AIXM Extensible Mark-up Language (XML) Schema. For ease the two components are known collectively as AIXM and, more important, provide a format for data to be transmitted electronically between computer systems thereby allowing data to be exchanged freely back and forth by means of a tool such as the EAD or some Airspace Management products.

The data to be shared is defined at section 2.1.2 IE Table – Aeronautical Information.

**[GUID-01]** The military units should migrate to EAD to ensure a high level of interoperability for the aeronautical information data and the military organisations should contact the EUROCONTROL EAD team to obtain more technical information on the services, data models and technical infrastructure to support the interface with EAD products.

## 2.1.2 IE Table – Aeronautical Information

**<u>Important note:</u> the table below may evolve in accordance with the future releases of services, products or systems implementing the information exchanges.**

| Identifier | Information Exchange identifier | Information Element Description | | | | | Producer | | Consumer | | Interface Quality of Service | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Interface Name | Content | Scope | Temporality | Format | Sending Operational Unit | Sending Technical System | Receiving Operational Unit | Receiving Technical System | Availibilty | Reliability | Data Integrity |
| AI-01 | SDO-01 | **SDO** - Static Data Operations – data providers | Input and validation of :<br>- ECAC full static data<br>- Worldwide minimum static data | ICAO Annex 15 | AIRAC cycle | AIXM (contact EAD to know latest version in use) | Civ mil AIS Office, ANSP | B2B | EAD SDO | B2B | 24 hours every day | At least 99.975%. | Part of LOA with EAD |
| AI-02 | SDO-02 | **SDO** - Static Data Operations – data users | - Download of static data in AIXM format<br>- Query the SDO database<br>- Graphical report | ICAO Annex 15 | On demand | AIXM (contact EAD to know latest version in use)<br>ARINC 424 also possible | EAD SDO | B2B | Military ANSP, Airspace user | B2B | 24 hours every day | At least 99.975%. | Part of LOA with EAD |
| AI-03 | INO-01 | **INO** - International NOTAM Operations – data providers | Worldwide creation of NOTAM, SNOWTAM and ASHTAM | ICAO Annex 15 | AIRAC cycle | XML or plain text | Civ mil, AIS Office, ANSP, ARO | B2B | EAD INO | B2B or AFTN | 24 hours every day | At least 99.975%. | Part of LOA with EAD |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AI-04 | INO-02 | **INO** - International NOTAM Operations – data users | Worldwide retrieval of :<br>- NOTAM, SNOWTAM and ASHTAM,<br>- pre-flight information bulletin | ICAO Annex 15 | As needed | XML or plain text | EAD INO | B2B | Military ANSP and Airspace user | B2B or AFTN | 24 hours every day | At least 99.975%. | Part of LOA with EAD |
| AI-03 | INO-03 | **INO BF -** Briefing Facility - data providers | Worldwide creation of flight plans | ICAO doc 4444 | On demand | ICAO doc 4444 | Civ mil, AIS Office, ANSP, ARO | B2B | EAD INO | B2B or AFTN | 24 hours every day | At least 99.975%. | Part of LOA with EAD |
| AI-04 | INO-04 | **INO BF -** Briefing Facility - data users | Retrieval of flight plans | ICAO doc 4444 | On demand | ICAO doc 4444 | EAD INO | B2B | Military ANSP and Airspace user | B2B or AFTN | 24 hours every day | At least 99.975%. | Part of LOA with EAD |
| AI-05 | PAMS - 01 | **PAMS** - Published AIP Management System | For ECAC Area, creation and upload of :<br>- text format AIPs,<br>- AIP Amendments (AMDT),<br>- AIP Supplements (SUP)<br>- Aeronautical Information Circulars (AIC) | ICAO Annex 15 | AIRAC cycle | XML or plain text | Civ mil, AIS Office, ATC, ARO | B2B | EAD PAMS | B2B | 24 hours every day | At least 99.975%. | Part of LOA with EAD |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AI-06 | PAMS - 02 | **PAMS** - Published AIP Management System | For ECAC Area, consultation of :<br>- text format AIPs,<br>- electronic AIPs,<br>- AIP Amendments (AMDT),<br>- AIP Supplements (SUP),<br>- Aeronautical Information Circulars (AIC),<br>- AIP Charts | ICAO Annex 15 for AIP materials<br>ICAO Annex 4 for charts | On demand | - XML or plain text<br>- eAIP and related charts from SDO data (AIXM + EUR extension - contact EAD to know latest version in use) | EAD PAMS | B2B | Military ANSP and Airspace user | B2B | 24 hours every day | At least 99.975%. | Part of LOA with EAD |

## 2.2 Airspace Management and Flow Management IEs

### 2.2.1 Military as Provider/Consumer

#### 2.2.1.1 Context

In the civil military ATM coordination context, data sharing is key in the decision making process as stated before. Improvement of data quality and content are recognised as enablers for performance improvement and enhancements in ATM. The provision of the correct information to the relevant parties at the right time was identified as a major area of improvement in the ASM process.

#### 2.2.1.2 Data sharing principles for FUA

The understanding of FUA usage diverges to large extent but some basic principles remain.

- The success of FUA is dependent on various ASM/ATFCM actors working together and sharing relevant data at strategic, pre-tactical and tactical levels,
- Under certain conditions, data confidentiality and sensitivity requires controlled access or/and availability,
- The efficient sharing of data relies on the timely provision of consolidated and up to date data,
- Data has to be exchanged between ASM, ATFCM and ATS processes for its optimal integration as required in the Business and Mission Trajectories concepts,
- ASM data sharing should migrate to standardised information (digital) formats / models comprising standards like the Aeronautical Information Exchange Model (AIXM).

Based on the actual exchange of data between the Network Manager (NM) and local ASM level, the exchange of ASM data and the data identified to be exchanged for AFUA and for FAB cooperation has been defined in terms of data sets.

Additional system requirements were identified as being necessary to support and automate the FUA processes. Therefore two EUROCONTROL Specifications for Airspace Management (ASM) Support System Requirements supporting the ASM processes at local and FAB level have been published:

- Part I [RD 8] covers the baseline system requirements for ASM Support System supporting the ASM processes at local and FAB level. Compliance with these requirements, despite the differences in the systems detailed specifications, shall ensure harmonisation of the systems' application, the systems' interoperability and to facilitate development of a standard interface with the corresponding stakeholder systems. Part II of the Specification will cover system interface requirements for ASM Support System supporting the ASM processes at local and FAB level.
- Part 2 [RD 9] defines how to exchange the optimised set of ASM data in a standardised manner at local and FAB levels, complementing Part I of the specification. The Specification spurs civil-military coordination through the sharing of ASM information and contributing to efficient use of airspace.

The data to be shared is defined at section 2.2.2 IE Table – Airspace Management / Flow management Information.

**[GUID-02]** The military units should implement the data sharing supporting the FUA as defined in the set of ERNIP documents [RD 4][RD 5][RD 6][RD 7] and in the EUROCONTROL Specifications for Airspace Management (ASM) Support System Requirements supporting the ASM processes at local and FAB level [RD 8][RD 9].

## 2.2.2 IE Table – Airspace Management / Flow management Information

**<u>Important note:</u> the table below may evolve in accordance with the future releases of services, products or systems implementing the information exchanges.**

| Identifier | Information Exchange identifier | Information Element Description | | | | Producer | | Consumer | | Interface Quality of Service | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Interface Name | Content | Temporality | Format | Sending Operational Unit | Sending Technical System | Receiving Operational Unit | Sending Technical System | Availibilty | Reliability | Data Integrity |
| AS-01 | ST-01 | Airspace Structure data | Common Airspace data reference | Strategic (till D-7)<br>AIRAC cycle or specified in NOTAMs (between AIRACs) | AIXM (contact EUROCONTROL NM and LARA to know latest version in use) over B2B | - National AIS<br>- NM ENV | B2B | All users of ASM | B2B | Part of LOA with ASM Service Provider | | |
| AS-02 | ST-02 | Long Term planning/ Event data | De-confliction major events and large scale exercises | Strategic (till D-7)<br>Yearly and half yearly<br>Exceptionally also Ad Hoc | AIXM (contact EUROCONTROL NM and LARA to know latest version in use) over B2B | - National high-level policy body<br>- National authorized entities | B2B | - NM<br>- FAB partners | B2B | Part of LOA with ASM Service Provider | | |
| AS-03 | ST-03 | AUP/UUP data | Consolidated National civil/military plan | Pre-Tactical (D-7 till H-3)<br>AUP* – once for the next day<br>UUP – Rolling UUP process | AIXM (contact EUROCONTROL NM and LARA to know latest version in use) over B2B | AMC | B2B | - NM<br>- FAB partners | B2B | Part of LOA with ASM Service Provider | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| AS-04 | ST-04 | ARES data | Continuous updated planning info | Pre-Tactical (D-7 till H-3)<br>Continuously | AIXM (contact EUROCONTROL NM and LARA to know latest version in use) over B2B among FAB partners<br>Proprietary format for local users | CIV and MIL Airspace Users | B2B | - AMC<br>- FMP<br>- FAB partners | B2B | Part of LOA with ASM Service Provider |
| AS-05 | ST-05 | Pretactical CDM data | Continuous opportunity to negotiate | Pre-Tactical (D-7 till H-3)<br>Continuously | AIXM (contact EUROCONTROL NM and LARA to know latest version in use) over B2B | - ACC/FMP<br>- AMC<br>- MIL Approved Agency | B2B | FAB partners | B2B | Part of LOA with ASM Service Provider |
| AS-06 | ST-06 | Airspace Status data | Common situational awareness | Tactical (H-3 till end ops)<br>Continuously | AIXM (contact EUROCONTROL NM and LARA to know latest version in use) over B2B | MIL SUP/AA | B2B | FAB partners | B2B | Part of LOA with ASM Service Provider |
| AS-07 | ST-07 | Tactical CDM data | Continuous opportunity to negotiate | Tactical (H-3 till end ops)<br>Continuously | AIXM (contact EUROCONTROL NM and LARA to know latest version in use) over B2B among FAB partners<br>Proprietary format for local users | - ACC/SUP<br>- FMP<br>- MIL Approved Agency<br>- MIL SUP | B2B | - ACC/SUP<br>- FMP<br>- MIL Approved Agency<br>- MIL SUP | B2B | Part of LOA with ASM Service Provider |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| AS-08 | ST-08 | Import ATFCM demand data | Expressing the Civil requirements | Depending state policy | AIXM (contact EUROCONTROL NM and LARA to know latest version in use) over B2B among FAB partners<br><br>Proprietary format for local users | FMP | B2B | Local ASM managers | B2B | Part of LOA with ASM Service Provider |

## 2.3 Flight Planning and Flight Data IEs

### 2.3.1 Military as Provider/Consumer

Flight Planning embraces exchange of flight plan data and associated messages between the Integrated Initial Flight Plan Processing System (IFPS), Air Traffic Services (ATS) and Aircraft Operators (AO). It is to be noted that the EU has published legislation for the submission of flight plans in the pre-flight phase [RD 11][RD 12].

Flight data in this context embraces inter-centre notification, coordination and transfer / current FPL messages (e.g. OLDI) and system coordination (SYSCO). It is to be noted that the EU has published legislation for the purpose of notification, coordination and transfer of flights between air traffic control units [RD 14][RD 15].

The data to be shared is defined at section 2.3.2 IE Table – Flight Planning and Flight Data.

#### 2.3.1.1 Flight Planning

Military Flight Plans are filed for GAT flights, mixed OAT/GAT flights as well as for pure OAT flights.

Military Flight Plans are filed in accordance with national military regulations and procedures as laid down in National Military AIP, where existing.

Military Flight Plans are filed adhering to the maximum extent possible to the ICAO FPL 2012 format for GAT and mixed OAT/GAT taking the Network Manager / Integrated Initial Flight Plan Processing System (IFPS) requirements and procedures.

The EUROCONTROL Specification for IFPL [RD 13] supports the IFPL regulation and is listed in the Official Journal as a Community specification for the Single European Sky.

**[GUID-03]** The military units shall implement the appropriate flight plan format (ICAO FPL 2012) and shall comply with the requirements applicable to the submission of FPLs to IFPS as defined in the EUROCONTROL Specification for the Initial Flight Pan [RD 13] and the Network Manager IFPS Users Manual [RD 10].

Providing OAT flight plans to civil ATS can create an enhanced awareness of civil ATS on military traffic. Mutual awareness is considered enhancing flight safety, reducing ATCO communication workload in civil and military units, enabling enhanced flexible use of airspace and facilitating tactical civil-military co-ordination. Using a common flight plan format can guarantee full system support in civil and military ground infrastructure (networks and data processing systems) and will enhance civil-military interoperability.

In order to support a wider distribution of military flight plans to concerned civil ATS units for mutual awareness, work is underway to enable the sharing of certain OAT FPLs and their further promulgation by NM/IFPS. This will offer an additional advantage for the military i.e. the further distribution of the flight plan information by IFPS to military ATS/AD units based on the filed route (as it is presently the case for GAT flights towards civil ATS units). It is clear that these OAT flight plans shall not be subject to any flow management provisions or restrictions.

#### 2.3.1.2 Inter-centre coordination and transfer (COTR)

Where the inter-centre (ACC) service is carried out by telephone, the transfer of data on individual flights, as part of the coordination process, is a major support task at ATC units,

particularly at Area Control Centres (ACCs). Such verbal "estimates" began to be replaced in the 1990s by the use of connections between Flight Data Processing Systems (FDPS) at ACCs, referred to as On-Line Data Interchange (OLDI). This impacts civil and military ACCs as well as Air Defence in some cases.

The use of automatic systems for the exchange of flight data for the purpose of notification, co-ordination and transfer of flights (COTR) between ATC units is covered in Regulation (EC) No. 1032/2006 [RD 14] amended by Regulation (EC) No. 30/2009 [RD 15] as far as the requirements for automatic systems for the exchange of flight data supporting data link services are concerned.

It applies to ANSPs which exchange data automatically with military ACCs and Air Defence units to perform situational awareness and co-ordination functions. As a general statement EC regulations do not apply to military units.

The EUROCONTROL Specification for OLDI [RD 16] supports the COTR regulation and is listed in the Official Journal as a Community specification for the Single European Sky.

**[GUID-04]** The military units shall implement the EUROCONTROL Specification for OLDI [RD 16] when subject to the COTR regulation [RD 14] or when exchanging flight data with civil ATSUs.

#### 2.3.1.2.1 Civil/Military Notification Situational Awareness

The need for current flight plan and control data to be made available between civil and military ACCs and Air Defence units to permit joint situational awareness can be described as follows:

The EUROCONTROL Specification for OLDI [RD 16] describes civil-military message sequence for the notification of Situational Awareness messages, the Basic Flight Data (BFD) and Change to Flight Data (CFD) messages.

#### 2.3.1.2.2 Civil-Military ATC Transfer of Flights

Flights which are being provided with an ATC service are transferred from one ATC unit (military or civil ATC centres) to the next in a manner designed to ensure complete safety. In order to accomplish this objective, it is a standard procedure that the passage of each flight across the boundary of the areas of responsibility of the two units is co-ordinated between them beforehand and that the control of the flight is transferred when it is at, or adjacent to, the said boundary.

The EUROCONTROL Specification for OLDI [RD 16] describes civil-military message sequence for civil-military transfer of flight, in particular the exchange of ABI, ACT, REV, PAC, MAC and LAM messages.

#### 2.3.1.2.3 Civil Military Coordination – Airspace Crossing

The airspace crossing function consists of a message exchange triggered by the controller who has the option either to notify the other unit that a flight under his control is intending to cross the airspace controlled by that unit, or to request the permission to cross that airspace. The airspace crossing co-ordination function could support FUA. Where there is a difficulty in crossing a major traffic flow due to the volume of traffic, a military controller may request a clearance from the civil sector. This allows the crossing to take place without major disruption to the flight of the military aircraft and there is no need for the military controller to provide separation in the segment of the flight for which a clearance has been issued. Similarly, a civil controller can request authorisation for a flight to cross airspace under military jurisdiction in order to provide a more direct route for the aircraft.

The EUROCONTROL Specification for OLDI [RD 16] describes civil-military message sequence for civil-military airspace crossing, in particular the exchanges of messages (XIN, XRQ, XAP, ACP, RJC, XCM) between two ATSUs and their respective controllers.

## 2.3.2 IE Table – Flight Planning and Flight Data

**<u>Important note:</u> the table below may evolve in accordance with the future releases of services, products or systems implementing the information exchanges.**

| Identifier | Information Exchange identifier | Information Element Description | | | Producer | | Consumer | | Interface Quality of Service | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Interface Name | Content | Format | Sending Operational Unit | Sending Technical System | Receiving Operational Units | Receiving Technical System | Availibilty | Reliability | Data Integrity |
| FD-01 | FPL-01 | Initial GAT Flight Plan FPL, CHG (Change), DLA (Delay), CNL (Cancel) | Submission of GAT Flight Plans and associated messages | - ADEXP FPL 2012 over AFTN or AMHS<br>- NOP<br>- NM B2B (to become SWIM yellow profile) | Civil or Military ANSP | FDPS NOP | NMOC | IFPS | 24 hours every day | At least 99.97%. | Part of LOA with NMOC |
| FD-02 | FPL-02 | Initial GAT Flight Plan FPL, CHG (Change) DLA (Delay) CNL (Cancel) | Dissemination of GAT Flight Plans and associated messages | - ADEXP FPL 2012 over AFTN or AMHS<br>- NOP<br>- NM B2B ( to become SWIM yellow profile) | NMOC | IFPS | Civil or Military ANSP / Command and Control (C2) | FDPS NOP | 24 hours every day | At least 99.97%. | Part of LOA with NMOC |
| FD-03 | FPL-03 | Initial OAT Flight Plan FPL, CHG (Change), DLA (Delay), CNL (Cancel) | Submission of OAT Flight Plans and associated messages | FPL 2012 over AFTN or AMHS | WOC | FDPS | NMOC | IFPS | 24 hours every day | At least 99.97%. | Part of LOA with NMOC |
| FD-04 | FPL-04 | Initial OAT Flight Plan FPL, CHG (Change), DLA (Delay), CNL (Cancel) | Dissemination of OAT Flight Plans and associated messages | FPL 2012 over AFTN or AMHS | NMOC | IFPS | Civil or Military ANSP / Command and Control (C2) / WOC | FDPS | 24 hours every day | At least 99.97%. | Part of LOA with NMOC |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FD-05 | FPL-05 | Extended GAT FPL<br><br>EFPL (Flight Plan)<br>ECHG (Change)<br>EDLA (Delay)<br>ECNL (Cancel) | Submission of extended GAT Flight Plans and associated messages<br>"Extended" implies future provision of additional 4D data | FIXM over B2B (to become SWIM yellow profile) | Civil or Military ANSP | FDPS | NMOC | IFPS | 24 hours every day | At least 99.97%. | Part of LOA with NMOC |
| FD-06 | FPL-06 | Extended GAT FPL<br><br>EFPL (Flight Plan)<br>ECHG (Change)<br>EDLA (Delay)<br>ECNL (Cancel) | Dissemination of extended GAT Flight Plans and associated messages | FIXM over B2B (to become SWIM yellow profile) | NMOC | IFPS | Civil or Military ANSP / Command and Control (C2) | FDPS | 24 hours every day | At least 99.97%. | Part of LOA with NMOC |
| FD-07 | OLDI-01 | BFD (Basic Flight Data)<br>CFD (Change to Flight Data) | Air situational awareness | OLDI over FMTP | Civil/Military ATC Unit | FDPS | Civil/Military ATC Unit / Command and Control (C2) | FDPS | 24 hours every day. Down-time periods bilaterally agreed. | At least 99.86 % on every OLDI link | Failure rate at application level shall be less than one transmission error per 2000 messages. |
| FD-08 | OLDI-02 | Advance Boundary Information (ABI), Activate (ACT), Revision (REV), Preliminary Activation (PAC), Abrogation of Co-ordination (MAC) and Logical Acknowledgement (LAM) messages | Notification and co-ordination of flights | OLDI over FMTP | Civil/Military ATC Unit | FDPS | Civil/Military ATC Unit / Command and Control (C2) | FDPS | 24 hours every day. Down-time periods bilaterally agreed. | At least 99.86 % on every OLDI link | Failure rate at application level shall be less than one transmission error per 2000 messages. |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FD-09 | OLDI-03 | Intention Notification Message (XIN), Clearance Request Message (XRQ), Alternate Proposal Message (XAP), Cancellation Message (XCM) | Airspace Crossing | OLDI over FMTP | Civil/Military ATC Unit | | Civil/Military ATC Unit / Command and Control (C2) | FDPS | 24 hours every day. Down-time periods bilaterally agreed. | At least 99.86 % on every OLDI link | Failure rate at application level shall be less than one transmission error per 2000 messages. |

## 2.4 Surveillance Data IEs

### 2.4.1 Military as Provider/Consumer

#### 2.4.1.1 Context

The surveillance domain includes two streams of information: the flight planning and flight data processing and the aircraft detection chain. Both streams of information are correlated together before being displayed with adequate identification data to the controller.

The aircraft detection and identification chain includes both ground and airborne components and it is composed of:

- Surveillance Sensors: Primary and secondary radar, ADS-B, Multilateration/WAM,
- Surveillance Data Distribution,
- Surveillance Data Processing,
- Surveillance Data Analysis.

Depending on the sensors technology, the associated surveillance layer can be organised into different families following two main characteristics:

- Cooperative / Non-cooperative surveillance: a cooperative surveillance system requires the target (aircraft) to provide the ground with a signal or a reply to an interrogation. On the contrary, a non-cooperative surveillance system does not require any signal from the target.
- Dependent / Independent surveillance: a dependent surveillance system relies on the aircraft to compute and provide its position (and also possibly other aircraft parameters, like indicated airspeed, magnetic heading, roll angle, track angle rate, selected altitude, vertical rate, ground speed, etc.) to the ground, whereas a surveillance system is independent when the aircraft position is computed by the ground component.

The current surveillance infrastructure is mainly composed of Secondary Surveillance Radar (SSR), Mono-pulse Secondary Surveillance Radar (MSSR), MSSR Mode-S and Primary Surveillance Radar (PSR). Recent technological developments such as Automatic Dependent Surveillance–Broadcast (ADS-B) and Wide-Area Multilateration (WAM) are deployed progressively in many parts of the world including Europe. EATMN will continue to be supported by a mix of surveillance techniques.

The interrelation of surveillance techniques with communications and navigation is becoming a reality. The scope of surveillance systems will extend to embrace an increasingly diverse range of avionic components, such as GNSS, traffic computers and cockpit display systems, as well as transponders.

The surveillance data processing system converts the target plots or reports coming from one or several sensors into a track. A track is a minimum of three target estimates identified as corresponding to the same target. The sub-system that actually creates the track is called a tracker. Different generations of tracker are:

- “Mono-radar trackers” can only create track from single radar,

- “Multi-sensor trackers” create one track per radar or sensors and then merge the tracks into one final track,
- “Advanced Multi-sensor trackers” that merge the plots or target reports from different sensors into a single track.

The purpose of the Surveillance Data distribution is to facilitate the optimum use and sharing of available surveillance information, building an intelligent logical network for the distribution of surveillance data. Surveillance Data Distribution System is a secure, high performance and extensible communication platform that provides:

- Data distribution functions,
- Data validation functions,
- Data filtering functions (geographical, altitude, category and other selection attributes),
- Data conversion,
- Security functions,
- ADS-B track server functions.

Modern surveillance data distribution, processing and analysis systems are widely deployed over Europe. A significant number of these systems are based on the EUROCONTROL products:

- ARTAS for the data processing system that is capable of merging plots or target reports from different sensors into identified tracks,
- SDDS for the data distribution system that is taking over from the end-of-life RMCDE system,
- SASS-C for the monitoring and the performance evaluation system.

These products are widely distributed throughout Europe contributing to significant performance improvements.

Interoperability between the various SDP technologies shall be properly taken into account, enabling global awareness for all cooperative and non cooperative targets mobiles.

The data to be shared is defined at section 2.4.2 IE Table – Surveillance Data.

#### 2.4.1.2 Civil-Military Relevance

The need to track non cooperative targets and to identify civil and military flights is an important military requirement. Consequently, civil-military surveillance interoperability implies the retention of primary surveillance radar (PSR). Similarly, as military aircraft operate in a mixed environment in controlled airspace where the infrastructure is common, military equipage with Mode S and ADS-B capabilities has been regulated for GAT operations in European airspace including obligations for State aircraft operators. Depending of local/specific requirements, the implementation of wide area multilateration (WAM), safety-assurance and weather systems may need to be considered by the military. Improved surveillance data-sharing between civil and military organisations is another important area for improvement.

The following specific interoperability approaches seem appropriate to promote good levels of military compliance with upcoming surveillance concepts:

- Primary Surveillance - There are security and safety imperatives justifying the retention of PSR (or any other form of independent non-cooperative surveillance). Transponder in failure or intentionally switched off are situations that call for the availability of primary information. For that purpose, PSR is expected to be maintained where operationally essential. Civil and military primary coverage often complement/duplicate each other to a lesser or greater extent, offering the possibility of rationalisation of surveillance infrastructures.

- Mode S - Mode S is a recognised and regulated requirement for State aircraft, influencing the interoperability of State aircraft aiming to fly in a Mode S-based environment. The surveillance and performance regulation [RD 37] includes detailed State aircraft equipage requirements for Mode S ELS, EHS and related deadlines but it acknowledges the fact that not all State aircraft can or will be equipped. Therefore, it describes transitional arrangements for non-Mode-S equipped State aircraft. Mode S equipage is also satisfying the Aircraft Identification requirements stipulated in appropriate SES Regulations (1206/2011 and 1207/2011) [RD 37][RD 41], in order to ensure the unambiguous and continuous individual identification of aircraft within EATMN. An important performance monitoring function, envisaged in the Network Function regulation 2019/123 [RD 3] must be ensured to detect transponder anomalies and to verify 1030/1090 MHz RF congestion also for State aircraft flying GAT. Separate EUROCONTROL Guidelines [RD 44] details procedures for the assessment of over-interrogations in the 1030/1090 MHz channels indicating mitigating measures and considers both civil and military use of those radio frequencies.

- ADS-B - ADS-B Out for transport-type State aircraft is also covered in a SES Regulation (1207/2011) [RD 41], as it is the case for Mode S. It is a baseline requirement, seen initially as a follow on of Mode S EHS capability through the addition of supplementary applications.

The carriage and operation of Mode S at European level, for GAT/IFR, is regulated by the Commission Regulation (EU) No 1207/2011 (SPI IR) [RD 41] successively amended by (EU) 1028/2014 of 26 September 2014, (EU) 2017/386 of 06 March 2017 and (EU) 2020/587 of 29 April 2020.

Article 8 of the SPI IR covers State aircraft and defines the cases for exemptions. 07 December 2020 is the deadline to implement Mode S ELS (all State aircraft), Mode S EHS and ADS-B OUT (transport-type State aircraft). In the sequence of the latest amendment, Article 8 describes the State aircraft-related provisions as follows:

*1. Member States shall ensure that, by 7 December 2020 at the latest, State aircraft comply with point (a) of Article 5(5).*

> *Point (a) of Article 5(5) states:*
>
> *By 7 December 2020 operators shall ensure that:*
>
> *(a) aircraft operating flights referred to in Article 2(2) (GAT/IFR) are equipped with serviceable secondary surveillance radar transponders that comply with the following conditions:*
>
> *(i) they have the capabilities set out in Part A of Annex II [Mode S ELS];*

*(ii) they have the continuity sufficient to avoid presenting an operational risk*

*2. Member States shall ensure that, by 7 December 2020 at the latest, transport-type State aircraft comply with point (c) of Article 5(5).*

*Point (c) of Article 5(5) states:*

*By 7 December 2020 operators shall ensure that:*

*(c) fixed wing aircraft with a maximum certified take-off mass exceeding 5 700 kg or having a maximum cruising true airspeed capability greater than 250 knots, operating flights referred to in Article 2(2) [GAT/IFR], with an individual certificate of airworthiness first issued on or after 7 June 1995, are equipped with serviceable secondary surveillance radar transponders that comply with the following conditions:*

*(i) they have the capabilities set out in Parts A, B and C of Annex II [Mode S EHS and ADS-B OUT];*

*(ii) they have the continuity sufficient to avoid presenting an operational risk.*

*3. Member States shall communicate to the Commission by 1 January 2019 at the latest the list of State aircraft that cannot be equipped with secondary surveillance radar transponders that comply with the requirements set out in Part A of Annex II (Mode S ELS), together with the justification for non-equipage.*

*Member States shall communicate to the Commission by 1 January 2019 at the latest the list of transport-type State aircraft with a maximum certified take-off mass exceeding 5 700 kg or having a maximum cruising true airspeed capability greater than 250 knots, that cannot be equipped with secondary surveillance radar transponders that comply with the requirements set out in Part B and Part C of Annex II (Mode S EHS and ADS-B Out), together with the justification for non- equipage.*

*The justification for non-equipage shall be one of the following:*

*(a) compelling technical reasons;*

*(b) State aircraft operating in accordance with Article 2(2) that will be out of operational service by 1 January 2024 at the latest;*

*(c) procurement constraints.*

*4. Where State aircraft cannot be equipped with secondary surveillance radar transponders as specified by paragraphs 1 or 2 for the reason set out in point (c) of paragraph 3 Member States shall include in the justification their procurement plans regarding these aircraft.*

Paragraph 5 of article 8 states also that Air Traffic Service Providers shall ensure that the State aircraft identified in paragraph 3 can be accommodated, provided that they can be safely handled within the capacity of the air traffic management system.

Paragraph 6 of the same article states: "*Member States shall publish the procedures for the handling of State aircraft which are not equipped in accordance with paragraphs 1 or 2 in national aeronautical information publications*".

Paragraph 7 prescribes that, on an annual basis, ATS providers have to communicate to the Member State that has designated them, their plans for the handling of non-equipped State aircraft. These plans shall take into account associated capacity limits of the ATM system.

A new paragraph 8 was inserted with the following text: *For State aircraft where the capability of the transponders to comply with the requirements of paragraphs 1 and 2 is temporarily inoperative, Member States shall be entitled to allow the operation of that aircraft in the Single European Sky airspace for a maximum of 3 consecutive days*.

Article 14a (Flight Plans) was inserted by the latest amendment:

*Operators of non-equipped State aircraft communicated as per Article 8(3) and operators of aircraft not equipped in accordance with Article 5(5) operating within the Single European Sky airspace, shall include the indicators SUR/EUADSBX or SUR/EUEHSX or SUR/EUELSX or a combination thereof, in Item 18 of the flight plan.*

Mode S equipage is also satisfying the Aircraft Identification (ACID) requirements stipulated in Regulation 1206/2011 (ACID IR) [Ref 52], laying down the requirements on aircraft identification for surveillance in order to ensure the unambiguous and continuous individual identification of aircraft within EATMN. Mode S transponders also give a fundamental basis for subsequent ADS-B Out capability as this technique relies on the Mode S 1090 MHz Extended Squitter data link.

The ACID IR was also amended by Regulation (EU) 2020/587 of 29 April 2020. Its Annex II was amended to add to the conditions for not assigning a conspicuity code in the case when "State aircraft are engaged on nationally sensitive operations or training that require security and confidentiality".

State aircraft from non-EU States are not covered by the requirements to equip in accordance with that Article 8 of the SPI IR. There is no extra territorial application of Union law.

Any legal questions related with SES regulatory provisions must be submitted to the European Commission.

In any case, Mode S and ADS-B implementation for military aircraft must be adequately coordinated with the equipage efforts in relation to military IFF, in accordance with NATO recommendations on the subject.

**[GUID-05]** If platform integration of positioning (PNT) data to support ADS-B implementation also fulfils the hardware requirements for implementing IFF Mode 5 Level 2 report capability on upgradeable Mode 5 Level 1 equipped platforms, the military units should consider both integrations at the same time.

The Downlink Format (DF) 19 supports the broadcast of extended squitter ADS-B messages in support of military applications.

The document "NATO/EUROCONTROL Guidelines for the Assessment of Mode 5 Frequency Supportability" [RD 43] provides non-binding technical guidance to civil and military entities involved in the assessment of frequency supportability in order to ensure that the implementation of IFF Mode 5 does not impact Mode S operations.

The airborne surveillance requirements regarding the new separation modes for aircraft operating in a mixed mode environment for the longer term, will be required to sustain both

business and mission trajectory for multiple aircraft types in accordance with agreed concepts. Applications have not yet been standardised for that purpose.

Other surveillance requirements impacting military are ACAS, Wake Vortex, EGPWS/TAWS where the military are expected to consider voluntary equipage at least for transport-type State aircraft flying recurrently GAT.

**Surveillance Data Sharing and Distribution**

As stated before, surveillance is provided using a mix of different surveillance techniques. This requires an appropriate function to provide a seamless interface between the surveillance system and the end user (controller and tools). Current mechanisms such as data fusion or multi-sensor trackers will need to be adapted.

Once the surveillance data from various sources has been merged, ATC will generally be unaware of the source of the surveillance data. The data presented should be considered by ATC to be fit-for-purpose with the systems integrity monitoring being used to filter out erroneous data.

Surveillance Data Processing and Distribution Systems (SDPDS), based on server technology, are widely implemented in ECAC. The SDPDS is capable of using multi-sensor position information from SSR (Mode-S) and ADS-B. Where required, the SDPDS uses Airborne Derived Data/Downlink Aircraft Parameters (ADD/DAP) to improve track quality and also distributes ADD with the track message. Surveillance data is used to support ATM applications, including operational tools like ground-based safety nets, automatic flight conformance monitoring, continuous descent approach and continuous climb departure.

Modern ATC systems rely on surveillance information provided by the different surveillance sources and provide a picture of the actual traffic situation. Surveillance data processing, distribution and sharing encompasses the following functions:

- Multi Sensor Tracking
    - Generating and keeping correlated tracks up-to-date by merging surveillance sensors (SSR, PSR, ADS/B, Multilateration).
    - Providing ATS units with a real-time air traffic situation picture resulting from the system tracks.
- Distributing air surveillance data to external clients such as Air Defence organisations.

Communication networks such as RADNET/SURNET and the Surveillance Data Distribution System (SDDS) are enablers supporting surveillance data sharing.

Surveillance data sharing between civil and military organisations and internationally across borders using communications and specific surveillance networks is expected to grow widely to ensure that all information exchange requirements can be satisfied with rationalised infrastructures. The emergence of distributed IP networks and concepts like SDDS and SDPDS will facilitate enhanced data distribution.

CNS rationalisation will lead to network optimisation, following the implementation of new functionalities and/or technologies that support higher performance and efficiency (in terms of cost, spectrum, etc.). Cost efficiency gains are expected due to the rationalisation of the existing infrastructures. Military infrastructure and systems can also contribute to CNS

rationalisation, leading to a more resilient and seamless European ATM Network and introducing economies of scale. In addition, CNS rationalisation will support the long-term availability of suitable radio spectrum.

Particular areas of future CNS rationalisation may comprise not only the reduction of Mode 3 A/C radars but also retention potential future replacement of primary surveillance radar (PSR) by multistatic PSR in the long term. Equipage with Mode S and ADS-B capabilities, consideration of wide area multilateration (WAM), safety and weather systems and improved surveillance data-sharing are other areas that may contribute to Surveillance rationalisation.

**[GUID-06]** The military units should contribute to the overall rationalisation objectives of the surveillance infrastructure.

Military adherence to data-sharing networks varies considerably depending on the State considered. Local bilateral connectivity installations will remain in some places, to cope with specific requirements.

## 2.4.2 IE Table – Surveillance Data

**<u>Important note:</u> the table below may evolve in accordance with the future releases of services, products or systems implementing the information exchanges.**

| Identifier | Information Exchange identifier | Information Element Description | | | | | Producer | | Consumer | | Interface Quality of Service | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Interface Name | Content | Scope | Temporality | Language or Format | Sending Operational Unit | Sending Technical System | Receiving Operational Unit | Receiving Technical System | Availibilty | Reliability | Data Integrity |
| SU-01 | AX-01 | SUR Plot and Track | Plots/tracks for aircraft identification/use in ACC SDPS and air situation picture (including for correlation) | ASTERIX | Real Time | ASTERIX civil-military categories | Civil ANSP | IP PENS RADNET[2] SDDS | Military ATC / command and control C2 | IP PENS RADNET SDDS | 24 hours every day | Part of LOA with SURV Service Provider | |
| SU-02 | AX-02 | ASTERIX messages | Monoradar Target, Monoradar Service, Service Msgs, Target Report, System Track Data and Flight Plan – MADAP | ASTERIX | Real Time | ASTERIX categories Cat 001, Cat 002, Cat 034, Cat 048, Cat 062 | Civil ANSP | IP PENS RADNET SDDS | Military ATC / command and control C2 | IP PENS RADNET SDDS | 24 hours every day | Part of LOA with SURV Service Provider | |
| SU-03 | AX-03 | OAT Plot and Track | Only if military radars comply with ATM requirements. | ASTERIX | Real Time | ASTERIX all categories | Military ATC / command and control C2 | IP PENS RADNET SDDS | Civil ANSP | IP PENS RADNET SDDS | 24 hours every day | Part of LOA with SURV Service Provider | |

[2] This specific network is only relevant for Germany/Benelux. Other countries have different infrastructure

## 2.5 Air-Ground IEs

### 2.5.1 Military as Provider/Consumer

Presently, the interaction between military aircraft and civil ground ATC infrastructure and units comprises air-ground VHF/UHF voice for ATC purposes, surveillance parameters (Mode 3/A, S and ADS-B Out) to enable the tracking of flights and, in few cases for transport type State aircraft, controller pilot data link communications (CPDLC) for ATC routine clearances. Initial 4D trajectory management, relying on ADS-C, starts to be implemented within the framework of PCP [RD 2] ATM Functionality 6 for the air-ground exchange of Extended Projected Profile (EPP) messages (time constraints).

The data and voice to be shared are defined at section 2.5.2 IE Table – Air Ground.

#### 2.5.1.1 Air-Ground Requirements

**Generic Aircraft Requirements**

Flight Management:

This functional block encompasses both the in-flight and the surface portions of the trajectory.

Management of the in-flight portion of the trajectory establishes the trajectory on the basis of defined points and structures in a navigation database established from formally published aeronautical information. It can be Lateral (2D), Vertical (3D), and Time (4D) and it provides the main guidance control orders to maintain the trajectory (the 2 latter involve speed guidance as well), depending on the aircraft functionality implemented. Other Flight Management functions are aircraft performance, predictions, and optimisations.

In a military aircraft, the Flight Management Function, when existing, can be implemented either in an FMS (Flight Management System) or be part of an MMS (Mission Management System), which performs also military-specific functions (e.g. threat assessment, weapon delivery, etc.).

The surface portion of the trajectory is currently controlled by pilots on the basis of digital airport maps.

Flight Guidance:

This corresponds to the control of the aircraft along its trajectory and it encompasses several modes from highly automated to lowly automated.

The flight control function is not shown here as it is not significant for ATM.

Positioning:

This represents the aircraft system elaboration of its evolving 4 dimensional position. It is a key low level function to both of the above functions and to ATM. It requires external or aircraft local infrastructure for positioning information (space-based Navaids Infrastructure, ground-based Navaids, and inertial systems). Military aircraft may use specific navigation systems (e.g. Governmental GNSS elements or TACAN) to achieve the positioning function.

Traffic:

This encompasses 3 different aspects of traffic surveillance.

- Firstly ATC surveillance, where through a surveillance infrastructure ATC independently establishes the aircraft situation with transponder signals and/or with aircraft derived information.
- Secondly, airborne traffic situation awareness ATSAW , which relies on the reception of aircraft-aircraft broadcast data (ADS-B out and in). In the "As-Is" situation, military aircraft are not equipped with ATSAW. The equivalent military systems based on tactical data links or on-board sensors are not certified for ATM usage.
- Thirdly, airborne collision avoidance ACAS, which provides advisories and resolution manoeuvres as last resort safety net (in the case of a traffic separation failure e.g. undetected or incorrect flight manoeuvre or deviation).

Weather:

Weather information and hazards detection are autonomous aircraft functions for short term awareness related to hazardous weather / hazardous atmospheric conditions detection.

Terrain:

This functional block encompasses terrain awareness and avoidance resolutions to avoid terrain encounters. It is a safety net in case of an incorrect flight manoeuvre or deviation when in proximity with terrain (mostly in certain approach conditions). It should be noted that ATM navigation services and trajectories are designed associated with a navigation performance and protected from terrain through structured routes and altitude minima.

Air-ground Datalink:

This represents the widely recognised term used in standards and requirements for the aircraft function. It represents the point-to-point datalink services, for ATC to Aircraft transactions (e.g. Context Management, Clearances, Traffic and Flight / Airport / Weather information), for Airline/AOC to Aircraft transactions, and mobile data exchange applications and data protocol mechanisms. In the "As-Is" situation, most military aircraft do not use the CPDLC application and vice-versa transactions (except recent transport-type aircraft).

Broadcast Data:

This represents the basic support for Aircraft to Aircraft, or Aircraft to Ground non-solicited aircraft data broadcasted – this is the ADS-B function. The current baseline is supported by the Mode S transponder 1090 ES (extended squitter). The name was changed from the Definition Phase to better reflect its non-solicited broadcast nature.

Voice:

Voice mobile communications (which is of 2 basic types: short-range/continental, long-range/remote-oceanic).

Note: The Communication Functional blocks concern mobile communications. Two aspects are implicitly included in each function – the actual application support to automated transactions, and the information support for the data exchange mechanisms. Information

exchange support is a key low level function to ATM, and which requires external mobile radio communication infrastructures.

Note: Other Functions, required in aircraft, but not explicitly represented on the sub-view diagram are recording of voice & datalink communications, and flight data recording, as these are not operationally used in ATM transactions, but for post-flight / distress / post-mortem analysis, as is emergency / distress localisation and communications.

Note: The update of the databases is performed periodically based on data from the AIP. This requires an interface that is not represented here.

**Trajectory Requirements**

The specific aircraft CNS technical enablers deemed required to support the Mission Trajectory concept include airborne capabilities to meet time constraints and to support trajectory management functions. New separation modes take advantage of trajectory sharing between air and ground and enhanced vertical and longitudinal navigational capabilities.

State aircraft operating within Business/Mission Trajectory structures needs to cope with separation modes. These will entail the availability of capabilities like ADS-B, Performance Based Navigation and flight guidance/flight control.

The following paragraphs summarise the air-ground requirements impacting military aircraft.

**[GUID-07]** The military aircraft shall be compliant with applicable requirements of SES regulations including:

- VHF 8.33 kHz channel spacing radios for all aircraft types (maintaining UHF provision and transition arrangements), as defined in documents [RD 30][RD 31][RD 32][RD 33],
- Mode S ELS (Elementary Surveillance) for all State aircraft types, as defined in documents [RD 41][RD 21][RD 39],
- Mode S EHS (Enhanced Surveillance) and ADS-B Out for transport type State aircraft, as defined in documents [RD 41][RD 21][RD 40],
- RVSM[3], as defined in document [RD 36].

**[GUID-08]** The military aircraft should be compliant with:

- Data Link Services using VHF Mode2 comprising CM and CPDLC applications for new transport type State aircraft, as defined in document [RD 27],
- TCAS (v 7.1), as defined in documents [RD 42],
- FM Immunity, as defined in documents JAA Temporary Guidance Leaflet (TGL) Nr 7 and Nr 16 where it is stated that compliance with the standards for immunity against interference from FM radio broadcast stations.

[3] There is no exemption for State aircraft to operate as GAT within RVSM airspace with a 1000 ft vertical separation minimum without an RVSM approval. The absence of such approval does not mean that State aircraft cannot access RVSM-designated airspace, but it does require a separation of 2000 ft to be observed and a separate flight plan to be filed.

## 2.5.2 IE Table – Air-Ground

**<u>Important note:</u> the table below may evolve in accordance with the future releases of services, products or systems implementing the information exchanges.**

| Identifier | Information Exchange identifier | Information Element Description | | | | Producer | | Consumer | | Interface Quality of Service | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Interface Name | Content | Scope | Format | Sending Operational Unit | Sending Technical System | Receiving Operational Unit | Receiving Technical System | Communications Class of Service | Applicable Technical Standards | Integrity, Availability |
| AG-01 | AGV-01 | A/G VHF Voice (25 kHz or 8.33 kHz) | Air-Ground ATC voice COM between pilot and ATCO | Continental airspace<br>(ICAO EUR region) | Phraseology as in ICAO PANS-ATM (Chapter 12) | Pilot / ATCO | VHF Radio | Pilot / ATCO | VHF Radio | ICAO Annex 10, volume III, Part 2 (Second Edition — July 2007 incorporating Amendment No 85) Chapter 2 'Aeronautical Mobile Service' | ICAO Annex 10, Volume 3, Part 2<br>ETSO-2C37e, ETSO-2C38e or ETSO-2C169a<br>EUROCAE ED 23B/23C | Integrity: commensurate with a 'major' failure condition.<br>*Continuity:* qualitative probability of 'remote'. |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AG-02 | CPDLC-01 | CPDLC ATS services | CPDLC messages/applications: DLIC, ACM, ACL, AMC as defined in IR 29/2009 | Continental airspace (en-route) above FL 285 as per Reg. 29/2009 | EUROCAE ED-110B<br>ETSI standard EN 303 214 | Pilot / ATCO | **ATN/V DL-2** | Pilot / ATCO | **ATN/V DL-2** | **RCP130, 240 specification. Nominal transaction time is stated as 95% transaction time (TT95%).** | ICAO Annex 10<br>ICAO Doc 9705 (ATN-B1)<br>ICAO Global Operational Data Link (GOLD) Manual document 10037<br>EASA AMC 20-11<br>EUROCAE ED-110B / ED-120C3 /ED 228°<br>EASA A-CNS | Integrity: commensurate with a 'major' failure condition (1E-5 per FH).<br>Continuity: designed to an allowable qualitative probability of 'probable'. |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AG-03 | CPDLC-02 | CPDLC CM Service Messages | Context Management messages | Continental airspace (en-route) above FL 285 as per Reg. 29/2009<br><br>CPDLC considered for NAT airspace in accordance with ICAO doc. 7030 Supp. | EUROCAE ED-110B<br><br>ETSI standard EN 303 214 | Pilot / ATCO | ATN/V DL-2 | Pilot / ATCO | **ATN/V DL-2** | **RCP130 specification. Nominal transaction time is stated as 95% transaction time (TT95%).** | ICAO Annex 10<br><br>ICAO Global Operational Data Link (GOLD) Manual document 10037<br><br>ICAO Doc 9705 (ATN-B1)<br><br>EASA AMC 20-11<br><br>EUROCAE ED-110B / ED-120C3 / ED-228A<br><br>EASA A-CNS | Integrity: commensurate with a 'major' failure condition (1E-5 per FH).<br><br>Continuity: designed to an allowable qualitative probability of 'probable'. |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AG-04 | ADS C-01 | ADS-C Contract, Requests and Reports (Extended Projected Profile) | Air-ground exchanges related with trajectory management/negotiation | Continental airspace | EUROCAE<br>ED-228A | Aircraft / Civil/Military ATC Unit | ATN/VDL-2, SATCOM or HFDL | Civil/Military ATC Unit / Aircraft | VDL-2 or FANS | RSP160 For ADS-C transactions, the nominal transaction time is stated as surveillance nominal Delivery Time (DT95%). | ICAO Annex 10<br>ICAO Global Operational Data Link (GOLD) Manual document 10037<br>EUROCAE ED228A / ED229 | Integrity: 1E-5 per FH<br>Continuity: 0.95 (DT 95%)<br>Availability: 0.989 |
| AG-05 | NAV-01 | Navigation Data<br>[to be detailed in a future iteration] | Navigation related data (e.g. GNSS) | | Depends on navigation requirements | NAV Infrastruct. / Aircraft | NAV AVX / NAVAIDS | Aircraft / NAV Infrastruct. | NAV AVX / NAVAIDS | Depends on navigation | | |
| AG-06 | SUR-01 | Surveillance Data<br>[Actual ASTERIX formats] | Surveillance related data / contract SSR Mode 3/A, Mode S, ADS-B, WAM, SUR data sharing) | | Depends on requirement (ICAO Annex 10) | SUR Infrastr. / Aircraft | SSR Mode 3/A, Mode S, ADS-B, WAM, SUR data sharing | Aircraft / SUR Infrastr. | SSR Mode 3/A, Mode S, ADS-B, WAM, SUR data sharing | Depends on requirement (ICAO Annex 10, SPI IR, etc.) | | |

# 3 Information Exchange Requirement Attributes and QoS

## 3.1 Flight Message Transfer Protocol (FMTP)

The Single European Sky (SES) Flight Message Transfer Protocol (FMTP) Implementing Rule was published as EC Regulation No. 633/2007 of 07/06/2007 [RD 24] and further amended by Commission Regulation (EU) No. 283/2011 [RD 25].

This regulation is supported by EUROCONTROL Specification of Interoperability and Performance Requirements for the Flight Message Transfer Protocol (FMTP) [RD 26] recognised as Community Specifications and a means of compliance to the FMTP Implementing Rule.

Article 1 of EC Regulation No. 633/2007 states: "*This regulation shall apply to communication systems supporting the coordination procedures between air traffic services units and controlling military units, using a peer-to-peer communication mechanism*."

Where justified by local requirements, the EUROCONTROL Roadmap on Enhanced Civil-Military CNS Interoperability and Technology Convergence [RD 1], recommends military organisations to implement FMTP for the exchange of inter-centre coordination and transfer and notification messages for the links with civil ATC centres supporting civil-military coordination, migrating from X.25 to IP in line with civil actions. As the transition period from FDE ICD Part 1 to FMTP has not fully completed, EUROCONTROL continues to provide support to stakeholders making use of the FDE ICD Part 1. EUROCONTROL Inter Centre Test Tool (ETIC) is a test tool available for technical staff to verify their implementations of the FMTP and the former FDE ICD Part 1 protocols.

The EUROCONTROL FMTP database is a means for stakeholders to share and have better visibility of the implementation status of the Flight Message Transfer Protocol. Within the database each ATC unit that implements FMTP is represented as single entity with a description of contact points, technical capabilities, supported OLDI messages and communication links with peers. However, a recent database focused on OLDI message implementation is being put into service to better capture operational evolutions.

The role of the Network Manager in this respect is to continue managing and developing the FMTP online database and provide ICAO EUR/NAT Regional Office (Paris) and other entities with appropriate Reports.

**[GUID-09]** The military units shall implement the EUROCONTROL FMTP Specification [RD 26] when subject to the FMTP as defined in Regulation (EC) No 633/2007 of 07 June 2007 [RD 24], or when replacing former FDE ICD Part 1 (X.25) connections, or when establishing new connections with civil ANSPs, to exchange notification, coordination or transfer messages.

## 3.2 New PENS Performance (QoS) requirements

**[GUID-10]** The military units should consider IP based infrastructure like PENS/NewPENS incl. addressing network security aspects to support their ground-to-ground information exchanges.

In the context of ICAO ATN/IPS (Doc 9896), QoS encompasses the capability of a network to provide prioritized communications services in a quantifiable manner for defined network traffic

classes [note: traffic at the class level is classified by the Class of Services (CoS)], over various underlying communication technologies, in accordance with stakeholder needs. Relevant metrics for QoS include:

- Service Availability – Reliability of users' connection to the network (Availability and reliability are not the same),
- Delay – time taken by a packet to traverse the network from end to end (from one identified point to another identified point, not necessarily with the whole network in between),
- Delay jitter – Variation of delay encountered by similar packets following the same route through the network (jitter definition does not imply the same route),
- Throughput – Rate at which packets go through the network,
- Packet Loss Rate – Rate at which packets are dropped, lost, or become corrupted while going through the network.

Class of Service (CoS): In an enterprise network, CoS differentiates high-priority traffic from lower-priority traffic. Tags may be added to the packets to identify such classes, but they do not guarantee delivery as do QoS functions, which are implemented in the network devices.

QoS vs. CoS: QoS is often used in conjunction with Class of Service. The shortest definition of CoS would be "a grouping". CoS defines groups of traffic with a specific type of service, QoS manages this type of service and assures that it is delivered. Similar types of data such as Voice, Live Video, or streaming video and large file transfer can be grouped together in a service class and treated with a same level of service priority.

Traffic Class (TC): Refers to an aggregation of data flows which are given similar service within a switched network.

In reference to QoS performance values described in the IETF RFCs referenced by ICAO document 9896 (ATN/IPS), the following QoS targets were inferred.

Applications like FMTP, AMHS, LARA, Radar and VoIP determine the required performance requirements and therefore dictate how the network should be deployed. Such applications depend on various parameters like Unicast and Multicast, IPv4 and IPv6 protocols, Port Connectivity, NTP synchronisation, Real Time performance, TCP and UDP Performances, etc. The obtained results in terms of Average Delay (ms), Jitter (ms), average bitrate (Kbps), Packets dropped (%) shall be used to compare with defined requirements for the specific application considered.

FMTP

Mission Criticality: medium

Application Type: a) Point-to-point over TCP/IP; b) Voice backup (Real-time Class of Service A); c) TCP port number 8500

Application message integrity: a) 1 in 2000; b) TCP retransmissions acceptable

Typical Message length: a) 150 bytes

Jitter: a) Insensitive

Network response time (NRT) for typical message length: a) less than 2 seconds

Bandwidth: a) 10kbps guaranteed per point-to-point

SURVEILLANCE DATA (RADAR)

Mission Criticality: a) high

Application Type: a) Point-to-point over TCP and UDP; b) Point-to-multipoint (multicast) over UDP; c) TCP/UDP port number 8600

Application message integrity: a) To be defined in a future release; b) TCP retransmissions should be avoided

Typical Message length: a) 256 bytes

Jitter: a) insensitive

Network response time (NRT) for typical message length: a) 200 milliseconds

Bandwidth: a) 10-30kbps per radar; b) will expand up to 64kbps per connection for:

i) Mode S (more information)

ii) primary radar (possibly more targets)

iii) system track exchange (more info)

AMHS

Mission Criticality: a) Low

Application Type: a) Point-to-point over TCP/IP; b) Store and forward service; c) TCP port number 102

Application message integrity: a) Less than $10^{-6}$ in terms of 1.000 octets message blocks

Typical Message length: a) 3 kbytes

Jitter: a) insensitive

Network response time (NRT) for typical message length: a) less than 10 seconds

Bandwidth: Currently approx. 20 kbps per point-to-point (except NMOC)

VoIP

Mission Criticality: a) Critical;

Application Type: a) Point-to-point over UDP; b) UDP port number 5060

Application message integrity: a) No retransmissions on UDP

Typical Message length: a) RTP-stream. Typical packet length for one channel: 160 bytes (payload only)

Network response time for typical message length: a) Acceptable latency (without jitter): 50ms

Jitter: a) Sensitive: 15 ms

Bandwidth: a) Net bandwidth 64kbps per channel with G.711, full-duplex: 190kbps; b) Acceptable Packet Loss rate: 0.5%

Bandwidth requirements for VoIP may vary depending on the selected test cases. To complete tests cases on either telephony or radio communication a minimum of 1 Mb/s is required. For combined radio and telephony tests, the requirements may grow up to 2Mb/s.

QoS and performance requirements for VoIP are defined in the EUROCAE WG67 EDs.

NMOC

Mission Criticality: For CHMI, Entry Node (AN3-DCS) and Web Services: high; Low for other type of traffic.

Application Type: a) Point-to-point over TCP/IP and UDP/IP; b) Point-to-multipoint (broadcast) over TCP/IP c) TCP/UDP port numbers: 80 (HTTP), 443 (HTTPS), 25 (SMTP), 161-162 (SNMP), DNS, NTP (123), 5004-5005 (RTP-SRTP), 10443, 10444, 20002, 20004

Application message integrity: a) No information

Typical Message length: a) No information. It's a highly heterogeneous traffic.

Jitter: a) For Voice over IP < 20 ms; b) Insensitive for other traffic.

Network response time (NRT) for typical message length:

a) For CHMI (NRT for transactions):

   <4 sec 95%

   <3.5 sec 80%

   <3 sec 70%

b) For Portal CIA (NRT for transactions):

   <4 sec 95%

   <3.5 sec 75%

   <3 sec 50%

   <150 msec for VoIP

Bandwidth:

a) For VoIP: 80 Kb per channel

b) Not information for other kinds of traffic: 1 Mbps per location needed.

EAD

Mission Criticality: a) No information

Application Type: a) Point-to-point over TCP/IP and UDP/IP; b) TCP/UDP port numbers: 1293 (Traffic tunnelled over IPsec)

Application message integrity: a) No information

Typical Message length: a) No information.

Jitter: a) Insensitive

Network response time (NRT) for typical message length: a) No information

Bandwidth: a) Highly bursty and asymmetric.

LARA

Mission Criticality: a) Critical

Application Type: The overall LARA technical architecture is based on the distributed client/server concept using modern JAVA technology and advanced Relational Data Base Management System (RDBMS). The LARA system is mainly composed of:

- The LARA Server (LS) that will host the LARA Data Base Management System (POSTGRES RDBMS) and related LARA applications. The LARA server will make use of the JAVA RMI. This API is implemented on top of the SSL/TCP session. Both IPv4 and IPv6 internet protocols can be supported.
- The LARA Working Position (LWP), a simple desktop or laptop PC that allows the user to access the LARA services. The LWP must have a JAVA runtime environment and must support the same communication protocols as the LS.

**[GUID-11]** When connected to a civil IP communication infrastructure, the military units should adhere to the CoS/QoS performance levels of each service and assess the criticality of the data exchanges.

## 3.3 Security

The present security requirements have been defined and discussed with National Military Organisations in the sequence of EUROCONTROL civil-military coordination activities being published in 2014 as a deliverable of the NATO-EUROCONTROL Security Coordination group (NEASCOG). They are included here for informative purposes without defining its applicability to any particular IEs.

**[GUID-12]** The military units should comply with the security measures defined in EUROCONTROL (NEASCOG)N(2014)0005 Initial Military Security Requirements for Centralised Services of 3 June 2014 [RD 45] when their systems exchange ATM information and data with civilian systems.

**Military Data Classification**

Military ATM data is by default non-classified, i.e. not subject to the military official security regime for Information Security.

However, there could be possible exemptions, if required by national policies. The national ATM security system has to cope with these exemptions; but they will stay at national level with no impact at ATM network level.

"Non-classified" does not mean releasable or accessible without restriction. Part of the information might be sensitive, and therefore must be protected with the appropriate level of measures. Protection refers to the 3 CIA requirements (Confidentiality, Integrity and Availability).

**Sensitivity levels**

Military ATM data may have 2 profiles from the security point of view:

- Sensitive (e.g. data provided by the military to ATM which contains aspects related with military operations, performance or assets): information with disclosure restricted to members of the ATM information exchange and people within their organisations (whether direct employees, consultants, contractors or outsourced staff working for the organisation) who need to know in order to take action.

- Non-sensitive (other data): normal ATM business information that may be shared with peers and partner organisations but it is not intended to be posted on the Web, published or broadcasted.

**Security requirements of military data provided to the ATM context**

Confidentiality and Integrity of military data provided by military users as input to the ATM context must be ensured. Military data provided to the ATM context (including non-sensitive) cannot be shared, distributed or disclosed without explicit consent of the owner. The ATM provider must ensure the security of military data it receives or produces or otherwise employs, so that access to it is restricted only to those authorised.

The 'need to know' principle shall be strictly followed. When providing data for ATM, the military will indicate:

- Sensitivity level of the information,

- Authorised recipients of the information.

Access control shall be exclusively granted on this 'need to know' basis, and reviewed on regular basis (at least once a year) by the military data owner.

Access to military data shall be enforced by unique authentication and strong passwords and encryption where applicable. Accounting, traceability, non-repudiation and liability shall be enabled.

**Digital storage**

Military sensitive data can be stored in data bases used by civil ATM, without encryption, provided that the access control described above is enabled

Military sensitive data shall not be stored in laptops, Portable Storage Devices, External / cloud storage, Bring your own device (BYOD), etc.

Ensuring Integrity of military data means safeguarding the data against improper information modification or destruction, and includes ensuring information non-repudiation and authenticity.

Non-sensitive military ATM data can be stored in data bases and portable means with no need for encryption (but with appropriate access control measures). Integrity of this data must also be ensured.

**Transmission of data**

When transmitting military data the following requirements must be ensured:

- Confidentiality,
- Availability,
- Integrity.

The Confidentiality requirement will allow for:

- Transmission of non-sensitive data through internet with authentication and PKI asymmetric encryption, and B2B, B2C services,
- Transmission of sensitive data with authentication and PKI asymmetric encryption through PENS or VPN.

**Access Control and Identity Management**

Access control and identity management should be exercised in the framework of established ATM functions. Those shall take due account of already existing national and military security network certificates arrangements and investigate possible designation of trusted certification authorities and cross-certificate mechanisms.

**Governance**

Complex interdependent systems like ATM networks require both a central authority and management and distributed (States) local authority and responsibility, e.g. accreditations, audits.

Already agreed national and international standards (e.g. ISO/IEC 27001) for protection of information and systems should apply at the maximum possible extent. This will facilitate: acceptance by appropriate authorities and military; Implementation of security controls; Governance and oversight.

The States and Military must be involved in the governance arrangements of the ATM services where they contribute or rely on for their State aircraft operations.

**Summary of Military Security Requirements Impacting ATM Functions**

ATM developments must offer equivalent security levels in relation with those prescribed for military for similar information management and exchange valid for the level of sensitivity under discussion, and a common security policy commensurate with the level of data sensitivity/security requirements and aligned with national Military security policy.

Security services offered by civil ATM are expected to cover a significant part of military security requirements. If military identify additional requirements they must be expressed in time to be considered or it will be only adopted at a later stage.

The Military shall be involved in incident and change management for civil ATM structures.

The compliance of ATM implementations with security requirements (including the ones coming from military needs, if any) shall be assessed before entry in operation.

ATM deployment must run a complementary complete Security Risk Assessment, commensurate with the level of data sensitivity/security requirements, under adequate supervision and to propose Security Risk Mitigations within the development phase. These mitigations will be implemented before the ATM function is put in operation.

During operations, the ATM operators shall put in place a security management system (SeMS), commensurate with the level of data sensitivity/security requirements, or will make sure that their security systems address the ATM operations. In particular, the analysis of emerging security threats shall be performed.

Personnel security clearances are a constituent of SeMS. Personnel security provisions shall be included in the CS Operator SeMS. When required, ATM operators shall have in place arrangement on security clearances for their personnel agreed by authorities of Member States.

Confidentiality and Integrity of military sensitive data shall be ensured. Military sensitive data provided to civil ATM cannot be shared, distributed or disclosed without explicit consent of the owner. The ATM provider shall ensure the security of military data it receives or produces or otherwise employs, so that access to it is restricted only to those authorised.

Access control shall be exclusively granted on ‘need to know’ basis, and reviewed on regular basis (at least once a year) by the military data owner.

Access to military sensitive data shall be enforced by unique authentication and strong passwords. Accounting, traceability, non-repudiation and liability shall be enabled.

Data Access rights to military data sets shall be associated with specific data access and usage conditions via security and clearance and Non-Disclosure Agreements.

Military sensitive data can be stored in data bases used by civil ATM, without encryption, provided that the access control described above is enabled.

Military sensitive data shall not be stored in laptops, Portable Storage Devices, External/cloud storage, Bring your own device (BYOD), etc.

Military data shall be guarded against improper information modification or destruction. This includes ensuring information non-repudiation and authenticity.

Non-sensitive military ATM data can be stored in data bases and portable means with no need for encryption. However, access control shall be also granted on a “need to know” basis and reviewed on regular basis (at least once a year) by the military data owner.

The data provided by civil ATM to the Military shall meet security requirements for Integrity and Availability.

Transmission of Military non-sensitive data through internet without authentication and encryption, and B2B, B2C services is allowed.

Transmission of sensitive data with authentication and encryption through PENS or VPN is allowed if all security measures have been adhered to.

Contingency measures must be envisaged to ensure the continuity of the ATM service in the case of events which result in significant degradation or interruption of its operations.

ATM shall take due account of already existing national and military security certificates arrangements and investigate possible designation of trusted certification authority and cross-certificate mechanisms.

States and Military shall be involved in the governance arrangements of the ATM implementations where they contribute or rely on for their State aircraft operations.

The following table summarises the security requirements applicable to ATM data.

| Data provided by MIL | Sensitive | Non-sensitive | ATM Security considered enough | Additional security required | Remarks |
|---|---|---|---|---|---|
| Normal GAT FPL (or mixed OAT/GAT) submitted to IFPS | | X | X | | This service is already in operation |
| "Extended" GAT FPL submitted to IFPS in relation with state aircraft GAT flights (or mixed OAT/GAT) | | X | X | | Data provided currently to IFPS include military flight plans for flights under GAT or mixed OAT/GAT. "Extended" implies future provision of additional 4D data |
| SUR plot and track data (ASTERIX) (only if military radars comply with ATM requirements) | | X | X | | This service is already in operation locally |
| Inclusion of OAT track sources may be envisaged if military organisations agree | X | | X | Not in principle, assuming that security measures implemented by civil meet security requirements for military sensitive data (Confidentiality and Integrity) | |
| Airspace data related with long term planning, pre-tactical and tactical reservation planning; CDM; airspace booking information | | X | X | | |
| Real status and utilisation of airspace | X | | X | | This data might be considered sensitive in some States (TBC) |
| Military AIS data provided to EAD | | X | X | | This service is already in operation for AIP data |
| Military information to support coordination of surveillance codes | | X | X | | This service is already in operation |
| Military information to support Mode S Interrogator Code Allocation | | X | X | | This service is already in operation |
| Military information to support Radio Frequency Function | | X | X | | This service is already in operation |
| Military information to support European Messaging Directory Service | | X | X | | This service is already in operation |
| Military information to support | | X | X | | This service is already in operation |

| | | | | | |
|---|---|---|---|---|---|
| European IPS Repository | | | | | |
| Military information to support centralised directory and certificate services | X | | X | | Possible cross-certificate exchanges; security certificates and encryption keys provided through PKI mechanisms |
| Military information to support Operation and Coordination of Network Security | X | | X | Not in principle, assuming that security measures from CS6-7 meet security requirements(Confidentiality and Integrity) for military sensitive data | |
| Military information supporting coordination, monitoring and anomaly resolution of Data-link communication, navigation avionics, Surveillance avionics, TCAS and RVSM | X | | X | | This service is already in operation<br>Some details might be sensible and require an appropriate level of safeguard |
| Military information supporting coordination, monitoring and anomaly resolution of 1030/1090 RF bands | X | | X | | This service is already in operation. Information related with transponder anomalies are exchanged with military organisations.<br>Some details might be sensible and require an appropriate level of safeguard |
| Military information supporting monitoring and prediction of satellite navigation (SAT-NAV) | It is difficult to determine at this stage if any sensitive data related to the military is involved | | X | | This service is not yet in operation |
| Technical network data inputs (e.g. QoS, network incident reports) concerning military subscribers (directly or through ANSP) as needed for CS#8 activities | X | | X | | PENS is an IP grade transport network not directly related with data consumption provision |
| Technical data related with the integration in the network of VDL2-equipped State aircraft operating as GAT | | X | X | | Air-ground CPDLC/Initial 4D data transport is not directly related with data consumption provision |

# 4 Summary of Guidance

The document describes the known system-related civil-military CNS information exchanges supporting Air Traffic Management (ATM). It identifies information flows between civil and military as well as the associated performance, quality of service (QoS) and security attributes.

It covers all information that is of potential interest to civil-military ATM/CNS system interoperability including trajectories / flight data, airspace management data, surveillance data, aeronautical information data, meteorological data, etc.

Measures to improve civil-military ATM/CNS system interoperability must be decided by the National Authorities or International Organisations, such as NATO, on the basis of identified Information Exchanges that are identified in the document.

The document should be considered as a guidance to support the civil-military system interoperability work to be conducted in the framework of any ATM research, development or deployment activities.

The following recommendations have been identified throughout this document:

**[GUID-01]** The military units should migrate to EAD to ensure a high level of interoperability for the aeronautical information data and the military organisations should contact the EUROCONTROL EAD team to obtain more technical information on the services, data models and technical infrastructure to support the interface with EAD products).

**[GUID-02]** The military units should implement the data sharing supporting the FUA as defined in the set of ERNIP documents [RD 4][RD 5][RD 6][RD 7] and in the EUROCONTROL Specifications for Airspace Management (ASM) Support System Requirements supporting the ASM processes at local and FAB level [RD 8][RD 9].

**[GUID-03]** The military units shall implement the appropriate flight plan format (ICAO FPL 2012) and comply with the Network Manager procedures when submitting FPLs to IFPS as defined in IFPS Users Manual [RD 10][RD 11][RD 12][RD 13].

**[GUID-04]** The military units shall implement the EUROCONTROL Specification for OLDI [RD 16] when subject to the COTR regulation [RD 14] or when exchanging flight data with civil ATSUs.

**[GUID-05]** If platform integration of positioning (PNT) data to support ADS-B implementation also fulfils the hardware requirements for implementing IFF Mode 5 Level 2 report capability on upgradeable Mode 5 Level 1 equipped platforms, the military units should consider both integrations at the same time.

**[GUID-06]** The military units should contribute to the overall rationalisation objectives of the surveillance infrastructure.

**[GUID-07]** The military aircraft shall be compliant with applicable requirements of SES regulations including:

- VHF 8.33 kHz channel spacing radios for all aircraft types (maintaining UHF provision and transition arrangements), as defined in documents [RD 30][RD 31][RD 32][RD 33],
- Mode S ELS (Elementary Surveillance) for all State aircraft types, as defined in documents [RD 41][RD 21][RD 39],
- Mode S EHS (Enhanced Surveillance) and ADS-B Out for transport type State aircraft, as defined in documents [RD 41][RD 21][RD 40],

- RVSM[4], as defined in document [RD 36].

**[GUID-08]** The military aircraft should be compliant with:

- Data Link Services using VHF Mode2 comprising CM and CPDLC applications for new transport type State aircraft, as defined in document [RD 27],
- TCAS (v 7.1), as defined in documents [RD 42],
- FM Immunity, as defined in documents JAA Temporary Guidance Leaflet (TGL) Nr 7 and Nr 16 where it is stated that compliance with the standards for immunity against interference from FM radio broadcast stations.

**[GUID-09]** The military units shall implement the EUROCONTROL FMTP Specification [RD 26] when subject to the FMTP as defined in Regulation (EC) No 633/2007 of 07 June 2007 [RD 24], or when replacing former FDE ICD Part 1 (X.25) connections, or when establishing new connections with civil ANSPs, to exchange notification, coordination or transfer messages.

**[GUID-10]** The military units should consider IP based infrastructure like PENS/NewPENS incl. addressing network security aspects to support their ground-to-ground information exchanges.

**[GUID-11]** When connected to a civil IP communication infrastructure, the military units should adhere to the CoS/QoS performance levels of each service and assess the criticality of the data exchanges.

**[GUID-12]** The military units should comply with the security measures defined in EUROCONTROL (NEASCOG)N(2014)0005 Initial Military Security Requirements for Centralised Services of 3 June 2014 [RD 45] when their systems exchange ATM information and data with civilian systems.

[4] There is no exemption for State aircraft to operate as GAT within RVSM airspace with a 1000 ft vertical separation minimum without an RVSM approval. The absence of such approval does not mean that State aircraft cannot access RVSM-designated airspace, but it does require a separation of 2000 ft to be observed and a separate flight plan to be filed.

# Annex A – Abbreviations

| Abbreviation | Description |
|---|---|
| ACC | Area Control Centre |
| AD | Air Defence |
| ADD | Aircraft Derived Data |
| ADS | Automatic Dependent Surveillance (C - Contract, B – Broadcast) |
| ADS-C EPP | ADS-C Extended Projected Profile |
| AFTN | Aeronautical Fixed Telecommunication Network |
| AFUA | Advance d Flexible Use of Airspace |
| AI | Aeronautical Information |
| AIM | Aeronautical Information Management |
| AIS | Aeronautical Information Services |
| AIXM | Aeronautical Information Exchange Model |
| AMAN | Arrival Manager |
| AMHS | Aeronautical Message Handling System |
| ANSP | Air Navigation Service Provider |
| AO | Aircraft Operator |
| AoR | Area of Responsibility |
| ASM | Airspace Management |
| ATC | Air Traffic Control |
| ATCO | Air Traffic Controller |
| ATFCM | Air Traffic Flow and Capacity Management |
| ATM | Air Traffic Management |
| ATS | Air Traffic Services |

| | |
|---|---|
| AUP | Airspace Use Plan |
| B2B | Business to Business |
| B2C | Business to Customer |
| C2 | Command and Control |
| CDM | Collaborative Decision Making |
| CM | Context Management |
| CNS | Communication Navigation Surveillance |
| COTR | Inter-centre coordination and transfer |
| CPDLC | Controller-Pilot Data Link Communications |
| DAP | Downlink Airborne Parameters |
| EAD | European AIS Data Base |
| EATMA | European ATM Architecture |
| EATMN | European ATM Network |
| ECAC | European Civil Aviation Conference |
| EUROAT | Harmonized Rules for Operational Air Traffic (OAT) under Instrument Flight Rules (IFR) inside controlled Airspace of the ECAC Area |
| FAB | Functional Airspace Block |
| FDPS | Flight Data Processing Systems |
| FF-ICE | Flight & Flow Integrated Collaborative Environment |
| FIXM | Flight Information Exchange Model |
| FOC | Flight Operations Centre |
| FMTP | Flight Message Transfer Protocol |
| FMS | Flight Management System |
| FPL | Flight Plan |
| FUA | Flexible Use of Airspace |
| GAT | General Air Traffic |
| GNSS | Global Navigation Satellite System |

| | |
|---|---|
| IE | Information Exchange |
| IFPS | Initial Flight Plan Processing System |
| HMI | Human-Machine Interface |
| HTTP | Hypertext Transfer Protocol |
| ICAO | International Civilian Aviation Organization |
| LOA | Letter of Agreement |
| NM | Network Manager |
| NMOC | Network Manager Operations Centre |
| MMS | Military Mission System (Military FMS) |
| NOP | Network Operations Portal |
| NOTAM | Notice to Airmen |
| MSSR | Monopulse Secondary Surveillance Radar |
| OAT | Operational Air Traffic |
| OATTS | Operational Air Traffic Transit Service |
| OLDI | On-Line Data Interchange |
| PBN | Performance Based Navigation |
| PCP | Pilot Common Projects |
| PENS | Pan-European Network Services |
| PSR | Primary Surveillance Radar |
| RAP | Recognised Air Picture |
| RVSM | Reduced Vertical Separation Minima |
| SDDS | Surveillance Data Distribution System |
| SDPDS | Surveillance Data Processing and Distribution System |
| SES | Single European Sky |
| SOA | Service-Oriented Architecture |
| SSR | Secondary Surveillance Radar |

| | |
|---|---|
| SWIM | System Wide Information Management |
| TACAN | Tactical Air Navigation system |
| TAD | Technical Architecture Documents |
| TCAS | Traffic Collision Avoidance System |
| TI | Technical Infrastructure |
| UHF | Ultra High Frequency |
| VHF | Very High Frequency |
| WAM | Wide-Area Multilateration |
| WOC | Wing Operations Centre |
| XML | Extensible Markup Language |
| YP | Yellow Profile |

# Annex B – Reference Material

The editions of documents contained in the list of reference materials below are valid at the date of publication of the present guidelines. In case the editions have changed at the time Military Organisations start their deployments activities, the latest versions of all EUROCONTROL publications are available on the EUROCONTROL public website.

## B.1 General

**[RD 1]** Roadmap on Enhanced Civil-Military CNS Interoperability and Technology Convergence, Edition 2.0, 17/10/2013,

**[RD 2]** Regulation (EU) No 716/2014 of 27 June 2014 on the establishment of the Pilot Common Project supporting the implementation of the European Air Traffic Management Master Plan,

**[RD 3]** COMMISSION IMPLEMENTING REGULATION (EU) 2019/123 of 24 January 2019 laying down detailed rules for the implementation of air traffic management (ATM) network functions and repealing Commission Regulation (EU) No 677/2011.

## B.2 Airspace Management

**[RD 4]** European Route Network Improvement Plan (ERNIP) - Part 1: European Airspace Design Methodology – Guidelines - 19 /11/ 2019,

**[RD 5]** European Route Network Improvement Plan (ERNIP) - Part 2: European ATS Route Network - Version 2019-2024 - 2/06/2019,

**[RD 6]** European Route Network Improvement Plan (ERNIP) - Part 3: Procedures for Airspace Management – 04/11/2019,

**[RD 7]** European Route Network Improvement Plan (ERNIP) - Part 4: RAD Users Manual – 19/11/2019,

**[RD 8]** EUROCONTROL Specification for Airspace Management (ASM) Support System Requirements supporting the ASM processes at local and FAB level - Part 1 – Ed. 1.0 - EUROCONTROL-SPEC-166 - 26/09/2017,

**[RD 9]** EUROCONTROL Specification for Airspace Management (ASM) Support System Requirements supporting the ASM processes at local and FAB level - Part 2 – Ed. 1.0 - EUROCONTROL-SPEC-179 - 13/01/2020,

## B.3 Flight

**[RD 10]** IFPS Users Manual – Ed. 24.0 – 30/06/2020,

**[RD 11]** Commission Regulation (EC) No 1033/2006 laying down the requirements on procedures for flight plans in the pre-flight phase for the single European sky,

**[RD 12]** Commission Implementing Regulation (EU) 2018/139 of 29 January 2018 amending Regulation (EC) No 1033/2006 as regards references to ICAO provisions,

**[RD 13]** EUROCONTROL Specification for the Initial Flight Plan - Ed. 1.3 Edition - EUROCONTROL-SPEC-101 - 26/02/2018,

**[RD 14]** Regulation (EC) No. 1032/2006 of 06 July 2006 laying down requirements for automatic systems for the exchange of flight data for the purpose of notification, coordination and transfer of flights between air traffic units,

**[RD 15]** Commission Regulation (EC) No 30/2009 of 16 January 2009 amending Regulation (EC) No 1032/2006 as far as the requirements for automatic systems for the exchange of flight data supporting data link services are concerned,

**[RD 16]** EUROCONTROL Specification for On-Line Data Interchange (OLDI) - Ed. 5.0 - EUROCONTROL-SPEC-106 - 14/07/2020,

## B.4 SWIM

**[RD 17]** Civil-Military Coordination Considerations for SWIM Deployment - Interoperability – 06/08/2019,

**[RD 18]** EUROCONTROL Specification for SWIM Service Description - Ed. 1.0 - EUROCONTROL-SPEC-168 - 01/12/2017,

**[RD 19]** EUROCONTROL Specification for SWIM Information Definition - Ed. 1.0 - EUROCONTROL-SPEC-169 - 01/12/2017,

**[RD 20]** EUROCONTROL Specification for SWIM Technical Infrastructure (TI) Yellow Profile - Ed. 1.1 - EUROCONTROL-SPEC-170 - 05/07/2020

## B.5 Communications

**[RD 21]** ICAO Annex 10 to the Convention on International Civil Aviation,

**[RD 22]** ICAO Document 9880 – AMHS Technical Manual,

**[RD 23]** EUROCONTROL Specification on the Air Traffic Services Message Handling System (AMHS) - Ed. 2.1 - EUROCONTROL-SPEC-136 - 06/09/2018

**[RD 24]** Regulation (EC) No 633/2007 of 07 June 2007 laying down requirements for the application of a flight message transfer protocol (FMTP) used for the purpose of notification, coordination and transfer of flights between ATC units,

**[RD 25]** Commission Regulation (EU) No 283/2011 of 22 March 2011 amending Regulation (EC) No 633/2007 as regards the transitional arrangements referred to in Article 7,

**[RD 26]** EUROCONTROL Specification of Interoperability and Performance Requirements for the Flight Message Transfer Protocol (FMTP) - Ed. 2.0 - EUROCONTROL-SPEC-100 - 14/06/2007.

**[RD 27]** Regulation (EC) No. 29/2009 of 16 January 2009 laying down requirements on data link services for the Single European Sky,

**[RD 28]** ICAO Global Operational Data Link Document (GOLD), 2nd Edition, 26/04/2013,

**[RD 29]** EUROCAE ED136-138 - VoIP in ATM,

**[RD 30]** Regulation (EC) No 1265/2007 of 26 October 2007 laying down requirements on air-ground voice channel spacing for the Single European Sky

**[RD 31]** Regulation (EC) No 1079/2012 of 16 November 2012 laying down requirements for voice channel spacing for the Single European Sky,

**[RD 32]** EUROCONTROL Guideline on 8.33 kHz for Military Operators, Ed. 2.0 - EUROCONTROL-GUID-174 - 05/07/2018,

**[RD 33]** EUROCONTROL Guidelines on the Use of UHF for ATC, GUID-138-2009, Ed. 1.0 - EUROCONTROL-GUID-138 - 02/06/2010,

## B.6 Navigation

**[RD 34]** ICAO Document 9613, Performance-based Navigation (PBN) Manual, AN/937, 3rd Edition, 2008,

**[RD 35]** Regulation (EU) No 2018/1048 of 18 July 2018 laying down airspace usage requirements and operating procedures concerning performance-based navigation,

**[RD 36]** EUROCONTROL Guidance Material for the Certification and Operation of State Aircraft in European RVSM Airspace, Edition 2.0,

## B.7 Surveillance

**[RD 37]** Regulation (EC) No. 1206/2011 of 22 November 2011 laying down requirements on aircraft identification for surveillance for the Single European Sky (amended by Regulation (EU) 2020/587 of 29 April 2020),

**[RD 38]** Regulation (EC) No 262/2009 of 30 March 2009 – laying down requirements for the coordinated allocation and use of Mode S interrogator codes for the single European sky,

**[RD 39]** EUROCAE ED-73E - Mode S transponders Minimum Operational Performance Specification for Secondary Surveillance Radar mode S transponders – May 2011,

**[RD 40]** EUROCAE ED 102A RTCA DO-260B - MOPS for 1090 MHz Extended Squitter Automatic Dependent Surveillance – Broadcast (ADS-B) & Traffic Information Services – Broadcast (TIS-B),

**[RD 41]** Regulation (EC) No. 1207/2011 of 22 November 2011 laying down requirements for the performance and interoperability of surveillance for the Single European Sky (amended by Regulation (EU) 2020/587 of 29 April 2020),

**[RD 42]** Regulation (EU) No 1332/2011 of 16 December 2011 – TCAS,

**[RD 43]** NATO/EUROCONTROL Guidelines for the Assessment of Mode 5 Frequency Supportability,

**[RD 44]** EUROCONTROL Guidelines on the Assessment of Ground-based Surveillance Interrogations – Ed. 2.0 - EUROCONTROL-GUID-178 – 08/09/2020

## B.7 Security

**[RD 45]** EUROCONTROL (NEASCOG)N(2014)0005 Initial Military Security Requirements for Centralised Services of 3 June 2014.

# Annex C – Document update procedures

It is necessary to periodically check this EUROCONTROL Guideline for consistency with referenced material. In addition, the content of these guidelines can evolve following feedback from implementation projects and field experience.

The main objectives of a regular review are:

a) to improve the quality of the guidance (e.g. clarity, testability, etc.);

b) to verify that the level of detail published is adequate;

c) to make all stakeholders including industry aware of the latest developments.

The update of these guidelines is expected to be initiated by stakeholders directly or through specific EUROCONTROL working arrangements like the Civil-Military CNS Focus Group (CNS FG), the Military Harmonisation Group (MILHAG), the Military ATM Board (MAB) or the Joint CNS Stakeholder Platform (JCSP) (or its subgroups). Any stakeholder that wishes to request a change to these guidelines can submit a change request (CR) to the document editors (page 2) or the generic email address: standardisation@eurocontrol.int.

The CR needs to provide following minimum elements:

- Originator information (name, Organisation, contact details);
- Guideline title, number and edition date;
- Page, chapter, section (subsection) where the issue appears;
- Description of the issue and reason for change;
- Specific change proposal text (incl. potential alternatives, if any);

Main steps towards a revised version:

- EUROCONTROL will assess each CR and consult relevant working arrangements (e.g. CNS- FG, MiLHAG, MAB, JCSP);
- The CR will be classified in terms of urgency and impact;
- A resolution proposal(s) will be prepared and, if needed, discussed with the originator;
- Agreed changes will be integrated into a revised version “Proposed Issue” including a summarised list of changes in the document record;
- The “Proposed Issue” will be consulted with relevant working arrangements (e.g. CNS- FG, MiLHAG, MAB, JCSP).

Note: Identified errors which may cause potential problems when implementing, may be corrected directly via separate “Corrigendum”.

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