

**eEAD**



# **Enhanced European AIS Database (eEAD)**

## **Concept of Operations (CONOPS)**

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Abstract				
<p>This document describes the concept of operations and the interactions between the service and the actors that are concerned by the implementation of the Enhanced European AIS Database Service. The document describes the overall eEAD operational concept, the system and service principles and provides description of its services. It is used as a reference document for the future eEAD Call For Tenders.</p>				
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The following table identifies all management authorities who have successively approved the present issue of this document.

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## EXECUTIVE SUMMARY

European AIS Database (EAD) is in operations since 2003 and is widely used, both within and beyond ECAC States.

The current needs and problems associated with the EAD are mainly related to the following:

- Timely replacement of EAD contracts (enhanced EAD system and service to be available in time);
- Modernisation of the EAD system architecture, (e.g. need for a modular approach and open interfaces between different modules);
- Improved interoperability and harmonisation linked to AIXM 5.1 between ANSP systems and EAD;
- Enhancements required to support SESAR and ICAO developments;
- Need to provide a common set of operationally validated data in support of Network Operations and as an enabler for the interoperability between ATM actors (e.g. the future Flight Object Interoperability).

eEAD service and system is an enhanced version of EAD aiming to address above mentioned needs.

The eEAD shall as a minimum ensure continuation of all services and functions of the current EAD system as well as meeting the current EAD service performance targets as from start of operations.

It will provide its clients with quality-assured, consolidated and consistent aeronautical information through a fully certified and integrated state-of-the-art AIM solution compliant with the EUROCONTROL System Wide Information Managements (SWIM) Specifications and following a Service Oriented Architecture.

The eEAD will offer services/tools enabling to fulfill the ICAO and Single European Sky (SES) obligations, such as compliance with the Aeronautical Data Quality (ADQ) Regulation.

eEAD builds on the experience with the EAD system and service, adding to its capabilities to further improve the data quality, as well as enhancements necessary to meet challenges and changes in the EATM environment.

eEAD is the succession of EAD by a new system, with the ultimate goal to cover the enhanced AIS related functionality of the eEAD CONOPS scope.

eEAD is also the first step towards the realisation of the target EAIMS (European ATM Information Management Service), which is an NM Strategic Project, part of the Network Strategy Plan, in-line with activities taking place under the SESAR Deployment Programme (SDP) and the (Pilot) Common Projects ((P)CP).

EAIMS aims at ensuring access to consolidated, consistent and NM operationally validated data in a seamless and transparent way as from a single access point to support ARO/AIS/ASM/ATFCM/ATS, flight operations and airport operations.

In parallel, EUROCONTROL NM is adapting its systems in view of achieving the target EAIMS concept through incremental steps.

Having consistent and accurate information, will eliminate the ambiguity and reduce the probability of potential hazards arising for ATM associated with data processing errors or

misinterpretation of data; hence the Service will contribute directly to the **reduction of safety risks**.

Inclusion of all the dynamic information (such as published by NOTAM) in the digital data sets will enable automated systems to **optimize the aircraft trajectory** on the ground and in the air and to avoid costly deviations from the ideal trajectory, which may be due to imprecise information.

Finally the continuous improvement of data quality processes, reduction of manual input, as well as, the integrated workflows between CACD and eEAD will as well contribute significantly to the **improvement of data quality**.

# CHAPTER 1 – Introduction

## 1.1 *Objective of the Document*

The eEAD CONcept of OPerationS (CONOPS) document describes the characteristics of the proposed system and services from the viewpoint of an individual who will use that system and services. It is used to communicate the quantitative and qualitative system and services characteristics to all Stakeholders. It gives an overview of the services of the enhanced European AIS Database (eEAD) and its overall operational concept including the interactions between services and actors of eEAD. This document will serve as a reference document for the Call For Tenders (CFT) issued for the development, implementation and operations of eEAD.

## 1.2 *Intended Audience*

This document is intended for all Stakeholders who are potential users of the eEAD, for industry in general as potential solution provider of the new eEAD system and services and for all Stakeholders of the current EAD, such as (list is not exhaustive):

- Air Navigation Service Providers (ANSPs) and in particular Aeronautical Information Services (AIS) organisations;
- Civil Aviation Authorities;
- Military administrations;
- Airline operators and related associations (IATA, IACA, etc.);
- Pilot associations (such as IAOPA);
- Military aircraft operators;
- Aircraft operations industry;
- Computer Flight Plan Service Providers, Data Packers and Data Integrators;
- ATM manufacturing industry.

## 1.3 *Background*

The present version of the CONOPS takes into account the input received through a Stakeholder consultation process initiated by EUROCONTROL as the Network Manager with workshops that took place on 9 November 2017 and on 14 February 2018 and also Stakeholder comments resulting from their review of CONOPS 3.0, CONOPS 4.0 and CONOPS 5.0.

# CHAPTER 2 – Context

## 2.1 *eEAD Objectives*

eEAD service and system is an enhanced version of EAD. It will provide its clients with quality-assured, consolidated and consistent aeronautical information through a fully certified and integrated state-of-the-art AIM solution compliant with the EUROCONTROL System Wide Information Managements (SWIM) Specifications and following a Service Oriented Architecture.

The eEAD will offer services enabling to fulfill the ICAO and Single European Sky (SES) obligations, such as compliance with the Aeronautical Data Quality (ADQ) Regulation (please see chapter 4.1.1 for the complete list) in order to ensure that quality aeronautical data and aeronautical information are provided in a timely manner, with the accuracy and resolution appropriate for their intended use, and the required integrity levels are met and maintained throughout the management process, supporting all phases of flight and aiming to help improving the efficiency of the flight operations.

eEAD builds on the experience with the EAD system and service, adding to its capabilities to further improve the data quality, as well as enhancements necessary to meet challenges and changes in the EATM environment.

eEAD is the succession of EAD by a new system before the end of the EAD contracts, with the ultimate goal to cover the enhanced AIS related functionality of the eEAD CONOPS scope.

## 2.2 *EAD Services and Current Operating Method*

EAD is in operations since 2003 and is widely used, both within and beyond ECAC States. It relies on its own infrastructure which includes two IT sites and two Operations Centres with helpdesk functions.

EAD offers a set of services provided in accordance with Decision N° 83 of 13 July 2000 of the EUROCONTROL Permanent Commission which entrusts EUROCONTROL with the task of developing, establishing and operating the European AIS Database (“EAD”).

EAD provides a cost effective integrated AIS solution with automated processes and a commonly developed and maintained application.

EAD as a centralized service provides harmonised and consistent data and enables data quality through ICAO standards and EUROCONTROL specifications. It assures timely availability of accurate data to enable safe route management, flight planning and operations. It contributes to overall cost reduction through commonly maintained system & applications and centralised world-wide NOTAM processing as well as through the integration of all different AIS components.

EAD provides static and dynamic data in conformity with ICAO Annex 15, for the complete ECAC airspace including all related Aeronautical Information Publication (AIP). In addition a world-wide “static data” is maintained in order to process and distribute world-wide NOTAM and allow the generation of pre-flight information bulletins (PIB). The information is accessible via dedicated applications or as XML-based data sets through web-based services.

The necessary data outside of the ECAC area and data of AIS from States not yet migrated to

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the EAD service is maintained, consolidated and quality assured by the EAD Data Operations Service Provider.

The EAD Migrated States either maintain their data, relying completely on the EAD service through a connection to specific EAD workstations or in their local database, which they synchronise with the relevant data with EAD.

The EAD has to fulfil the requirements of EU Regulation 73/2010 (ADQ). To be ADQ compliant and to facilitate the ADQ compliance of its Stakeholders, EAD is being enhanced with additional capabilities, such as AIXM 5.1 data exchange format to bridge the gap until full migration to the eEAD.

Other regulations for the EAD Service are 552, 1034, 1035 and as from January 1<sup>st</sup>, 2020 373 shall be fulfilled. The EAD also complies with ISO 9001 current version and shall need to comply with ISO 27001 and Air Traffic Safety Electronics Personnel (ATSEP) as from January 1<sup>st</sup>, 2020 in the context of 373.

The operational Services include:

- SDO - Static Data Operations;
- INO - International NOTAM Operations;
- PIB - Generation of Pre-Flight Information Bulletins;
- Briefing Facility for ATS Reporting Offices (including management of flight planning);
- PAMS - Published AIP Management System;
- Workflow Management.

Additionally, the following services are offered:

- Electronic AIP Production;
- Chart Production.

Furthermore EAD offers to its clients:

- 24h/day and 7 days/week service availability: processing of aeronautical information and provision of a Service Desk as a single point of contact for all EAD clients;
- Periodic data quality reviews: data input by both EUROCONTROL and clients is reviewed regularly against international regulations and printed publications in order to increase data quality and continually improve data completeness, correctness and timeliness;
- Consistency with ICAO and EUROCONTROL standards and recommendations: the system, database and the operations are updated whenever new standards are introduced or old ones are amended;
- Migration Support: clients are supported to ensure a smooth transition to EAD;
- User groups: one of the goals is to ensure clients' evolving requirements are understood. Regular User Groups are held, to provide clients with a forum to exchange ideas and experiences.

Presently 53 data providers make use of the EAD services for the maintenance of their static data and for NOTAM operations, whilst more than 200 data users make a direct use of the services and data. In addition some 25,000 subscribed regular users are making use of EAD Basic (i.e. the web application). In addition presently, there are 25 data providers using AIP

Production tool, 16 of them using Chart Production tool and 23 data providers using Briefing Facility.

Additional information can be consulted on the EUROCONTROL web site: <http://www.eurocontrol.int/articles/european-ais-database-ead>.

### **2.2.1 Limitations and Problem Statement**

The needs and problems associated with the current situation are mainly related to the following:

- Timely replacement of EAD contracts (enhanced EAD system and service to be available in time);
- Modernisation of the EAD system architecture, (e.g. need for a modular approach and open interfaces between different modules);
- Improved interoperability and harmonisation linked to AIXM 5.1 between ANSP systems and EAD;
- Enhancements required to support SESAR and ICAO developments;
- Need to provide a common set of operationally validated data in support of Network Operations and as an enabler for the interoperability between ATM actors (e.g. the future Flight Object Interoperability).

### **2.3 eEAD within EAIMS and Intended Benefits**

The European ATM Information Management **Service** (EAIMS) is an NM Strategic Project, part of the Network Strategy Plan, in-line with activities taking place under the SESAR Deployment Programme (SDP) and the (Pilot) Common Projects ((P)CP).

EAIMS aims at ensuring access to consolidated, consistent and NM operationally validated data in a seamless and transparent way as from a single access point to support ARO/AIS/ASM/ATFCM/ATS, flight operations and airport operations.

eEAD is the first step towards the realisation of the target EAIMS project; EUROCONTROL is procuring an eEAD system to replace the current EAD through an open Call For Tenders (CFT). The new eEAD will ensure as a minimum the continuation of all services and functions of the current EAD system.

In parallel, EUROCONTROL NM is adapting its systems in view of achieving the target EAIMS concept through incremental steps.

In summary, EAIMS will be implemented as a combination of systems and services which are grouped as follows:

- **The eEAD system** which will be implemented following an open Call For Tender and will be a reference source for the AIS Data. The further enhancements will include aircraft type characteristics and performance data in support to flight operations.
- **Adaptations to NM systems**, including adaptations to the existing NM CACD system, which maintains the ATFCM and dynamic ASM Data. These adaptations to CACD are needed to ensure alignment of the CACD and eEAD data models and to allow for the implementation of the integrated workflows.

The EAIMS will deliver a common source for consistent, accurate and up-to-date ATM data

set for the actors of the upstream and downstream data chain with the following direct benefits<sup>1</sup>:

- **Reduced Safety Risks:** Potential hazards can arise from inconsistencies in ARO/AIS/ASM/ATFCM/ATS information, from difficulties in interpreting multiple data sources, from out of date information and from the lack of dynamic updates in digital data sources. Having consistent, quality assured, complete, accurate and up-to-date information will reduce the likelihood of such hazards arising for ATM.

The **provision of advanced pre-flight briefing facilities** (based on digital NOTAM) and/or interfaces enabling such facilities to be provided by others will also reduce the risk of pilots missing safety critical NOTAM information (as it may happen today due to long/complex text-based pre-flight information bulletins) and will increase the pilot awareness.

- **Increased Efficiency:** This can be achieved through improved productivity and reduction of global costs: single data entry and retrieval reduce global costs by avoiding duplication of work at the local level and by reducing manual interventions. Inclusion of all the dynamic information (such as published by NOTAM) in the digital data sets will enable automated systems to optimize the aircraft trajectory on the ground and in the air and to avoid costly deviations from the ideal trajectory, which may be due to imprecise information.
- **Increased Data Quality:** The continuous improvement of data quality processes, reduction of manual input, as well as, the integrated workflows between CACD and eEAD will contribute significantly to the improvement of data quality.

## 2.4 eEAD Link with SESAR Deployment and ICAO GANP

### 2.4.1 eEAD Link with SESAR Deployment

Interdependencies between eEAD and the six ATM Functionalities (AFs) of the Pilot Common Projects (PCP) – Reg. (EU) 409/2013 have been analysed.

There is a **strong coherence** between the eEAD and the PCP ATM Functionalities. It concerns mainly:

- AF#3 “Flexible Airspace Management & Free Route” explicitly mentions as system requirement centralised AIS systems such as the eEAD, which “*make available environment data for flexible airspace structures to all involved operational stakeholders in a timely manner*”

The eEAD, will allow the maximum awareness of consistent data for the introduction of the Flexible Use of Airspace Concept on a day-to-day basis. It will support stakeholders and users in the establishment of realistic and robust operational decisions.

- AF#4 “Network & Collaborative Management” requires the availability of reference aeronautical data to support the Network Manager functions, such as collaborative NOP. The eEAD together with NM Systems will allow to smoothly integrate the upstream (data originators, AIS) and the downstream (data service providers, airlines) data chains.
- AF#5 ‘iSWIM’ supports information exchanges that are built on standards and delivered through an internet protocol (IP)-based network by SWIM enabled systems. The eEAD

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<sup>1</sup> Overall evolution from AIS to AIM also contributes to these benefits.

will implement SWIM compliant services using the yellow SWIM TI Profile for aeronautical information features on request, aerodrome mapping data, Digital NOTAM. This will ensure that the ATM actors that use the eEAD for aeronautical information provision comply with the SWIM interoperability requirements.

### **2.4.2 eEAD Link with ICAO GANP**

The link between the ICAO GANP and eEAD should be made through the reference to the Aviation System Block Upgrades (ASBU) methodology proposed by ICAO.

ICAO GANP statement: “The Global Air Navigation Plan’s Aviation System Block Upgrades methodology is a programmatic and flexible global systems engineering approach that allows all Member States to advance their Air Navigation capacities based on their specific operational requirements. The Block Upgrades will enable aviation to realize the global harmonization, increased capacity, and improved environmental efficiency that modern air traffic growth now demands in every region around the world.”

The core of the ASBU concept is linked to four specific and interrelated aviation performance improvement areas, namely:

- Airport operations
- Globally-interoperable systems and data
- Optimum capacity and flexible flights; and
- Efficient flight paths

ASBU defines four Blocks, organised as a roadmap:

- Block 0 – until 2018
- Block 1 – between 2019 and 2025
- Block 2 – between 2025 and 2031
- Block 3 – from 2031 onwards

It is worth mentioning that the methodology is currently under revision and a new edition will be issued by ICAO in 2019, aligned with the start of Block 1.

Another important aspect of the ASBU methodology is represented by the performance-based approach towards the implementation of the defined modules. In order to support the implementation and the adoption of this methodology, ICAO has provided a manual in this respect: ICAO Doc 9883 – Manual on Global Performance of the Air Navigation System.

The aeronautical information, supported by the necessary systems and technical infrastructure is integrated in the Performance Improvement Area 2 – Globally-interoperable systems and data realising the operational concept identified as: Flight & Flow – Interoperability for a Collaborative Environment (FF-ICE).

There are two threads contributing to this operational concept that relate to the aeronautical data, namely: DATM (digital ATM information) and SWIM (system-wide information management). eEAD is addressing both of them, following the specifications developed and provided by SESAR.



**2.4.2.1 eEAD and GANP ASBU Block 0**

DATM is identified in Block 0<sup>2</sup> (B0-DATM). All these goals have been already achieved by the EAD, which means that eEAD, by inheritance, will also, be compliant with the B0-DATM milestone, as indicated in the table below.

B0-DATM	eEAD
digital processing and management of information from origination to publication	The upstream data chain is supported through the current EAD, in a controlled, quality assured manner, integrated in dedicated Workflow Management processes
use of aeronautical exchange model (AIXM)	eEAD will exchange the aeronautical information by the means of AIXM 5.1 (see 3.2.1 – 1)
migration to electronic aeronautical information publication (AIP)	Continuation of the service provided already the EAD (see 3.2.1 – 4)
better quality and availability of data	The quality assurance processes provided by ICAO Annex 15 and specified by the EU Regulation 2017/373 (reference 1) are going to be implemented in eEAD (continuing from the EAD regulatory certification in this respect)

**Figure 1: eEAD and GANP ASBU Block 0**

**2.4.2.2 eEAD and GANP ASBU Block 1**

B1-DATM (DTAM in Block 1) addresses the need for increased information integration and will support a new concept of ATM information exchange fostering access via internet-protocol-based tools. The main characteristics of B1-DATM are the cross-exchange of common ATM data elements with the initial introduction of the ATM Information Reference Model (AIRM), i.e. a transversal integration of the information management.

eEAD should be capable of realising the benefits of B1-DATM and of supporting its Stakeholders in achieving these goals, providing a cost-efficient added value to their services.

B1-DATM	eEAD
access and equity: greater and timelier access to up-to-date information by a wider set of users	the availability and timely access to the eEAD services will be ensured through the system architecture and will be monitored through KPIs
efficiency: Reduced processing time for new information; increased ability of the system to create new applications through the availability of standardized data	eEAD is going to be developed at the core of the European ATM network and it is intended to increase the synergy with the EAIMS functions

<sup>2</sup> There is no SWIM implementation associated with Block 0

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B1-DATM	eEAD
interoperability: Essential for global interoperability	The global interoperability is a paramount condition for a safe, quality assured and efficient service; eEAD is addressing this objective by implementing the Commission Regulation 2017/373 and 552/2004 requirements in this respect, e.g. a globally adopted data exchange model (AIXM), domain specific business rules, harmonisation and coordination with the stakeholder communities
safety: Reduced probability of data errors or inconsistencies; reduced possibility to introduce additional errors through manual inputs	EAD constituents are currently certified against the Commission Implementing Regulation (EU) No. 1034/2011 with the highest regard placed on safety of operations; in the same time, the digital data exchange through standardised interfaces and services, together with the verification and validation processes

**Figure 2: eEAD and GANP ASBU Block 1**

B1-SWIM, defined as “performance improvement through the application of system-wide information management (SWIM)” identifies the implementation of system-wide information management (SWIM) services, both in terms of applications and infrastructure, with the goal of creating an aviation intranet, based on standard data models and internet-based protocols, maximising as such the interoperability. The benefits expected through the increase of safety, efficiency as well as the environmental considerations (e.g. more efficient flights, reduction of paper usage, etc.) are considered by the operational concept of eEAD.

In this respect, both ICAO GANP and the SESAR SWIM specifications are aligned with the objectives of eEAD.

**2.4.2.3 eEAD and GANP ASBU Block 2**

The DATM modules specified by the ASBU methodology are only defined in the context of the Blocks 0 and 1.

Within Block 2, only SWIM is specified, in the context of “enabling airborne participation in collaborative ATM”. This is designated as “air-ground SWIM”, as opposed to the “ground-ground SWIM” which was the scope in Block 1.

For the purpose of the eEAD, B2-SWIM should not be a priority, for two reasons:

- the elements of the “air-ground SWIM” concept are not yet defined<sup>3</sup>
- considering the incremental approach of the GANP ASBUs, the ground infrastructure principles implemented in Block 1 should be compatible with and support the air-ground applications
- the current scope of eEAD does not include the air-ground applications, which may be supported by dedicated Stakeholders, based on the information management services provided by eEAD

Additionally to the GANP ASBU modules specific to the eEAD context, additional objectives

<sup>3</sup> ICAO ANC, through its working arrangements of the Panels is currently in the process of defining the air-ground component of SWIM

are identified within the Performance Improvement Area 2 (Globally interoperable systems and data), pertaining to the services and the intended use of EAIMS.

## 2.5 *Moving Towards Global Interoperability*

The ICAO Global Air Navigation Plan [19] has established a roadmap for Information Management including AIS/AIM which requires States to implement improvements such as: Digital NOTAM, enhanced quality and digital data, Electronic Charts, Digital Briefing, eAIP, AIXM, SWIM, etc. The implementation of these features will require robust AIS/AIM Databases established and updated by the States. The eEAD architecture will support the implementation of AIS/AIM Database with a similar large scale geographical coverage also in other parts of the world.

In this context, eEAD will facilitate global interoperability and will provide access to users from other areas of the world. It will be able to communicate through the SWIM protocols with similar systems from other regions to create a global network of aeronautical data hubs. The eEAD system itself could be replicated and instantiated to run as a separate system servicing other ICAO Regions which could prove to be a cost effective solution for non-ECAC States.

## 2.6 *Geographical Coverage*

The eEAD shall provide three types of data and products with the following geographical coverage:

- **Static AIS Data** of all ECAC and world-wide non-migrated states, covering the aeronautical data needed for the processing of world-wide NOTAM (ICAO Annex 15) and for ATM operations. The migrated data providers will be providing and maintaining their full data set in AIXM 5.1 compliant format.
- **World-wide NOTAM**, which are ICAO and OPADD compliant, will be made available to eEAD data users in a manner similar to today's EAD. **Digital NOTAM** will also be provided for all migrated states and, with limited geographical scope, for the non-migrated states as part of the eEAD further enhancements.
- **AIPs** of all ECAC and world-wide migrated states. It will also cover the maintenance of the non-migrated states in the ECAC region, States adjacent to the EUROCONTROL area of responsibility (known as the ECAC+ region<sup>4</sup>), the member States of ASECNA<sup>5</sup> and Cape Verde, with the possibility to gradually increase geographical coverage to the world-wide scope.

The detailed Data Scope is explained in Chapter 3.3, and ANNEX 2 – eEAD Data Catalogue.

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<sup>4</sup> ECAC+ region: Currently covering Afghanistan, Algeria, Belarus, Egypt, Iraq, Israel, Jordan, Kazakhstan, Kyrgyz Republic, Libya, Morocco, Saudi Arabia and Uzbekistan.

<sup>5</sup> ASECNA: Covering Benin (DB), Burkina Faso (DF), Cameroon (FK), Central African Republic (FE), Chad (FT), Comores (FM), Congo Brazzaville (FC), Cote D'Ivoire (DI), Gabon (FO), Ghinee Bissau (GG), Guinee Equatorial (FG), Madagascar (FM), Mali (GA), Mauritania (GQ), Niger (DR), Senegal (GO) and Togo (DX).

# CHAPTER 3 – Operational Concept

## 3.1 *eEAD System and Services General Principles*

### 3.1.1 *General*

EUROCONTROL remains the owner of the eEAD system and services as per the Decision of the Permanent Commission N°83 “entrusting the Organisation with the task of developing, establishing and operating the European AIS Database”.

The eEAD shall as a minimum ensure continuation of all services and functions of the current EAD system as well as meeting the current EAD service performance targets as from start of operations. The minimum system and service requirements are available in the EAD Business Plan 2018 - 2022 [29], with regards to the service availability, service capacity and service operations performance and quality.

The functions and services of EAD shall be continued and kept up-to-date, at least until equivalent functions and services are supported by the eEAD – beyond the end of the current EAD contracts if needed.

### 3.1.2 *Governance*

The governance of the eEAD shall be ensured by EUROCONTROL in its role of Network Manager and the ANSPs. The development and service provision of system and data operations will however be outsourced using an open procurement procedure. The current EAD Service Steering Group (SSG) structure will be maintained and will report to director NM and will potentially report to Network Management Board (NMB).

ANSP involvement in reporting and change management shall be guaranteed through an appropriate coordination mechanism for optimised implementation of ANSP requirements at least at the same level as in the existing EAD working arrangements.

### 3.1.3 *Data Ownership*

The ownership of those aeronautical data falling under ICAO Annex 15 (or related European legislation) and entered into the eEAD by the responsible AISP, shall remain with this AISP.

### 3.1.4 *Regulatory / Standards*

eEAD shall be compliant with standards and regulatory requirements from ICAO, ISO and from the European Union:

- Data provision and quality requirements (ICAO & EU);
- Safety regulation requirements (EU);
- Security regulation requirements (ISO);
- Standardisation and normalisation implementations (ISO).

As such EUROCONTROL shall remain an approved Air Navigation Service Provider certified to provide air navigation services ((EC) reg 216/2008 & (EU) reg 1035/2011) from the first day of operations of the eEAD.

The eEAD shall be aligned with ICAO Global Air Navigation Plan roadmap for Information Management including AIS/AIM requiring States to implement improvements such as: Digital NOTAM, enhanced quality and digital data, Electronic Charts, Digital Briefing, eAIP, AIXM, SWIM, etc.

### **3.1.5 Modularity/Vendor Locking**

The eEAD system and services shall be developed and operated using where possible a modular approach (i.e. self-contained functional modules/components allowing easy upgrading and vendor-switching), tendered in a way that avoids monopolistic situations.

Technical requirements for the eEAD modules will ensure the maximal use of open standards and technologies in order to maximize the interoperability, minimize the dependency from single supplier and to facilitate adaptation to new technologies in a SWIM environment.

eEAD tendering requirements will make sure to attract a best choice per component (COTS, custom made, etc.) which guarantees flexibility, scalability and maintainability.

### **3.1.6 Architecture**

Global system architecture shall allow easy accommodation of high interoperability based on SWIM with systems of current data providers and with future regional hubs.

It will provide interfaces in a way allowing third-party software developers to incorporate functions based on data available from or through eEAD.

The eEAD shall facilitate a fully digital data publication process, allowing for the exchange of consistent data between Stakeholders. This implies that the necessary backward compatibility is present inside the eEAD and that the AIXM business rules are clear and detailed enough to ensure interoperability of the data.

### **3.1.7 Migration**

The eEAD should offer ANSPs extensive possibilities for integration into their own AIM/ATM infrastructure and business processes through a structured migration management. The interfaces of the eEAD should allow for an advanced and efficient integration of the eEAD services and functions in the local AIM/ATM systems of the ANSPs. In order to allow the ANSPs to perform this integration, structured migration support should be offered, including training and the availability of a test system.

## **3.2 Operational Scope and Services**

This Chapter describes the characteristics of the proposed eEAD system and services from the viewpoint of end user who will use that system and services.

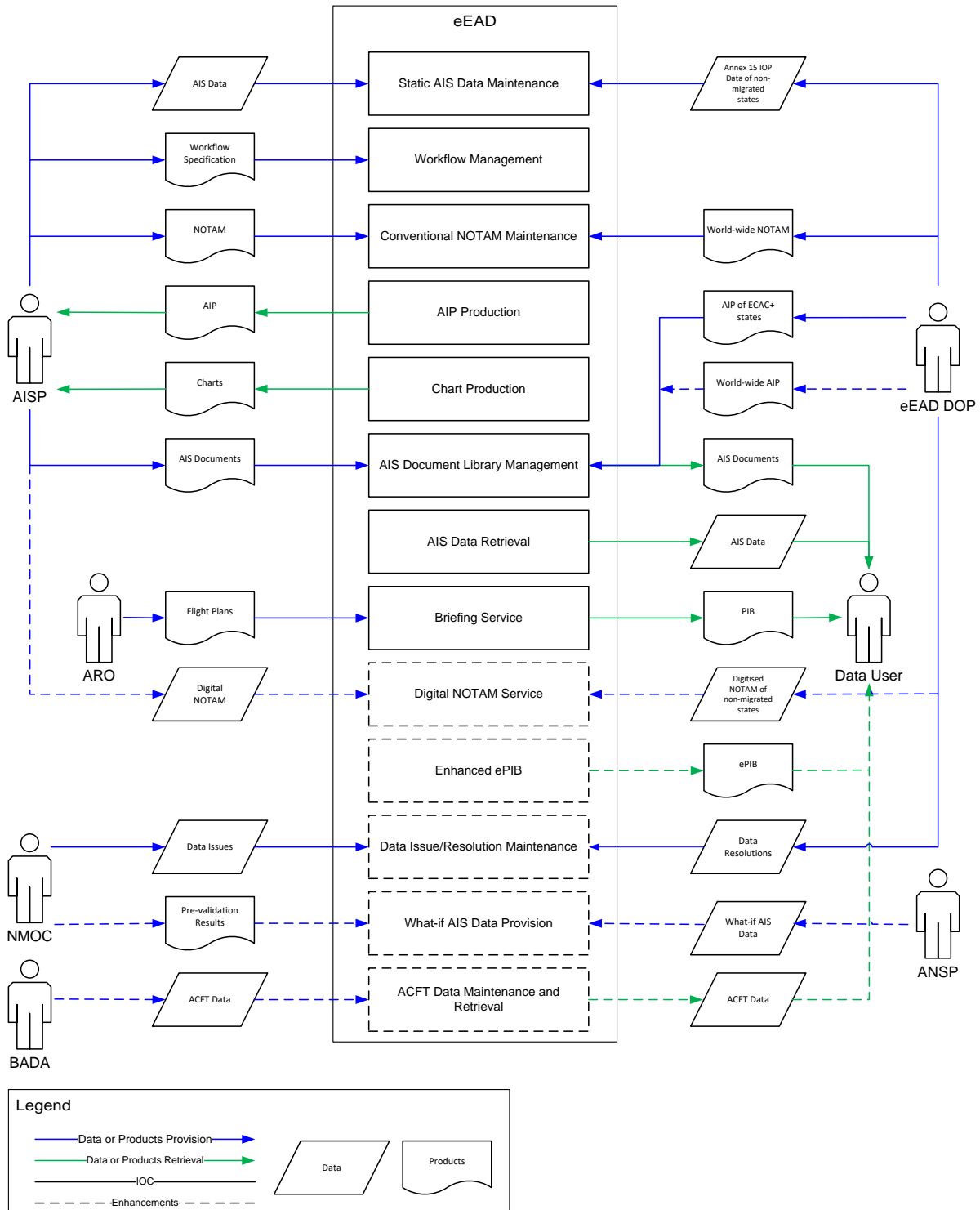
The eEAD shall as a minimum ensure continuation of all services and functions of the current EAD system as from start of operations. This is referred to as eEAD “Initial Operational Capability (IOC)”, as shown in the Figure 3 below. eEAD IOC main goal is to ensure non-regression to the EAD system and services.

# Enhanced European AIS Database (eEAD)

## Concept of Operations (CONOPS)

Beyond IOC, eEAD will be further enhanced with additional capabilities, such as new generation of briefing services for ARO as compared to what is currently provided by EAD including Digital NOTAMs, and enhanced pre-flight briefing.

The diagram below illustrates the eEAD operational services from the viewpoint of data providers and data users who will use that system and services.



**Figure 3: eEAD Business Services**

### 3.2.1 eEAD Business Services

The following provides a high level description of the eEAD operational services to be implemented in the initial **eEAD release (IOC)**:

1. **Static AIS Data Maintenance:** will enable AISP's to maintain their static AIS Data driven by the definition of ICAO Annex 15, PANS-AIM and compliant with the Aeronautical Information Exchange Model (AIXM) version 5.1. It will allow eEAD DOP to maintain static AIS Data of the non-migrated states and provide eEAD clients with the services related to AIS data quality, consistency and completeness assessment.

Through this service, AISP's will provide their data to eEAD, according to the harmonised guidelines agreed upon by ECAC States as representing best AIS practices for receipt, storage and publications of AIS Data (AIS Data Process). eEAD will enable interactive real-time visualisation of AIS Data and will facilitate data harmonization.

For the AISP clients this service will provide the facility to upload via B2B and store their static AIS Data in the eEAD repository via SWIM compliant interface.

While providing this service, eEAD will ensure that the ownership of all data items in the eEAD is clearly defined and uncoordinated change of the data by other parties apart from the owner is prevented. It will provide functionalities to ensure that national datasets provided by migrated States are identical to those stored in the eEAD. It will as well detect conflicts between data uploaded by different users and facilitate solutions between them.

Static AIS Data maintenance service will be designed considering the future integration of dynamic AIS Data, hence, maintenance of the digital NOTAM in the future.

eEAD DOP will be responsible for the maintenance of the static data in eEAD for the non-migrated states (as categorised by, ANNEX 2 – eEAD Data Catalogue eEAD Data Breakdown flagged as “Annex 15 IOP Data”), covering both the needs of ATM operations and world-wide NOTAM processing.

This service will as well support AISP's to determine the completeness of their own AIS data, on a per data provider basis. It will allow analysing and clarifying why data is missing, and if applicable submitting a reason for the missing data. It will also serve to simplify conflict resolutions for the data whose ownership is in question.

2. **Workflow Management:** which shall support AISP's defining their own data maintenance workflows (i.e. process definitions and organisational structures). It will allow AISPs to control the execution of workflow instances (i.e. automatic routing of a process instance to the next responsible actor according to its process definition) and provide information about running processes (i.e. Monitoring - Where is my process instance now).

This service is intended to be tightly integrated with Static Data Maintenance in a way that supports eEAD ADQ compliance.

3. **Conventional NOTAM Maintenance:** as a minimum covers current EAD functionality and includes the services to maintain traditional NOTAM driven by the definition of ICAO Annex 15 and in compliance to OPADD.

The service will be provided via B2B and B2C interfaces and will enable world-wide NOTAM distribution to non-migrated states via AHMS (e.g AFTN etc.) and will support world-wide NOTAM processing by the eEAD DOP. It will provide applications to ensure completeness and integrity of the NOTAM distribution (e.g. check if the NOTAM is missing by analysing possible gaps in the NOTAM numbering and take appropriate actions to obtain the missing NOTAM as quickly as possible). Processed ICAO and OPADD

compliant world-wide NOTAM will be available to the eEAD data users in a manner similar to today's EAD.

4. **AIP Production:** will enable the production of the AIP, including Amendments and Supplements, and AIC, based on the AIS Data stored in the eEAD and in compliance with eAIP specifications. The usage of a common eEAD AIP production tool will support states in their efforts of harmonising the AIP structure and ensuring data completeness.
5. **Chart Production:** will enable AISP's to generate and maintain aeronautical charts, as defined as minimum in ICAO Annex 4, based on AIS Data stored in the central AIS Data repository of eEAD.
6. **AIS Document Library Management:** will allow to store and retrieve AIP, AMDT, AIC, SUP and Charts. AISP's will be responsible for the maintenance of their own documents and eEAD DOP will be responsible for the AIP maintenance of the non-migrated states in the ECAC region, with the possibility to gradually increase service geographical coverage to the world-wide scope.
7. **AIS Data Retrieval:** will allow users to retrieve static AIS Data stored in the eEAD in a form of Data Sets and Reports. It will also support graphical visualisation of the AIS Data for B2C clients and data distribution and data retrieval via B2B. The service includes conventional NOTAM subscription and retrieval via B2B and AFS.
8. **Briefing Service:** will enable the generation of Pre-Flight Information Bulletin (PIB), management of the MET messages like in EAD (METAR/SPECI, SIGMET/AIRMET, TAF), provided from the local MET offices, covering the requirements put by ICAO on AIS for pre-flight Briefing as described by ICAO Annex 15 and Doc 8126.

It will support ARO and their clients as a minimum to the extent covered today by the EAD. At eEAD IOC, this service will be provided by the eEAD as in EAD today. Beyond the timeframe of the eEAD IOC, the flight management part of this service may be provided by NM systems, which is subject to impact analysis. (No decision is taken yet at the time of CONOPS)

9. **Data Issues and Data Resolution maintenance:** will enable data conflicts and inconsistencies resolution, by facilitating data provider's collaboration.

This service will support production of Annex 15 IOP Data sets, which will serve NM to build the consolidated IOP data, which is needed for flight plan validation, flight profile calculation and ATFCM processes. The IOP Data will be a key enabler for the EAIMS, bringing the two communities (upstream and downstream data chain) closer together in order to achieve a seamless ATM data chain. Please see ANNEX 1 – EAIMS Description for more details. This service is aimed to be part of eEAD IOC depending on the market capabilities.

The following describes the **further enhancements** to the eEAD operational services after introduction of the eEAD IOC, allowing to facilitate achievement of the overall EAIMS objectives:

1. **Digital NOTAM:** will enable AISP's, to maintain their dynamic AIS Data in a fully digital and integrated way, enabling enhanced PIB production and dynamic Annex 15 IOP Data updates. Limited scope of conventional NOTAMs from non-migrated states will as well be provided in digital NOTAM format for the generation of enhanced PIB.
2. **enhanced PIB (ePIB) generation:** will provide the eEAD Clients with digitally enhanced pre-flight information bulletins, combining tabular presentation of the NOTAM information with graphical views, as proposed by SESAR and described in the "Digitally Enhanced Pre-Flight Briefing (ePIB) Specification".



3. **What-if AIS Data Provision:** will allow ANSP such as National Environment Coordinator (NEC) to encode What-if AIS Data such as new sectorisation without affecting the “real” data, and submit these draft data proposal for initial pre-validation in NM systems. NM will be able to provide feedback on these data and in case a positive pre-validation result is achieved, What-if AIS Data will seamlessly enter AIS Data chain as AIS Data Change Proposal to be further processed by AISP.
4. **ACFT Data Maintenance and Retrieval:** The service will allow upload and usage of the data driven by the BADA model and some other relevant data to be used mainly for consistent flight trajectory computations by NM systems and by other ATM actors.

### 3.2.2 eEAD Support Services

Furthermore eEAD will offer to its clients:

- 24h/day and 7 days/week service availability: to process aeronautical information and to provide a Service Desk as a single point of contact for all eEAD clients;
- Services to manage organisations, sub organisations on several levels and related users to access all services provided by the eEAD;
- Periodic data quality reviews: data input by both EUROCONTROL and clients will be reviewed regularly against the international regulations and printed publications in order to continuously improve data quality, data completeness, correctness and timeliness. eEAD further enhancements will offer eEAD DOP in performing their data review and coordination functions an automated processes to determine AIS Data quality, consistency and timeliness in line with the industry standards.
- Necessary applications to support AISP’s in planning and performance assessment activities and to provide the business intelligence facilities necessary for data analysis and decision making;
- Continuous alignment with ICAO and EUROCONTROL standards and recommendations;
- Migration Support: existing EAD clients will be supported to ensure a smooth transition from EAD to eEAD and new clients to migrate to eEAD.

While providing the above service, eEAD will rely on highly available IT infrastructure with service desk functions. It will ensure as a minimum meeting the current EAD service performance targets as from start of operations as defined in EAD Business Plan 2018-2022 [29], with regards to the service availability, service capacity and service operations performance and quality.

## 3.3 Data Scope

The eEAD will become a repository of the following data as categorised by the eEAD Data Catalogue:

- The **AIS Data** is the static and dynamic data driven by the definition of ICAO Annex 15. The AIS data is further split into:
  - The **Annex 15 IOP Data:** The AIS data used by ATM systems to describe the aeronautical infrastructures (waypoints, routes, airports, elementary airspace volumes, etc.). The precise data scope of the Annex 15 IOP Data is defined in

the ANNEX 2 – eEAD Data Catalogue This data is subject to more stringent availability and completeness rules, in order to support the downstream ATM operations;

- The **Annex 15 Non-IOP Data**: all the AIS Data that are not in the Annex 15 IOP Data. (For details see ANNEX 2 – eEAD Data Catalogue).
- The **Aircraft Type Characteristics and Performance Data (ACFT Data)** contains information driven by the BADA model and some other relevant data and could also be provided through the eEAD. This data can be used by all ATM actors for flight trajectory computations. As a consequence it will have to cover all operational aircraft types with genuine or “synonym” performance data (For details see ANNEX 2 – eEAD Data Catalogue).

### 3.4 *Technical Scope*

The eEAD system will be implemented by a service oriented architecture integrating industry solutions (when possible) and using open standards.

The services provided by eEAD are organised in highly cohesive modules that have minimal external dependencies as follows (list is not exhaustive):

- Static AIS Data Maintenance
- NOTAM Maintenance
- AIS Document Library Management
- AIP Production
- Chart Production
- Briefing Service

It is considered that the Static AIS Data and NOTAM Maintenance is the most important part of eEAD and impacting the most stakeholders. The AIS Document Library Management is in complement to the digital data provision of the AIS data management.

The remaining three modules are in support of some stakeholders that make use these services.

All of the modules shall be as much as possible self-contained, so that they can be easily replaceable, from the technical point of view.

It is considered that sharing common components and having a harmonised system, for instance in terms of look and feel of the different user interfaces, is less important than having independent and easily replaceable modules.

The different use cases of the eEAD will be supported via B2C interfaces, as well as B2B interfaces, when applicable.

The B2B interfaces will be compliant with the EUROCONTROL SWIM specifications, and allow third-party software providers to develop solutions based on the services and data available from the eEAD system.

The B2C interfaces will be preferably web-based and use open standards.

The service oriented architecture will allow additional modules to be added while minimising the need for change of existing modules.

Access to the eEAD services will be possible via Internet and via newPENS.

The eEAD shall be capable of handling all AFTN/AMHS traffic related to the services provided,

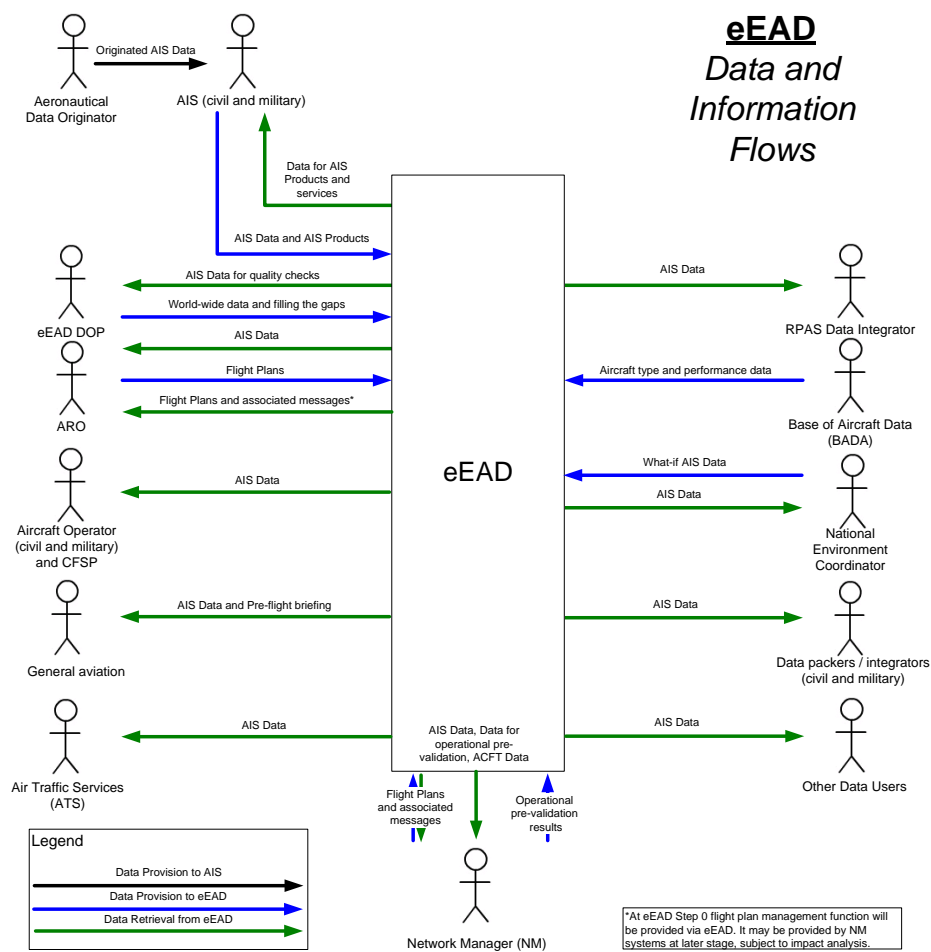
avoiding the requirement to create local interfaces to connect the eEAD to the user-side communication systems.

eEAD shall support the exchange of aeronautical data in AIXM 5.1 compliant format (and subsequent versions).

EUROCONTROL shall ensure that the business rules for the AIXM 5.1 are improved and that implementation guidelines are provided, in order to contribute to a harmonised implementation of the AIXM 5.1 by different Stakeholders, so that true interoperability can be achieved, both amongst external systems and between those systems and eEAD.

### 3.5 Data and Information Flows

The data and information flows between the eEAD and its Stakeholders are illustrated in the diagram below.



**Figure 4: eEAD Data and Information Flows**

### 3.6 Stakeholders, Roles and Responsibilities

The list of the eEAD Stakeholders described below is not exhaustive: it is limited to those who are directly addressed by the concept of operations. Other actors, such as system

manufacturers are not discussed here, although they will play an important role in the development of the eEAD.

### **3.6.1 Aeronautical Information Service (civil and military)**

The main task of Aeronautical Information Service (AIS), as defined in the ICAO Annex 15 is to ensure the provision of aeronautical information necessary for the safety, regularity and efficiency of international air navigation.

This will require the AIS to have access and/or use the eEAD in order to get accurate and up-to-date aeronautical data.

eEAD provides: necessary services and applications taking into account user roles, user data coverage responsibilities and access rights that enable national and sub-regional (FAB) Aeronautical Information Services to fulfil their ICAO and European obligations through:

- B2B/B2C interfaces that allow AIS to maintain and process the data (including interactive realtime visualisation of data), to coordinate and to make available the digital AIS data (static and dynamic) that is under their responsibility;
- B2B/B2C interfaces/applications that allow AIS to use the eEAD data for the production and distribution (where applicable) of the AIP, Charts, NOTAM and related products.

#### Provider Role

The AIS shall provide the complete set of AIS Data and AIS publications (AIP, Chart, etc.) in their responsibility to eEAD.

The National AIS will remain responsible for their own data as the authorised source, and obligations to provide the Aeronautical Information Service will remain with each Member State if so mandated in legislation.

Therefore, there is no change in data maintenance responsibilities due to eEAD.

#### User Role

The AIS may use the eEAD for the subscription to the AIS Data (e.g. Data Sets) and AIS publications stored in the eEAD as well as for the production and distribution (where applicable) of the AIP, Charts, NOTAM and related products.

### **3.6.2 eEAD Data Operations Provider (DOP)**

The eEAD DOP is responsible for implementing all the management processes, which are necessary to ensure that the data operation services are delivered to the level specified in the agreed SLA.

The activities of the eEAD DOP are as follows:

- Supports EUROCONTROL, ECAC member States, National civil and military AIS, civil and military ANSP and other legitimate eEAD users in fulfilling their mission in accordance with performance standards established in the agreed Service Level Agreement (SLA) between EUROCONTROL and the eEAD DOP;
- Maintains the Annex 15 IOP Data (as categorised by the eEAD Data Catalogue, flagged as “Annex 15 IOP Data”), manages and co-ordinates the resolution of AIS Data Issues. Annex 15 IOP Data is covering both the needs of ATM operations and world-wide NOTAM processing;
- Complements the data input provided by the National AIS of ECAC States or of other

legitimate eEAD users with necessary data outside of the ECAC area, in order to process and make available world-wide NOTAM and to support briefing services;

- Realises regular reviews including the data completeness of data updated by the eEAD DOP and by clients, and coordinates with the clients the clarification of identified discrepancies and the resolution of AIS Data Issues;
- Supports the migration to operations of new clients and of current EAD clients to the eEAD, performs the day-to-day support to clients according to the agreed SLA, facilitates the Annex 15 data validation, data coordination, and general support through the eEAD Service Desk.

eEAD provides: applications that enable the eEAD DOP to fulfil its obligations for the provision of data operations services through:

- B2B/B2C interfaces that allow the eEAD DOP to receive (where possible in digital format), process, coordinate and maintain in the eEAD database the Annex 15 IOP Data and to make available in a library the AIP publications that are under its responsibility;
- B2B/B2C interfaces that allow the eEAD DOP to receive and process TAM<sup>6</sup> messages, including Digital NOTAM, where available, as well as graphical facilities, workflow, investigation and reporting features;
- A service desk tool that allows the eEAD DOP to support the eEAD Service Desk function and to support the clients.

#### Provider Role

The eEAD DOP will feed the eEAD with Annex 15 IOP Data, will maintain the eEAD library with AIP Publications, which are under its responsibility, and will ensure the processing and digitisation of TAM<sup>2</sup> messages received via AFTN, NewPENS, etc. The provided service will facilitate the maintenance of its databases by Data Providers and include data consistency checks for enhancing the consistency of the AIS Data. The eEAD DOP will also support the eEAD Service Desk function which will be the main interface between Clients and the eEAD.

#### User Role

The eEAD DOP will use the data available through the eEAD to fulfil the above role as provider and for data comparison, verification and validation of the data originated from non-migrated states.

### **3.6.3 Air Traffic Services Reporting Office (ARO)**

The main task of ARO, as defined in ICAO Annex 2, ICAO Annex 11 and ICAO Doc 4444, is to ensure the receiving reports concerning air traffic services and processing of flight plans submitted before departure. The provision of ARO services is and will continue to be a State's responsibility.

As the interface between AO (civil and military) and ATSATS, ARO will continue to have a major role as an initial advisor ensuring the consistency of FPLs. In the field of general assistance, the ARO after receiving a flight plan, or change thereto, will:

- check it for compliance with the format and data conventions;
- check it for completeness and, to the extent possible, for accuracy;

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<sup>2</sup> NOTAM, SNOWTAM, BIRDTAM (military only), ASHTAM messages

- take action, if necessary, to make it acceptable to the Air Traffic Services; and
- indicate acceptance of the flight plan or change thereto, to the originator (AO).

This will require the ARO to have access and/or use the eEAD in order to get accurate aeronautical data via B2B/B2C interfaces.

eEAD provides: services and applications for the retrieval of the pre-flight briefing (e.g. different type of PIB, NOTAM List, Single NOTAM, etc.) and for the flight plan management (e.g. retrieval, encoding, verification, validation and distribution of Flight Plans (IFR, VFR, OAT and GAT or mixed thereto) and related FPL follow up (FAM) and ATFCM messages) through:

- B2C/B2B interfaces that allow the ARO and its clients (e.g. PilotsPilots) to obtain pre-flight briefing information and perform flight plan management (including interactive visualisation.visualisation).

#### Provider Role

- The ARO shall submit flight andplansand changes thereto, including ATFCM messages, to NM via eEAD for validation and further processing concerning flights inside IFPZ;
- The ARO shall submit flight plans and changes thereto to concerned ATS units via eEAD for flights outside IFPZ.

#### User Role

- The ARO shall receive pre-flight briefing information (including interactive visualisationvisualisation);
- The ARO shall encode, verify and validate Flight Plans (IFR,VFR, OAT and GAT or mixed thereto) and related FAM and ATFCM messages, including Route Assistance, Addressing Assistance and interactive visualisation via eEAD;
- The ARO shall receive FPL, Operational Reply Messages (e.g. ACK, REJ, MAN), FAM and ATFCM messages from NM via eEAD;;
- The ARO shall receive FPL, FAM and free text messages from other ATS units and AO via eEAD.

### **3.6.4 Aircraft Operator (AO) (civil and military) & Computer Flight Plan Service Provider (CFSP)**

Airlines strive to satisfy their business objectives and optimise the operations by determining the optimum departure and arrival times of the aircraft and the routes and levels at which they wish them to fly. They need to make informed choices from possible route options available for flight planning purposes as produced from the updated airspace data and the most efficient route network available at that time.

AO and CFSP's will benefit from high quality of AIS Data within eEAD, which will be used to build consolidated IOP data by NM systems.

Quality assured aeronautical data will be one of the enablers to optimise the flight profiles and will lead to increased fuel efficiency and reduced flight times.

eEAD provides: a reference source of harmonized and quality assured digital aeronautical data (AIS Data) to support their activities.

#### Provider Role

AOs (civil and military) and CFSPs are not providing data to eEAD.

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#### User Role

AO's and CFSPs will use the AIS Data from eEAD to support their activities.

### **3.6.5 General Aviation (GA)**

GA encompasses all other commercial (Business Aviation activities), sporting and recreational flying (General Aviation) which are an integral part of the European transport system. General Aviation specifically needs to reserve airspace for particular operations through national airspace usage regulators (recreation and sport aviation operating under VFR).

eEAD provides: a reference source of harmonized and quality assured digital aeronautical data to support their activities.

Data is provided primarily through B2C interfaces, while certain data sets are made available through B2B services in order to integrate it into Electronic Flight Bag through third party, GPS/navigation and similar devices used for pre-flight briefing and in-flight awareness. Access to eEAD services will be either directly (for cross-border flights) or through national AIS portals, with customised information and presentation in national language.

#### Provider Role

GA is not providing data to the eEAD.

#### User Role

GA will use available AIS Data available in the eEAD to support flight planning and briefing.

### **3.6.6 Air Traffic Services (civil and military)**

Access to a common reference for airspace data will be vital to ensure close co-ordination between all civil and military ATC units.

ATS will benefit from the high quality of AIS Data within eEAD, which will be used to build consolidated IOP data by NM systems allowing better prediction of sector loads which, in conjunction with improved trajectories will allow for flow measures to be applied with much higher accuracy.

eEAD provides: a reference source of static and dynamic AIS Data to build the IOP Data to be used for operations.

#### Provider Role

ATS is a data originator for eEAD and not providing any data directly to eEAD.

#### User Role

ATS may use directly the AIS data within eEAD, or may use it indirectly, via the consolidated IOP view, including ASM/ATFCM data, which will be provided by NM.

### **3.6.7 RPAS Data Integrator**

Unmanned Aircraft Systems (UAS) are an aircraft and its associated elements, which are operated with no pilot on board. Remotely Piloted Aircraft Systems (RPAS) are a set of configurable elements consisting of a remotely piloted aircraft, its associated remote pilot station(s), the required command and control links and any other system elements as may be required. The term Drone is used to speak of UAS and RPAS. Drones must be flown outside

of specified reserved areas, staying within defined limitations for the operation (e.g. distance from aerodromes, max. altitude 500 feet above the ground/water, etc.).

RPAS data integrators are developing RPAS Flight Management Systems (FMS) or Applications (Apps) to accommodate safe RPAS operations within certain areas. For this purpose, RPAS data integrators need both the static (baseline) data and the dynamic updates in order to create No Drone Zones which would prevent RPAS to be flown in these areas. In addition to the already available data in eEAD, States may request to create their own specific Drone Prohibited/Allowed Areas, which will be made available in eEAD. For this kind of data no specific format is needed as the RPAS FMS/Apps could process AIXM 5.1 compliant format.

eEAD provides: the static and dynamic AIS Data needed by RPAS data integrators. eEAD allows States to create their own Drone Prohibited/Allowed areas, which are available to RPAS data integrators. Furthermore eEAD will provide support for digital NOTAM processing and generation. RPAS FMS/Apps could receive and process digital NOTAMs automatically. It could also generate draft NOTAMs from RPAS users be routed via standardized interfaces to be implemented by State AIS providers or to be relayed to eEAD subject to needs and approval of the relevant AIS authorities.

#### Provider Role

RPAS Data integrators are not providing data in eEAD.

#### User Role

RPAS Data integrators will use AIS Data made available through the eEAD.

### **3.6.8 Aircraft Data Provider (ADP)**

NMOC and other ATM actors require reliable aircraft performance parameters for the trajectory calculations. Currently, Base of Aircraft Data (BADA) datasets are used to feed the NM core systems through CACD and are updated whenever a new BADA version is available (several times each year). This represents about 200 Aircraft Types covering more than 99 % of the flights managed by NM.

Base of Aircraft Data (BADA), is an Aircraft Performance Model (APM) developed and maintained by EUROCONTROL through active cooperation with aircraft manufacturers and operating airlines. BADA is designed to be used in flight trajectory simulation, validation and assessment of new ATM concepts, ATC procedures and trajectory prediction in operational ATM systems.

eEAD provides: necessary services and applications to integrate aircraft type characteristics and performance data.

(For details see ANNEX 2 – eEAD Data Catalogue)

#### Provider Role

It will feed the eEAD with aircraft data (aircraft type data according to ICAO 8643, aircraft performance data).

#### User Role

No specific user role.



### **3.6.9 National Environment Coordinator (NEC)**

The NEC provides a single link between NM and the ANSP to coordinate the data provision and data validation required for NM operations.

eEAD provides: services and applications to enable the provision and validation of data under their responsibility, through:

- B2B/B2C interfaces that allow NECs to provide and request pre-validation and coordination of the What-if AIS Data through the construction of the IOP Data in the NM systems and acquiring the corresponding feedback as shown in Figure 4.

#### Provider Role

NEC will provide the description of What-if AIS Data (e.g. new operational airspace structures) to the eEAD without affecting the “real” data, and submit the draft data proposal for pre-validation in NM systems. NMOC will be able to provide feedback on these data and in case a positive pre-validation result is achieved, What-if AIS Data will seamlessly enter AIS Data chain as AIS Data Change Proposal to be further processed by AISP.

The NEC will carry out any necessary coordination within the ANSP ensuring that internal ANSP processes are applied.

There is no change in the current role of NEC due to introduction of the eEAD.

#### User Role

The NEC will use the eEAD for the construction of the What-if AIS Data sets, containing operational airspace structures, for their pre-validation by NM systems.

### **3.6.10 Data Packers and Data Integrators (civil and military)**

Data integrators (also known as “data houses”) are a major AIS client. The data is coded into industry specific formats (e.g. ARINC 424) and made available to Flight Management Systems (FMS) providers which turn it into operational data for feeding on-board FMS, EFB devices, creating charts and flight manuals. Industry requirements for obstacle and terrain data, airport mapping databases, etc. have triggered the development of additional coding standards, which are likely to be also supported by AIS Data. Data integrators are interested in both static (baseline) data and dynamic updates, although the current data distribution channels are not yet able to automatically process dynamic updates in digital format.

eEAD provides: a reference source for AIS Data.

#### Provider Role

Data integrators are not providing data in eEAD.

#### User Role

Data integrators will use AIS Data made available through eEAD to support their operations.

### **3.6.11 Network Manager Operations Centre (NMOC)**

The mission of the Network Manager Operations Centre (NMOC Brussels and Brétigny-sur-Orge) is to deliver core network operational services across several domains:

- Flow and Capacity Management;
- ATM Access Gateway/Flight Planning Operations;

- Information Management;
- Crisis and Contingency Management;
- Post-operations analysis and reporting

Access to and sharing of harmonised and complete airspace data is of paramount importance to NMOC in managing the translation of strategic airspace and capacity plans into real-time network operations.

The NM systems contain airspace data to support the ATFCM and flight planning processes.

eEAD provides: the Annex 15 IOP Data for NM to build the IOP Data (including ASM/ATFCM Data). It also provides ACFT Data for the trajectory calculation.

#### Provider Role

NMOC is not providing data in eEAD.

#### User Role

NM systems will use eEAD Annex 15 IOP Data and add ASM/ATFCM Data in order to construct the IOP Data.

The EAIMS IOP Data will contain the required data supporting the seamless ASM/ATFCM process. The consideration of these data such as sector configuration, airport/tower data, dynamic airspace information (real-time activation/de-activation of allocated airspace and CDRs availability, TRA permeability, etc.), and restrictions will enable NM to assess the impact at the network level of the traffic demand and to co-ordinate the implementation of the most adequate ATFCM solution (flight and flow re-routing, sector management, revised airspace allocation, traffic synchronisation, etc.) and to support the flight planning by IFPS.

A reliable and common source for aircraft data (i.e. BADA) through eEAD is also needed for Trajectory Prediction to ensure consistency of the trajectory calculations.

#### Data Consolidation/Operational Validation Role

NMOC will play a vital role to optimize the integration and consolidation of operational data individually done by most actors in the downstream data chain in isolation. It will implement extensive operational pre-validation and validation and provide feedback on the data errors and **AIS Data Issues** for resolution before the **IOP Data** is provided and used by the flight operations community, including the NMOC operations. The operational pre-validation and validation by NMOC covers the suitability for operational usage of the IOP Data needed for flight plan validation, flight profile calculation and ATFCM processes. This will be a key enabler for the EAIMS, bringing the upstream and downstream data chain communities closer together in order to achieve a seamless ATM data chain.

### **3.6.12 Other Data Users**

Other Data Users include actors such as flight simulators, gamers and software developers which will play an important role in the development of the eEAD through providing feedback on the quality of eEAD data.

They are interested in both static (baseline) data and dynamic updates, although the current data distribution channels are not yet able to automatically process dynamic updates in digital format.

eEAD provides: a reference source for AIS Data.

#### Provider Role

Other Data Users are not providing data in eEAD.

User Role

They will use AIS Data made available through eEAD to support their activities.

# CHAPTER 4 – Regulatory Requirements

## 4.1 *Regulations and Recommendations*

### 4.1.1 *Data Provision/Quality*

For the eEAD data provision/quality, following Regulations/Standards apply:

1. Commission Regulation (EU) No 1025/2012 laying down common rules on European standardization [2];
2. Commission Regulation (EU) No 677/2011 of 7 July 2011 laying down detailed rules for the implementation of air traffic management (ATM) network functions and amending Regulation (EU) No 691/2010 [5];
3. Commission Regulation (EU) No 1191/2010 amending Regulation (EC) No 1794/2006 laying down a common charging scheme for air navigation services [6];
4. Commission Regulation (EU) No 73/2010 of 26 January 2010 laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky, covering the origination, production, storage, handling, processing, transfer and distribution of the Integrated Aeronautical Information Package (IAIP), electronic terrain and obstacle data and aerodrome mapping data as amended by Commission Implementing Regulation (EU) No 1029/2014 of 26 September 2014, and Commission Regulation (EC) No 552/2004 Chapter III for Verification of Compliance and Annex II, Part B, point 7 and 8 for Specific Requirements [7];
5. Commission Regulation (EU) No 255/2010 of 25 March 2010 laying down common rules on air traffic flow management, which in Article 6(5) specifies the responsibility of the ATS units for ensuring the data quality of required ATFM data to the central ATFM unit. Some of the required data items are part of the States' IAIP publication and could therefore be covered by the ADQ compliance [8];
6. Commission Regulation (EU) No 552/2004 of the European Parliament and of the Council of 10 March 2004 laying down requirements on the interoperability of the European Air Traffic Management network (the interoperability Regulation) as amended by Regulation (EU) No 1070/2009 of the European Parliament and of the Council of 21 October 2009 [11];
7. ISO 9001:2015, specifying requirements for a quality management system [12];
8. ISO/IEC 59:1994, Code of good practice for standardization [15];
9. ICAO Annex 15 – Aeronautical Information Service [18, 17].

### 4.1.2 *Safety*

For the safety associated with the eEAD Service, following Regulations apply:

1. Commission Implementing Regulation (EU) 2017 of 1 March 2017 Laying Down Common Requirements for Providers of Air Traffic Management/Air Navigation Services and other Air Traffic Management Network Functions and their Oversight,

taking into account possible amendments affected by EASA NPA 2016-02 [23] (will enter into force starting from 1 January 2020) [1];

2. Air Traffic Safety Electronics Personnel (ATSEP) as from January 1<sup>st</sup>, 2020 in the context of 2017/373 [1];
3. Commission Regulation (EU) No 1035/2011 of 17 October 2011 laying down common requirements for the provision of air navigation services and amending Regulations (EC) No 482/2008 and (EU) No 691/2010 (as amended by Commission Regulation (EU) No 448/2014 of 2 May 2014) [3];
4. Commission Implementing Regulation (EU) No. 1034/2011 of 17 October 2011 – Safety Oversight covering the oversight of changes to ATM functional systems [4];
5. Commission Regulation (EU) No. 677/2011 of 7 July 2011, Annex VI, Chapter 2 – Safety, items f) and g) [5];
6. Commission Regulation (EU) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency (after second extension) [9].

#### **4.1.3 Security**

1. ISO/IEC 27001:2013, specifying the requirements for establishing, implementing, maintaining and continually improving an information security management system [13];
2. ISO/IEC 27002:2013, specifying security standards and information security management practices [14].

#### **4.1.4 Requirements to set-up and Operate the Service**

For the full benefits of eEAD to all ATM community, it is vital that all EUROCONTROL Member States are connected and migrated to the service. Hence all ANSP shall conform to eEAD requirements of data provision and data quality and incorporate the related processes locally.

In accordance with EC regulation, with eEAD, EUROCONTROL will continue to be certified by EASA as Aeronautical Information Service Provider based on the use of eEAD. The data provision and migration to eEAD will be enforced as minimum through ESSIP.

# ANNEX 1 – EAIMS Description

## ***A1.1 Description***

The European ATM Information Management **Service** (EAIMS) is an NM Strategic Project, part of the Network Strategy Plan, in-line with activities taking place under the SESAR Deployment Programme (SDP) and the (Pilot) Common Projects ((P)CP).

The EAIMS aims at ensuring access to consolidated, consistent and operationally validated data in a seamless and transparent way as from a single access point to support ARO/AIS/ASM/ATFCM/ATS, flight operations and airport operations.

EAIMS builds on the experience and also, where relevant, on the existing infrastructure and capabilities of the EAD (European AIS Database) and CACD (NM Central Airspace and Capacity Database) services as well as on the ADR (Airspace Data Repository) concept and experience.

As a first step in the realisation of the target EAIMS operational concept EUROCONTROL is procuring an Enhanced EAD (eEAD) system, as described in the main part of the CONOPS document, to replace the current EAD through an open Call For Tenders (CFT). The objectives of eEAD are described in the main part of this document.

In parallel, EUROCONTROL NM is adapting its systems in view of achieving the target EAIMS concept through incremental steps.

EAIMS involves many actors who will enable the availability and quality of highly accurate and consistent data. EAIMS will be run under the auspices of EUROCONTROL as the Network Manager.

EAIMS will support a seamless process from publication preparation to usage of data in daily operations and will provide electronic access to the data through interoperability mechanisms.

Achieving a seamless ATM data chain in Europe will require bringing the upstream and downstream user communities ‘closer together’. This implies harmonisation and integration of both operational processes and supporting systems and requires extensive operational validation and consolidation activities. The competences, the specific expertise, the outputs and the added value of each of the two are essential to build the whole integrated data chain.

In the downstream part, substantial economies of scale (data management, operational data validation, system implementation) and significant consistency improvements are within reach by preparing the reference data for operations ideally only once.

Flight data interoperability is being developed in Europe as part of the SESAR concept for trajectory management. Fundamentally, it assumes the availability of up-to-date and consistent ATM information across the interoperable area to ensure consistency of the trajectory calculations. Preparing and maintaining this European-wide data multiple times wherever it is needed does not make sense in many respects (consistency and therefore safety, cost efficiency, etc.).

Beyond the human aspects involved in this convergence, the main challenge is to reconcile the operational constraints with official data provision requirements in order to achieve a consistent data chain, and in the end that published data can serve operations.

The EAIMS will as well include a new generation of briefing services for ARO as compared to what is currently provided by EAD including Digital NOTAMs, and graphical pre-flight briefing.

The EAIMS will be implemented by a service oriented architecture integrating industry solutions (when possible) with NM systems and using open standards.

The different use cases of the EAIMS will be supported via B2C interfaces as well as via B2B interfaces, supporting the digital data exchange with external systems. The B2B interfaces will be compliant with the EUROCONTROL SWIM specifications.

EAIMS will be implemented as a combination of systems and services which are grouped as follows:

- **The eEAD system**, as explained in the main part of this CONOPS document, will be composed by several independent modules in a Service Oriented Architecture. One of those modules will be a reference source for AIS data and a central access point for aircraft type characteristics and performance data. This system will provide services to support Aeronautical Information Services to fulfil their ICAO and Single European Sky (SES) obligations. As part of the overall aeronautical data process improvement and data quality brought by EAIMS, this system will implement its part of the workflows for the production of operationally validated data.
- **The NM systems**: several NM systems are involved in the provision of EAIMS services
  - **CACD**, which remains a reference source for the ATFCM and dynamic ASM data. The main modifications required in CACD are the model adaptations (for consistency with eEAD model) and the implementation of the integrated workflow with eEAD.
  - **IFPS**, which provides IFR flight plan processing and may potentially provide services for VFR and OAT flight plan processing in support of the flight management function of EAIMS, subject to impact analysis (no decision is taken on that at the time of eEAD CONOPS).
  - **ETFMS**, which will provide the simulation and the operational validation capabilities.

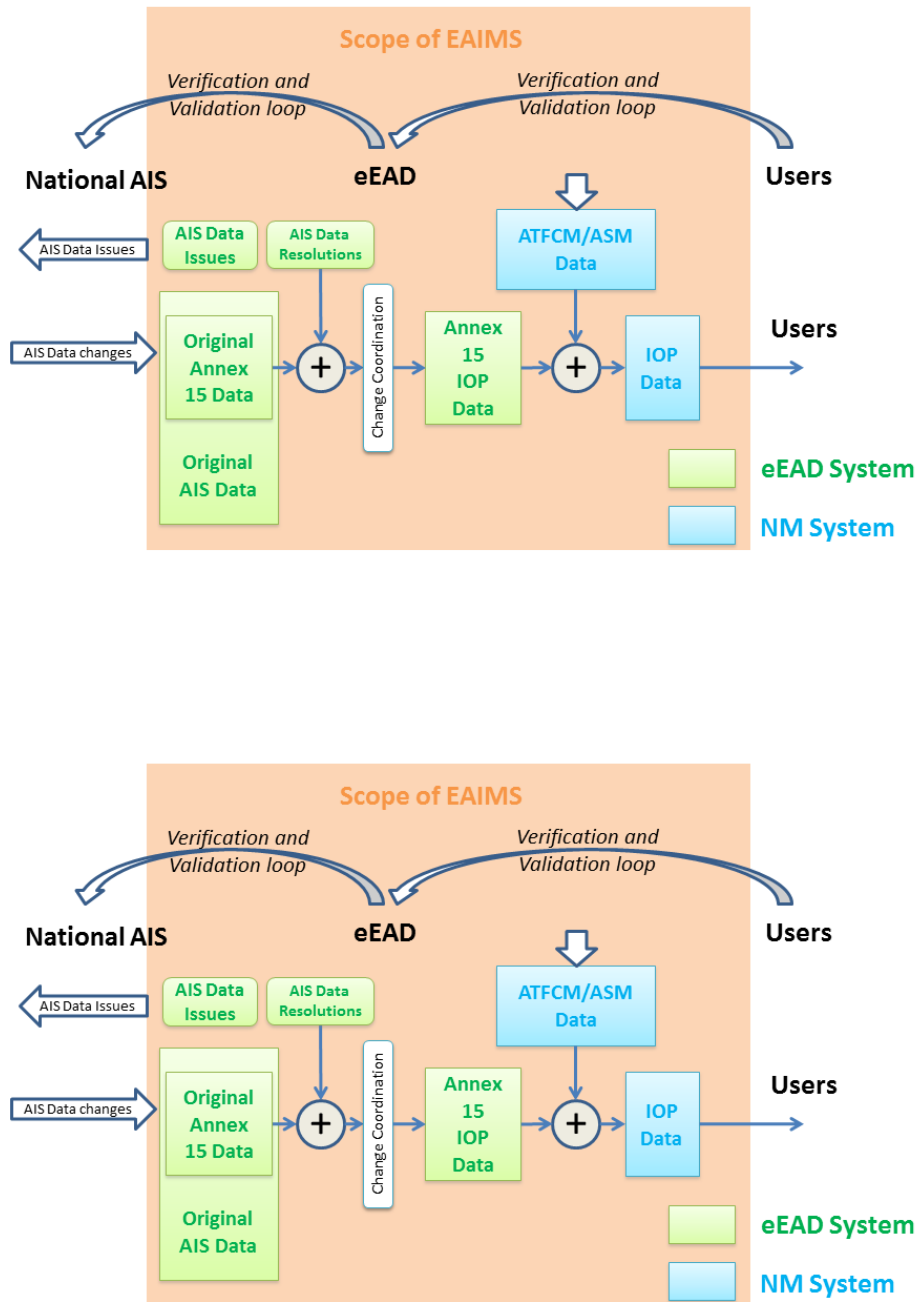
## ***A1.2 Targeted Operating Method***

The key objective of the EAIMS is to establish access to all the required, consolidated, consistent and operationally validated AIS/ATFCM/ASM data in a seamless and transparent way as from a single access point. A key concept introduced by the EAIMS is a process to build up a common operationally usable data set (called the “Interoperability Data” or **IOP Data**) as the missing bridge between the upstream and downstream data chains. The part of the IOP Data corresponding to the ICAO Annex 15 is referred to as **Annex 15 IOP Data**. The scope of the IOP Data is defined in ANNEX 2 – eEAD Data Catalogue – “Annex 15 IOP Data” category.

The AIS data being the reference for a majority of ATM data and processes, some concepts have been developed to ensure that EAIMS improves and makes its operational use more efficient.

Sometimes, the AIS data comes with issues that make them not directly usable operationally (for example route or airspace gaps between countries). Also, EAIMS users of the AIS Data may sometimes adjust this data for technical reasons (for example the simplification of arcs of circle into polygons). This is the reason why the concept of EAIMS IOP Data has been introduced. It is illustrated in the following figure and explained hereafter.

Enhanced European AIS Database (eEAD)  
 Concept of Operations (CONOPS)



**Figure 5: Upstream - Downstream Data Integration Process**

The **Original AIS Data** is the AIS Data as published under the state authority through the AIS channels. This Data is maintained by the States for those migrated to eEAD and by the eEAD DOP for the non-migrated States.

Sometimes, due to incomplete cross-border coordination or even to geo-political conflict



situations, the AIS Data comes with insufficient consistency between sources, lack of completeness or non-alignment with stated operational requirements (this could be route gaps, airspace border gaps/overlaps, different attributes for the same feature, etc.). All such issues, when detected by the eEAD Data Operations Provider (DOP) and by any EAIMS user, will be reported to the eEAD DOP for analysis. They will be captured by means of an **AIS Data Issue** in the eEAD system. An AIS Data Issue is raised if the reported issue is due to the data itself and not to the technical constraints of the EAIMS user systems. The eEAD DOP will support the National AIS, NM and other Stakeholders in handling the AIS Data Issues; the eEAD system will provide features to facilitate this task. The resolution of such AIS Data issues by the National AIS may take time, or in case of conflict situations, may continue indefinitely.

The eEAD system will store the Data Resolutions in a way that allows them to be re-applied automatically to the Original AIS Data once agreed by the relevant state authorities, to avoid human workload. Data Resolutions are only managed within the scope of the Annex 15 IOP Data. This new concept has been introduced to ensure that data, which is critical from an operational point of view, is handled with priority. This will guarantee on one side the continuity of the Network operations and on the other side a consistent set of data to be shared between all operational stakeholders. This data will be subject to a strict coordinated change management process linked to the AIRAC cycle under NM responsibility. Non-IOP data issues will continue to be treated as today under the routine data correction process.

ATFCM and ASM Data are entered by NM operators and external EAIMS users and reference the Annex 15 IOP Data.

As stated above, one of the objectives of the EAIMS service is to build a common operationally usable data set, called the **IOP Data**, which is conceptually composed of the Annex 15 IOP Data, the ATFCM and the ASM Data and is the referenced operational data for the European ATM Network operations.

EAIMS users are free to retrieve data from the Original AIS Data or the IOP Data in complete or partially. As Annex 15 data may differ in the Original AIS Data and in the IOP Data, the origin of the data shall be unambiguously flagged by the EAIMS system. Users can apply technical adaptations to the retrieved data set if required in order to use them on their local systems.

# **ANNEX 2 – eEAD Data Catalogue**

*Note: This annex is provided in a separate file.*

# ANNEX 3 – Stakeholder Requirements Mapping

ANSP representatives of the EAD Service Steering Group (EAD-SSG) have expressed their high level requirements and guiding principles at a Stakeholder consultation workshop hosted by the EUROCONTROL in its capacity of Network Manager on 9 November 2017.

This Annex lists those requirements and provides mapping of those requirements, where applicable into the main part of the eEAD CONOPS. If the requirement is not applicable for CONOPS, it provides a response or another reference.

The stakeholder requirements are provided in the context of EAIMS consultation workshop, and based on previous EAIMS CONOPS; hence the “description” in below table refers to “EAIMS”. Please read “EAIMS” as “eEAD” if it is referred in “description”, in italic format.

## A3.1 Basic Principles

Description	Reference
The functions and services of EAD shall be continued and kept up-to-date, at least until equivalent functions and services are offered by the <i>EAIMS</i> – beyond the end of the current EAD contracts if needed (cf. PC Decision No. 83).	Chapter 3.1.1
The <i>EAIMS</i> shall as a minimum ensure continuation of all services and functions of the current EAD system.	Chapter 3.1.1
Control of those aeronautical data falling under ICAO Annex 15 (or related European legislation) and entered into the <i>EAIMS</i> by the responsible AISP, shall remain with this AISP as Authorized Source and data owner.	Chapter 3.1.3
The <i>EAIMS</i> shall facilitate a fully digital data publication process, which ensures that Stakeholders’ datasets are seamlessly quilted and can be multilaterally exchanged between stakeholders without need for intermediaries or conversions.	Chapter 3.1.6
Specifications for the different <i>EAIMS</i> components shall be developed by EUROCONTROL together with relevant experts from the ANSPs.	Refer to MoM of meeting 09 Nov 2017 and 14 Feb 2018, this is not in scope of CONOPS.
The governance of the <i>EAIMS</i> should be ensured by EUROCONTROL and the ANSPs. The development and	Chapter 3.1.2

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operational exploitation of the system should however be outsourced using an open procurement procedure.

ANSP involvement in reporting and change management should be guaranteed at the same level as in the existing EAD and CACD working arrangements.

Independent and adequate resources (budget and staff) shall be ensured by EUROCONTROL for project management, system and incident management, release management, client management and evolution management.

Chapter 3.1.2

This is not in CONOPS scope, more relevant to project management.

As EUROCONTROL is moving away from NES architecture, which all EAIMS services would have been integrated into NM Eco System, we do not see the role of EUROCONTROL as integrator of different COTS products of eEAD. Instead EUROCONTROL proposes a separate Lot in the CFT for the integration and verification services. The lots corresponding to the service provision after the start of operations of the new eEAD are still to be defined, but the same principle of independent lots could be applied whenever relevant (e.g. data operations vs. technical services). EUROCONTROL intention is to ensure the overall project management with own staff.

The *EAIMS* should be developed using a modular approach (i.e. self-contained functional modules allowing easy upgrading and vendor-switching), tendered in a way that ensures monopolization of the system by a single service provider is not possible.

Chapter 3.1.5

Technical requirements for the *EAIMS* components should require maximal use of open standards and technologies, in order to:

Chapter 3.1.5

- maximize the system's internal/external interoperability;
- minimize dependency from single suppliers;
- facilitate adaption to new technologies in a SWIM

environment.

The *EAIMS* should offer ANSPs extensive possibilities for integration into their own AIM/ATM infrastructure and business processes through a structured migration management. Chapter 3.1.7

## **A3.2 Functional Scope**

### **Description**

The *EAIMS* shall provide:

- Full support for the execution of all AIS data management processes (IFR and VFR), including provision of the data to AIS and integrated briefing;
- Full support for the provision of ARO functions;
- All functions currently performed by the CACD database;
- Data harmonization and normalization, enabling multilateral exchange of compliant datasets;
- Provision of standardized interfaces for the up/download of data by authorized Stakeholders (e.g. WFS and other SWIM-compliant interfaces);
- Data downloads and reports from all data in all current public data exchange formats required for the use of the data in ATM systems (e.g. AIXM, ARINC) and any other global standard considered relevant (e.g. KML, SVG)
- Interactive visualisation of all geographical data maintained in *EAIMS*;
- A graphical data origination workspace, where relevant ATM users (e.g. airspace designers) can create new data and combine them with or validate them against existing data;
- Services allowing third-party software developers to

### **Reference**

As *EAIMS* CONOPS is transformed into eEAD CONOPS, below applies to eEAD CONOPS scope

Chapter 3.2.1, 3.6.1 and 3.6.3

Chapter 3.2.1(8) and 3.6.3

Not part of eEAD CONOPS

Chapter 3.2.1 (1)

Chapter 3.1.6, 3.2.1 (1) and 3.4

EUROCONTROL commits to the SWIM compliant interfaces; but not to the other interfaces like ARINC. These services will be better provided by 3<sup>rd</sup> parties as needed by individual users. From EAD experience it is too costly to maintain and not relevant to many AISP's (or could be provided based on the UPP principle to interested parties)

Chapter 3.2.1 (1) and 3.6.1

Chapter 3.2.1 (3)

Chapter 3.1.6 and 3.4

incorporate functions based on data available from or through *EAIMS*.

### **A3.3 Functional Scope Extension**

#### **Description**

The scope of the *EAIMS* and of the eEAD system could be enlarged at a later time into other SWIM domains (e.g. MET).

Such extension, however, require further consultation of all Stakeholders concerned in order to establish their interest in the application and its technical and operational feasibility.

Taking into account the time needed for this process, the development of any such additional functions is out of the scope the initial eEAD CFT.

The eEAD system shall be developed in such a way that additional modules can be added to it afterwards without need for changes to the existing eEAD components or the related contractual arrangements.

#### **Reference**

Referring to *EAIMS* 2<sup>nd</sup> Stakeholder Consultation workshop on 14 Feb 2018, it is agreed to take out MET data from the eEAD scope. Any other further potential extension for later will require further consultation with all relevant Stakeholders.

Same as above

Agreed, same as above

Chapter 3.4

### **A3.4 CONOPS and Business Model**

#### **Description**

The CONOPS of *EAIMS* shall be jointly developed by EUROCONTROL and the ANSPs.

The business model shall:

#### **Reference**

3 Consultations workshops and 4 Stakeholders review cycle foreseen.

EUROCONTROL proposal is to maintain the existing EAD cost recovery policy to be adapted for the cost recovery due the 80% migration threshold being reached. A gradual increase of charges may be foreseen. Not in scope of CONOPS hence main document is not updated.

- clarify the cost recovery model for ANSPs – with concrete implementation provisions;
  - formulate the conditions for use of ANSP data, and the conditions for customer access to services provided by EAIMS;
  - show the plans (if any) of EUROCONTROL to use *EAIMS* for direct services to end users (e.g. VFR ARO services).
- The services to be provided by eEAD are defined in Chapter 3.2.

### **A3.5 Software Interface Requirements**

#### **Description**

The *EAIMS* shall provide software interfaces to its users allowing access to all functions offered by the system.

All interfaces shall be available as B2B and B2C:

- All B2B interfaces shall use SWIM services to exchange data between EAIMS and the external systems concerned.
- All B2C interfaces shall be fully web-based and use open standards. EUROCONTROL shall maintain and guarantee interfaces at ECIT level or equivalent, as a minimum.

#### **Reference**

Chapter 3.4

Chapter 3.4

### **A3.6 Data Requirements**

#### **Description**

Unless already provided by the users of the *EAIMS*, the *EAIMS* itself shall ensure at least the availability of following data:

- world-wide coverage of static data required for the validation of NOTAM or flight plans;
- all data currently maintained in CACD and required to provide the associated NM functions;
- world-wide NOTAM coverage;
- world-wide AIP coverage.

#### **Reference**

As EAIMS CONOPS is transformed into eEAD CONOPS, below applies to eEAD CONOPS scope

ANNEX 2 – eEAD Data Catalogue

Not in scope of eEAD CONOPS

ANNEX 2 – eEAD Data Catalogue

Chapter Moving Towards Global Interoperability

The ICAO Global Air Navigation Plan [19] has established a roadmap for Information Management

including AIS/AIM which requires States to implement improvements such as: Digital NOTAM, enhanced quality and digital data, Electronic Charts, Digital Briefing, eAIP, AIXM, SWIM, etc. The implementation of these features will require robust AIS/AIM Databases established and updated by the States. The eEAD architecture will support the implementation of AIS/AIM Database with a similar large scale geographical coverage also in other parts of the world.

In this context, eEAD will facilitate global interoperability and will provide access to users from other areas of the world. It will be able to communicate through the SWIM protocols with similar systems from other regions to create a global network of aeronautical data hubs. The eEAD system itself could be replicated and instantiated to run as a separate system servicing other ICAO Regions which could prove to be a cost effective solution for non-ECAC States.

Geographical Coverage and 3.2.1 (6)

Chapter 3.2.1 (1)

The *EAIMS* shall have services in place to ensure that:

- The ownership of all data items in the *EAIMS* is clearly defined and uncoordinated change of the data by other parties than the owner is prevented;
- National datasets provided by migrated States are identical to those stored in the *EAIMS*;
- Conflicts between data uploaded by different users are



detected and solution of them is facilitated.

### **A3.7 Data Communication Requirements**

#### **Description**

For the communication between the *EAIMS* servers and the local interfaces, equal secure access shall be provided over the public internet and over the PENS (or any successor of it, as applicable).

The *EAIMS* shall be capable of handling all AFTN/AMHS, email and SMS traffic related to the services provided, avoiding the requirement to create local interfaces to connect the *EAIMS* to user-side COM systems.

*EAIMS* shall support the exchange of aeronautical data in AIXM 5.1 format (and subsequent versions). EUROCONTROL shall ensure that the business rules for the 5.1 format are improved so that reliable data exchange in AIXM 5.1 can be guaranteed, both amongst external systems and between those systems and *EAIMS*.

For the initial release of *EAIMS* it shall in any case be avoided to use a newer AIXM version which is not fully interoperable with systems using AIXM 5.1 data exchange.

#### **Reference**

Equal secure access is considered the same as the current EAD services over VPN. Chapter 3.4

It will be limited to eEAD information. Chapter 3.4

Chapter 3.4, 3.1.7 and 3.2.1 (1)

Chapter 3.4

## ANNEX 4 – References

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2. Commission Regulation (EU) No 1025/2012 of 25 October 2012 laying down common rules on European standardization.
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# GLOSSARY

Abbreviation	Description
<b>ACFT</b>	Aircraft Type Characteristics and Performance
<b>ACK</b>	ACKNOWLEDGE (MESSAGE)
<b>ADP</b>	Aircraft Data Provider
<b>ADQ</b>	Aeronautical Data Quality
<b>ADR</b>	Airspace Data Repository
<b>AF</b>	ATM Functionality
<b>AFS</b>	Aeronautical Fixed Service
<b>AFTN</b>	Aeronautical Fixed Telecommunication Network
<b>AI</b>	Aeronautical Information
<b>AIC</b>	Aeronautical Information Circulars
<b>AIM</b>	Aeronautical Information Management
<b>AIP</b>	Aeronautical Information Publication
<b>AIRAC</b>	Aeronautical Information Regulation and Control
<b>AIRMET</b>	Airmen's Meteorological Information
<b>AIS</b>	Aeronautical Information Service
<b>AISP</b>	Aeronautical Information Service Provider
<b>AIXM</b>	Aeronautical Information Exchange Model
<b>AMHS</b>	ATS Message Handling System
<b>ANSP</b>	Air Navigation Service Provider

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Concept of Operations (CONOPS)

<b>APM</b>	Aircraft Performance Model
<b>AO</b>	Aircraft Operator (civil and military)
<b>AOC</b>	Airline Operational Control
<b>API</b>	Application Programming Interface
<b>Apps</b>	Applications
<b>ARINC</b>	Aeronautical Radio, Incorporated
<b>ARO</b>	Air Traffic Services Reporting Office
<b>ASBU</b>	Aviation System Block Upgrades
<b>ASECNA</b>	Agency for the Safety of Air Navigation in Africa and Madagascar
<b>ASM</b>	Airspace Management
<b>ATC</b>	Air Traffic Control
<b>ATFCM</b>	Air Traffic Flow and Capacity Management
<b>ATFM</b>	Air Traffic Flow Management
<b>ATM</b>	Air Traffic Management
<b>ATS</b>	Air Traffic Services
<b>ATSEP</b>	Air Traffic Safety Electronics Personnel
<b>B2B</b>	Business to Business
<b>B2C</b>	Business to Customer
<b>BADA</b>	Base of Aircraft Data
<b>CACD</b>	Central Airspace & Capacity Database
<b>CDR</b>	Conditional Route
<b>CFSP</b>	Computer Flight Plan Service Provider

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Concept of Operations (CONOPS)

<b>CFT</b>	Call For Tenders
<b>COM</b>	Communication
<b>COTS</b>	Commercial Off The Shelf
<b>CONOPS</b>	Concept of Operations
<b>CP</b>	Common Projects (SESAR)
<b>CS</b>	Centralised Services
<b>CWP</b>	Controller Working Position
<b>DATM</b>	Digital ATM
<b>DOC or Doc</b>	Documentation (Document)
<b>DOP</b>	Data Operations Provider
<b>EAD</b>	European AIS Database
<b>eEAD</b>	Enhanced European AIS Database
<b>EAIM</b>	European Aeronautical Information Management
<b>EAIMS</b>	European ATM Information Management Service
<b>eAIP</b>	electronic Aeronautical Information Publication
<b>EASA</b>	European Aviation Safety Agency
<b>EATM</b>	European Air Traffic Management
<b>EC</b>	European Commission
<b>ECAC</b>	European Civil Aviation Conference
<b>ECIT</b>	EAD Client Interface
<b>ECTL</b>	EUROCONTROL
<b>EETF</b>	Evolution Task Force

Enhanced European AIS Database (eEAD)  
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<b>EFB</b>	Electronic Flight Bag
<b>ENV</b>	Environment
<b>ePIB</b>	Enhanced Pre-Flight Information Bulletin
<b>ESSIP</b>	European Single Sky ImPlementation
<b>ETFMS</b>	Enhanced Tactical Flow Management System
<b>EU</b>	European Union
<b>EUROCAE</b>	The European Organisation for Civil Aviation Equipment
<b>EUROCONTROL</b>	European Organisation for the Safety of Air Navigation
<b>FAB</b>	Functional Airspace Block
<b>FAM</b>	Flight Activation Monitoring
<b>FDP</b>	Flight Data Processing
<b>FF-ICE</b>	Flight and Flow Information for a Collaborative Environment
<b>FICE</b>	Increased Interoperability, Efficiency & Capacity through FF-ICE
<b>FMS</b>	Flight Management System
<b>FPL</b>	Flight Plan
<b>GA</b>	General Aviation
<b>GANP</b>	Global Air Navigation Plan (ICAO)
<b>GAT</b>	General Air Traffic
<b>GEN</b>	General
<b>GPS</b>	Global Positioning System
<b>HMI</b>	Human Machine Interface
<b>IACA</b>	International Air Carriers Association

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<b>IAIP</b>	Integrated Aeronautical Information Package
<b>IAOPA</b>	International Council of Aircraft Owner and Pilot Associations
<b>IATA</b>	International Air Transport Association
<b>ICAO</b>	International Civil Aviation Organization
<b>IEC</b>	International Electrotechnical Commission
<b>IFPS</b>	Integrated Initial Flight Planning System
<b>IFPZ</b>	IFPS Zone
<b>IFR</b>	Instrument Flight Rules
<b>INO</b>	International NOTAM Operations
<b>IOC</b>	Initial Operational Capability
<b>IOP</b>	Interoperability
<b>IOC</b>	Initial Operational Capability
<b>IPV6</b>	Internet Protocol version 6
<b>ISO</b>	International Standards Organization
<b>iSWIM</b>	initial SWIM
<b>IT</b>	Information Technology
<b>ITY</b>	Interoperability
<b>KML</b>	Keyhole Markup Language
<b>MAN</b>	MANUAL (MESSAGE)
<b>MET</b>	Meteorological
<b>METAR</b>	Aerodrome Routine Meteorological Report
<b>MoM</b>	Minutes of Meeting



Enhanced European AIS Database (eEAD)  
Concept of Operations (CONOPS)

<b>NEC</b>	National Environment Coordinator
<b>NES</b>	NM Ecosystem
<b>NM</b>	Network Manager
<b>NMB</b>	Network Management Board
<b>NMOC</b>	Network Manager Operations Centre
<b>NOP</b>	Network Operations Plan
<b>NOTAM</b>	Notice To Airmen
<b>NPA</b>	Notice of Proposed Amendment
<b>OAT</b>	Operational Air Traffic
<b>OPADD</b>	Operating Procedures for AIS Dynamic Data
<b>PAMS</b>	Published AIP Management System
<b>PANS</b>	Procedures for Air Navigation Services
<b>PC</b>	Provisional Council
<b>PCP</b>	Pilot Common Projects (SESAR)
<b>PENS</b>	Pan-European Network Services
<b>PIB</b>	Pre-flight Information Bulletin
<b>REJ</b>	REJECT (MESSAGE)
<b>RPAS</b>	Remotely Piloted Aircraft Systems
<b>RTCA</b>	Radio Technical Commission for Aeronautics
<b>SDO</b>	Static Data Operations
<b>SDP</b>	SESAR Deployment Programme
<b>SES</b>	Single European Sky

Enhanced European AIS Database (eEAD)  
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<b>SESAR</b>	Single European Sky ATM Research
<b>SIGMET</b>	Significant Meteorological Information
<b>SLA</b>	Service Level Agreement
<b>SMS</b>	Short Message Service
<b>SPECI</b>	Aerodrome Special Meteorological Reports
<b>SSG</b>	Service Steering Group
<b>SUP</b>	Supplement
<b>SVG</b>	Scalable Vector Graphics
<b>SWIM</b>	System Wide Information Management
<b>TAF</b>	Aerodrome Forecast
<b>TAM</b>	NOTAM, SNOWTAM, BIRDTAM (military only), ASHTAM and ATFM messages
<b>TLP</b>	Traffic Light Protocol
<b>TRA</b>	Temporary Reserved Areas
<b>UAS</b>	Unmanned Aircraft Systems
<b>UPP</b>	User-Pays Principle
<b>VFR</b>	Visual Flight Rules
<b>WFS</b>	Web Feature Services
<b>WOC</b>	Wing Operations Centre
<b>XML</b>	Extensible Markup Language

# TERMINOLOGY

<b>ACFT Data</b>	is composed of Aircraft Type Characteristics and Performance Data. Aircraft Type Characteristics Data is data of administrative character mostly referring to the identification of the aircraft as contained in ICAO Doc 8643 Aircraft Type Designators, such as manufacturer, model, etc., and also data describing physical features of an aircraft (e.g. Mass). The Aircraft Type Performance Data refers to the operational capabilities of an aircraft, such as the Rate of Climb. The ACFT part of the eEAD Data Catalogue contains ACFT Data elements (or references to them) of the BADA 3 & 4 data families (including coefficients of the BADA model algorithms) and of the non-BADA Data that are stored in the system.
<b>Adaptations to NM systems</b>	including adaptations to the existing NM CACD system, which will be the reference source for the ATFCM and Dynamic ASM Data.
<b>Aeronautical Data</b>	a representation of aeronautical facts, concepts or instructions in a formalized manner suitable for communication, interpretation or processing.
<b>Aeronautical Information</b>	Information resulting from the assembly, analysis and formatting of aeronautical data.
<b>Aeronautical Information Service (AIS)</b>	a service established within the defined area of coverage responsible for the provision of aeronautical information/data necessary for the safety, regularity and efficiency of air navigation.
<b>AIC</b>	means Aeronautical Information Circular as defined in Annex 15 to the Chicago Convention.
<b>AIP</b>	means Aeronautical Information Publication as defined in Annex 15 to the Chicago Convention.
<b>Air Navigation Service Provider (ANSP)</b>	a body that manages flight traffic on behalf of a company, region or country.

<b>Airspace Data Repository (ADR) project</b>	project to develop a virtual Airspace Data Repository providing a common and consistent network view on the airspace information that will support the ASM/ATFCM/ATC collaborative process.
<b>AIS Data</b>	eEAD data driven by the ICAO Annex 15 data model e.g. Waypoints, Routes, Aerodromes etc. as defined in eEAD Data Catalogue.
<b>AIS Data Change Proposal</b>	used as a means of recording progress through the process steps, acting as both a means of progress tracking and maintaining an audit trail.
<b>AIS Data Issue</b>	due to several reasons Original AIS Data stored in the system may not be suitable for the operational usage for a certain Data User (this could be route gaps, airspace border gaps/overlaps, missing data or different attributes for the same feature, etc.). Such issues may be captured by means of an AIS Data Issue in the system.
<b>AISP</b>	means aeronautical information service provider i.e. the organisation responsible for the provision of an aeronautical information service.
<b>Annex 15 IOP Data</b>	the AIS Data used by ATM systems to describe the aeronautical infrastructures (waypoints, routes, airports, elementary airspace volumes, etc.). The precise data scope of the Annex 15 IOP Data is defined in the ANNEX 2 – eEAD Data Catalogue.
<b>Application</b>	means an element of the System breakdown. It is constituted by an integrated group of components identified in the system design. It normally is used in the software context.
<b>ATFCM Data</b>	EAIMS data driven by NM Flow Management data model e.g. Flow Restrictions, Runway Configurations etc.
<b>Authorised Data</b>	data coming from an Authorised Source.

<b>Authorised Source</b>	managed repository of valid or trusted data that is recognized by an appropriate set of governance entities and supports the governance entity's business environment.
<b>Availability</b>	means the agreed timetable of the service "minus" Planned Unavailability of the service when within the agreed timetable (outside of contingency situations).
<b>B2B Services</b>	services delivered via a computer to computer interface. One system will interact with another system via services. Services are made available via a set of APIs (Application Programming Interface) that a software developer has to use to make his own system inter-operate with the other system.
<b>B2C</b>	services delivered via an HMI, targeted for human interaction. An end user can interact with the system via a client application. The client application interacts via services with the system.
<b>Briefing</b>	a service which provides AIS Data updates and MET information essential for the safety, regularity and efficiency of air navigation, in relation with a flight route or an ad-hoc need. This includes the ICAO Annex 15 and Doc 8126 requirements and respective guidelines for pre-flight briefing.
<b>Call for Tenders</b>	means the Call for Tenders relating to the EUROCONTROL Enhanced European AIS Database (eEAD), including any documentation as attached to it or referenced in it as applicable.
<b>Central Airspace and Capacity Database (CACD)</b>	formerly the ENV Database. It is the common airspace data repository feeding NM operational systems. CACD provides data for use by the Integrated Initial Flight Plan Processing System (IFPS), Repetitive Flight plan (RPL), Enhanced Tactical Flow Management System (ETFMS), etc. systems of the Network Manager.
<b>Chart</b>	a graphical representation (to scale or not to scale) of geographical and/or aeronautical objects.

<b>Chicago Convention</b>	means the Convention on International Civil Aviation signed on 7 December 1944.
<b>Client</b>	means an entity that has access to the system as a provider or user of the data.
<b>Contingency</b>	situations where a prolonged disruption of normal operation of the service is encountered due to damages resulting from natural causes and disasters, as well as from deliberate attacks (e.g. fire, flood, atmospheric electrical discharge, solar induced geomagnetic storm, nuclear accident, volcanic activity, biological hazard, civil unrest, and other forms of natural or man-made disaster).
<b>COTS (Commercial-Off-The-Shelf)</b>	means products commercially available in a standard configuration, which are offered to sale to the general public. COTS normally relate to standard pieces of software or hardware, which can, be “plugged” into applications and delivers well-specified functions and interfaces.
<b>Data</b>	means all data required for the eEAD Service, as defined in the eEAD Data Catalogue.
<b>Data Originator</b>	means an entity responsible for data origination. Data origination means the creation of a new data item with its associated value, the modification of the value of an existing data item or the deletion of an existing data item.
<b>Data Provider</b>	means a Client who enters and maintains in the eEAD (EAD) Data for which it is responsible.
<b>Data Resolution</b>	temporary modification for Original AIS Data (without changing the Original AIS Data) needed to resolve an AIS Data Issue or IOP Data Issue. Data Resolutions are part of the extracted Annex 15 IOP Dataset.
<b>Data User</b>	means a client who uses the eEAD (EAD) data.
<b>Database</b>	means a collection of independent works, data or other materials arranged in a systematic or methodical way and individually accessible by electronic or other means.

<b>Development</b>	means the whole of tasks, actions and activities to be performed to evolve the system from customer needs to system, people, and product and process solutions. The function encompasses the planning and execution of the definition, design, design implementation, integration, analyses and control type of activities.
<b>Digital NOTAM</b>	a data set made available through digital services containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to systems and automated equipment used by personnel concerned with flight operations. Further defined and described in the Digital NOTAM Event Specification.
<b>Downstream Data Chain</b>	is a term used to refer to the data chain functions from Application/Integration to end-use.
<b>Draft Data</b>	data that is not yet released and which can be modified without restrictions.
<b>Dynamic ASM Data</b>	EAIMS data driven by Airspace Management processes i.e. Airspace activation, AUP categories, etc.
<b>Dynamic Data</b>	data that reflects temporary changes or permanent changes made on short notice.
<b>EAD Contracts</b>	means the present EAD contracts including the Appendices and Annexes attached hereto.
<b>eEAD Data Catalogue</b>	is a general description of the eEAD data scope capturing the data requirements to meet the eEAD needs as specified within the current CONOPS.
<b>eEAD system</b>	subject of the eEAD CFT and will be the reference source for the AIS Data and a central access point for Aircraft Type Characteristics and Performance Data.
<b>ePIB (Enhanced Pre-Flight Information Bulletin)</b>	is a kind of PIB in which the aeronautical and MET information are presented interactively, using a combination of tabular and graphical formats and taking into

consideration human factors such as the use of normal sentence case, user-preferred abbreviations, semantic prioritisation and filtering, etc.

**EUROCONTROL**

means the European Organisation for the Safety of Air Navigation established by the EUROCONTROL International Convention relating to Co-operation for the Safety of Air Navigation as amended at Brussels in 1981, having its headquarters located at Rue de la Fusée 96, BE-1130 Brussels, Belgium.

**EUROCONTROL  
Permanent Commission**

represents Member States at ministerial level. It formulates general policy and is responsible for decisions and regulatory functions. The Commission also approves the EUROCONTROL annual budget, the five-year programme, contract regulations, financial regulations and staff regulations, and is responsible for appointing the Director General and Directors. It gives a final ruling on the Agency's annual accounts.

**EUROCONTROL  
Provisional Council (PC)**

Member States are represented in the Provisional Council at Director General of Civil Aviation level. The European Union participates in the work of the Provisional Council. The Provisional Council is responsible for implementing EUROCONTROL's general policy, as established by the Permanent Commission, and for supervising the Agency's work.

**Flight Operations  
Community**

term used to refer to actors in the downstream data chain such as Aircraft Operators, Airport Operators, Military, ATC, etc.

**Hazard**

means a potentially unsafe condition resulting from failures, malfunctions, external events, human errors or combinations thereof.

**Incident Management**

means the process to remedy as quickly as possible failures or potential failures in the services to clients. In addition to incident recovery, Incident Management shall register all incidents for later investigation purposes.

**Incident(s)**

means an event which is not part of the standard operation of a service and which causes or may cause disruption to or



	a reduction in the quality of services and customer productivity.
<b>Infrastructure</b>	means all assets required by an organisational unit to perform its activities, this includes buildings, IT systems, power supplies, etc.
<b>Integration</b>	means the activity associated with the assembly of completed system components.
<b>IOP Data</b>	operationally usable data set, which is conceptually composed of the Annex 15 IOP Data, the ATFCM and the ASM Data and is the referenced operational data for the European ATM Network operations.
<b>Member States</b>	means the member states of EUROCONTROL at the Effective Date and any time thereafter.
<b>Migrated</b>	means a Client (Data Provider) that has been declared operational by EUROCONTROL for all of the areas for which it is responsible.
<b>NewPENS</b>	a pan-European, ATM-grade, IP transport service building on the current PENS service and aimed at being available as of mid-2018.
<b>NM systems</b>	refer but not limited to the Enhance Tactical Flow Management System (ETFMS), PREDICT System, Initial Flight Plan Processing System (IFPS) and Airspace Data Management System (CACD) of NMOC. They are responsible for the flow and capacity management and provision of the ATFCM and Dynamic ASM Data.
<b>Non-Migrated State</b>	a state that is not considered a Migrated State.
<b>NOTAM</b>	NOTAM (notice to airmen) is a notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.

<b>Original AIS Data</b>	AIS Data as published under the state authority through the AIS channel.
<b>Pre-Flight Information Bulletin (PIB)</b>	is a presentation of current NOTAM and MET information of operational significance prepared prior to flight.
<b>Pre-validation (Data)</b>	means a process enabling testing of potential data changes for operational use.
<b>Provider Role</b>	specifies the eEAD Stakeholder role in regards of the provision and maintenance of eEAD data retaining full control of - and intellectual property rights over - the information input into the eEAD as well as providing eEAD services under the given functionality.
<b>Quality Assurance</b>	means the planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality.
<b>Reference Source (Trusted Source)</b>	reference source and referenced data sources describe a situation in which data sets are published by someone other than the authoritative source and are often the compilation of multiple sources of authoritative data. The data are trusted because there is an official process for compiling the data from authoritative sources and the limitations, currency, and attributes are known. Metadata are provided; the data are often formatted into a standardized form; and linkages to the originating source are provided with the data. This trusted/reference source is recognized by the authoritative source as an official publisher of this subset. Typically a trusted/reference source is established to integrate data from multiple jurisdictions and to compile them into a standard format. These trusted data are adequate, convenient, and cost effective for users that need a regional view.
<b>Test/Training System</b>	a replica of the Operational System used for training/ testing purpose. Using this system will not influence or impact the day-to-day operations.
<b>Upstream Data Chain</b>	is a term used to refer to the data chain functions from the point of origination to the point of publication.

<b>User Role</b>	specifies the eEAD Stakeholder role in regards of the usage of eEAD system and services to support their day-to-day operations and activities.
<b>Validation</b>	means confirmation and provision of objective evidence that the requirements for a specific intended use or application have been fulfilled. In other words, validation is checking the system's usability from the user's perspective.
<b>Validation (Data)</b>	means a process ensuring data is tested for operational use.
<b>Verification</b>	means confirmation and provision of objective evidence that specified requirements have been fulfilled. In other words, verification is checking that the system does what it was designed to do.
<b>Verification (Data)</b>	means a process ensuring data is tested against a specific set of business rules and which may result in three different non-compliant levels: warning, error or fatal error.
<b>What-if AIS Data</b>	a subset of AIS Data used exclusively for Pre-validation/Simulation scenarios.