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EUROCONTROL

Integrated Aeronautical Information database

Workshop for the development of Operational skills for the transition from AIS to AIM for Civil Aviation Authorities (CAA) and Air Navigation Service Providers

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Dakar

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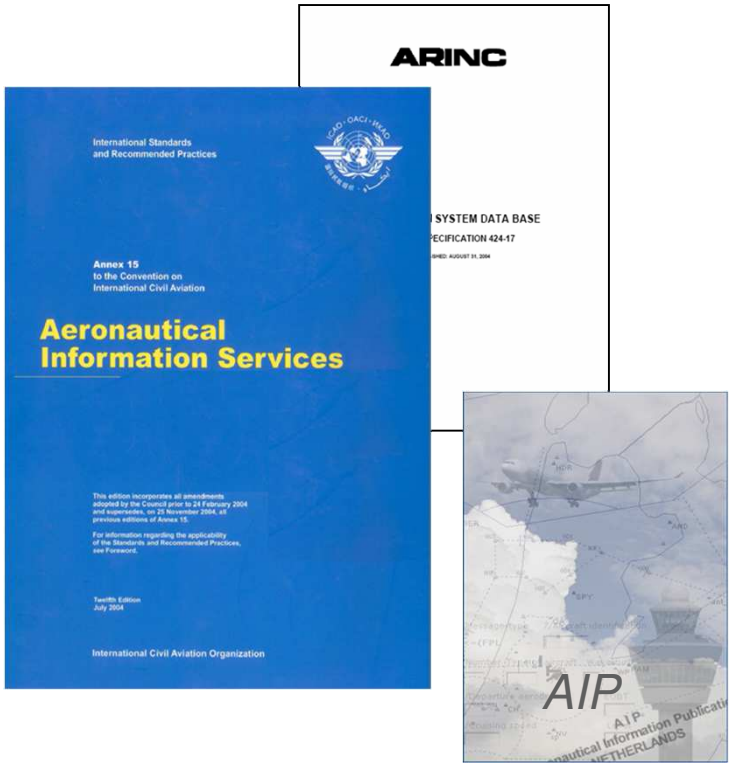
AIXM
Why necessary?

- EAD Feasibility Study (by “CAPdebis”) - 1993
  - “*The exchange of static data in an electronic format is rare for ground based systems. Other than ARINC 424 format, which was developed according to the demands of FMS, a state of the art, commonly used standard format for the exchange of static data information […] is not available.*”

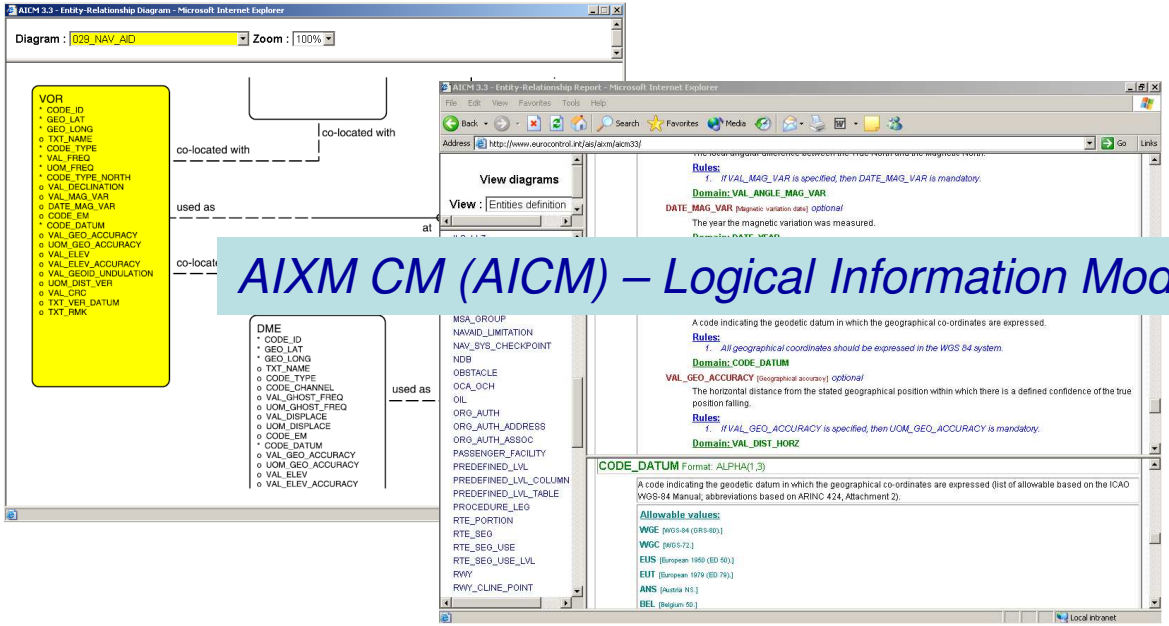
AIXM
Development

- Standard for aeronautical information encoding and digital dissemination
- Based on:
  - ICAO Annex 15
  - Industry standards such as ARINC 424
  - Other standards, best practices, AIP
- Development started in 1997
  - Initially developed for the European AIS Database (EAD)
- The latest version of the model is 5.1 (Feb 2010)
  - Cover both static and dynamic data
  - Means of Compliance for EU Aeronautical Data Quality (ADQ) regulation (73/2010)
  - Basis for eAIP, Digital NOTAM
  - Contribution to ICAO
  - Available for industry implementations



AIXM

Two main components



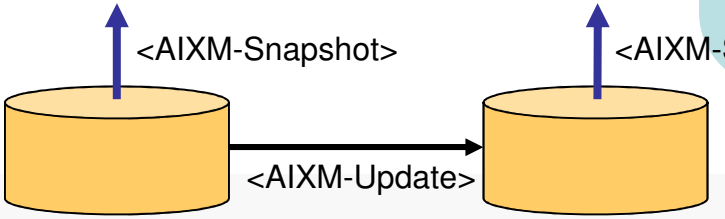
AIXM CM (AICM) – Logical Information Model

- *Description of the data independent from the data storage and exchange specifications*
- *AICM describes the aeronautical entities, their attributes and relationships*

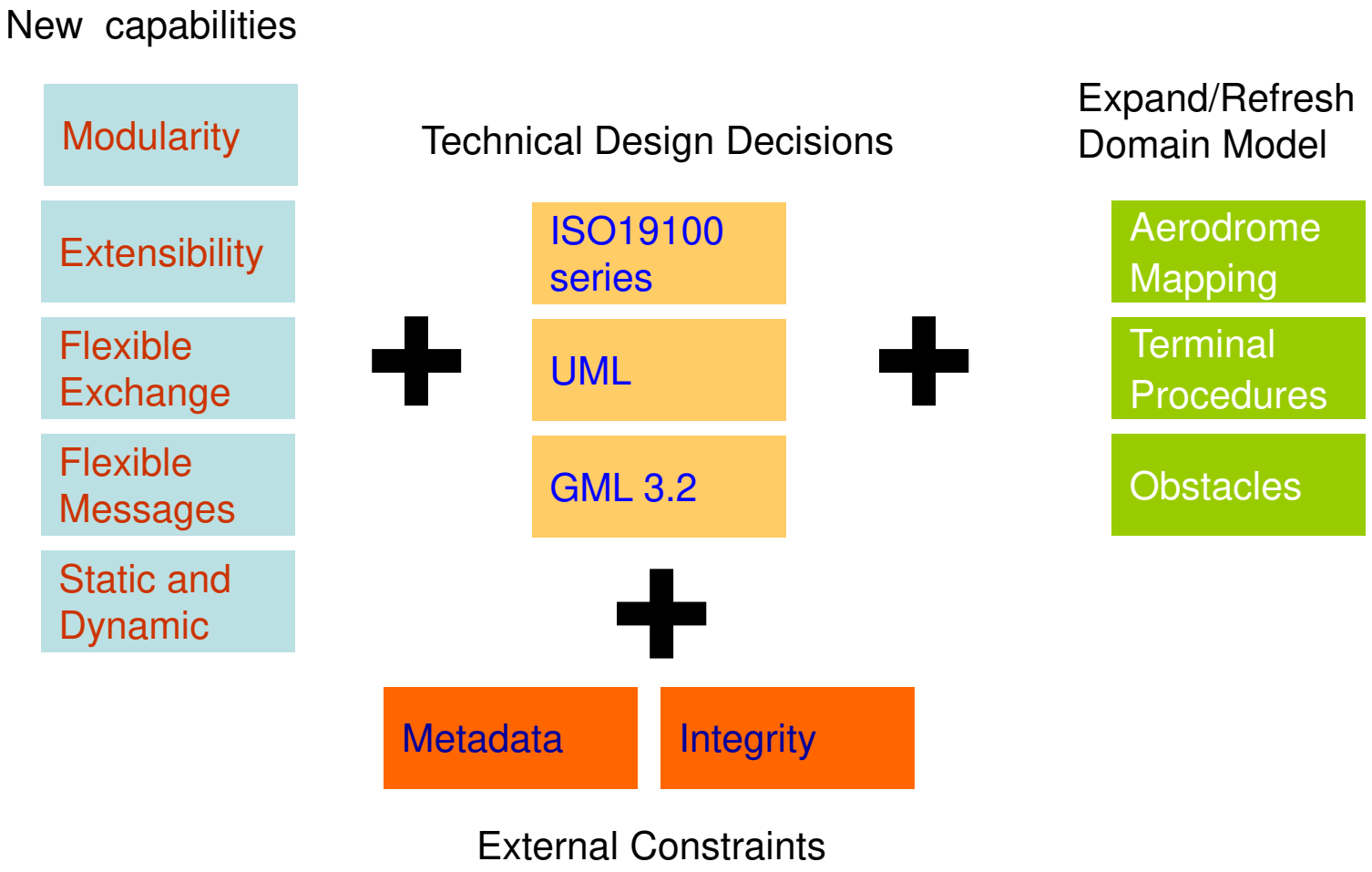
```
<AIXM-Snapshot>
    <Vor>
        <VorUid>
            <codeID>AML</coc
            <geoLat>34.3928N
            <geoLon>123.4333W</geoLon>
        </VorUid>
    …
</AIXM-Snapshot>
```

AIXM – Data Exchange Format (XML)

- *Enable systems to exchange aeronautical information in the form of XML encoded data*
- *AIXM is an implementation of the AICM in the form of an XML schema*



AIXM
AIXM 5 Design Objectives



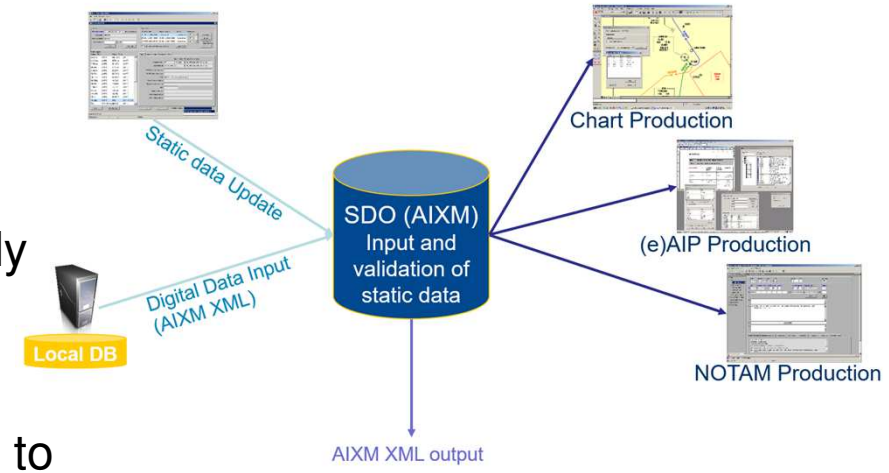
AIXM
AIXM 5 Design Objectives

- Adoption of a number of international standards that maximize the chances for interoperability while also reducing the implementation costs:
  - UML (Unified Modeling Language) for developing AIXM 5 logical information model
  - GML - Geography Markup Language, a specialization of XML for geographical data - for data encoding
  - ISO19100 series of geospatial information standards as data modelling framework
- Equal coverage for static and dynamic data; be able to communicate both 'permanent' changes, such as those that occur at AIRAC cycles and temporary situations, typically promulgated through NOTAM; this requires the introduction of an exhaustive temporality concept in the model;
- Modularity and extensibility: offer the possibility to easily re-use a part of the exchange specification for a particular domain, which might be interested only by a limited number of features without dealing with the complexity of the whole AIXM; offer the possibility for third parties to expand the model – additional features, additional properties or domain values – for local application; Place names in local language are a typical example.
- Flexibility of messages and exchange scenarios: the AIXM 4.5 model version is limited to two standard messages: Snapshot and Update – which have been proven sufficient for a central AIS database concept such as the EAD, but insufficient for a few other kinds of applications. User communities and applications should have the possibility to decide on the types of messages that they want to compose using the AIXM pool of features and also on the scenarios in which these messages are used.
- Exhaustive metadata incorporation into the model has been identified
- Update of some concepts (aerodrome mapping, terminal procedures and obstacle data - eTOD)

AIXM

Typical Implementation of the model

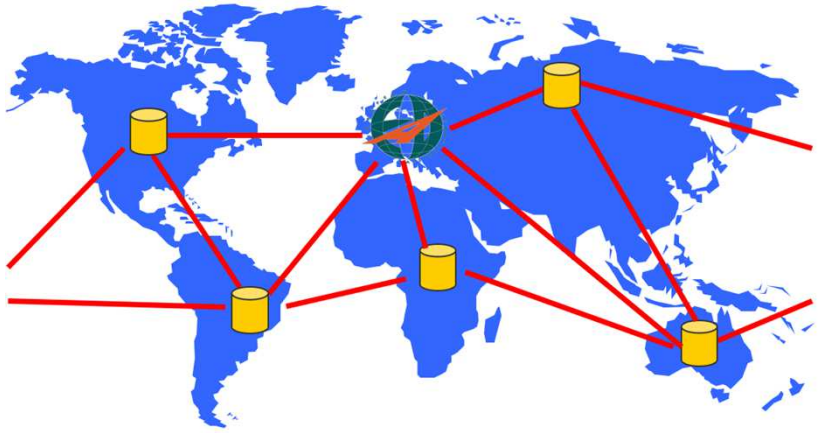
- AIXM-based database is implemented in tools for the management of aeronautical information
- Input
  - Data may be input either:
    - Through input screens or
    - Ingested automatically, if already available in digital format
- Output
  - Data stored in the database is used to support the creation of the (e)AIP, charts, NOTAM, etc.
  - AIXM is then used as output format for transmitting the aeronautical information to other databases, systems



AIXM

Typical Implementation of the model

- Sharing of system and service implementation costs can be realized by establishing regional systems (e.g. European AIS Database (EAD))



… Connecting with the world …

Important notes:

- AIXM XML expertise is not necessary for AIS/AIM operators!!!
  → *Only necessary for system developers and programmers*
- Operational staff is only required to understand the logical information model
  → *AIS tools available on the market could even hide some part of the complexity of the logical information model*

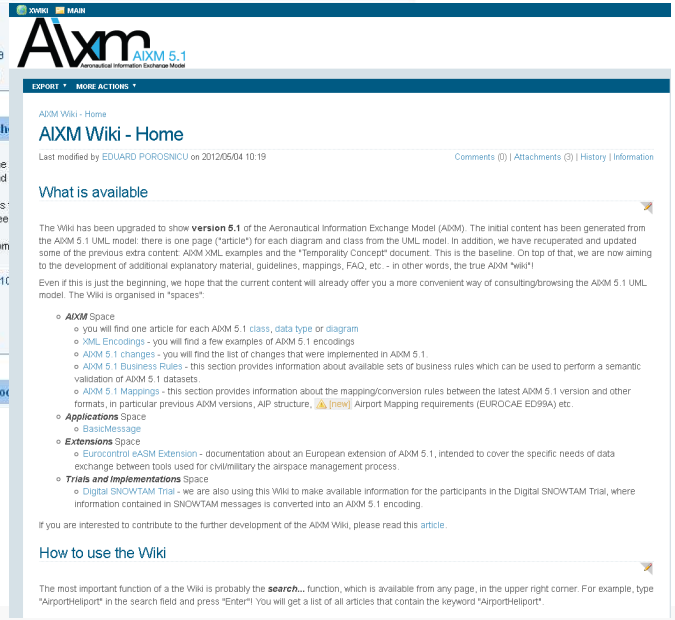
AIXM
Complementary Information

- Mapping AIP – AIXM 5
  - https://ext.eurocontrol.int/aixm_confluence/display/ACGAIP/Coding+Guidelines

- Mapping PANS AIM AIP datasets to AIXM 5
  - https://ext.eurocontrol.int/aixm_confluence/display/ACGAIP/Mapping+PANS-AIM+AIP+Data+Set+to+AIXM+5

AIXM
Complementary Information

- www.aixm.aero
- www.aixm.aero/wiki
- AIXM Forum



SWIM
System Wide Information Management

- SWIM consists of **standards**, **infrastructure** and **governance** enabling the management of ATM information and its exchange between qualified parties via interoperable services

- Global interoperability and standardization are essential to:

Share information about:

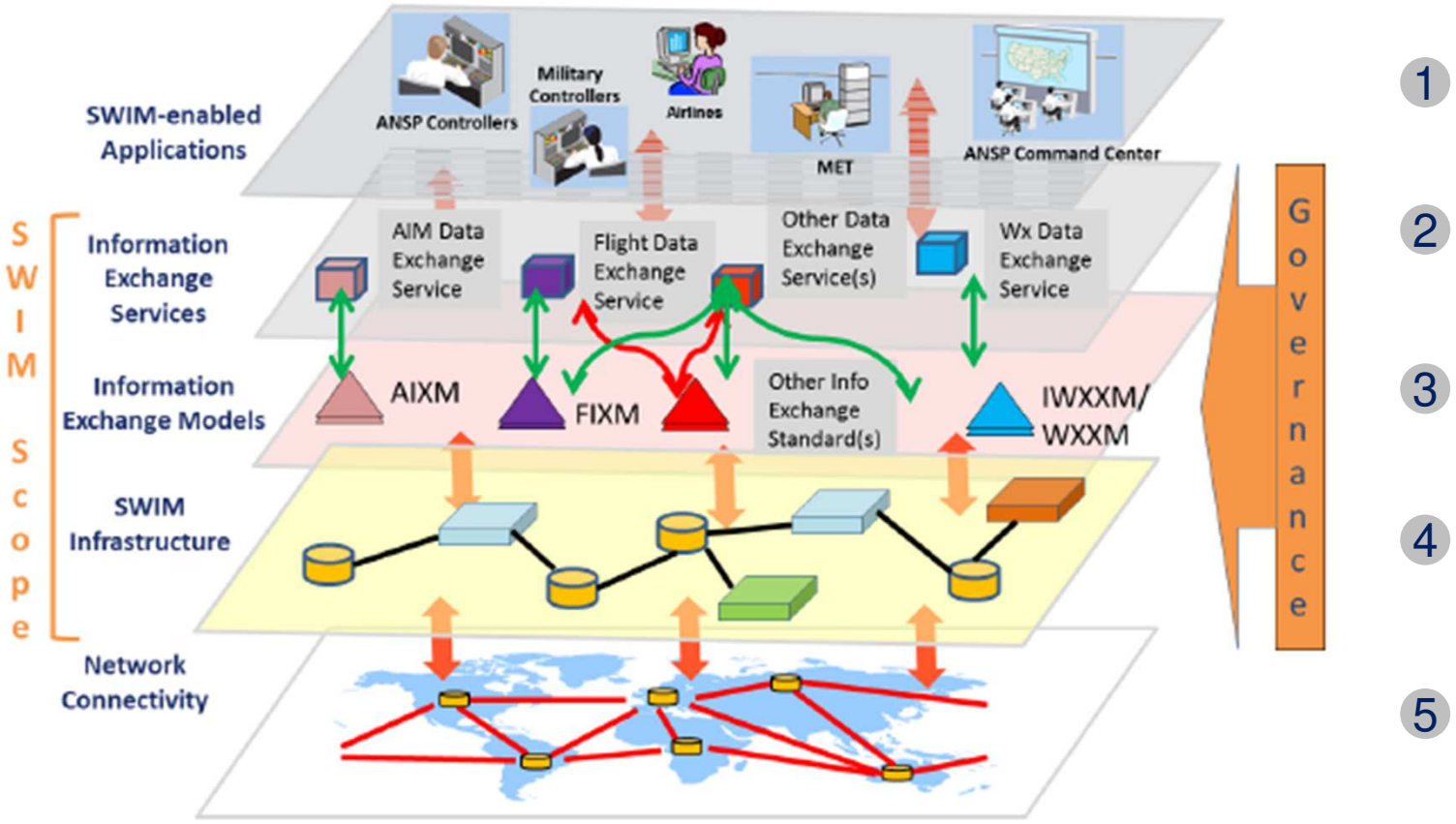
- Aeronautical
- Flight trajectory
- Aerodrome operations
- Meteorological
- Air traffic Flow
- Surveillance
- Capacity

Between ATM actors:

- Pilots
- Airport operations centres
- Airline operations centers
- ANSP
- MET
- Military

SWIM

Global Interoperability framework – 5 layers



The scope of SWIM is limited to the three middle and to the governance of these layers

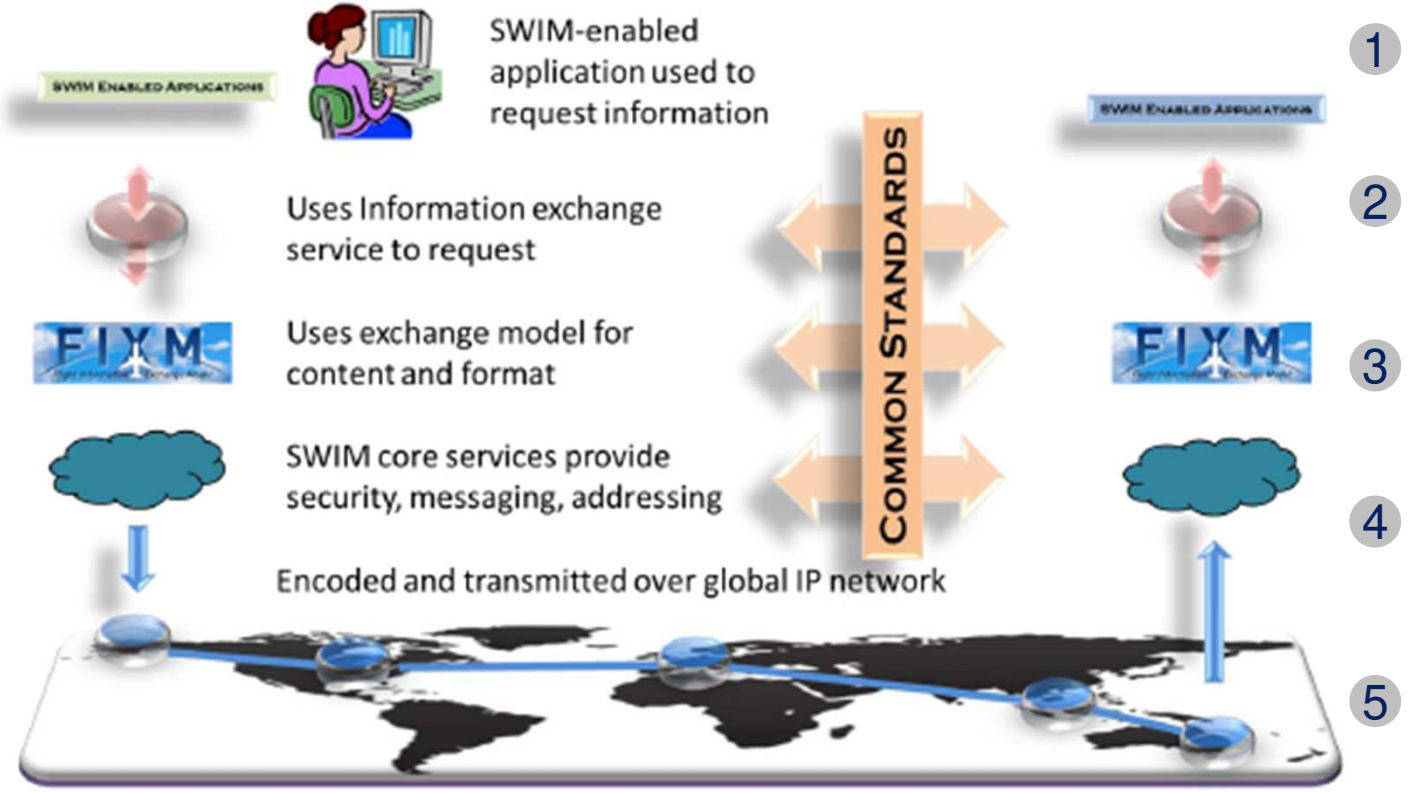
SWIM

Global Interoperability framework – 5 layers

1. **SWIM-enabled Applications: P**roviders and users of information using applications that interoperate through SWIM;
2. **Information Exchange Services:** Set of information exchange services defined for each ATM information domain that can be used by SWIM-enabled applications according to governance specifications, and agreed upon by SWIM stakeholders.
3. **Information Exchange Models:** Information exchange models defining the syntax and semantics of the data exchanged by applications
4. **SWIM Infrastructure:** Core services such as interface management, request-reply and publish-subscribe messaging, service security, etc.
5. **Network Connectivity:** Consolidated telecommunications services composed of a collection of the interconnected network infrastructures of the different stakeholders

SWIM

Global Interoperability framework – 5 layers



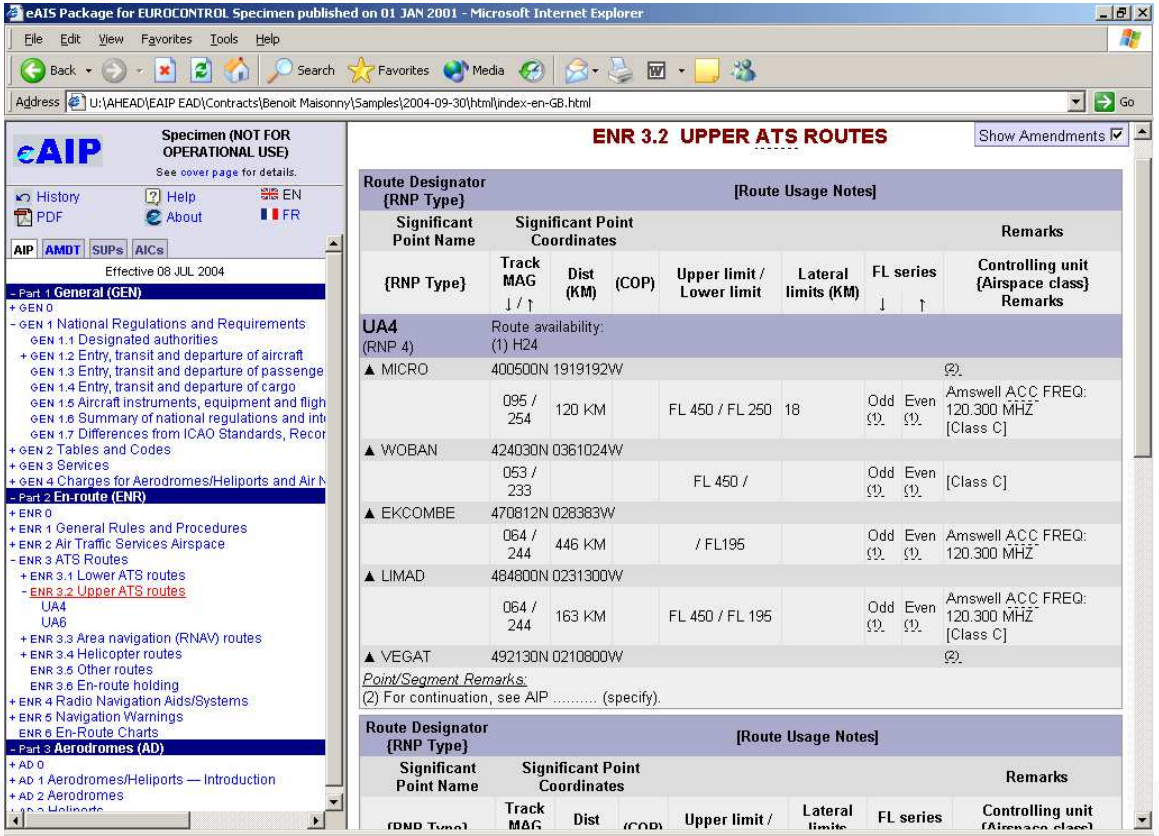
More information is available in the ICAO Manual on SWIM concept (Doc 10039)

improved AIP product, with increased consistency, integrity and usability

eAIP
Principles

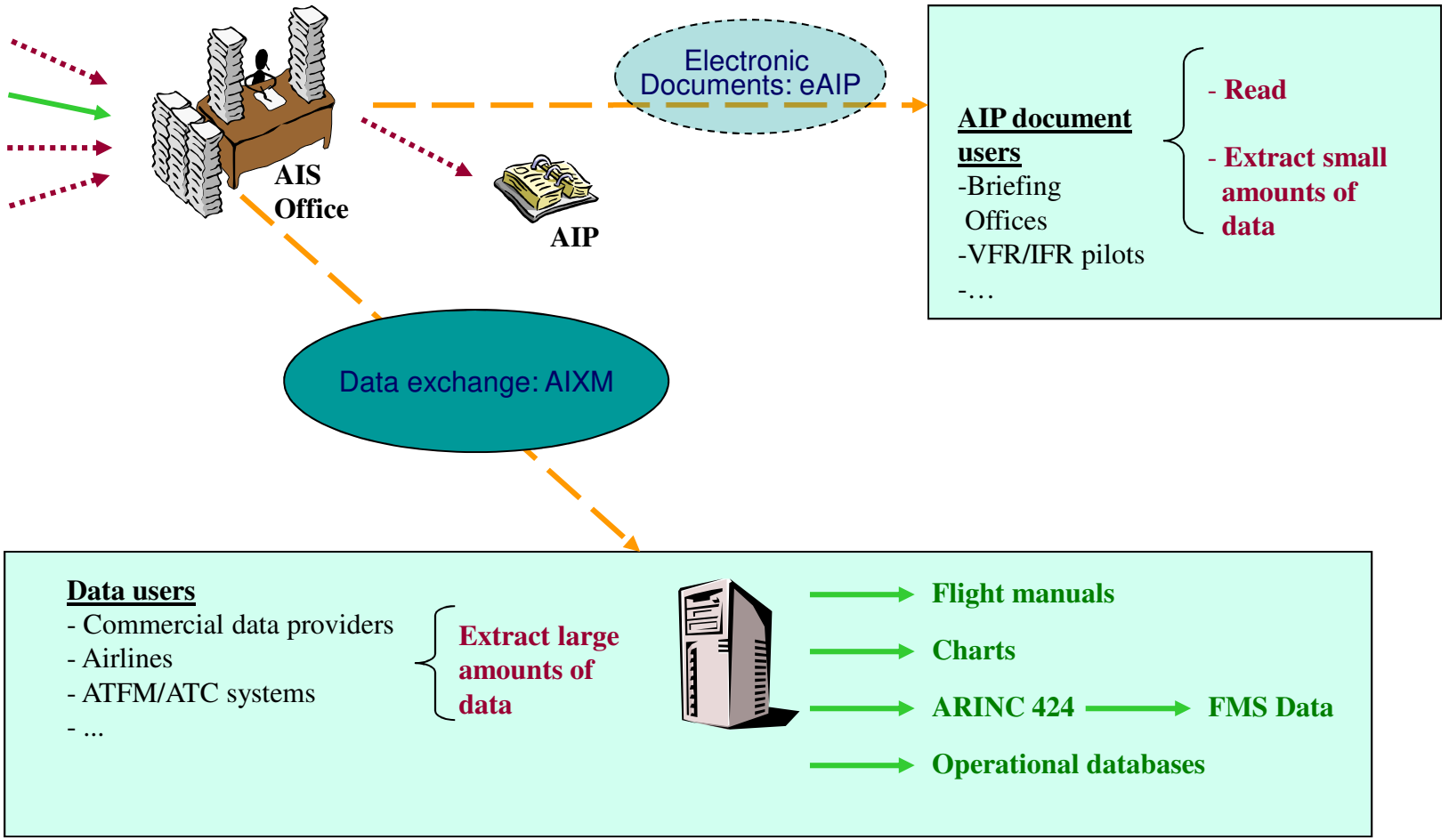
Publish the content of an AIP, AIP AMDT, SUP and AIC in a structured electronic format, which is optimized for visualizing on a computer screen, using Web technology.

- Easily accessible from a terminal
- Ease of browsing, facilitated by the HTML technology
- Ability to visualise changes
- No maintenance effort (page replacement at every amendment)
- No postal delays (if distributed through the Internet)
- Improved AIP product, with increased consistency, integrity and usability

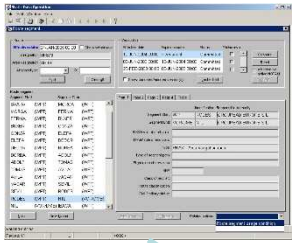


eAIP
eAIP versus AIXM

There are two categories of AIP users



eAIP
Relation between AIXM and eAIP



Static data Update

Digital Data Input
(AIXM XML)

SDO (AIXM)
Input and validation of static data

AIXM XML output

XML

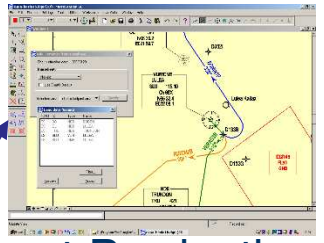
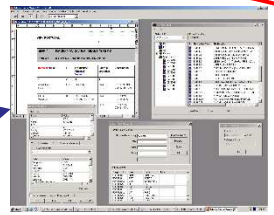
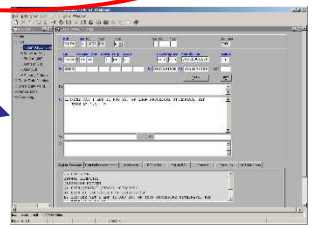


Chart Production



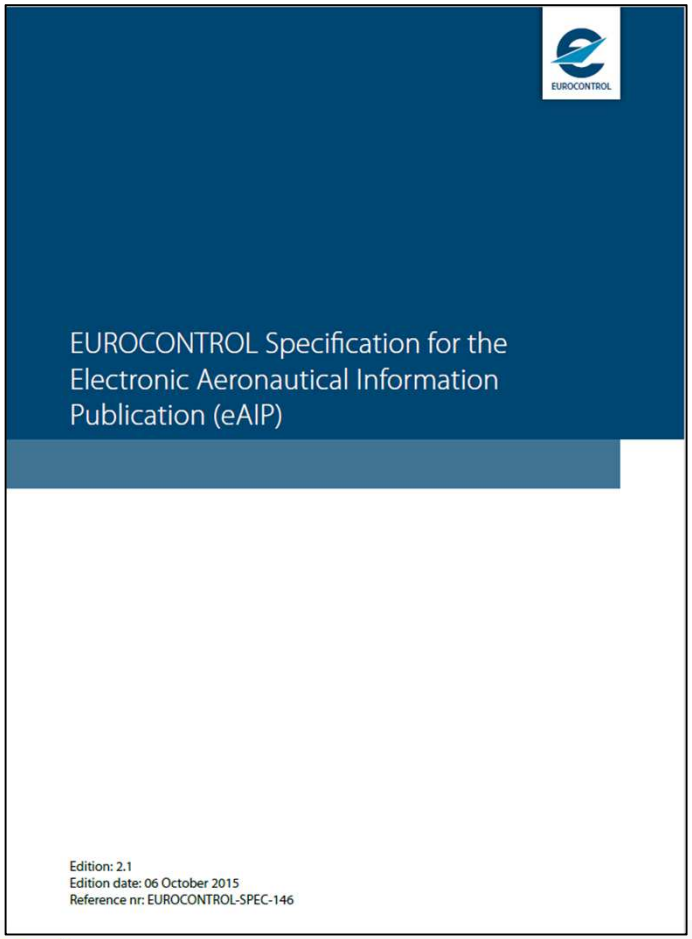
(e)AIP Production



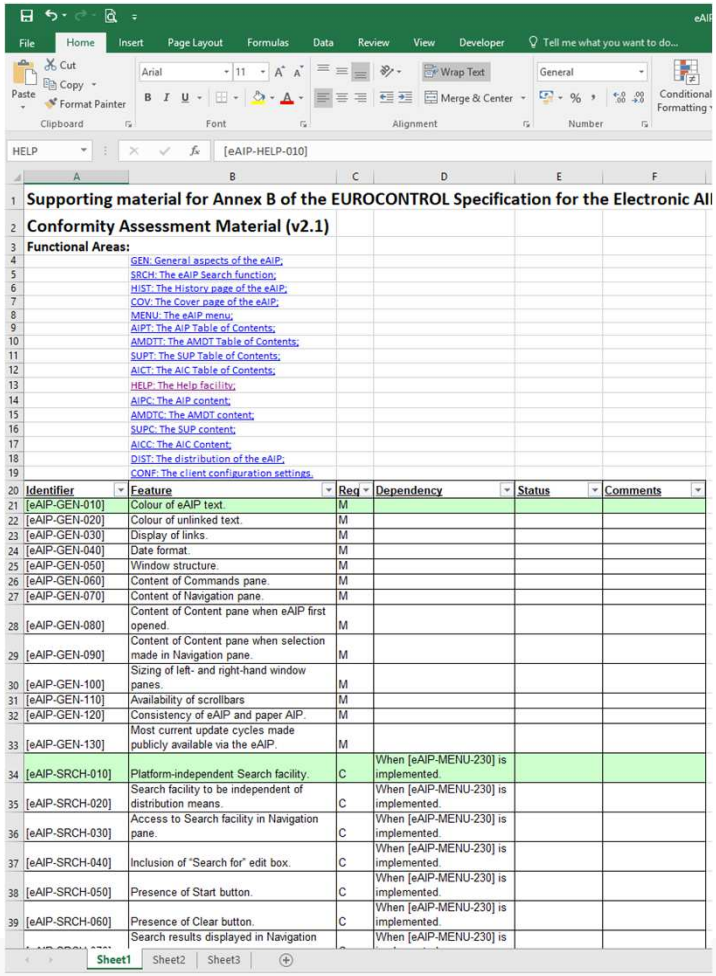
NOTAM Production

eAIP
Additional information

- eAIP Specifications



- eAIP Conformity Assessment Matrix



Supporting material for Annex B of the EUROCONTROL Specification for the Electronic AI

Conformity Assessment Material (v2.1)

Functional Areas:

GEN: General aspects of the eAIP;
SRCH: The eAIP Search function;
HIST: The History page of the eAIP;
COV: The Cover page of the eAIP;
MENU: The eAIP menu;
AIPT: The AIP Table of Contents;
AMDTT: The AMDT Table of Contents;
SUPT: The SUP Table of Contents;
AICT: The AIC Table of Contents;
HELP: The Help facility;
AIPC: The AIP content;
AMDTC: The AMDT content;
SUPC: The SUP content;
AICC: The AIC Content;
DIST: The distribution of the eAIP;
CONF: The client configuration settings.

Identifier	Feature	Req	Dependency	Status	Comments
[eAIP-GEN-010]	Colour of eAIP text.	M			
[eAIP-GEN-020]	Colour of unlinked text.	M			
[eAIP-GEN-030]	Display of links.	M			
[eAIP-GEN-040]	Date format.	M			
[eAIP-GEN-050]	Window structure.	M			
[eAIP-GEN-060]	Content of Commands pane.	M			
[eAIP-GEN-070]	Content of Navigation pane.	M			
[eAIP-GEN-080]	Content of Content pane when eAIP first opened.	M			
[eAIP-GEN-090]	Content of Content pane when selection made in Navigation pane.	M			
[eAIP-GEN-100]	Sizing of left- and right-hand window panes.	M			
[eAIP-GEN-110]	Availability of scrollbars	M			
[eAIP-GEN-120]	Consistency of eAIP and paper AIP.	M			
[eAIP-GEN-130]	Most current update cycles made publicly available via the eAIP.	M			
[eAIP-SRCH-010]	Platform-independent Search facility.	C	When [eAIP-MENU-230] is implemented.		
[eAIP-SRCH-020]	Search facility to be independent of distribution means.	C	When [eAIP-MENU-230] is implemented.		
[eAIP-SRCH-030]	Access to Search facility in Navigation pane.	C	When [eAIP-MENU-230] is implemented.		
[eAIP-SRCH-040]	Inclusion of "Search for" edit box.	C	When [eAIP-MENU-230] is implemented.		
[eAIP-SRCH-050]	Presence of Start button.	C	When [eAIP-MENU-230] is implemented.		
[eAIP-SRCH-060]	Presence of Clear button.	C	When [eAIP-MENU-230] is implemented.		
	Search results displayed in Navigation		When [eAIP-MENU-230] is		

Integrated briefing
Principles

- Provision of relevant aeronautical information (AI) which is mainly available in the form of the Integrated Aeronautical Information Package (IAIP) allowing the pilot to prepare him/herself before conducting a flight
- The process where a user is supplied with or supplies himself with all relevant aeronautical information (AI) in order to plan or to execute a flight is known as briefing
- The typical system output of a briefing process is the ‘Preflight Information Bulletin (PIB)’. Additionally, static data such as AIP, AIP SUP or AIC is either provided through consultation or in electronic form through briefing systems

Integrated briefing
Principles

- Integrated Briefing is a system or service meeting and fulfilling the generic briefing process and enhancing it by integrating access to and provision of additional data elements such as:
  - AIS (NOTAM, SNOWTAM, ASHTAM, Static data elements of AIP etc)
  - ARO (flight plan and all related entities)
  - MET (SIGMET, METAR, SPECI, TAF, Upper Wind and temperature, etc.),
  - ATFM (entities related to flight plan such as AIM, ANM, CRAM or flight plan updates influencing the flight intention)
  - Other information such as GPS availability, etc.

Integrated briefing
Self-Briefing

Facilitation of Self-Briefing

- “Self Briefing” refers to the ability for a pilot to make use of briefing equipment by himself/herself, entering the required information and obtaining the briefing
- “Self Briefing” is not intended to indicate the location of the briefing equipment. Whether the pilot uses equipment at a major airport, at a local airfield or uses the Internet to obtain the briefing can all be instances of “Self Briefing”.
- In an automated environment (Self-Briefing), AIS staff is often not personally present at service station and the provision of relevant data is assured through (self) briefing systems (PC Terminal, printer etc) supported by means of consultation.