AIM AUTOMATION

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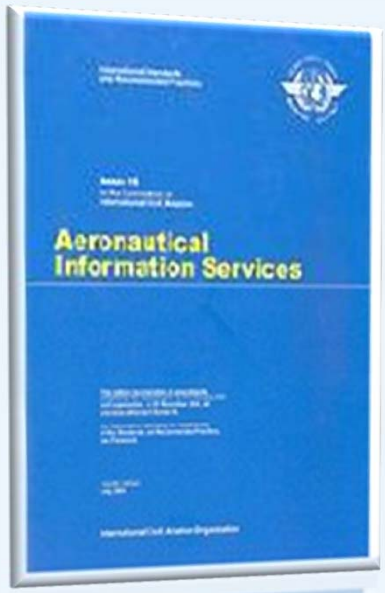
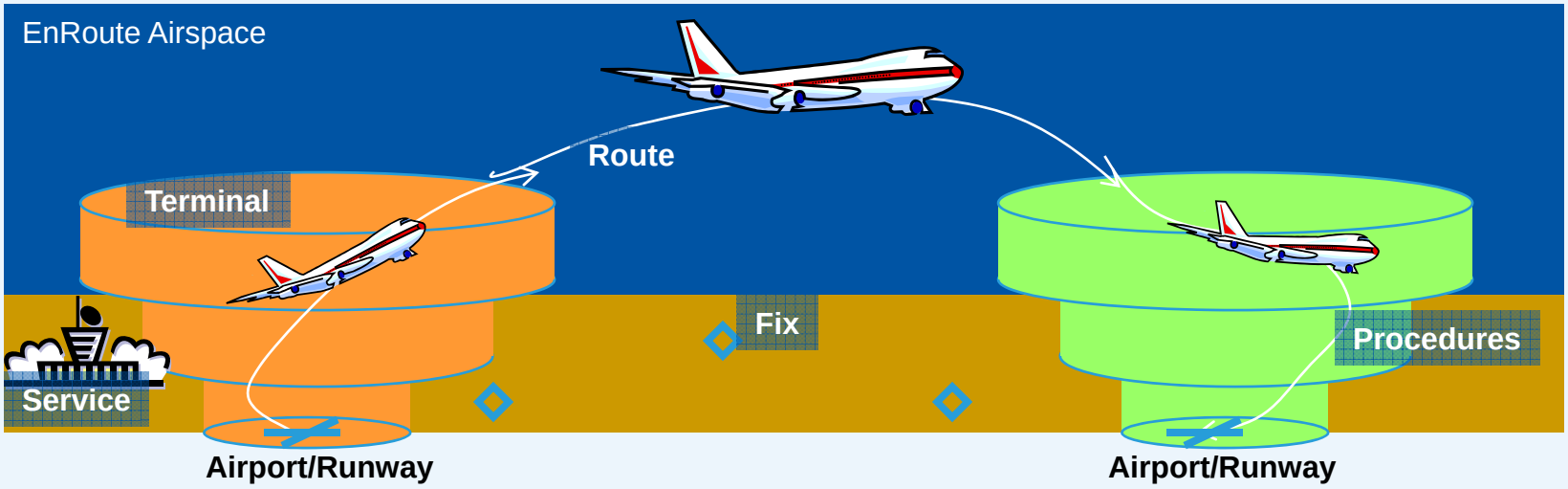
North American, Central American and Caribbean Office

AIM AUTO Overview

- AIS to AIM Transition Roadmap: Phase 2 –Going Digital
- Data Quality Monitoring and Data Integrity Monitoring
- Integrated Aeronautical Information Databases
- Electronic AIP (eAIP)
- Unique Identifiers
- Terrain Obstacles Aerodrome Mapping
- AIXM
- SWIM



Aeronautical Information Management

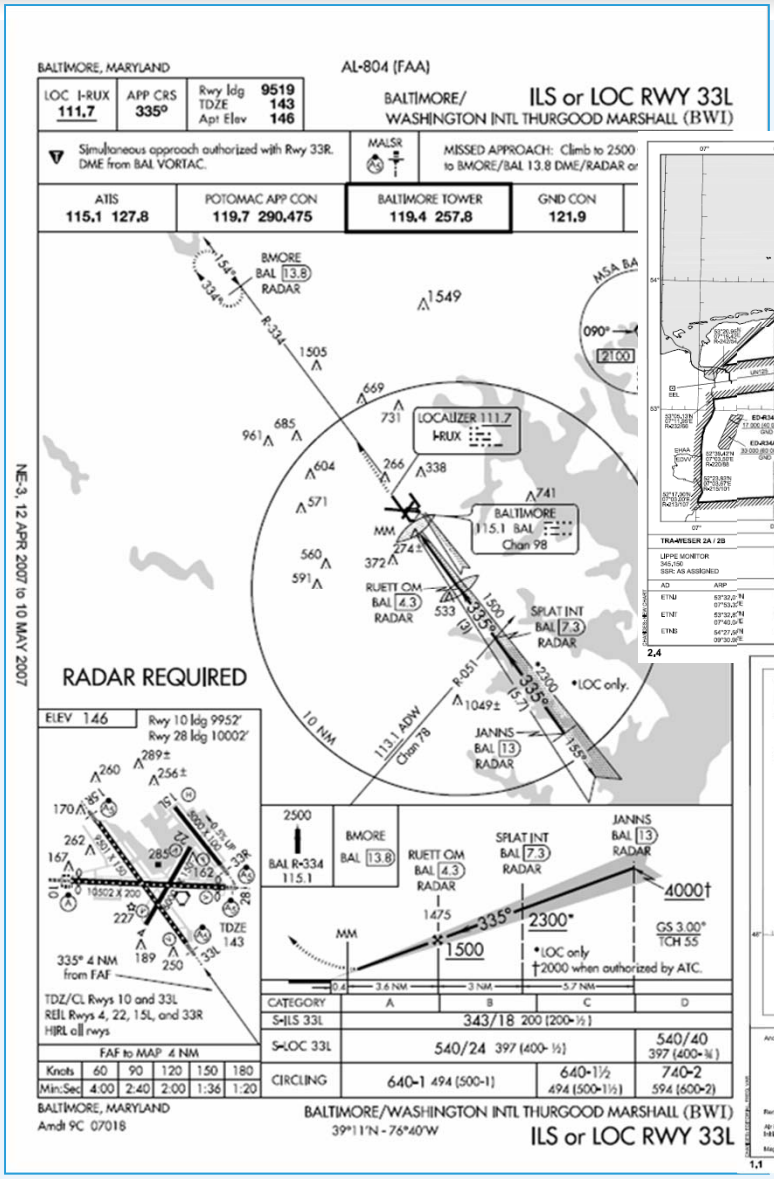


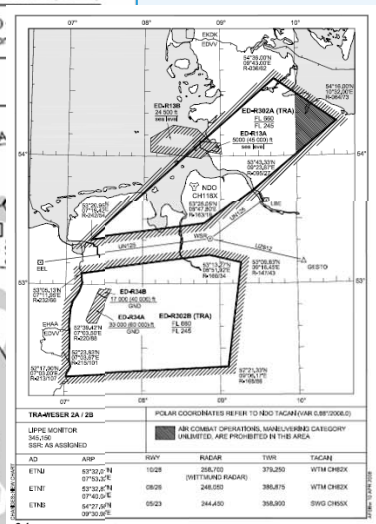
- Aerodromes
- Airspace
- NAVAIDS & Fixes
- Obstacles

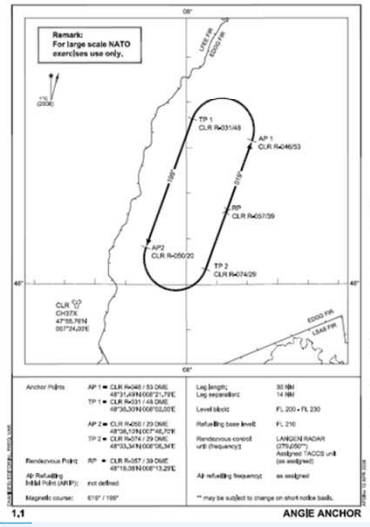
- Routes
- Procedures
- Organizations & Services

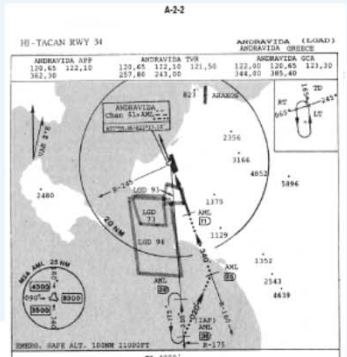
- Navigation data is integrated with other data and loaded into aircraft autopilots and air traffic control systems

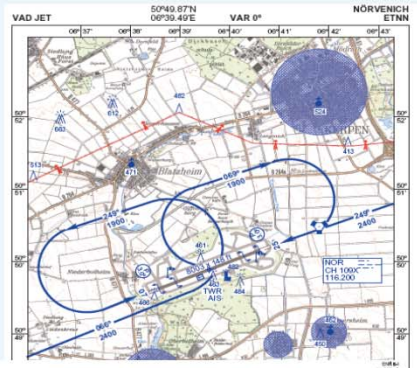
- Data is also used to produce charts and other aeronautical publications

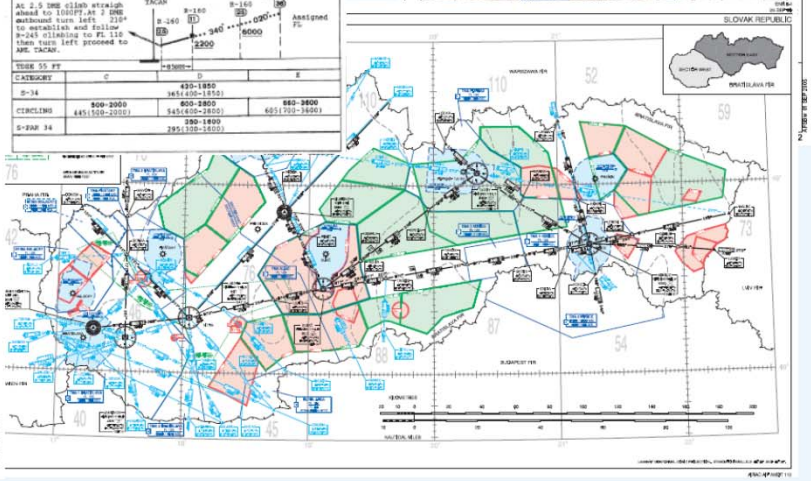


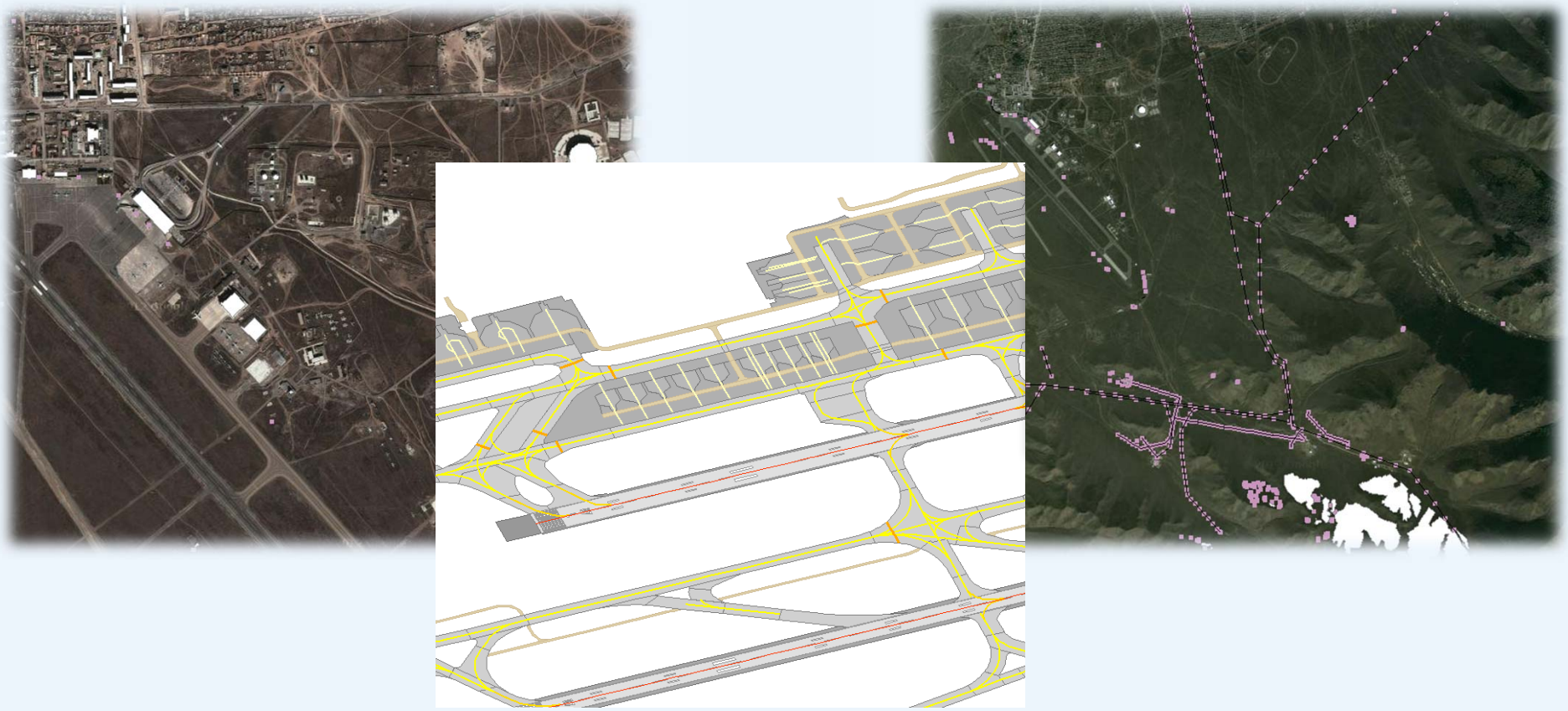




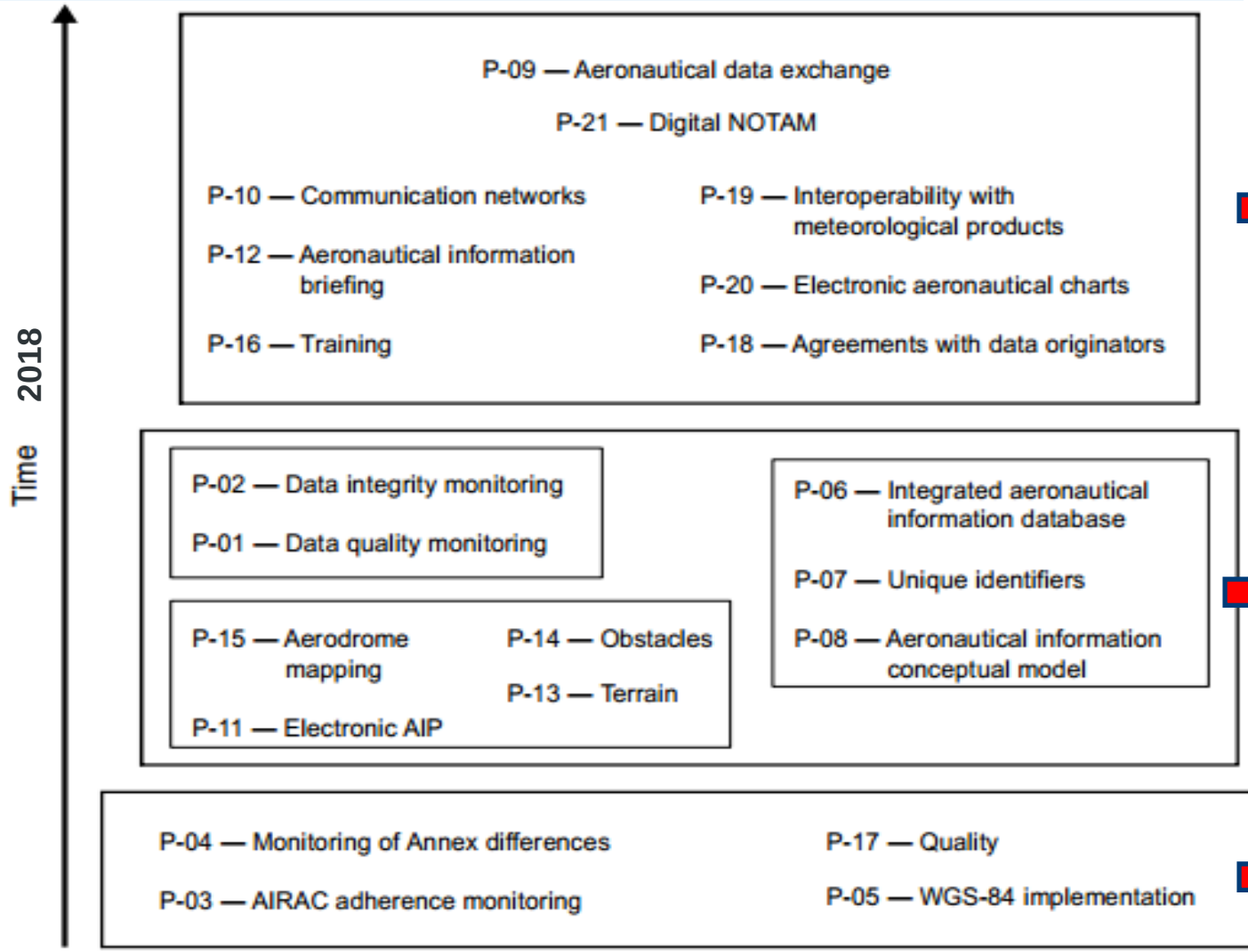








- **Data is distributed from an AMDB to generate with a Geographic Information System (GIS), aerodrome charts**



Information and data Management & Communications

Phase 3

Interface to SWIM

Database-driven processes

Phase 2

System and process development

Quality requirements

Phase 1

The basis

Phase 2 – Going Digital

The transition to AIM, establish data-driven processes for the information production in all States.

- **using computer technology and digital communications**
- **introducing structured digital data from databases into their production processes.**
- **introduction of highly structured databases and tools such as Geographic Information Systems (GIS)**

Phase 2 – Going Digital

- An aeronautical information conceptual model (AICM) will provide guidance for States to implement their digital databases.
- Guidance material will include advice on a minimum data set to begin a gradual development of the database.
- Many States are already providing electronic equivalents of their AIPs, on CD or on the Internet.
- These electronic AIPs may be accessible for printing and/or for navigation via a web browser tool.
- Guidance material that will be based on existing best practices will be provided to States to ensure that new types of media will be harmonized for users.

AIS to AIM : Going digital

- **Introduction of database driven processes**
- **Products Supply of data and information**

- **P-01 Data Quality monitoring**
- **P-02 Data Integrity monitoring**
- **P-06 Integrated aeronautical information data**
- **P-07 Unique identifiers**
- **P-08 Aeronautical Information conceptual model**
- **P11 Electronic AIP**
- **P13 Terrain**
- **P14 Obstacle**
- **P15 Aerodrome mapping**

P-01: Data Quality Monitoring
P-02: Data Integrity Monitoring

- **P-01 — Data quality monitoring**
  - **An ongoing challenge for organizations producing information is to ensure that the information quality suits its users and that final users are provided with quality data.**
- **P-02 — Data integrity monitoring**
  - **Data integrity requirements introduced by safety objectives must be measurable and adequate.**

What is data quality?
Monitoring aspects

What is Data Quality?

Annex 15 Para. 3.7.6. :The established quality management system shall provide users with the necessary **security and confidence** that distributed aeronautical data and aeronautical information **satisfy the aeronautical data quality requirements** for **accuracy, resolution and integrity** […], and that the data **traceability** requirements are met through the **provision of appropriate metadata** […]. The system shall also provide **assurance of the applicability period of intended use of aeronautical data** as well as that the **agreed distribution dates** will be met.

Data Quality means:

- **Real-world alignment**
- **Reflects the perspective of the data provider**
- **Ability for the purpose of use**
- **Reflects the perspective of the data consumer**

The importance of data about data

- **Critical for data to be timely and accurate**
- **Essential for data specialists to know:**
  - ***Who*** **is responsible for the data**
  - ***What*** **is the source of the data**
  - ***When*** **is the data effective**
  - ***Where*** **is the data source**
  - ***How*** **was the data captured**

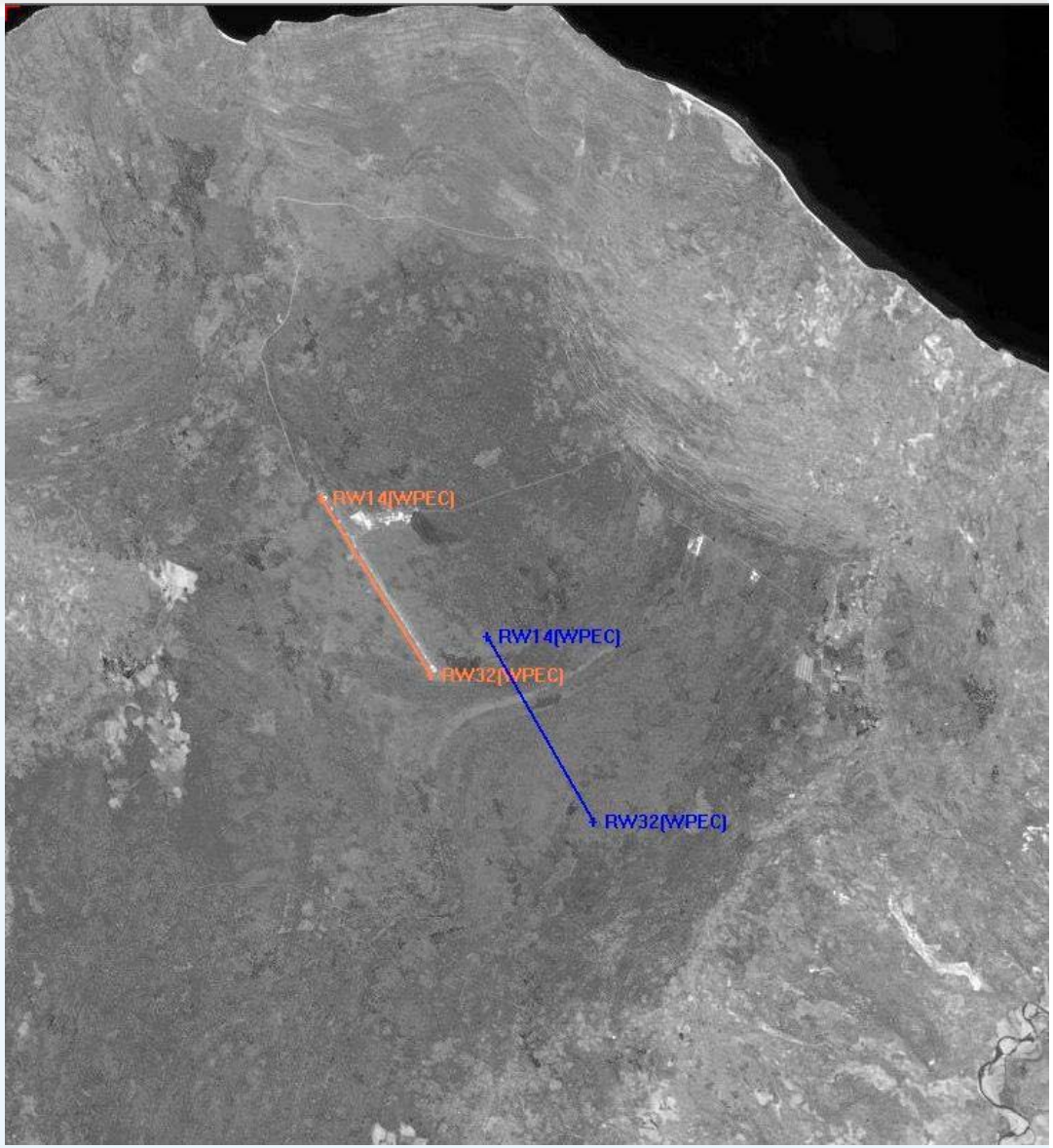
- **METADATA is the who, what, when, where and how**

Runway

- Real Location

- AIP Location (Official)

  - Accuracy
  - Resolution
  - Integrity



JEPPESEN image

Annex 15
Data Quality Specifications

- **Accuracy:** A degree of conformance between the estimated or measured value and the true value (**HOW CLOSE TO REALITY**)

- **Resolution:** A number of units or digits to which a measured or calculated value is expressed and used (**HOW MANY DIGITS AFTER COMMA**)

- **Integrity:** A degree of assurance that aeronautical data and its value has not been lost or altered since the data origination or authorized amendment (**HOW GOOD IS THE DATA**)

Data Integrity Monitoring

- The introduction of complex flows within any element of the Aeronautical Data Chain, such as the transition from data to document or from data import to data export, creates barriers to the maintenance of the quality/integrity of the aeronautical data.

- **Source data is being produced, distributed and stored electronically, transformation from one environment to another provides the greatest challenge to the protection of data integrity throughout the process.**

- **In order to ensure the end-to-end integrity of aeronautical data, it is essential that the data process is fully identified, and understood. The establishment of this process is critical as it identifies the key participants, processes, inputs and outputs that must be addressed in any regularized process**

- The outputs of the process will be products that meet the specific needs of users for aeronautical data (human-based or system-based - FMS), using information derived from an AIP or a flight management system using its integrated geospatial data).

P-06: Integrated Aeronautical Information Database

- The establishment and maintenance of a database where digital aeronautical data from a State are integrated and used to produce current and future AIM products and services is the main step in **Phase 2** of the transition to AIM.
- A database may be operated by States or by regional initiatives under delegation from States. The design of such a database will not be identical in all States or regions because local technical or functional requirements must be considered. However, the material that will be provided under Step **P-08** will provide guidance that may be used to validate the design for facilitating the future data .exchange.

- **P-08 — Aeronautical Information Conceptual Model**
- Defining the semantics of the aeronautical information to be managed in terms of digital data structures is essential for introducing interoperability.
- The existing documentation developed by States and international organizations and considered mature enough for global applicability will be used to produce common guidance material.
- This may serve as a reference for the database design needed in **P-06** for States that do not yet have a database.

The AIXM Metadata Profile

- **The profile includes six models:**
  - **Metadata for the AIXM message**
  - **Metadata for an AIXM feature**
  - **Metadata for an AIXM feature time-slice**
    - **A time-slice allows temporality – able to exchange data on features described at different points in time**
  - **Constraint information**
  - **Citation and Responsible Party information**
  - **Data Quality information**

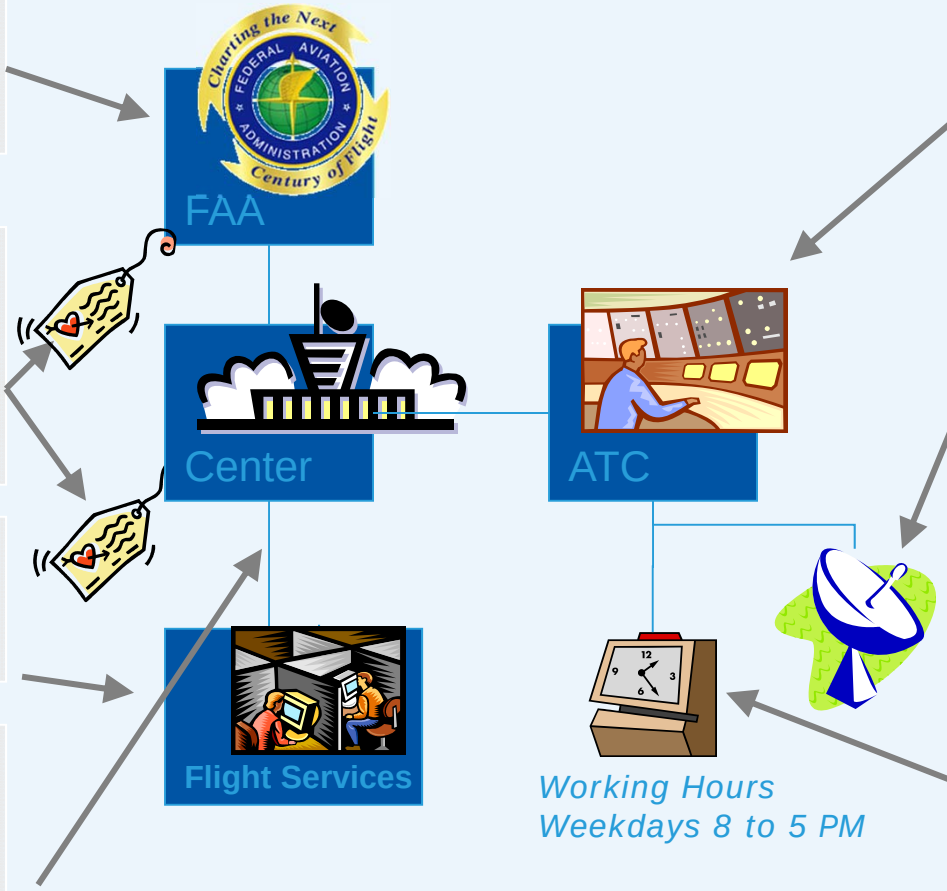
Services Concept

Organization
AICM: ORG_AUTH
AIXM: <Org>
Organization authority

Address
AICM:
ORG_AUTH_ADDRESS
UNIT_ADDRESS
AIXM: <Oaa>, <Uas>
Address of an organization or unit.

Unit
AICM: UNIT
AIXM: <Uni>
Unit within an organization

Association
AICM: ORG_AUTH_ASSOC
UNIT_ASSOC
AIXM: <Oas>, <Uac>
A parent-child relationship between units or organizations.



Service
AICM: SERVICE
AIXM: <Ser>
A service provided by a unit.

Frequency
AICM: FREQUENCY
AIXM: <Fqy>
Frequency(ies) on which the service is provided

Timesheet
AICM: Timetable
AIXM: <Ftt>, <Stt>
Operating hours for a frequency or service

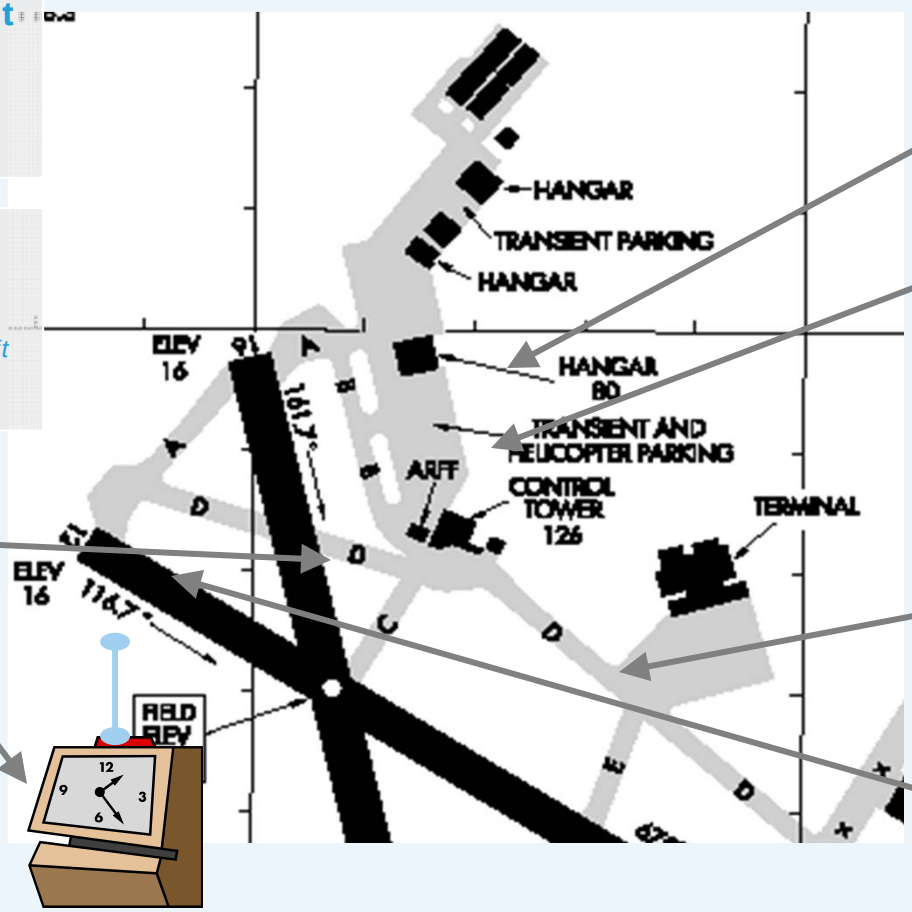
Airports Concept

Aerodrome and Heliport
AICM: AD_HP
AIXM: <Ahp>
Defines the airport or heliport and provides general information.

Usage Limitation
AICM: AD_HP_USAGE
AIXM: <Ahu>
Rules describing flights and aircraft that can operate at the airport or heliport.

Runway
AICM: RWY
AIXM: <Rwy>
A runway at an airport.

Airport Timesheet
AICM: TIMESHEET
AIXM: <Aht>
Operating hours of the airport



Continuous

Obstacle at Airport
AICM: AD_HP_OBSTACLE
AIXM: <Aho>
Obstacle at an airport

Apron
AICM: APRON
AIXM: <Apn>
Locations where aircraft park and passengers enter and exit the aircraft.

Taxiway
AICM: TWY
AIXM: <Twy>
Fixed path used by aircraft to travel to and from a runway.

Runway Direction
AICM: RWY_DIRECTION
AIXM: <Rdn>
Defines runway direction, approach lighting and thresholds.

AUTO-AIM Databases:

Aeronautical static databases

Obstacle databases

Terrain databases

Basic databases

NOTAM database

FPL database

RPL database

Meteorological database

Aerodrome Mapping

Procedures Design

Phase 1

NOTAM Management Database
Flight Plan Database
Pre-flight Information Briefing
Web briefing for pilots & airlines
Aeronautical Static Database Creation & Management
AIM Management Training on Databases

Phase 2

Automated AIP Production
Automation Charting eMAP
Airspace Modelling
AIXM Aeronautical Exchange
OPMET Integration for Web briefing
FDPS Integration
eTOD Terrain and Obstacle DB
IFPS and Interface

Phase 3

E-Mail
SAT and Radar Images
Coordination Messages
IFPS
Air Traffic Flow & Capacity Management

Flight Plan (FPL)
Pre Flight Information Bulletin (PIB)

- ICAO compliant
- Message dialogue
- Inbound and Outbound lists
- Common Aeronautical Database with NOTAM and MET
- Single IFR Flight Plan addressing
- Operational flight plan and airline fleet monitoring
- According to ICAO PANS-RAC (Doc4444 Amdt 1 - Flight Plan 2012 Compliant)

- Home Office PIB
- Aerodrome ,
- Normal Route
  FIR, AD (DEP, DEST, ALTN, Intermediate)
- Geographic PIBs
  - Special Areas - polygons, circles, restricted areas
  - Narrow Route – Flight Corridor
- Based on same NOTAM/Flight Plan/MET Databases
- Briefing based on filed (navigation) FPL
- Summaries (FIR, AD, NOF, MET)

Use of automation in AIM

3.6 ~~3.6.5~~ Use of automation

3.6.1 ~~**Recommendation.**~~ Automation ~~*enabling digital data exchange should*~~ shall be introduced with the objective of improving the timeliness ~~speed~~, quality, efficiency and cost-effectiveness of aeronautical information services.

"Automation" in a broader sense to get away from paper and undocumented processes

Use of automation in Annex 15 with AMDt 37, has been transformed from a recommendation to a standard. New paragraphs are added to address consistency in the formats for delivery and provide performance requirements to enable digital data exchange and the use of aeronautical information and data exchange models to be globally interoperable.
Recommendations are provided concerning the performance requirements for the aeronautical information model used and the aeronautical data/information exchange model (AIXM 5.1) that should be used.

Use of automation in AIM

3.6.2 Where aeronautical data and aeronautical information are provided in multiple formats, processes shall be implemented to ensure data and information consistency between formats.

3.6.3 In order to meet the data quality requirements, automation shall:

a) enable digital aeronautical data exchange between the parties involved in the data processing chain; and

b) use aeronautical information exchange models and data exchange models designed to be globally interoperable.

Note.— Guidance on the aeronautical information and data exchange models may be found in the Aeronautical Information Services Manual (*Doc 8126*).

- **The AIXM as a global standard for the representation and exchange of aeronautical information. AIXM**
- **The overall objective of the use AIXM as a basis for modernizing their aeronautical information procedures and transitioning to a net-centric, global aeronautical management capability.**
- **More specifically, AIXM is being used in the net-centric System Wide Information Management (SWIM)**

P11: Electronic AIP (eAIP)

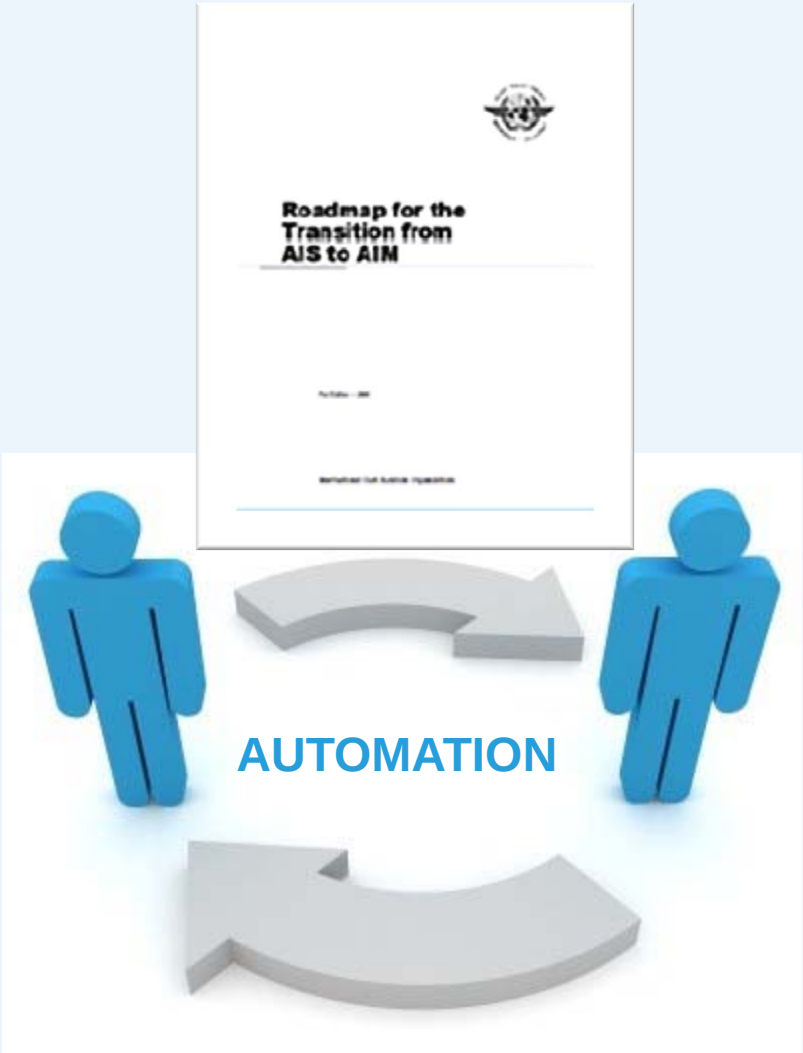
The AIP will not be eliminated. On the contrary, it will be adapted to include the new data products needed during the transition to AIM.

Guidance material will be required to help States implementing the web browser form of the electronic AIP in order to avoid the proliferation of different presentations of AIP information over the Internet.

- **AIP provides the main source of information about ANS infrastructure**
- **AIP function won`t disappear: the AIP is the authoritative source**
- **From a manually assembled document to a document coming from electronic DATA**

P07-Unique Identifiers

- **Improvements to the existing mechanisms for the unique identification of aeronautical features are required to increase the effectiveness of information exchange without the need for human intervention.**



P13 - Terrain, P14 - Obstacles and P15 - Aerodrome Mapping

P-13 — Terrain

- The compilation and provision of terrain data sets is an integral part of the transition to AIM.

P-14 — Obstacles

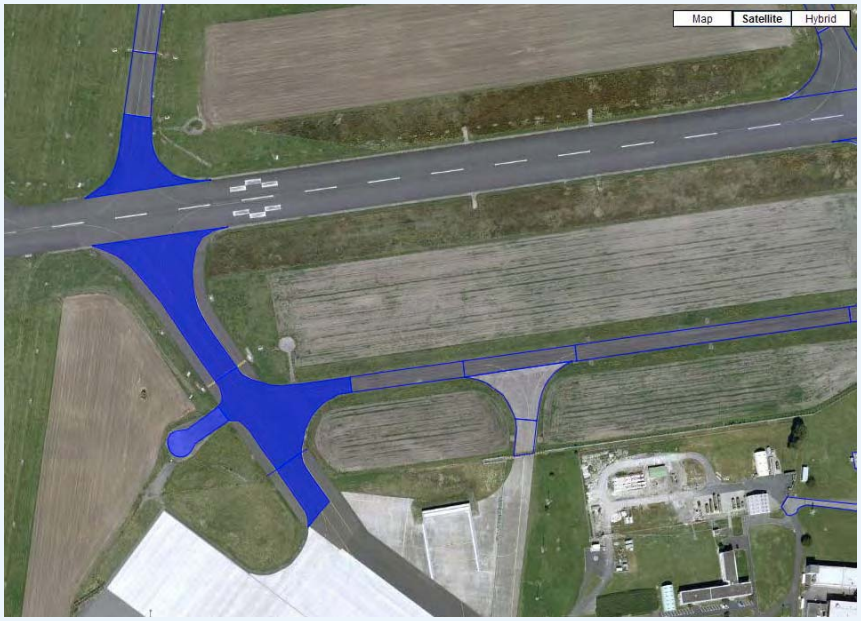
- The compilation and provision of obstacle data sets is an integral part of the transition to AIM.

P-15 — Aerodrome mapping

- There is a new requirement emerging from industry for traditional aerodrome charts to be complemented by structured aerodrome mapping data that can be imported into electronic displays

Aerodrome Mapping data

- **Aerodrome Mapping Data: Chapter 11 is added to support applications that improve situational awareness or supplement surface navigation and thereby provide safety and operational benefits**



ICAO Aeronautical Charts (Databases)

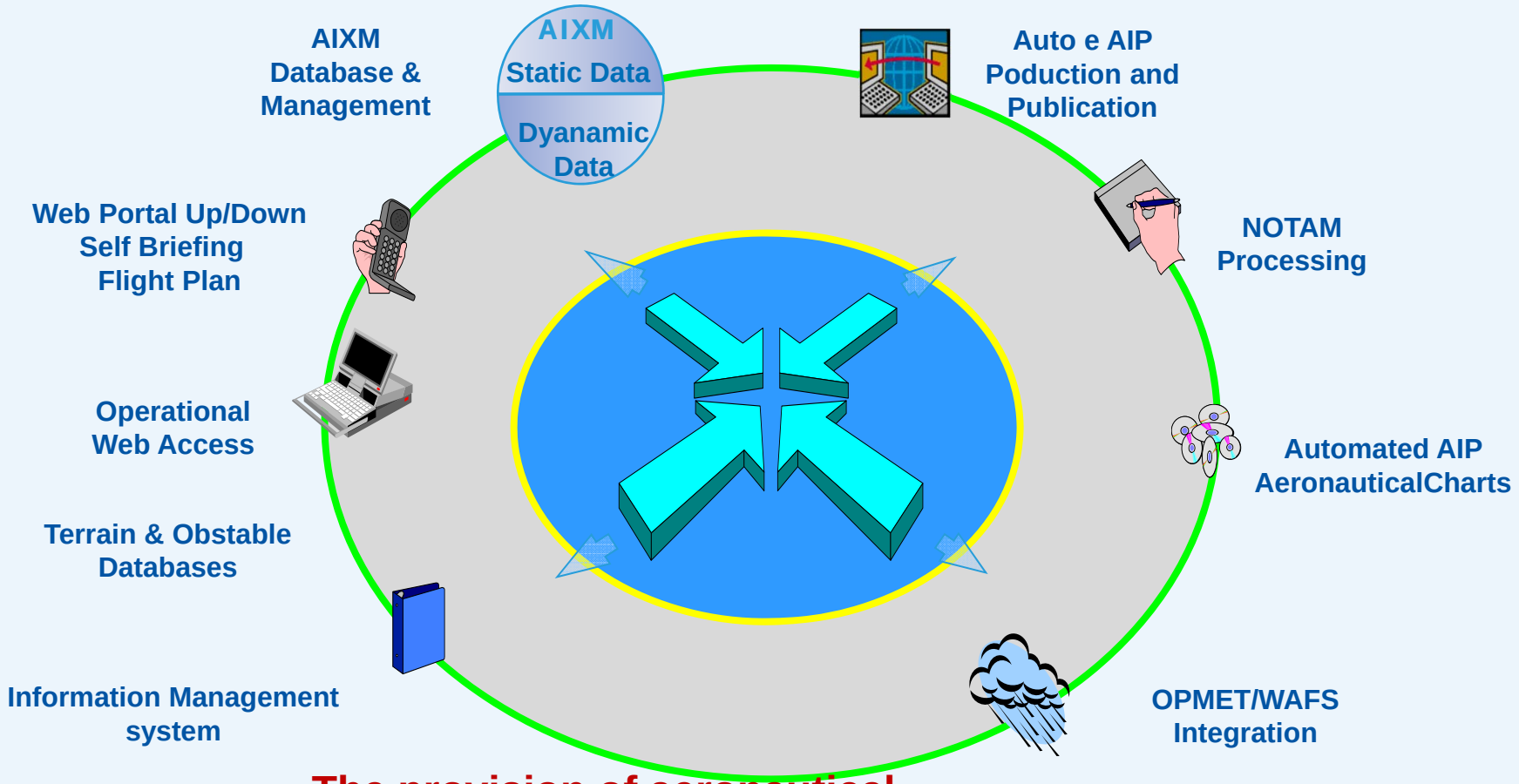
ICAO chart types:

- Aerodrome Obstacle Chart - ICAO Type A (Operating Limitations)
- Aerodrome Obstacle Chart - ICAO Type B
- Aerodrome Terrain and Obstacle Chart - ICAO (Electronic)
- Precision Approach Terrain Chart - ICAO
- En-route Chart -ICAO
- Area Chart - ICAO
- Standard Departure Chart – Instrument (SID) - ICAO
- Standard Arrival Chart – Instrument (STAR) - ICAO
- Instrument Approach Chart - ICAO
- Visual Approach Chart ICAO
- Aerodrome/Heliport Chart - ICAO
- Aerodrome Ground Movement Chart - ICAO
- Aircraft Parking/Docking Chart - ICAO
- World Aeronautical Chart - ICAO 1:1000000
- Aeronautical Chart - ICAO 1:500000
- Aeronautical Navigation Chart – ICAO Small Scale
- Plotting Chart – ICAO
- Electronic Aeronautical Chart Display — ICAO
- ATC Surveillance Minimum Altitude Chart — ICAO

Aeronautical Static Database AICM/AIXM

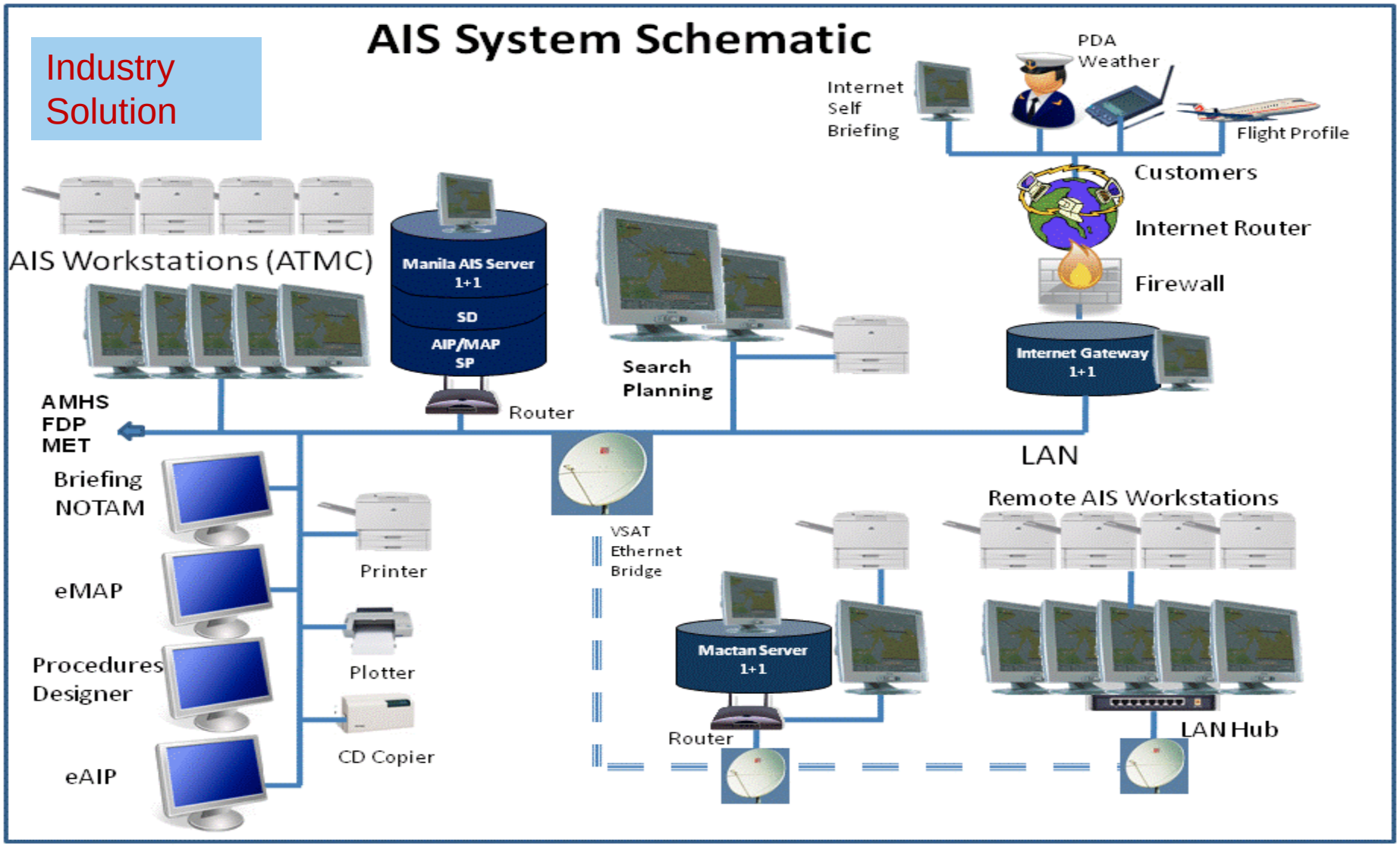
- FIR/UIR - identifier and name as well as the relation to the neighbour FIRs/UIRs
- Aerodromes, Airbases, heliports - ICAO and IATA identifier, city and airport name, aerodrome reference point (WGS84), landing directions and the FIR within which the aerodrome is located
- Navigational Aids - identification, name, frequency and/or channel, frequency band type, location, FIR within which the aid is located, aerodrome if relevant, equipment type (VOR/DME, ILS, TACAN and others)
- Obstacles and Terrain
- Terminal Areas, Waypoints - designator, name, location, FIR within which the waypoint is located, usage of the waypoint (upper, lower, terminal airspace etc.
- Airways - designator, type, level band (high, low, both), all waypoints and navigational aids on which an airway is based, all FIR/UIR crossed
- SIDs and STARs, Approach Procedures for aerodromes
- Restricted Airspace - nationality letter, type (danger, military, prohibited, restricted, warning area etc.), designator, name, approximated centre and radius, lower/upper limit, the complete polygon or circle or mix thereof description

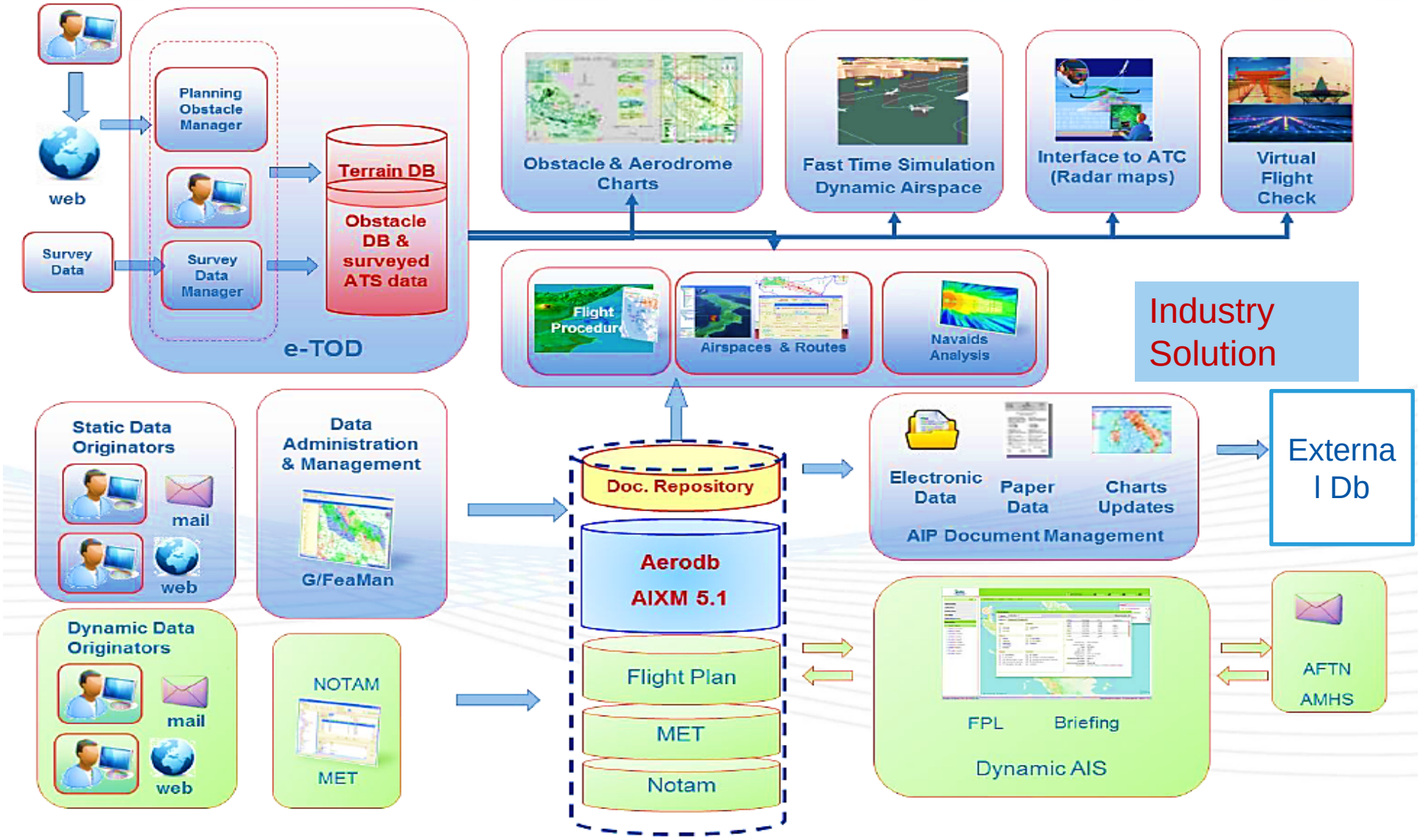
Basic AIM Environment



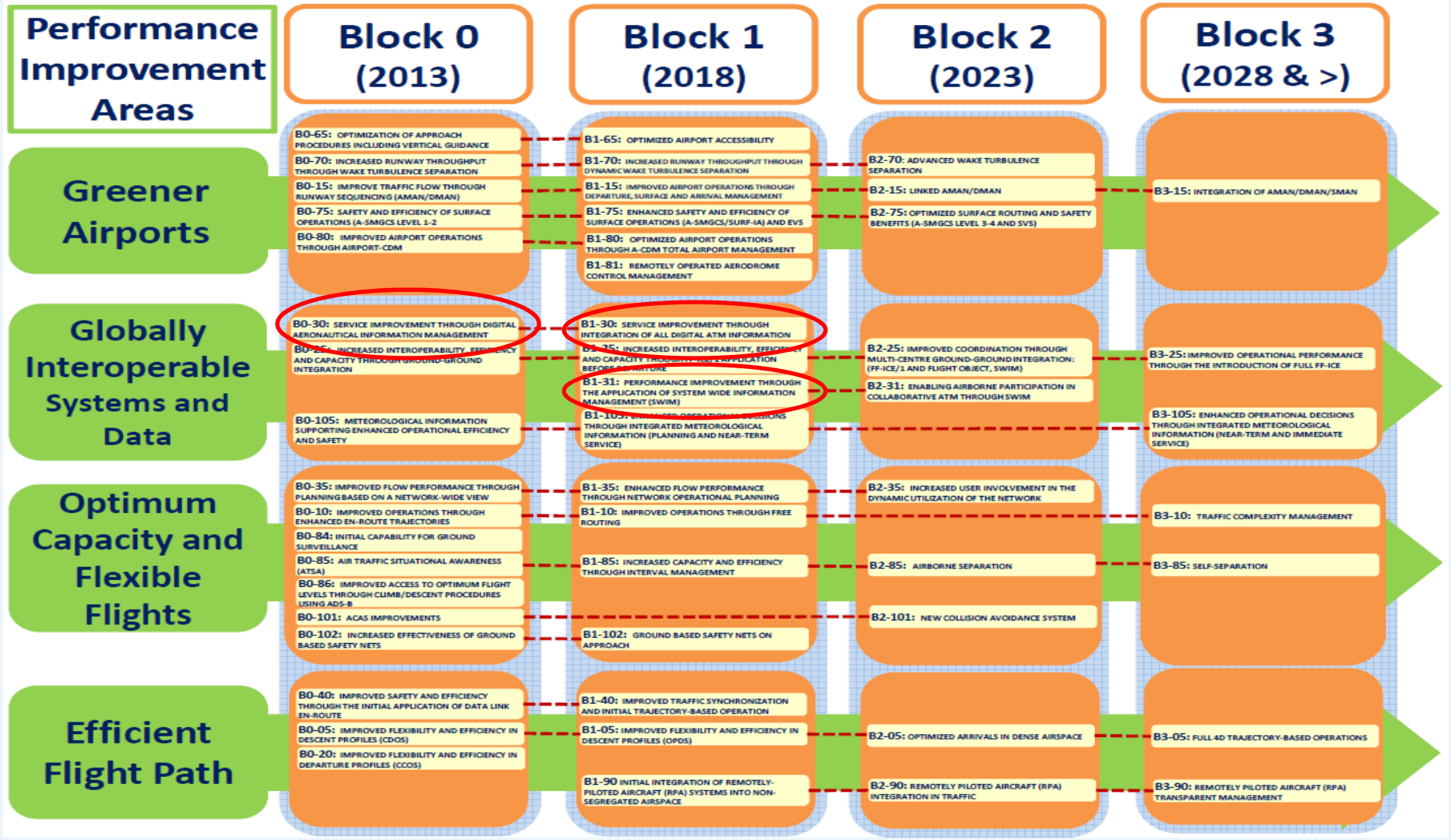
The provision of aeronautical information is a core element of air navigation services

Industry Solution

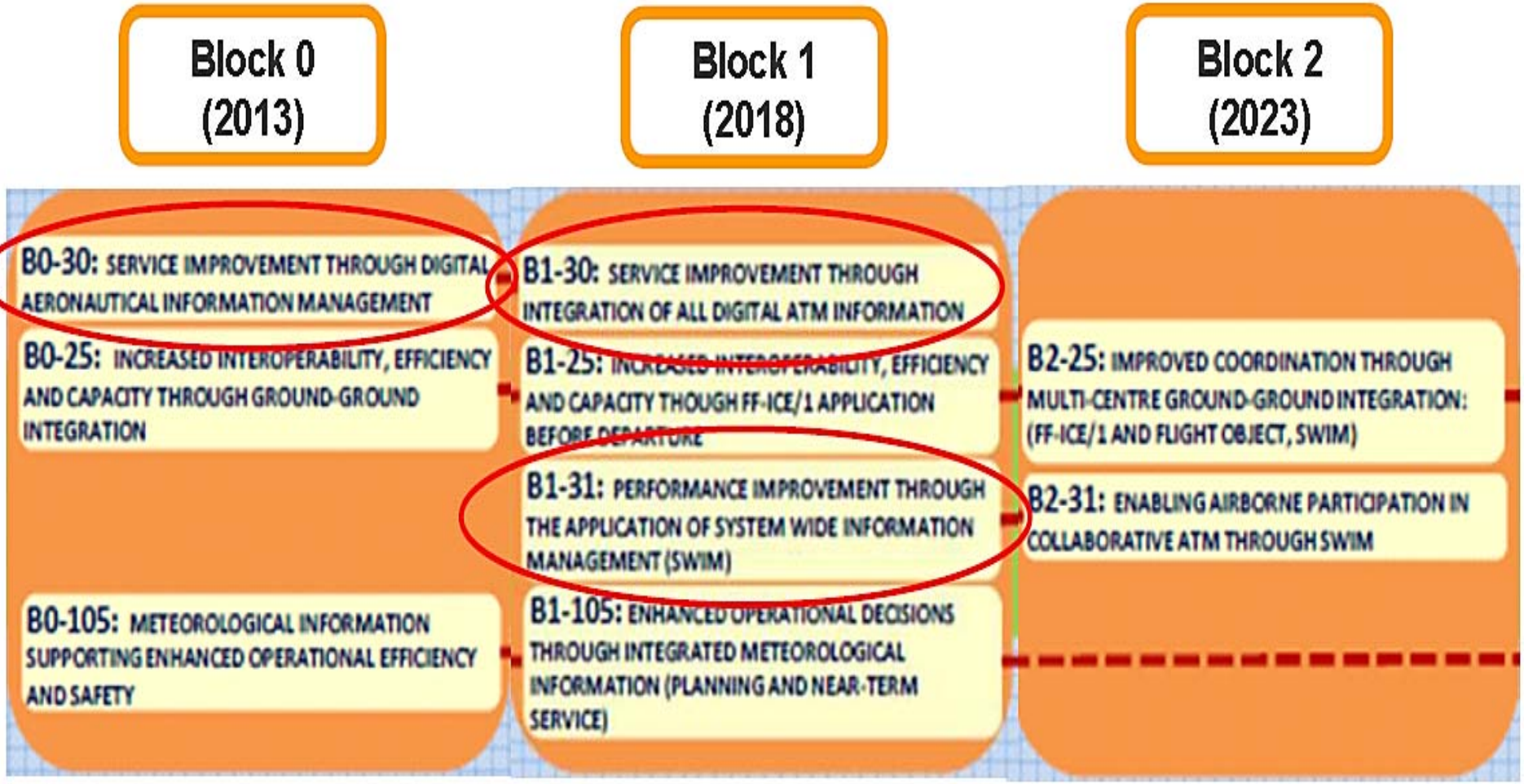



web
Survey Data
Planning Obstacle Manager
Survey Data Manager
Terrain DB
Obstacle DB & surveyed ATS data
e-TOD
Obstacle & Aerodrome Charts
Fast Time Simulation Dynamic Airspace
Interface to ATC (Radar maps)
Virtual Flight Check
Flight Procedur
Airspaces & Routes
Navaids Analysis
Industry Solution
Static Data Originators
mail
web
Data Administration & Management
G/FeaMan
Doc. Repository
Aerodb
AIXM 5.1
Flight Plan
MET
Notam
Electronic Data
Paper Data
Charts Updates
AIP Document Management
Externa l Db
Dynamic Data Originators
mail
web
NOTAM
MET
FPL
Briefing
Dynamic AIS
AFTN
AMHS

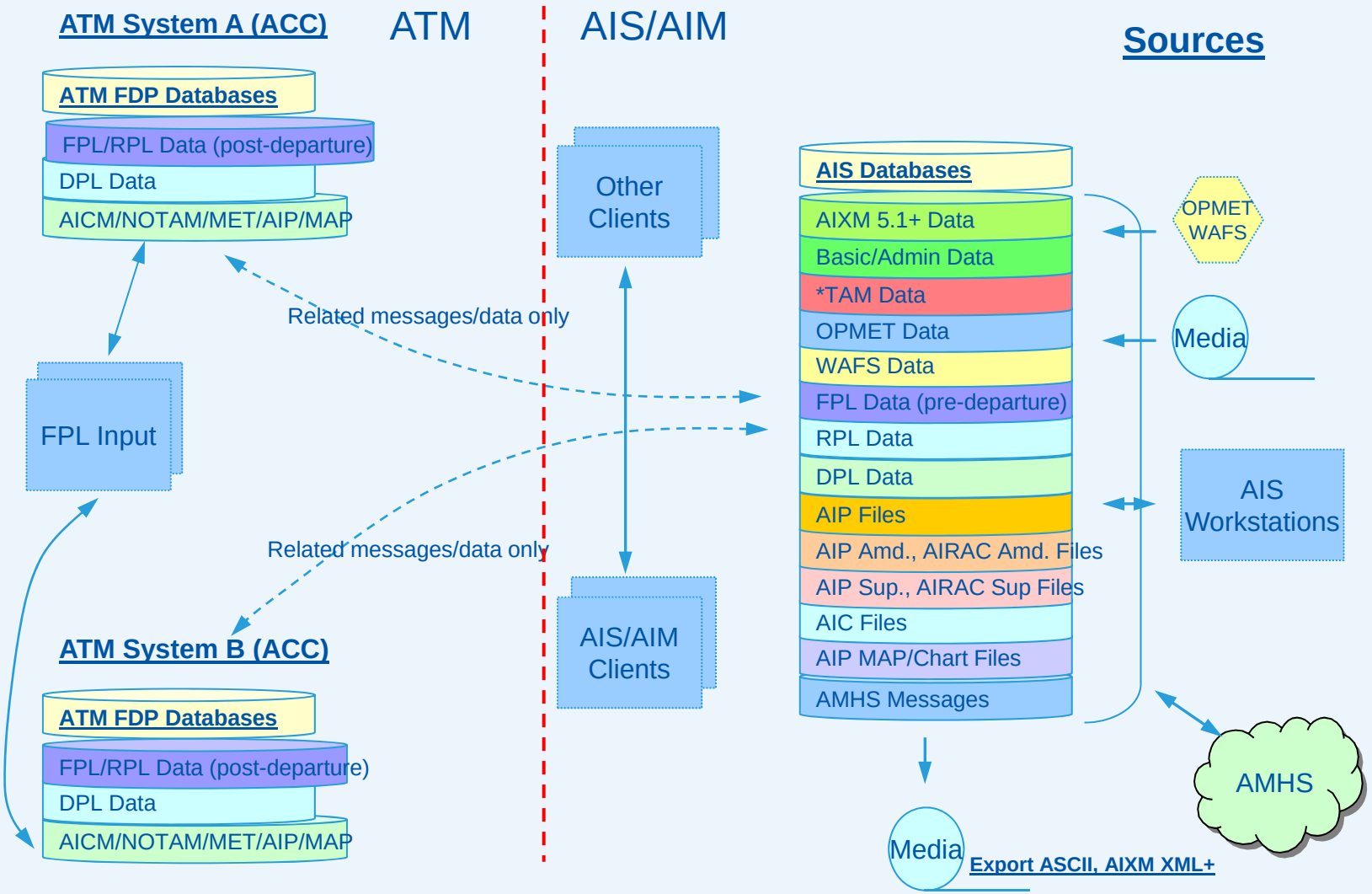
Aviation System Block Upgrades (ASBU)



Aviation System Block Upgrades
- Globally Interoperable Systems and Data -



Basic SWIM Environment



Thank You

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