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Data Quality – What Has Changed?

- Definition has expanded to include new requirements
- Requirements are easier to meet using digital data sets
- PANS AIM
- State importance in the data processing chain
- ICAO Aviation System Block Upgrades
- Why does it matter?

Annex 15 – Data Quality Definition

 Data quality. A degree or level of confidence that the data provided meet the requirements of the data user in terms of accuracy, resolution, integrity

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(or equivalent assurance level), traceability, timeliness, completeness and format.
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Annex 15 – Data Quality

 2.1.4 Each Contracting State <u>shall</u> ensure that the aeronautical data and aeronautical information provided are complete, timely and of required quality in accordance with 3.2

3.2 Data quality specifications

- 3.2.1 Data Accuracy
- 3.2.2 Data Resolution
- 3.2.3 Data Integrity
- 3.2.4 Data Traceability
- 3.2.5 Data **Timeliness**
- 3.2.6 Data Completeness
- 3.2.7 Data Format

Annex 15 – Data Accuracy

 Data accuracy. A degree of conformance between the estimated or measured value and the true value.

3.2.1 Data Accuracy

- The order of accuracy for aeronautical data <u>shall</u> be in accordance with its intended use.
- Note.— Specifications concerning the order of accuracy (including confidence level) for aeronautical data are contained in the PANS-AIM (Doc 10066), Appendix 1.

Annex 15 – Data Resolution

 Data resolution. A number of units or digits to which a measured or calculated value is expressed and used.

3.2.2 Data Resolution

- The order of resolution of aeronautical data <u>shall</u> be commensurate with the actual data accuracy.
- Note 1.— Specifications concerning the resolution of aeronautical data are contained in the PANS-AIM (Doc 10066), Appendix 1.
- Note 2.— The resolution of the data contained in the database may be the same or finer than the publication resolution.

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Annex 15 – Data Integrity

 Data integrity (assurance level). A degree of assurance that aeronautical data and its value has not been lost or altered since the origination or authorized amendment.

3.2.3 Data Integrity

- 3.2.3.1 The integrity of aeronautical data <u>shall</u> be maintained throughout the data process from origination to distribution to the next intended user.
- Note.— Specifications concerning the integrity classification related to aeronautical data are contained in the PANS-AIM (Doc 10066), Appendix 1

Annex 15 – Data Traceability

 Data traceability: The degree that a system or a data product can provide a record of the changes made to that product and thereby enable an audit trail to be followed from the end-user to the originator.

3.2.4 Data Traceability

 3.2.4.1 Traceability of aeronautical data <u>shall</u> be ensured and retained as long as the data is in use.

5.3 Digital Data Sets

 5.3.1.2 Each data set <u>shall</u> be provided to the next intended user together with a minimum set of metadata that ensures data traceability from the end-user to the originator.

Annex 15 – Data Timeliness

 Data timeliness. The degree of confidence that the data is applicable to the period of its intended use.

- 3.2.5 Data Timeliness
- 3.2.5.1 Timeliness <u>shall</u> be ensured by including limits on the effective period of the data elements.

Note 1.— These limits may be associated with individual data elements or data sets.

Annex 15 – Data Completeness

 Data completeness. The degree of confidence that all of the data needed to support the intended use is provided.

- 3.2.6 Data Completeness
- 3.2.6.1 Completeness of the aeronautical data <u>shall</u> be ensured in order to support the intended use.

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Annex 15 – Data Format

 Data format. A structure of data elements, records and files arranged to meet standards, specifications or data quality requirements.

3.2 Data Format

 3.2.7.1 The format of delivered data <u>shall</u> be adequate to ensure that the data is interpreted in a manner that is consistent with its intended use.

Annex 15 – Use of Automation

- Annex 15, Edition 15
- 3.6.1 Automation <u>shall</u> be <u>introduced</u> with the <u>objective</u> of <u>improving</u> the timeliness, quality, efficiency and cost effectiveness of aeronautical information services.

- Annex 15, Edition 16
- 3.5.1 Automation <u>shall</u> be <u>applied in order to ensure</u> the timeliness, quality, efficiency and cost-effectiveness of aeronautical information services.

Annex 15 – Data Set Updates

6.3.3 Data set updates

 6.3.3.2 Permanent changes and temporary changes of long duration (three months or longer) made available as digital data <u>shall</u> be issued in the form of a complete data set or a sub-set that includes only the differences from the previously issued complete data set.

 6.3.3.3 Recommendation. – When made available as a completely re-issued data set, the differences from the previously issued complete data set <u>should</u> be indicated.

PANS AIM – Appendix 1 Specs

2.1 Information management requirements

- 2.1.1.6 Appendix 1 shall be considered as a reference for aeronautical data and aeronautical information origination and publication requirements.
- Note 1.— Appendix 1 presents the scope of data and information that can be collected and maintained by the AIS.
- Note 2.— Appendix 1 provides a common language that can be used by data originators and the AIS.
- Note 1.— Appendix 1 contains aeronautical data attributes, metadata, and accuracy requirements.

PANS AIM – Quality Control

- 2.1.3. Quality control
- 2.1.3.2 When the same data is duplicated in different Aeronautical Information Products, coherency checks <u>should</u> be undertaken.

PANS AIM - QMS

3.1 Quality management system

- 3.1.3 In the framework of the quality management system, a user feedback system <u>shall</u> be defined and implemented.
- Note 3.— Formal arrangements concerning data quality between originator and distributor and between distributor and next intended user <u>may</u> be used to manage the aeronautical information data chain.

PANS AIM – Data Origination

4.1 Data Origination Requirements

 4.1.1 Data <u>shall</u> be collected and transmitted to the AIS in accordance with the accuracy requirements and integrity classification specified in Appendix 1.

PANS AIM – Metadata

4.2 Metadata Requirements

- 4.2.1 The metadata to be collected <u>shall</u> include, as a minimum:
 - a) the name of the organizations or entities performing any action of originating, transmitting or manipulating the data;
 - b) the action performed; and
 - c) the date and time the action was performed.

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PANS AIM – Paper vs Data Set

- 5.2.1 Aeronautical Information Publication (AIP)
- 5.2.1.1.3 When the AIP Data Set (as specified in 5.3.3.1) is provided, the following sections of the AIP <u>may</u> be left blank and a reference to the data set availability <u>shall</u> be provided:
- 5.2.1.1.4 When the Obstacle Data Set (as specified in 5.3.3.2.2) is provided, the following sections of the AIP <u>may</u> be left blank and a reference to the data set availability <u>shall</u> be provided:

PANS AIM – Printed AIP Changes

5.2.3.1 Printed AIP

• 5.2.3.1.5 New or revised information <u>shall</u> be identified by an annotation against it in the margin. A thick black vertical line or, where the change incorporated covers one line only or a part of a line, a thick black horizontal arrow, is sufficient to identify the change.

PANS AIM – eAIP Changes

5.2.4 Electronic AIP (eAIP)

 5.2.4.2 New or revised information <u>shall</u> be identified either by an annotation against it in the margin or by a mechanism that allows comparing the new/revised information with the previous one.

PANS AIM – Digital Data Exchange

5.3 Digital Data

- 5.3.1.1 The ISO 19100 series of standards for geographic information <u>shall</u> be used as a reference framework.
- Note.— This is intended to facilitate and support the use and exchange of digital data sets between data providers and data users.
- 5.3.1.5 The aeronautical data exchange model used <u>should</u>:
- Note 1.— The intent of using a commonly used data encoding format is to ensure interoperability of aeronautical data exchange between agencies and organizations involved in the data processing chain.

PANS AIM – Data Set Duplicates

5.3.3 Data sets

Note.— A data subject may appear in multiple data sets.

PANS AIM – Data Set Distribution

5.4 Distribution Services

 Note.— Further guidance on digital data set distribution can be found in the Manual on System Wide Information Management (SWIM) Concept (Doc 10039).

PANS AIM – Data Set Update Cycle

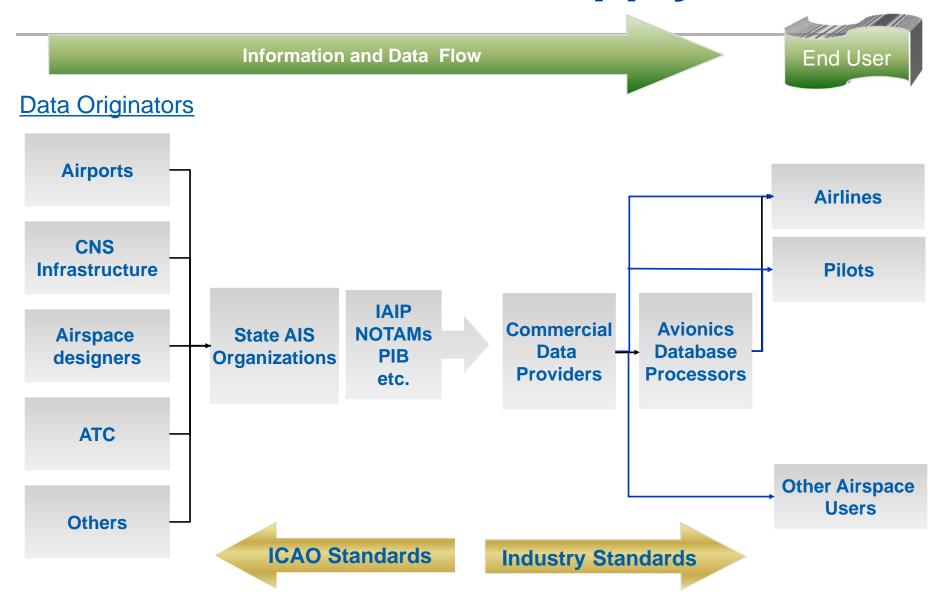
6.1 Aeronautical Information Product updates

 6.1.1 The same update cycle <u>shall</u> be applied to the AIP Amendments, the AIP data set and the Instrument Flight Procedures data set in order to ensure the coherence of the data items that appear in multiple Aeronautical Information Products.

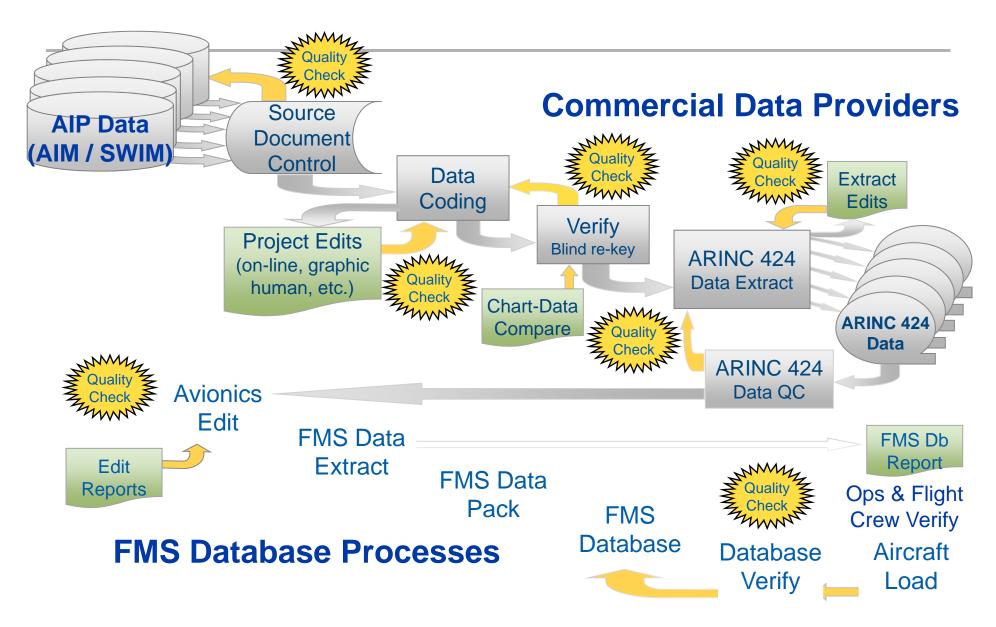
PANS AIM – Digital Data Updates

- 6.1.5 Specifications for digital data updates
- 6.1.5.1 The update interval for the AIP data set and Instrument Flight Procedures data sets <u>shall</u> be specified in data product specification.
- 6.1.5.2 Data sets that have been made available in advance (according to the AIRAC cycle) <u>shall</u> be updated with the non-AIRAC changes that occurred in between the publication and the effective date.

Aeronautical Data Supply Chain

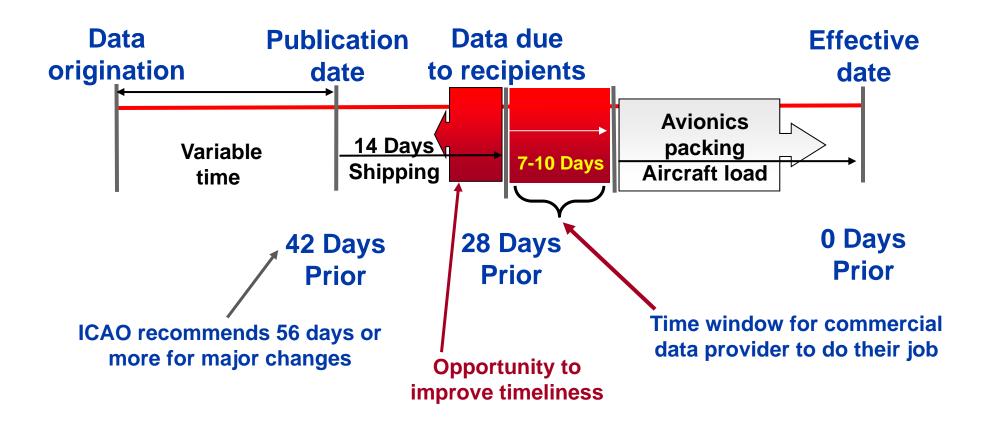


Aeronautical Data Process



Timeline for Data Processing

Aeronautical Information Regulation and Control (AIRAC) Cycle



ICAO Aviation System Block Upgrades (ASBUs)

Performance Improvement Areas

Block 0 (2013)

BO-65: OPTIMIZATION OF APPROACH

PROCEDURES INCLUDING VERTICAL GUIDANCE

BO-70: INCREASED RUNWAY THROUGHPUT

BO-15: IMPROVE TRAFFIC FLOW THROUGH

B0-80: IMPROVED AIRPORT OPERATIONS

RUNWAY SECUENCING (AMAN/DMAN) BO-75: SAFETY AND EFFICIENCY OF SURFACE

OPERATIONS (A-SMGCS LEVEL 1-2

THROUGH AIRPORT-CDM

Block 1 (2018)

B1-70: INCREASED RUNWAY THROUGHPUT THROUGH

B1-15: IMPROVED AIRPORT OPERATIONS THROUGH

DEPARTURE, SURFACE AND ARRIVAL MANAGEMENT

B1-75: ENHANCED SAFETY AND EFFICIENCY OF

B1-80: OPTIMIZED AIRPORT OPERATIONS

SURFACE OPERATIONS (A-SMGCS/SURF-IA) AND EVS

THROUGH A-COM TOTAL AIRPORT MANAGEMENT B1-81: REMOTELY OPERATED AERODROM CONTROL MANAGEMENT

B1-65: OPTIMIZED AIRPORT ACCESSIBILITY

Block 2 (2023)

Block 3 (2028 & >)

====B3-15: INTEGRATION OF AMAN/DMAN/SMAN

Greener **Airports**

Globally Interoperable Systems and Data

Optimum Capacity and Flexible Flights

Ffficient Flight Path AFRONAUTICAL INFORMATION MANAGEMENT

BO-25: INCREASED INTEROPERABILITY, EFFICIENCY AND CAPACITY THROUGH GROUND-GROUND INTEGRATION

B0-105: METEOROLOGICAL INFORMATION SUPPORTING ENHANCED OPERATIONAL EFFICIENCY AND SAFETY

BO-35: IMPROVED FLOW PERFORMANCE THROUGH

PLANNING BASED ON A NETWORK-WIDE VIEW

BO-10: IMPROVED OPERATIONS THROUGH

B0-84: INITIAL CAPABILITY FOR GROUND

BO-85: AIR TRAFFIC SITUATIONAL AWARENESS

BO-86: IMPROVED ACCESS TO OPTIMUM FLIGHT LEVELS THROUGH CLIMB/DESCENT PROCEDURES

B0-102: INCREASED EFFECTIVENESS OF GROUND

BO-40: IMPROVED SAFETY AND EFFICIENCY

THROUGH THE INITIAL APPLICATION OF DATA LINK

BO-20: IMPROVED FLEXIBILITY AND EFFICIENCY IN

ENHANCED EN-ROLITE TRAJECTORIES

B0-101: ACAS IMPROVEMENTS

DESCENT PROFILES (CDOS)

DEPARTURE PROFILES (CCOS)

SURVEILLANCE

(ATSA)

B1-30: SERVICE IMPROVEMENT THROUGH INTEGRATION OF ALL DIGITAL ATM INFORMATION

R1-25: INCREASED INTEROPERABILITY FEEICIENCY AND CAPACITY THOUGH FF-ICE/1 APPLICATION

B1-31: PERFORMANCE IMPROVEMENT THROUGH THE APPLICATION OF SYSTEM WIDE INFORMATION MANAGEMENT (SWIM)

B1-105: ENHANCED OPERATIONAL DECISIONS THROUGH INTEGRATED METEOROLOGICAL INFORMATION (PLANNING AND NEAR-TERM

B1-35: ENHANCED FLOW PERFORMANCE THROUGH NETWORK OPERATIONAL PLANNING

B1-85: INCREASED CAPACITY AND EFFICIENCY THROUGH INTERVAL MANAGEMENT

B1-102: GROUND BASED SAFETY NETS ON

R1-40: IMPROVED TRAFFIC SYNCHRONIZATION AND INITIAL TRAJECTORY BASED OPERATION

BO-05: IMPROVED FLEXIBILITY AND EFFICIENCY IN B1-05: IMPROVED FLEXIBILITY AND EFFICIENCY IN DESCENT PROFILES (OPDS)

> B1-90 INITIAL INTEGRATION OF REMOTELY PILOTED AIRCRAFT (RPA) SYSTEMS INTO NON-SEGREGATED AIRSPACE

B2-70: ADVANCED WAKE TURBULENCE

= = B2-15: LINKED AMAN/DMAN

B2-75: OPTIMIZED SURFACE ROUTING AND SAFETY BENEFITS (A-SMGCS LEVEL 3-4 AND SVS)

B2-25: IMPROVED COORDINATION THROUGH B3-25: IMPROVED OPERATIONAL PERFORMANCE MULTI-CENTRE GROUND-GROUND INTEGRATION: THROUGH THE INTRODUCTION OF FULL FF-ICE (FF-ICE/1 AND FLIGHT OBJECT, SWIM)

B2-31: ENABLING AIRBORNE PARTICIPATION IN COLLABORATIVE ATM THROUGH SWIM

B2-35: INCREASED USER INVOLVEMENT IN THE

B2-101: NEW COLLISION AVOIDANCE SYSTEM

DYNAMICUTILIZATION OF THE NETWORK

B2-85; AIRBORNE SEPARATION

B3-105: ENHANCED OPERATIONAL DECISIONS THROUGH INTEGRATED METEOROLOGICAL INFORMATION (NEAR-TERM AND IMMEDIATE SERVICE)

B3-10: TRAFFIC COMPLEXITY MANAGEMENT

B3-85; SELF-SEPARATION

B2-05: OPTIMIZED ARRIVALS IN DENSE AIRSPACE B3-05: FULL 4D TRAJECTORY-BASED OPERATIONS

B2-90: REMOTELY PILOTED AIRCRAFT (RPA) B3-90: REMOTELY PILOTED AIRCRAFT (RPA) INTEGRATION IN TRAFFIC TRANSPARENT MANAGEMENT

ICAO ASBU Performance Improvement Area (PIA) Aeronautical Information

Block 0 - 2013



B0-30

Globally Interoperable Systems and Data Service Improvement through Digital Aeronautical Information Management The initial introduction of digital processing and management of information, through aeronautical information service (AIS)/aeronautical information management (AIM) implementation, use of aeronautical information exchange model (AIXM), migration to electronic aeronautical information publication (AIP) and better quality and availability of data.

Block 1 – 2018



B1-31

Globally Interoperable Systems and Data Performance
Improvement through
the application of
System-Wide
Information
Management (SWIM)

Implementation of system-wide information management (SWIM) services (applications and infrastructure) creating the aviation intranet based on standard data models, and internet-based protocols to maximize interoperability.

Aeronautical Data Quality Matters

- Aircraft are becoming database driven and their operation requires access to aeronautical information of a significantly higher quality than is currently available.
- The role and importance of aeronautical information changed significantly with the implementation of RNAV, RNP and more precise airborne computer systems.
- Efforts of States should be aimed at improving their AIM systems to assure that aeronautical data will be available in the right quality, the right form and at the right time.
- Aeronautical data of insufficient quality may compromise the safety of air traffic operations, which can lead to an airspace user hazard resulting in an incident or accident.