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Aerodrome Data Management and Quality Control Requirements for Sustainability

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References

- **ICAO SARPS Annex 14 Vol. I, 7th Edition, July 2016 – Aerodrome Design and Operations**
- **ICAO SARPS – Annex 15, 15th Edition, July 2016 - Aeronautical Information Services**
- Aeronautical Information Services Manual (Doc 8126).

ICAO SARPs

✓ **Annex 14 Volume I – 7th Edition, July 2016 - Aerodrome Design and Operations**

Chapter 2: Aerodrome Data
2.1 Aeronautical Data
2.5 Aerodrome dimensions and related information including Obstacles

✓ **Annex 15 – 15th Edition, July 2016 - Aeronautical Information Services**

Chapter 3: Aeronautical information management
Appendix 7: Aeronautical data publication resolution and integrity classification
Appendix 8: Terrain and obstacle data requirements

✓ **Annex 4 – 11th Edition, July 2009 last Amended 10/11/2016 - Aeronautical Charts**

Appendix 6 Aeronautical data quality requirements

Content

- Aeronautical information management
- Quality Control Requirement
- Quality Management System

Data and Information

DATA: Facts or statistics concerning objects, vents or other entities e.g. Runway status data, etc. *Databases store data.*

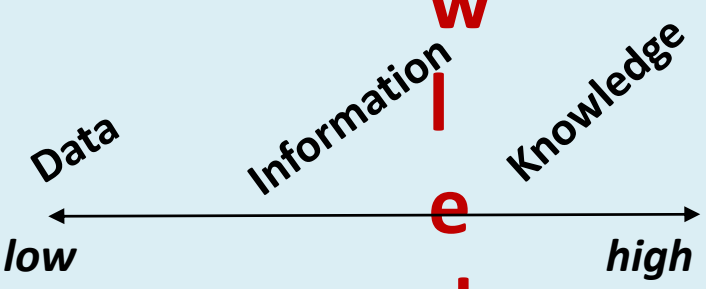
INFORMATION: Data presented in a form suitable for interpretation, e.g. NOTAM/SNOWTAM, Charts and Maps, etc.

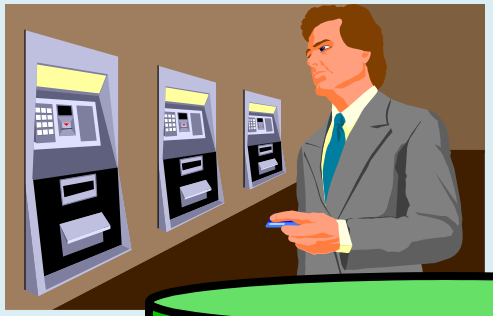
- *Data is converted into information by programs and queries to be usable by the users.*

KNOWLEDGE: Insights into appropriate actions based on interpreted data.

Knowledge

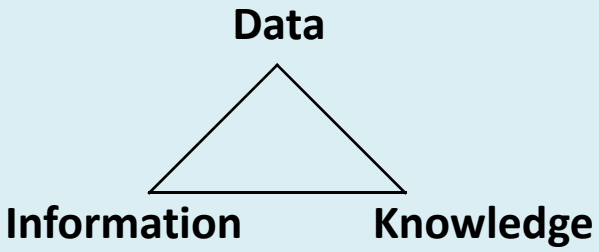
Size, Complexity, Management Cost):





DATA

INFORMATION



Why manage data?

Risks of not effective data management:

- Confused data due to;
  - Duplicated data/different values
  - Erroneous or corrupted data
- Loss of data
- Difficult to use (data proliferation)
- Difficult to find (retrieve) data
- Hard to track/trace data sources

AERONAUTICAL INFORMATION MANAGEMENT

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AERONAUTICAL INFORMATION MANAGEMENT

- **Information management requirements**

✓ The information management resources and processes established by an aeronautical information service (AIS) shall be adequate to ensure the timely collection, processing, storing, integration, exchange and delivery of quality-assured aeronautical data and aeronautical information within the air traffic management (ATM) system.

Aeronautical Information Management

- **Aeronautical data and aeronautical information validation and verification**

✓ Material to be issued as part of the Integrated Aeronautical Information Package shall be thoroughly checked before it is submitted to the AIS, in order to make certain that all necessary information has been included and that it is correct in detail prior to distribution.

Aeronautical Information Management

- **Aeronautical data and aeronautical information validation and verification (Cont'd)**

✓ An AIS shall establish verification and validation procedures which ensure that upon receipt of aeronautical data and aeronautical information, quality requirements (accuracy, resolution, integrity and traceability) are met

electronic Data Management

- Designing data entry system
- Data entry
- Data cleaning – consistency checks
- Data security & backups
- Storage – how safe is your data?
- Documentation

Database Management

DATABASE: A shared collection of interrelated data designed to meet the varied information needs of an organization.

DATABASE MANAGEMENT SYSTEM: A collection of programs to create and maintain a database.

Define

Construct

Manipulate

Annex 15 – Use of Automation

- 3.5.1 Automation shall be applied in order to ensure the timeliness, quality, efficiency and cost-effectiveness of aeronautical information services.

Metadata

- Meta-data is data about the data
- Describes the dataset
- Enables effective management of the data resources
- Allows the dataset to be fully understood
- Is an essential part of the data documentation

meta-data turns raw data into “information”

Metadata – Annex 15

- Annex 15 (4.2.1): The metadata to be collected shall 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.

Quality Control Requirement for Sustainability

Definitions

- ✓ **Quality management**: Coordinated activities to direct and control an organization with regard to quality (ISO 9000).
- ✓ **Validation**: Confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled (ISO 9000).
- ✓ **Verification**: Confirmation, through the provision of objective evidence, that specified requirements have been fulfilled (ISO 9000).

Quality Control Requirement for Sustainability

- ✓ Specifications governing the quality system are given in Annex 15, Chapter 3:
- ✓ Data quality specifications:
  Accuracy - Resolution - Integrity
- ✓ Aeronautical Data Publication Accuracy, Resolution and Integrity Classification are contained at Appendix 5 to Annex 14 Vol. I and Appendix 7 to Annex 15

Data Quality

- **Data quality**. A degree or level of confidence that the data provided meet the requirements … (Annex 15)
- **Data quality specifications:**
  - Data Accuracy
  - Data Resolution
  - Data Integrity
  - Data Traceability
  - Data Timeliness
  - Data Completeness
  - Data Format

Quality Control Requirement for Sustainability

Data quality specifications

- **Accuracy**
- The order of accuracy for aeronautical data shall be as specified Annex 14, Volumes I and II,
- Chapter 2. In that respect, three types of positional data shall be identified:
- surveyed points (runway thresholds,
- navigation
- aid positions, etc.),
- calculated points (mathematical calculations from the known surveyed points of points in space/fixes) and
- declared points (e.g. flight information region boundary points

Quality Control Requirement for Sustainability

Data quality specifications

- **Resolution**
  The resolution of the data features contained in the database should be commensurate with the data accuracy requirements

- **Integrity**
  The integrity classification for aeronautical data shall be as specified in Tables A7-1 to A7-5 of Appendix 7 of Annex 15
- The integrity of aeronautical data shall be maintained throughout the data process from survey/origin to
- distribution to the next intended user (the entity that

Quality Control Requirement for Sustainability

Data quality specifications (Cont'd)

- **Integrity**
  - The integrity classification for aeronautical data shall be as specified in Tables A7-1 to A7-5 of Appendix 7 of Annex 15
  - The integrity of aeronautical data shall be maintained throughout the data process from survey/origin to distribution to the next intended user (the entity that receives the aeronautical information from the AIS provider). Based on the applicable integrity classification for Routine Data, essential data and critical data

Quality Control Requirement for Sustainability

- **Data protection**
- Aeronautical data and data sets shall be protected in accordance with data error detection, security, and authentication techniques
- Electronic aeronautical data sets shall be protected by the inclusion in the data sets of a 32-bit cyclic redundancy check (CRC) implemented by the application dealing with the data sets. This shall apply to the protection of the integrity classification of data sets

Quality Control Requirement for Sustainability

- **Use of Automation**
- Automation shall be introduced with the objective of improving the timeliness, quality, efficiency and cost effectiveness of aeronautical information services

- *Guidance material on the development of databases and the establishment of data exchange services may be found in Doc 8126*

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

Quality Control Requirement for Sustainability

- ✓ Protection of electronic aeronautical data while stored or in transit shall be totally monitored by the cyclic redundancy check (CRC).

- ✓ Guidance material on the aeronautical data quality requirements (accuracy, resolution, integrity, protection and traceability) is contained in the World Geodetic System — 1984 (WGS-84) Manual (Doc 9674).

Quality Control Requirement for Sustainability

- ✓ Supporting material in respect of the provisions of Appendix 5 to Annex 14 related to accuracy and integrity of aeronautical data is contained in RTCA Document DO-201A and European Organization for Civil Aviation Equipment (EUROCAE) Document ED-77.

Quality Management System

- ✓ Detailed information is contained at Chapter 3.7 of Annex 15
- ✓ Quality management systems shall be implemented and maintained encompassing all functions of an AIS The execution of such quality management systems shall be made demonstrable for each function stage.

- ✓ Note.— Guidance material is contained in the Manual on the Quality Management System for Aeronautical Information Services (Doc 9839) (to be developed)

Quality Management System (Cont'd)

- ✓ Each quality management system shall include the necessary policies, processes and procedures, including those for the use of metadata, to ensure and verify that aeronautical data are traceable throughout the aeronautical information data chain so as to allow any data anomalies or errors detected in use to be identified by root cause, corrected and communicated to affected users.

- ✓ All necessary measures shall be taken to monitor compliance with the quality management system in place.

Human factors considerations

- ✓ Due consideration shall be given to the integrity of information where human interaction is required and mitigating steps taken where risks are identified.
- ✓ Note.— This may be accomplished through the design of systems, operating procedures or improvements in the operating environment.

Conclusion

- **Information management.** IM provides accredited, quality-assured and timely information used to support ATM operations. Information management will also monitor and control the quality of the shared information and provide information-sharing mechanisms that support the ATM community. (Global ATM Operational Concept – Doc 9854)
- **Aeronautical information management (AIM).** The dynamic, integrated management of aeronautical information through the provision and exchange of quality-assured digital aeronautical data in collaboration with all parties. (Annex 15)

Conclusion (Cont'd)

- A quality management system (QMS) is a formalized system that documents processes, procedures, and responsibilities for achieving quality policies and objectives.
- A QMS helps coordinate and direct an organization's activities to meet customer and regulatory requirements and improve its effectiveness and efficiency on a continuous basis.
- ISO 9001: 2015; the international standard specifying requirements for quality management systems, is the most prominent approach to quality management systems.
- Data Management is a component of QMS. QMS supports data management process.


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Thank You