



The European Organisation for Civil Aviation Equipment
L'Organisation Européenne pour l'Équipement de l'Aviation Civile

STANDARDS FOR PROCESSING AERONAUTICAL DATA

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ED-76A

June 2015

Supersedes ED-76

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FOREWORD

1. This document was prepared jointly by EUROCAE Working Group 44 "Aeronautical Databases" and RTCA SC-217 "Aeronautical Databases", and was approved by the Council of EUROCAE on 16 June 2015.
2. EUROCAE is an international non-profit making organisation in Europe. Membership is open to manufacturers and users of equipment for aeronautics, trade associations, national civil aviation administrations, and, under certain conditions, non-European organisations. Its work programme is principally directed to the preparation of performance specifications and guidance documents for civil aviation equipment, for adoption and use at European and world-wide levels.
3. The findings of EUROCAE are resolved after discussion amongst Members of EUROCAE and in collaboration with RTCA Inc, Washington D.C., and/or the Society of Automotive Engineers (SAE), Warrendale PA, U.S.A., through their appropriate committees.
4. This document supersedes ED-76 "Standards for Processing Aeronautical Data" (October 1998).
The main changes are outlined in section "Revisions to EUROCAE ED-76 / RTCA DO-200A" below.
5. This document is technically identical to RTCA DO-200B "Standards for Processing Aeronautical Data".
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EXECUTIVE SUMMARY

Processing of aeronautical data using quality management (QM) principles contributes to safety. Indeed, insufficient, corrupt or erroneous aeronautical information has the potential to adversely affect the safety of aircraft operations. In addition, Air Traffic Management (ATM) modernization programs such as NextGen and Single European Sky ATM Research (SESAR) are implementing services that are dependent on the robust management of data and information supporting air operations. This standard supports the safety of operations and proposed ATM modernization initiatives including the capabilities and flexibilities provided by Performance Based Navigation (PBN) and collaborative capabilities between both ground and aircraft operations enabled by System Wide Information Management (SWIM).

In this context, since the publication of EUROCAE ED-76 / RTCA DO-200A, international regulation and technical standards related to aeronautical data processing have been developed or revised. For example, the European Commission Regulation (EU No 73/2010) – also known as ADQ IR for Aeronautical Data Quality Implementing Rule – establishes requirements on the quality of aeronautical data and aeronautical information for the single European sky. Another example is the ICAO Annex 15 that was revised to include more thorough provisions related to data quality throughout the data processing chain up to publication by States. It was deemed necessary to revise the current RTCA/EUROCAE standard for processing aeronautical databases (EUROCAE ED-76 / RTCA DO-200A) to remain current with associated changes made to related international regulation and standards. EUROCAE WG-44 / RTCA SC-217 Terms of Reference were revised accordingly.

The revision to EUROCAE ED-76 / RTCA DO-200A takes into account suggested changes from industry and authorities' experience and feedback, as well as the related regulation and technical standards. It was expanded to cover all types of aeronautical data and not only navigation data. It also includes an adaptation of EUROCAE ED-215 / RTCA DO-330 "Software Tool Qualification Considerations" for the data processing domain. A summary of changes to EUROCAE ED-76 / RTCA DO-200A is provided in section "Revisions to RTCA EUROCAE ED-76 / RTCA DO-200A".

This standard provides recommended minimum requirements for the processing of aeronautical data. It aims to assist aeronautical data chain participants and regulatory authorities in meeting their responsibilities. It is intended to be used by organizations seeking approval of the method(s) they use to process or manipulate data. As a result, the document is structured in a manner, which will assist the organizations to:

1. Relate material obtained from the relevant regulatory authority to the requirements set forth herein; and,
2. Determine if its processing method(s) meets the requirements.

This standard is divided as follows:

Section 1 – An introductory section which provides:

1. Information on the purpose and scope of the document;
2. An explanation of how to use and apply the document;
3. A list of baseline documents used in the development of the document;
4. An explanation of the concept that ultimate responsibility for ensuring data meets the quality for its intended use rests with the end-user; and,
5. An explanation of the concepts of data quality characteristics, required data quality, assuring quality through quality management, aeronautical data chains and the functional links in those chains.

Section 2 – Defines the requirements. Organizations intending to demonstrate compliance with this standard will need to review this section to ensure they meet all requirements relevant to their data processing activities. This section:

1. Establishes the users' responsibility for defining their Data Quality Requirements (DQRs), and
2. Provides requirements for aeronautical data processing and quality management.

Section 3 – Describes a method, but not the only method, that can be used to demonstrate compliance with the requirements. States or approval authorities may determine that an application for approval using alternative methods of demonstrating compliance may also be acceptable.

Section 4 – Describes the Membership of EUROCAE WG-44 and RTCA SC-217

Appendix A – A glossary of terms and abbreviations used in this standard;

Appendix B – Provides guidance on defining DQRs in support of those requirements expressed in Section 2;

Appendix C – provides guidance and further details on the methods available to demonstrate compliance;

Appendix D – provides guidance on the application of EUROCAE ED-215 / RTCA DO-330 to qualify tools in the aeronautical data processing domain;

Appendix E – provides an example of the organization of compliance documentation; and,

Appendix F – summarizes the list of applicable “shalls” of this standard.

REVISIONS TO EUROCAE ED-76 / RTCA DO-200A

The following list is a summary of the major changes made to EUROCAE ED-76 / RTCA DO-200A for the EUROCAE ED-76A and RTCA DO-200B versions.

1. Editorial errors found during the revision of the document were corrected.
2. Changes impacting entire document:
 - a. Expansion from navigation data centric focus to include all types of aeronautical data.
3. Terms reviewed and revised to ensure they were used consistently throughout the document. A brief summary of these changes follows:
 - a. Terms “receive”, “assemble”, “translate”, “select”, “format” and “distribute” clarified to refer to process phases and used consistently in the document
 - b. “Format” – process versus data structure
 - c. “Authoritative source” versus “non-authoritative source”
 - d. “Application Integration” as the functional link and “application integrator” as the associated organization
 - e. “Preparation” added as functional link
 - f. “Origination” as functional link and not as a process
 - g. “Competency” added and used to replace related terms “skills” “knowledge”
 - h. “Data Process Assurance Level (DPAL)” added link to data quality
 - i. “Data provider” / “Supplier” added and used consistently
 - j. “Aeronautical Data Chain” added and used to replace “supply/processing chain”
 - k. “End-user” is associated to “End-use” versus “intended use”
 - l. “Transmission” added as related to “Transmit” functional link and used to replace “transfer”, “exchange”, etc.
 - m. Integrity – clarified as it applies to data or process
4. Executive Summary - Revised to reflect changes as Noted in this summary and current industry and authority activities (i.e., SESAR / NextGen and PBN, SWIM, ADQ).
5. Section 1.1 - Revised to reflect current industry and authority activities (i.e., SESAR/ NextGen and PBN, SWIM, ADQ).
6. Section 1.4.2 - Reference Documents - Revised to include EUROCAE ED-215 / RTCA DO-330 “Software Tool Qualification Considerations” and EUROCAE ED-98B RTCA DO-276B “User Requirements for Terrain and Obstacle Data”.
7. Figure 1-1 - Added to visually depict links between Reference Documents and EUROCAE ED-76A / RTCA DO-200B Aeronautical Data Chain.
8. Figure 1-2 - Flow of Aeronautical Data - Revised to simplify the illustration of the flow of aeronautical data from originators to end-users.
9. Section 1.5.4.2 - “Commentary on navigation data” and “Commentary on terrain data” - Deleted.
10. Sections 1.5.4.3 and 1.5.4.5 - Revised to reflect current electronic transmission format.
11. Section 1.5.4.5 - Application Integration - Expanded to state the role of the application integrator.
12. Figure 1- 3 - Applicability of EUROCAE ED-76A / RTCA DO-200B - Revised to depict the activities performed within the processes of Aeronautical Data Preparation, Transmission, and Application Integration.
13. Section 2.2 - Compliance Plan - Renamed Compliance Documentation Package to depict the division of the section into 2.2.1 Compliance Requirements and 2.2.2 Compliance Documentation.

14. Sections 2.3.4, 2.4.3, C.7 - Revised text to provide clarity on data error management.
15. Section 2.3.5 - Added requirement for evidence of mutual agreement of DQRs and communication of any DQR changes between user and data supplier.
16. Section 2.4.1.6 a) - Expanded to provide more information on role of validation when source is not an authoritative source.
17. Section 2.4.4 - Deleted term “Skills” to reflect that the definition of competency includes the word skill. Wherever applicable in the document, the word skill was deleted.
18. Section 2.4.5 - Tool Qualification, added new figure for “Criteria for Tool Qualification” - Changes to align with EUROCAE ED-215 / RTCA DO-330 “Software Tool Qualification Considerations”.
19. Section 2.4.6 - Data Security - Added requirement to include emerging data security requirements.
20. Section 2.5.4 - Control of Documentation added to provide clarification about documentation requirements.
21. Section 2.5.4 - Quality Records re-numbered to Section 2.5.5 because of addition of 2.5.4 Control of Documentation.
22. Section 2.5.5 - Management Review re-numbered to Section 2.5.6 because of addition of 2.5.4 Control of Documentation.
23. Appendix A - Glossary revisions to refine terms in alignment with definitions in ICAO Annex 15, International Standards and Recommended Practices for Aeronautical Information shall apply. In some cases, additional statements were added because the term has special meaning to the EUROCAE ED-76A / RTCA DO-200B document, or it is necessary to add contextual statements to increase understanding and ability to apply the term.
24. Appendix B.1.7 - Expanded information about Format and included examples.
25. Appendix C.2.3 - Validation and Verification - Revised content to include text, examples, figures, and tables that provide applicable guidelines for validation and verification activities.
26. Appendix C.2.1.4 - Added Validation by sampling.
27. Appendix C.8 - Data Security added to provide guidelines to Section 2.4.6.
28. Appendix D - Tool Qualification Guidelines - Added to align with EUROCAE ED-215 / RTCA DO-330 “Software Tool Qualification Considerations” and the requirements in Section 2.4.5 Aeronautical Data Tool Qualification.
29. Appendix E - Guidance on Compliance Documentation - Added to provide guidelines on documentation required to indicate compliance to EUROCAE ED-76A / RTCA DO-200B requirements.
30. Appendix F - Added to provide a matrix of the “shalls” of EUROCAE ED-76A / RTCA DO-200B.
31. The membership list was revised and this summary of revisions was included.

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CHAPTER 1

PURPOSE AND SCOPE

1.1 CONTEXT

ATM modernization programs such as NextGen and SESAR are implementing services that support aeronautical applications and depend on the robust management of aeronautical data and information. This standard supports these proposed modernization efforts including the capabilities and flexibilities provided by Performance Based Navigation (PBN). Several other NextGen and SESAR collaborative capabilities implement shared responsibilities between both ground and aircraft operations. System Wide Information Management (SWIM) enables the provision of data and information supporting these concepts of future enhancements.

This standard addresses aeronautical databases as well as the associated data processing. These databases may be utilized by airborne or ground-based aviation products. This standard includes guidance and requirements for data processing activities that may occur between data origination and end use.

1.2 INTRODUCTION

This standard provides the minimum requirements and guidance for the processing of aeronautical data that are used for navigation, flight planning, terrain/obstacle awareness, flight deck displays, flight simulators and for other applications. Such data would be passed on to the user as a data set. The standard provides requirements to develop, assess change, and support implementation of data quality management. ISO 9001 provides the foundation for the Quality Management System (QMS) requirements for this standard. When applied by each organization in the aeronautical data chain, the standard will provide assurance that the level of data quality is established and maintained.

1.3 HOW TO USE THIS DOCUMENT

This standard represents a consensus reached within the aviation community and has been written so that it may be applied by the regulatory authorities as an acceptable means of ensuring that aeronautical data maintains the required data quality and supports its intended use. It does not, in itself, have any authority over organizations responsible for processing aeronautical data.

This standard is intended to address the specific issues of the aeronautical data process. It assumes that those organizations have in place an acceptable QMS and does not attempt to specify requirements other than those associated with the aeronautical data process.

This standard uses the term “shall” to identify requirements within this standard, which can be traced to particular aspects of the aeronautical data process. The term “should” is used where a procedure is recommended as an improvement to the aeronautical data process or to support demonstration of compliance, over and above the minimum requirements specified in this standard.

1.4 SCOPE

This standard provides minimum requirements for all phases of the data process applicable to the processing of aeronautical data, including quality assurance and QMS. This standard provides guidance to assess compliance and determination of the levels of process assurance. This standard supports the development of aeronautical databases. Section 1.5.5.1 defines what is not in the scope of this document. This standard is a complementary standard to those reference documents listed in Section 1.4.2.

1.4.1 Definition of Terms

The definitions of terms used in this standard are provided in a glossary in [Appendix A](#). Several terms have been given specific and more restricted meanings than may be understood from general use. Full appreciation of the intended differentiation between terms that are often used as synonyms in non-technical publications will be helpful to the reader. Terms like “accuracy”, “resolution”, “assurance level”, “validation” and “verification” are defined in [Appendix A](#) and are further addressed in [Appendix B](#), where their interrelationships are discussed.

1.4.2 Reference Documents

[FIGURE 1-1](#) maps relevant reference documents to the functional links based on their typical use. Different participants throughout the data chain can perform multiple functions depending upon which environment they operate in. A number of the indicated reference documents are used repeatedly across the data chain. Those instances were not mapped across all functional links to avoid cluttering the image. For example, ARINC 424 is used widely in multiple functional links.

NOTE: *The list of reference documents stated is not intended to be exhaustive.*

1. AEEC ARINC Specification 424, *Navigation System Data Base*
2. ANSI/ASQ Z1.4, *Sampling Procedures and Table for Inspection By Variable for Percent Nonconforming*
3. ARINC 842-1, *Guidance for Usage of Digital Certificates*
4. ATA Specification 42, *Aviation Industry Standards for Digital Information Security, Revision 2013.1*
5. ICAO Annex 4, *International Standards and Recommended Practices - Aeronautical Charts*
6. ICAO Annex 11, *International Standards and Recommended Practices -Air Traffic Services*
7. ICAO Annex 14, *International Standards and Recommended Practices - Aerodromes and Heliports*
8. ICAO Annex 15, *International Standards and Recommended Practices - Aeronautical Information Services*
9. ICAO Doc 8126, *Aeronautical Information Services Manual AN/872*
10. ICAO Doc 9613, *Manual on Required Navigation Performance AN/937*
11. ICAO Doc 9674, *World Geodetic System 1984, (WGS-84) AN/946*
12. ISO 2859-1, *Sampling Procedures for Inspection by Attributes*
13. ISO/IEC 27001 Annex A, *Controls/ ISO 27002, Code of Practice for Information Security Management for Additional Information, June 2005*
14. ISO/IEC 27002, *Information technology - Security Techniques - Code of Practice for Information Security Management, June 2008*
15. ISO/IEC 27005, *Information Technology - Security Techniques - Information Security Risk Management, June 2008*
16. NIST FIPS 198-1, *The Keyed-Hash Message Authentication Code (HMAC), July 2008*
17. NIST SP 800-53 Rev. 4, *Security and Privacy Controls for Federal Information Systems and Organizations, Apr 2013*
18. NIST SP 800-39, *Managing Information Security Risk: Organization, Mission, and Information System View, Mar 2011*
19. NIST SP 800-57, *Recommendation for Key Management: Part 1: General (Revision 3), Jul 2012*
20. NIST SP 800-131A, *Transitions: Recommendation for Transitioning the Use of Cryptographic Algorithms and Key Lengths, Jan 2011*
21. PCI Security Standards Council, *Payment Card Industry Data Security Standard, Nov 2013*

22. EUROCAE ED-12C / RTCA DO-178C, *Software Considerations in Airborne Systems and Equipment Certification*
23. EUROCAE ED-77 / RTCA DO-201A, *Industry Requirements for Aeronautical Information Services*
24. RTCA DO-229D, *Minimum Operational Performance Standards for Global Positioning System/Wide Area Augmentation System Airborne Equipment*
25. EUROCAE ED-75D / RTCA DO-236C Change 1, *Minimum Aviation System Performance Standards: Required Navigation Performance for Area Navigation*
26. RTCA DO-257A, *Minimum Operational Performance Standards for the Depiction of Navigational Information on Electronic Maps*
27. EUROCAE ED-99C / RTCA DO-272C, *User Requirements for Aerodrome Mapping Information*
28. EUROCAE ED-98B / RTCA DO-276B, *User Requirements for Terrain and Obstacle Data*
29. EUROCAE ED-119B / RTCA DO-291B, *Interchange Standards for Terrain and Aerodrome Mapping Database Exchange*
30. RTCA DO-309, *Minimum Operational Performances Standards (MOPS) for Helicopter Terrain Awareness and Warning Systems (HTAWS) Airborne Equipment*
31. EUROCAE ED-179B / RTCA DO-315B, *Minimum Aviation System Performance Standards (MASPS) for Enhanced Vision Systems, Synthetic Vision Systems, Combined Vision Systems and Enhanced Flight Vision Systems*
32. EUROCAE ED-215 / RTCA DO-330, *Software Tool Qualification Considerations*

FIGURE 1-1 provides an overview of the relationship of ICAO and other industry standards to the applicable functional links of the aeronautical data chain. The documents' revisions have been intentionally omitted in FIGURE 1-1.

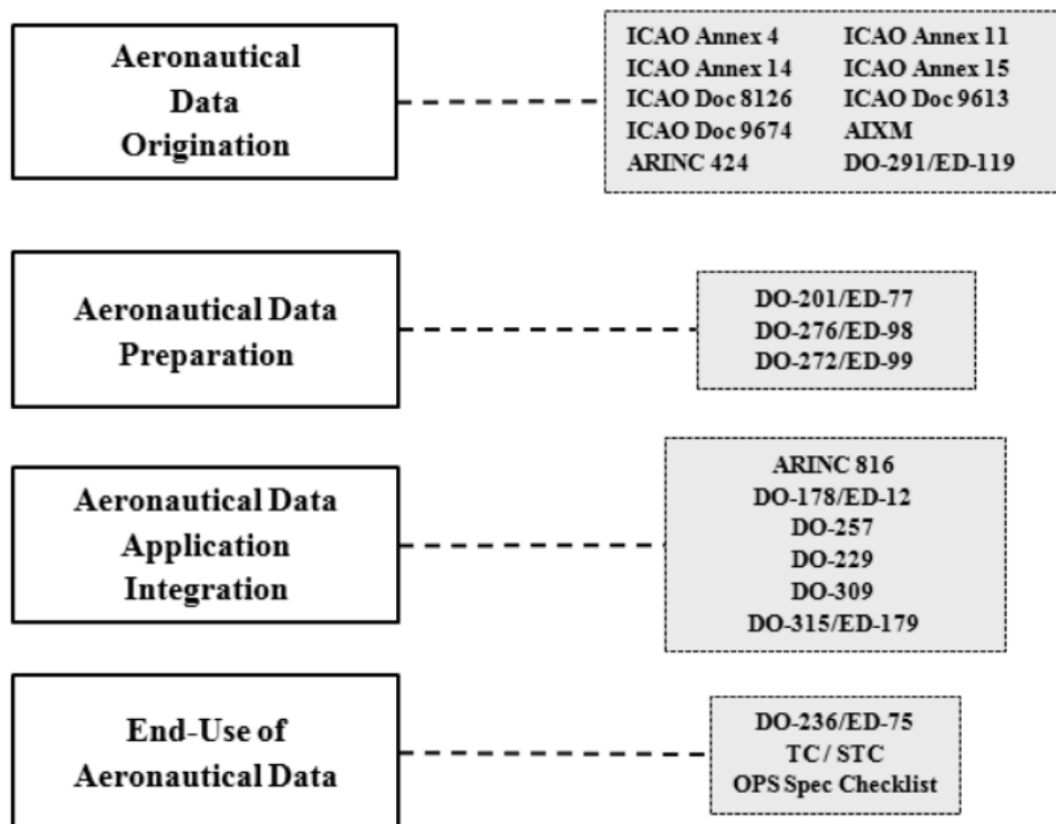


FIGURE 1-1: RELATIONSHIPS BETWEEN AERONAUTICAL DATA CHAIN AND REFERENCE DOCUMENTS

1.5 APPLICATION OF STANDARD

Ultimate responsibility for ensuring data meets the quality for its intended use rests with the end-user. To a large extent, this responsibility can be met by obtaining data from a supplier accredited against this standard by an appropriate organization. This standard is intended to assist aeronautical data chain participants, the users and regulatory authorities in meeting their responsibilities.

EUROCAE ED-76A / RTCA DO-200B may be used by States and organizations as supporting material in respect of the processing of aeronautical data.

1.5.1 Data Quality

The quality of data is a degree or level of confidence that the data provided meets the requirements of the user. The quality of aeronautical data and the way that it is processed are characterised by:

1. Accuracy;
2. Resolution;
3. Assurance Level;
4. Traceability;
5. Timeliness;
6. Completeness; and,
7. Format.

The seven characteristics listed above are defined in [Appendix B](#). The degree that a data element meets the DQRs determines its fitness for the intended use.

1.5.2 Determining Data Quality Requirements

Operators, air traffic service providers and national aviation authorities have developed guidelines on the levels of risk that are judged to be acceptable for different phases of flight. These are defined either on the basis of risk pertaining to a specific operation, such as a landing or as a risk of failure per flight hour. From an analysis of the potential causes of failure and the allowable risk, it is possible to derive the allowable contribution to failure of the individual components of the system. Based upon such a breakdown, the users of aeronautical data are able to understand their capabilities and determine the DQRs (e.g., accuracy, resolution, assurance level).

1.5.3 Assuring Quality

1.5.3.1 Quality Management

The nature of the aeronautical data process combines detailed data, with a multi-level data environment and related processes and procedures. In this end-to-end environment, data is originated at its source(s) and processed to meet the requirements of its target application(s) (See [FIGURE1-2](#)). A Quality Management Process provides the framework upon which the procedures for doing the job are developed, managed, controlled, assessed, and changed to supply data of the required quality. Confidence, defined by assurance level, is achieved and maintained through use of a Quality Management Process. The Data Process Assurance Level (DPAL) is defined by levels of processing rigor represented by the amount of verification and validation tasks performed on the data to achieve these assurance levels.

1.5.3.2 Traceability

An essential part of any QM process is the need to validate and verify data. Where it is found that data does not meet the stated quality requirements it is necessary to determine the sources of the error to allow corrective action to be taken. To achieve this, data should be traceable to the supplier and to the next user, and errors should be traceable to their root causes.

NOTE: *The requirement for traceability extends from its origination through to its use. The aim of such traceability is to ensure that all anomalies or errors detected can be traced back to their origins, and the resolution of the anomalies promulgated to all others who might be affected.*

1.5.4 Aeronautical Data Chain

1.5.4.1 Overview

An "Aeronautical Data Chain" is a conceptual representation of the path that a set, or element, of aeronautical data takes from its origination to its end-use. With an aeronautical data chain, as in a physical chain, each link is connected to its adjacent links. The symbolic links that make up an aeronautical data chain may be as broad as organizations or departments within organizations, or, as refined as individuals or specific equipment. These are described in the following sections. Many different aeronautical data chains may contribute to a collection of data that is used by an end-user. When reading the sections of this standard that refer to chain "links" or "participants", envision the functions performed by the organization, and how the organization handles aeronautical data to determine applicability to a particular situation.

An aeronautical data chain is a series of interrelated links wherein each link provides a function that facilitates the handling of aeronautical data for a specific use. There are typically five major types of links in a chain and a chain can be of varying length as a link type can occur more than once. The functional links are; Origination, Transmission, Preparation, Application Integration, and End-Use of aeronautical data. A chain should be viewed as a circular flow of information whereby the end-use of aeronautical data determines what aeronautical data should be originated.

Each of the functional links in a chain may be performed by a single organization, or distributed among various separate organizations. For example, a State addresses the three functional links of origination, preparation, and aeronautical information integration for a specific application prior to end-use. Conversely, two examples of distributed aeronautical data chains are:

1. Approach procedure data may be originated by a State and issued into the public domain. Another organization may process (compile) the approach information, translate the information into coding (e.g., ARINC 424) and transmit the result to a Flight Management System (FMS) application integrator who processes the data into a format that allows the target FMS application to access the data. The resultant data is then loaded into the target FMS application; or,
2. Terrain data may be originated by a State and issued into the public domain. Another organization may process (compile) the terrain data, translate, format, and transmit the result to the terrain application integrator. The application integrator, in turn, processes the data into a format that allows the target application to access the data. The resultant data is then loaded into the target application.

An example of an aeronautical data chain, from origination to its end-use is shown in FIGURE 1-2. Within the aeronautical data chain the typical organizations are:

1. Data Originators;
2. Aeronautical Information Services (AIS) or Terrain Data Agencies;
3. Data Providers;
4. Application Integrators; and,
5. End-Users.

Each of the boxes shown in FIGURE 1-2 is associated with one of the organizations listed above. Within each box (e.g., organization) an aeronautical data chain can have many links as each organization may perform one or all of the functions that comprise chain links. The connectors between boxes represent the transmission link although the transmission link can occur within an organization or between processes.

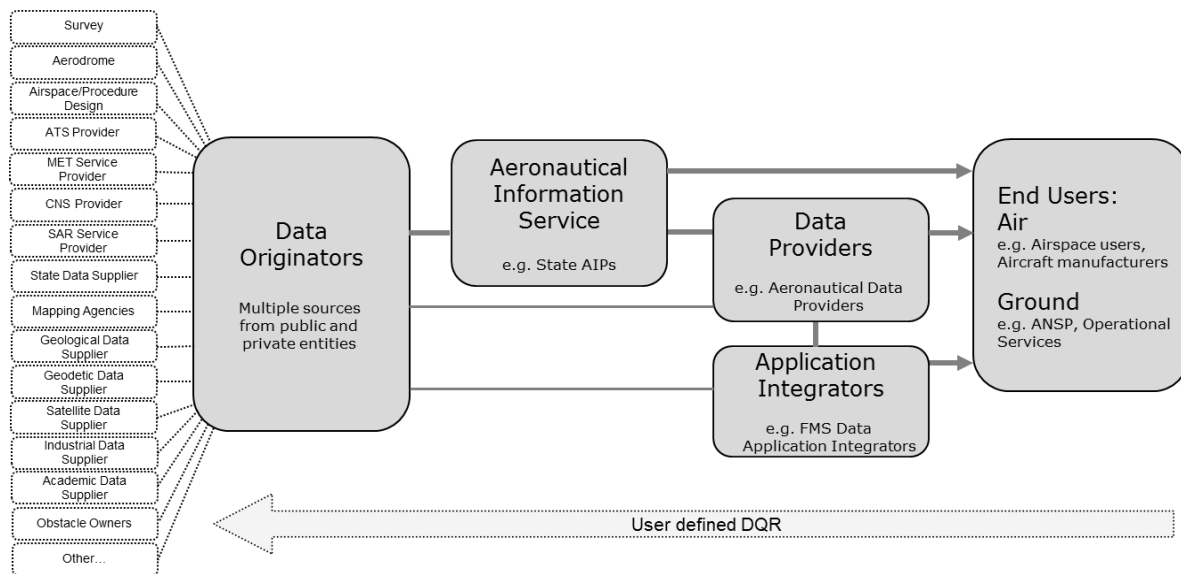


FIGURE 1-2: AERONAUTICAL DATA CHAIN PARTICIPANTS AND FLOW OF AERONAUTICAL DATA

FIGURE 1-2 illustrates the flow of aeronautical data from originators to end-users. As indicated, there are multiple possible paths in the flow involving various participants. Most commonly, aeronautical data will flow through the State AIS (as indicated by the bold lines).

FIGURE 1-2 also illustrates that DQRs take a reverse direction. Users establish DQRs which leads to derived requirements for data suppliers at previous stages in the flow. Standards for DQRs at each stage may be defined by ICAO for particular data types. Alternatively, users at each stage may define unique DQRs for particular data types to meet operational needs.

Each of the functional links in an aeronautical data chain is described below. Each of the descriptions includes the logical definition of the function, a historical perspective on who performs the described function and some relevant existing regulation and/or guidance on requirements for performing the described function.

1.5.4.2

Aeronautical Data Origination

Origination is a functional link whereby values, identifiers or other information are determined and assigned to required data elements for a subsequent functional link. For example, surveying to determine the elevation of the end of a runway, and calculating coordinates for a waypoint that is the intersection of two existing airways fall under the aeronautical data origination functional link.

Any participants in an aeronautical data chain may originate aeronautical data. Historically, most aeronautical data is originated by an authoritative source (e.g., individual States, organizations on behalf of the State). Other originators may supplement data originated by an authoritative source or originate data themselves. Examples of other chain participants that may originate aeronautical data include, but are not limited to, data providers, airlines, aircraft manufacturers, airport authorities, defence mapping agencies, communication service providers and geospatial information providers.

It is important that any data flow through a formal state publication (e.g., State Aeronautical Information Publication (AIP)) is considered an authoritative source and the validation requirements would be inherently met with the published data set.

The first aeronautical data chain participant who accepts data coming from a non-authoritative source is required to validate the data (See [Section 2.4.1, item 6](#)).

NOTE: *Some aeronautical data, like terrain, obstacle and aerodrome mapping data may not be originated by an authoritative source. In such cases, data processing may require additional effort to meet DQRs for the intended use. EUROCAE ED-99C / RTCA DO-272C, User Requirements for Aerodrome Mapping Information and EUROCAE ED-98B / RTCA DO-276B, User Requirements for Terrain and Obstacle Data provide additional information on the processing of these data.*

1.5.4.3 Aeronautical Data Transmission

Transmission is a functional link whereby data is moved from one physical location to another. This is a link that joins other processes and/or organizations and typically occurs many times in a data chain. For example, State originated data being published into the public domain, either on paper or electronically, or electronic information being moved from one computer to another fall under the Aeronautical Data Transmission functional link.

There are many types of electronic transmission (e.g., copying data files onto portable storage media, electronic data communication, electronic mail, file transmission over the internet, and digital data exchange (e.g., AIS/MET data link services). The primary issues associated with data transmission are detecting errors and ensuring the data configuration management requirements are satisfied. Another consideration is the security (e.g., protecting the data from modification by an external entity, minimising the potential for accepting incorrect data) of the transmission.

Transmission is a function performed by all chain participants. Electronic transmission protocols typically involve some type of error checking to detect corruption during the transmission.

1.5.4.4 Aeronautical Data Preparation

Preparation is a functional link whereby a variety of aeronautical data elements are analyzed, translated, assembled and/or formatted to produce data configured for a subsequent functional link. The data may be received from one or more chain participants and may be in different configurations and formats. In the following examples, all activities fall under the aeronautical data preparation functional link:

1. Processing information for an AIP amendment, entering AIP information into a database and translating a chart or textual depiction of an approach procedure into ARINC 424 coding, or,
2. Acquiring charts or digital terrain elevation files, scanning and digitising the chart, entering terrain elevation in a database, analysing consistency of terrain contours, converting to a reference coordinate system and compiling with previous values for the same area.

Any participant in an aeronautical data chain can prepare aeronautical data. Typically, this is done by a combination of data originators, AIS, and data providers. States issue volumes of information at a single time (e.g., AIP amendments). The information contained in the AIP is configured and formatted prior to its release. Data not published in the AIP (e.g., aerodrome mapping data, terrain data) should look different. Data providers combine data from a supplier accredited against this standard or from an authoritative source (e.g., previously validated data, authoritative source data) with data they have originated for the DQRs of the subsequent users.

1.5.4.5 Aeronautical Data Application Integration

Application Integration is a functional link whereby data is processed into an application specific configuration and format. Application Integration may include all phases of aeronautical data processing (e.g., receive, assemble, translate, select, format, distribute). Examples of the Aeronautical Data Application Integration functional link are converting an electronic text file into a binary format and reformatting data into a product specific format.

The application integrator is the one carrying out the Application Integration functional link. The application integrator is usually the application manufacturer. The application integrator (collaborating with the airframe manufacturer as required) is responsible for ensuring that the data quality requirements are commensurate with the intended function of the target application.

1.5.4.6 End-Use of Aeronautical Data

End-use is a functional link for accessing and acting upon the output of an application. This functional link includes loading information into the target application. Examples of end-use include: recalling a list of arrival transitions on a Flight Management System (FMS), then selecting and flying the appropriate one; or selecting a route in a flight planning system, then receiving and flying the appropriate path.

1.5.5 General Aeronautical Data Processing Model

1.5.5.1 Overview

This standard provides the requirements for Aeronautical Data Preparation, Transmission, and Application Integration. Requirements for the other two functional links, Data Origination and End-use, are outside the scope of this standard except when origination is performed by non-authoritative source.

Within the Aeronautical Data Preparation, Transmission, and Application Integration functional links there are six processing phases:

1. Receive (transmission);
2. Assemble;
3. Translate;
4. Select;
5. Format; and,
6. Distribute (transmission).

Each participant may perform some or all of the processing phases; however in the aeronautical data chain, at a minimum, each participant receives data from the previous data chain participant and distributes data to the next data chain participant.

FIGURE 1-3 depicts the phases associated with the Aeronautical Data Preparation, Transmission, and Application Integration functional links.

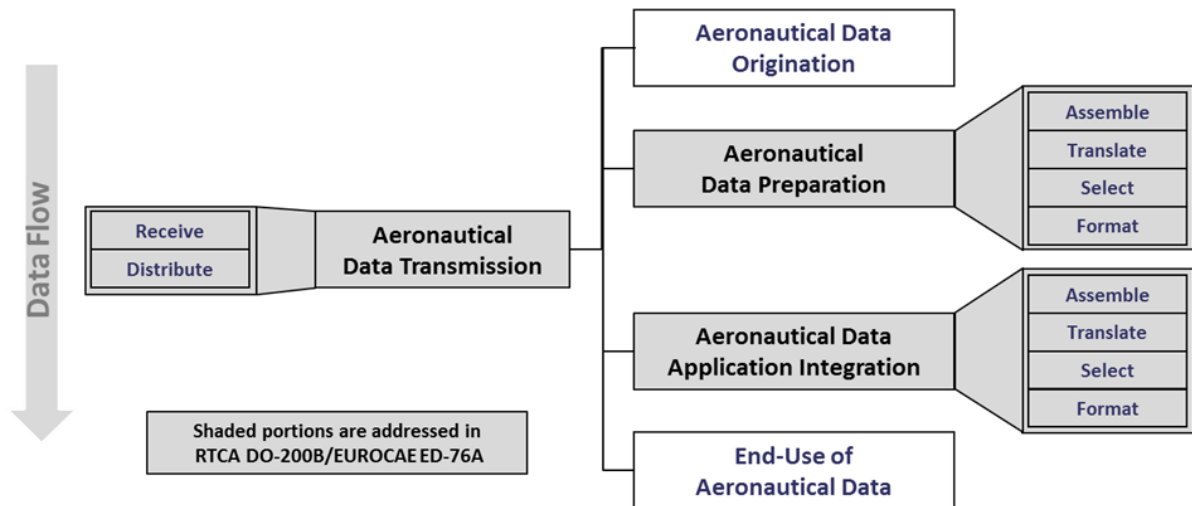


FIGURE 1-3: APPLICABILITY TO EUROCAE ED-76A / RTCA DO-200B REQUIREMENTS

1.5.5.2 Aeronautical Data Transmission: Receive Phase

The Receive Phase involves the reception, verification and validation of data. Verification of received data involves checks that ensure the integrity of the transmitted data. Validation involves checks of the data for applicability to its identity or as appropriate for its use. If errors, omissions or inconsistencies are identified, they are reported to the data supplier for correction and tracked by the receiving organization to ensure that the deficiency is corrected.

1.5.5.3 Aeronautical Data Preparation: Assemble Phase

The Assemble Phase involves the collection and collation of data from one or more suppliers. The Assemble Phase should result in a database that will meet the DQRs of the next participant in the chain. In the early stages of an aeronautical data chain, for example, within a national AIS organization, this should involve assembling inputs from surveyors, procedure designers and other services responsible for originating aeronautical data. In the later stages, it may involve assembling inputs from different chain participants that have already performed an aeronautical data preparation function and translating the data into a format that supports the data quality requirements of the next phase.

Checks are carried out to ensure that the assembled data meets the quality requirements. If errors, omissions or anomalies are identified in the assembled data, they are reported to the responsible data supplier for analysis and correction and are tracked by the assembling organization to ensure that they are corrected, or recorded for potential notification to the next participant in the chain.

The source, accuracy, resolution and reported integrity of each data element, together with details of any changes made to received data, need to be recorded to assist in any future audit activity.

1.5.5.4 Aeronautical Data Preparation: Translate Phase

The Translate Phase involves changing how information is expressed. For example, textual descriptions of procedures may be converted to ARINC 424 leg types using the ARINC 424 coding rules.

Checks (e.g., feedbacks) are carried out to ensure the integrity of the original data is maintained after translation.

NOTE: The Assemble and Translate Phases are typically combined.

1.5.5.5 Aeronautical Data Preparation: Select Phase

The Select Phase involves selecting specific data elements from the collection of aeronautical data produced by the assemble phase. The output from the Select Phase is a subset of the original collection that is matched to the DQRs of the next participant in an aeronautical data chain.

During the Select Phase, checks are made to ensure that the subset collection of data elements is consistent with the original collection and that no individual data elements that are needed for completeness have been omitted. A procedure will normally exist for identifying the source of any deficiencies that are found and for taking corrective action. Such corrective action may include coordination with the prior and/or subsequent chain participant and may require additional iterations through the Receive and Assemble Phases.

1.5.5.6 Aeronautical Data Preparation: Format Phase

The Format Phase involves converting the selected data subset into a format that is acceptable to the next functional link in the chain. This may take the form of a published exchange standard format for the transmission of data (e.g., ARINC 424, AIXM); a proprietary format for loading in a target application or another agreed format.

Checks (e.g., feedback) are made to ensure that the data elements are compatible with the format selected. The source of every error is identified in order that appropriate corrective action can be taken.

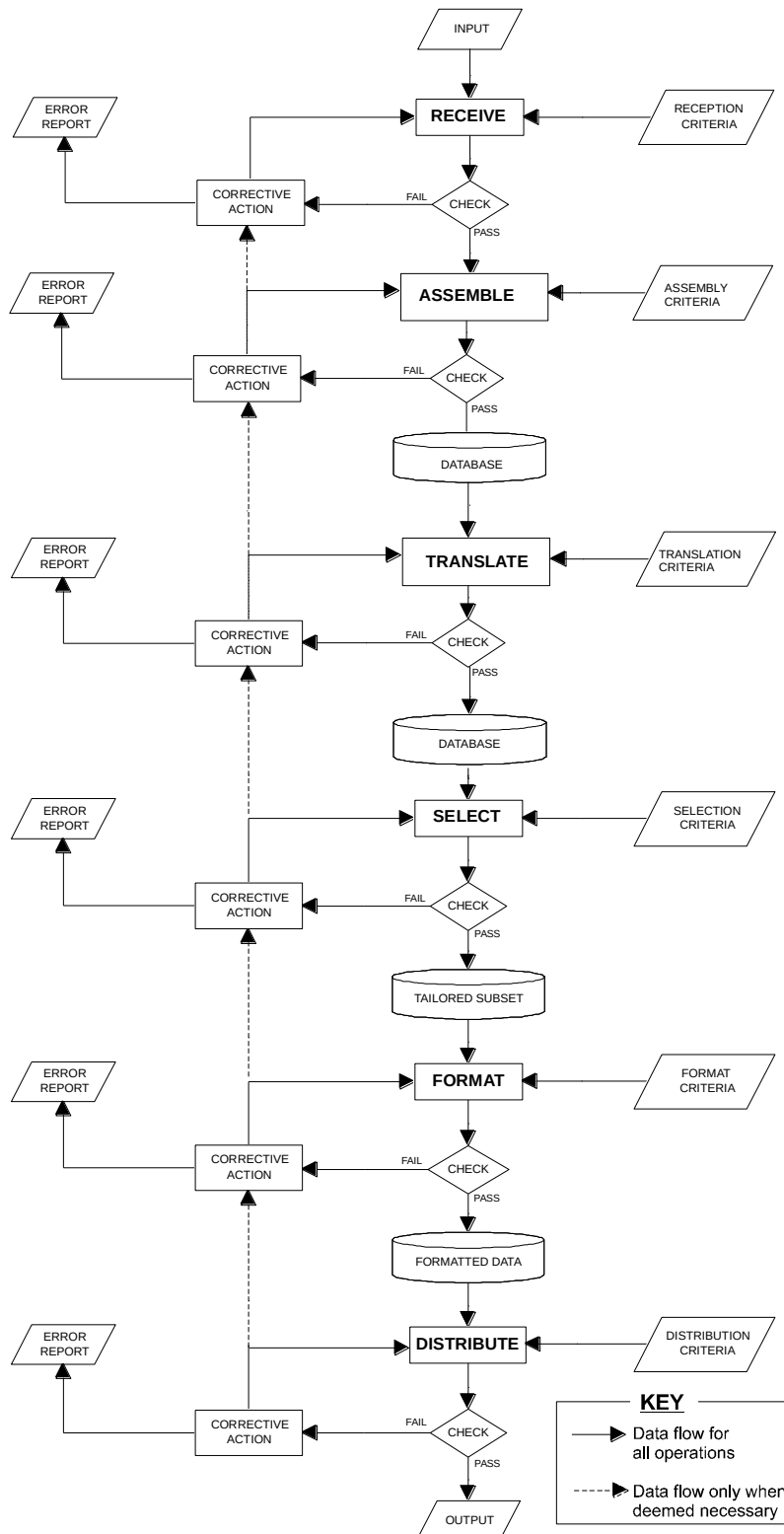
A protection mechanism that meets the minimum requirements for the data integrity, such as the Cyclic Redundancy Check (CRC), is employed to protect from transmission errors once verification and validation are successfully completed. The choice of the error detection scheme depends upon the DQRs as well as the risk of corruption posed by the storage and transmission.

1.5.5.7 Aeronautical Data Transmission: Distribute Phase

The Distribute Phase completes the processing data model and forms part of the transmission link in an aeronautical data chain. This phase involves the delivery of the formatted data set to users. Examples of delivery media are magnetic or optical media, solid state devices, direct computer-to-computer links or wireless data communications. These transmission methods allow verification checks to be made using the protection mechanism output issued by the format phase. Where the distribute phase involves a number of discrete transmissions, such verification checks need only be performed at the final transmission to ensure that no data loss or degradation has occurred. Additional protection may be provided within the specific distribution methods for part or all of the distribute phase.

During the Distribute Phase, checks are carried out to ensure that the distributed data meets or maintains the DQRs and that there are no media errors. If errors or omissions are identified, these errors are reported to the appropriate participant in the data chain and procedures are followed to ensure that the deficiencies are corrected and recorded for potential notification to the end-users of the data.

FIGURE 1-4 provides a generic data processing model that indicates typical steps and data flow from the Receive to Distribute phases.



NOTE: In this figure, checks refer to validation and verification techniques such as the ones described in Appendix C.2.2.

FIGURE 1-4: A GENERAL AERONAUTICAL DATA PROCESSING MODEL

CHAPTER 2

REQUIREMENTS

2.1 INTRODUCTION

As stated in [Section 1](#) the nature of the data process leads to the necessity to implement techniques and procedures throughout the entire process to ensure the aeronautical data meets quality requirements. Such techniques and procedures are called a QM process. The following section addresses the data quality process and QM requirements. If any participant in the aeronautical data process claims to meet these requirements, then they shall demonstrate compliance with these requirements (See [Section 3](#)).

When the achievement of the data quality depends upon the quality of data obtained from a previous participant, then either the data accepted from the previous participant is validated to the required level, or an assurance of data quality is sought from that previous participant. For the majority of aeronautical data there is no benchmark against which the quality of data accepted from a previous chain participant can be validated. The need to obtain assurance of the data quality will therefore normally flow back through the system until it reaches the originator of each data element. Unless data is received from an authoritative source or an organization accredited against this standard, the first known data supplier that uses the data in the aeronautical data chain accepts the responsibilities of the data originator. Consequently, reliance is placed upon the use of appropriate procedures in every stage of the process.

2.2 COMPLIANCE DOCUMENTATION

2.2.1 Compliance Plan

A compliance plan shall be prepared to document how requirements for processing aeronautical data will be accomplished. The plan shall address all aspects of the aeronautical data process carried out by the organization choosing to comply with this standard. It shall identify and provide reference to:

1. A definition of DQRs;
2. A definition of aeronautical data processing requirements;
3. A definition of quality management requirements;
4. The identification of those responsible for compliance with the requirements;
5. A declaration of the standards used, and,
6. A completed compliance matrix (See [Appendix F](#) for guidance).

2.2.2 Compliance Documentation

Compliance documentation shall be prepared in order to provide evidence supporting a statement of compliance to RTCA DO-200B/EUROCAE ED-76A. All organizations claiming compliance to this standard shall be capable of demonstrating their compliance with all the requirements defined in [Section 2](#). A detailed list of suggested compliance documentation and organization of plans and procedures is provided in [Appendix E](#).

2.3 DEFINING DQRS

2.3.1 Overview

All participants in an aeronautical data chain shall ensure that DQRs are defined and documented for the data's intended use.

2.3.2 Data Quality Characteristics

The data quality requirements shall characterize the data by:

1. The accuracy of the data;
2. The resolution of the data;
3. The confidence that the data has not been corrupted while stored, processed or transmitted (assurance level);
4. The ability to determine the origin of the data (traceability);
5. The level of confidence that the data is applicable to the period of intended use (timeliness);
6. The data needed to support intended use (completeness); and,
7. The format of the data.

2.3.3 User

The user of aeronautical data shall:

1. Determine DQRs (See Appendix B);
2. Base the data quality of any particular data element upon the most restrictive requirement for its application;
3. Assure the quality requirements are attained. This duty may be partially discharged by obtaining data from a data supplier, accredited against this standard by an appropriate organization;
4. Inform their supplier of any perceived error discovered in the supplied data; and,
5. Be responsible for establishing their requirement for being notified of data alteration.

2.3.4 Supplier/Processor

The following requirements apply to a data supplier/processor:

1. The supplier/processor shall provide data that meets the DQRs;
2. The supplier/processor shall have a system for handling errors or anomalies identified during data processing, and those identified after delivery of the data to the user(s);
3. All problems reported with the data shall be analyzed and any errors or anomalies documented and resolved or addressed (i.e. endeavoured to be resolved);
4. All errors or anomalies detected in the data shall be resolved or addressed prior to delivery;
5. Information concerning any errors in the data that have been delivered shall be made available to all affected users; and,
6. The means by which errors are resolved shall be made available to all affected users.

2.3.5 Documentation Requirements (User/Supplier)

The following shall be documented:

1. The DQRs;
2. The delivery requirements;
3. The identification of all the suppliers of data used by the organization and the approval status of each;
4. Evidence of a mutual agreement of DQRs between the user and the data supplier shall be available. The DQRs shall be under configuration control and both parties shall approve all modifications. Exceptions to these requirements are :
 - a. Obtaining the data in the AIP or receiving the data through an authoritative source; and,
 - b. Obtaining data from a non-authoritative source where appropriate validation is required (See [Section 2.4.1](#)); and
5. Changes to the DQRs shall be coordinated between the user and data supplier. When applicable, sufficient advance notice of changes shall be given to allow subsequent participants in the data chain (e.g., avionics manufacturer, aircraft manufacturer and potentially the operator) time to review the effect of the change.

2.4 DEFINING AERONAUTICAL DATA PROCESSING REQUIREMENTS

2.4.1 Data Processing Procedure Requirements

The Data Processing Procedures shall define:

1. The means used to confirm that the data has been received without corruption;
2. The means by which data is assembled;
3. The means used to ensure that stored data is protected from corruption;
4. The method of origination for all data that is originated locally, (i.e., when it has not been originated by authoritative source nor supplied by a separate organisation accredited against this standard);
5. The means used to confirm that locally originated data (i.e. when it has not been originated by authoritative source nor supplied by a separate organisation accredited against this standard) has not been corrupted prior to being stored;
6. The means by which validation and verification of any data element is to be performed. This shall include:
 - a. When the supplier is neither an authoritative source nor a supplier accredited against this standard by an appropriate organization, the means by which an appropriate validation is to be performed;
 - b. When multiple suppliers are used for a data element, the means by which differences between them are determined and resolved; and,
 - c. When separate data elements have a defined dependency, the means by which this dependency is confirmed and any anomalies are resolved; and,
 - d. To ensure the appropriate DPAL.
7. The action to be taken when data fails a verification or validation check;
8. The requisite competencies necessary to perform each procedure;
9. The tools required for the procedure;
10. The methods to be used to verify received data;
11. The methods by which data quality is preserved;
 - a. The method to be used to evaluate degradation of accuracy when the resolution of a data element is reduced or the data is translated into a different coordinate system or unit of measurement; and,
 - b. The method by which the user is assured that delivered data meets the DQRs; and,

12. The methods to be used to provide the user with the ability to verify that the data received by the user has not been corrupted.

2.4.2 Data Alteration Communication Requirement

Within the data chain, a user shall not alter the data without informing the supplier or the data originator of the change. The user shall receive an agreement from the supplier on the data alteration in a timely manner. Altered data shall not be distributed if the supplier or data originator rejects the alteration. Records shall be kept of all alterations and shall be made available to all subsequent users upon their request. This requirement only applies to the alteration of the data and does not apply to assembling, translating, selecting, or formatting the data. For example, defining a path other than that associated with the procedure as designed, deleting a fix that is published as part of the procedure, or changing the name of a fix that was named by the data originator are all considered to be data alterations. Yet, encoding a procedure to meet the intended use with no impact on the actual procedure as designed is not considered an alteration.

2.4.3 Data Configuration Management

The objectives of data configuration management are to:

1. Ensure data configuration controls have been implemented to provide assurance data values in delivered data products are applicable to the declared period of validity;
2. Support the requirement for traceability of each data element to its source;
3. Reduce the vulnerability of the data processing activities to loss or corruption of stored data regardless of the media or system used to store the data; and,
4. Prevent unintentional deviations caused by differing DQRs.

2.4.3.1 Data Configuration Management Plan Requirements

The data configuration requirement activities shall be defined and documented in a Data Configuration Management Plan. The plan shall identify all data to be placed under configuration management. It shall include:

1. All delivered data products; and,
2. All data that are identified in the planning process as required to be stored to ensure that the production process can recover from data loss or data corruption.

2.4.3.2 Data Configuration Management Requirements

The following requirements apply to the data placed under configuration management. Each distinct version of a data element or data set shall be assigned a unique identification. The data element identification shall be contained within the data element or data set, as well as being used as a physical label attached to any portable storage medium used to hold the data elements. The configuration management procedures shall ensure that a data element cannot be changed without changing the data element identification.

Records shall be maintained that identify the data content of all data elements in order to support traceability.

These records shall be sufficient to allow the following to be established:

1. That data element has not been separated from its correct label;
2. The start and end dates of the period of validity of the data element;
3. The date of production of the data element;
4. The supplier of each data value contained within the data element or data set;
5. The procedures used to produce the data element; and,
6. Verification and validation checks, including feedback comparison output as relevant.

A copy of each data element shall be retained for a period determined by the Configuration Management Plan.

The method of storage and the numbers of copies maintained shall be such that:

1. The integrity of each data element can be assured for the entire period that it is to be retained; and,
2. Data storage media is protected against physical damage and degradation.

2.4.4 Competency Management

The objectives of competency management are to:

1. Identify and establish the competencies required for performing the process; and,
2. Ensure and document personnel assigned to perform data processing have the necessary competencies for the work process.

2.4.4.1 Competency Management System Requirements

Procedures shall be established to define the means personnel acquire and maintain the competencies required for the applicable process. Competencies can be obtained from a variety of means (e.g., basic education, formal academic training, vocational courses, on-the-job training, recurrent and refresher training, accumulation of experience or combination of these means).

Records shall be maintained so that the qualifications of personnel assigned to perform specific procedures can be confirmed.

Short-falls in competencies shall be identified and corrective actions shall be taken and documented.

2.4.5 Aeronautical Data Tool Qualification

Tools (e.g., software) can be used to eliminate, reduce or automate the activities associated with aeronautical data processes. Tool qualification is the process by which assurance is achieved that tools employed will neither introduce errors into the data nor fail to detect an error. When required, tool qualification shall be performed within the context of the tool's intended use, using EUROCAE ED-215 / RTCA DO-330 with adaptations provided in EUROCAE ED-76A / RTCA DO-200B Appendix D.

The objectives of tool qualification are:

1. Demonstrate that the tool complies with its requirements; and,
2. Ensure that the tool provides equivalence to any activities that it automates and tool qualification is commensurate with the tool's intended use or the data production process.

2.4.5.1 Determining Requirement for Tool Qualification

Tools shall be qualified when data processes are eliminated, reduced or automated by the use of the tool without the output being verified. Only tools that have the ability to insert or fail to detect an error in the aeronautical data process require qualification. The following requirements apply equally to tools obtained "off the shelf" or developed by the data chain participants.

1. Each proposal for a new tool or for a modification of an existing tool, shall be reviewed to determine whether the tool is required to undergo qualification; and,
2. Where a decision is made that qualification is not required, justification for that decision shall be documented.

The tool qualification process may be applied to a single tool, a collection of tools, or one or more functions within a tool. For a tool with multiple functions, if protection between tool functions can be demonstrated, only those functions that are used to eliminate, reduce or automate data processes, and whose outputs are not verified, need to be qualified. Protection is the use of a mechanism to ensure that a tool function cannot adversely impact another tool function. A tool is qualified where the intention to use the tool is stated in the data processing procedures. A tool is qualified to support data quality, as defined in the DQRs. If a tool is used to provide data compliance with additional or modified DQRs, the need for re-qualification shall be assessed.

FIGURE 2-1 presents the criteria to be used to determine the need and type of qualification.

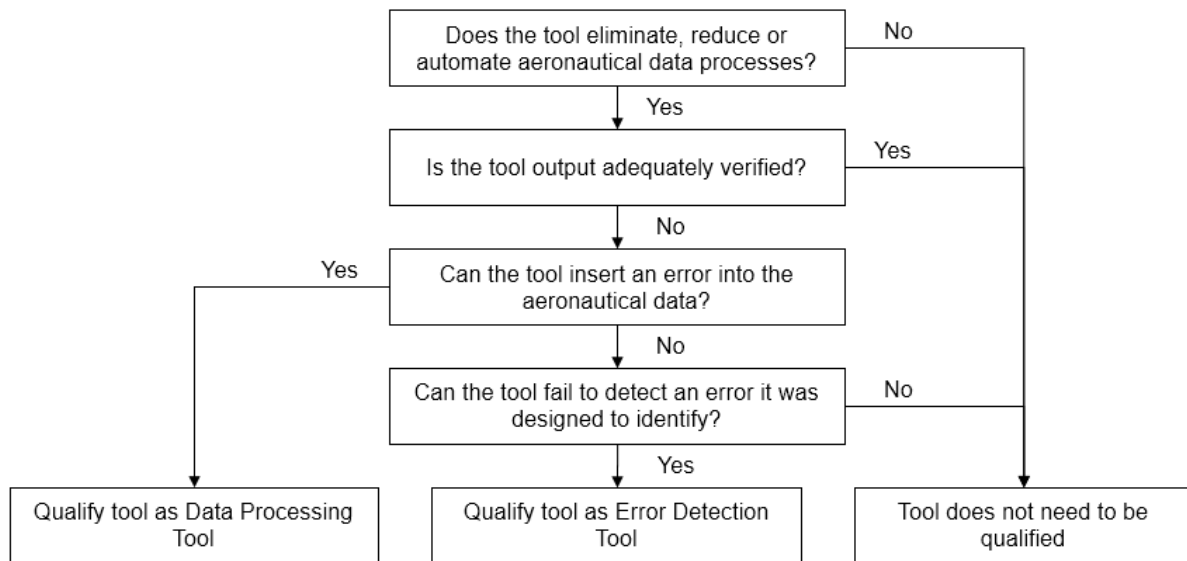


FIGURE 2-1: CRITERIA FOR TOOL QUALIFICATION

The first question posed is whether or not the tool eliminates, reduces, or automates an activity associated to the aeronautical data chain, which includes any action that is performed to complete an aeronautical data chain functional link. If the answer is yes, the next question is posed, and if no, the tool does not need to be qualified.

The second question is whether or not the activity or resultant output of the tool will be adequately verified by a different qualified tool or a manual process. If the answer is no, the next question is posed, and if yes, the tool does not need to be qualified.

The third question is whether or not the tool has the ability to insert an error into the aeronautical data contained in the database being processed. If the answer is yes, the tool shall be qualified as a data processing tool. If the answer is no, the next question is posed.

The final question posed, for tools that have not yet been identified as needing qualification, is whether or not the tool could theoretically fail to detect an error it was designed to identify. If the answer is yes, the tool shall be qualified as an error detection tool, and if no (which essentially means that the tool was not designed to directly perform modification or verification of any aeronautical data elements), the tool does not need to be qualified. It should be noted that the error detection tool does not need qualification to find any error that may exist in the data, but only errors in the data it is designed to find.

NOTE: *The decision to reference EUROCAE ED-215 / RTCA DO-330 for RTCA EUROCAE ED-76A / RTCA DO-200B's tool qualification standard is made to specify an actionable set of objectives through which tool qualification rigor can be tied to DPAL. Additionally, it brings tool qualification methods into alignment with related domains in the aviation software industry.*

2.4.5.2 Determining Tool Qualification Level

When tool qualification is needed, the impact of the tool use in the aeronautical data chain should be assessed in order to determine its tool qualification level (TQL).

The appropriate DPAL (See [Appendix C.2.3](#) for DPAL information) and TQL are indicated in [TABLE 2-1](#). Three levels of tool qualification, TQL-3 to TQL-5, are identified based on the tool use and its potential impact in the aeronautical data chain. TQL-3 is the most rigorous level and TQL-5 is the least rigorous level.

The objectives, activities, and guidance required for each Tool Qualification Level are described in EUROCAE ED-215 / RTCA DO-330 with adaptations provided in Appendix D of this standard (TQL-1 and TQL-2 are not invoked).

DPAL	Data Processing Tool	Error Detection Tool
1	TQL-3	TQL-5
2	TQL-4	TQL-5
3	Not required	Not required

TABLE 2-1: TOOL QUALIFICATION LEVEL DETERMINATION

2.4.5.3 Tools Previously Qualified Under EUROCAE ED-76 / RTCA DO-200A

If an organization has tools that were previously qualified under EUROCAE ED-76 / RTCA DO-200A and it desires to meet EUROCAE ED-76A / RTCA DO-200B process standards, those tools can continue to be used without additional qualification activities taking place as long as the following conditions are met:

1. The tool has not changed since its previous qualification;
2. The tool environment has not changed since its previous qualification; and,
3. The use of the tool to eliminate, reduce or automate activities associated with aeronautical data processes remains the same.

Tools previously qualified under EUROCAE ED-76 / RTCA DO-200A that have changed and require requalification after a data supplier has transitioned to meet EUROCAE ED-76A / RTCA DO-200B process standards shall perform that new qualification based on the following guidelines.

First, the tool is classified as a data processing or error detection tool using [Section 2.4.5.1](#). Then, the RTCA DO-200B/EUROCAE ED-76A tool qualification level that the tool corresponds to is determined using [Section 2.4.5.2](#). Based on this determination, one of the three following requirements applies:

1. For tools categorized as TQL-3, the new tool qualification process shall follow RTCA DO-200B/EUROCAE ED-76A tool qualification standards.
2. For tools categorized as TQL-4, the tool qualification process approved under RTCA DO-200A/EUROCAE ED-76 may continue to be used so long as concurrence from the authority granting recognition of compliance to this standard has been obtained/maintained. This concurrence may be granted based on an analysis of the tool addressing one or more of the following concepts:
 - a. Configuration management of the tool;
 - b. Effectiveness of problem reporting activity for the tool;
 - c. Stability and maturity of the tool;
 - d. Relevance of tool service history environment;
 - e. Actual error rates and tool service history; and,
 - f. Impact of tool modifications.

If concurrence cannot be achieved or is not desired, EUROCAE ED-76A / RTCA DO-200B tool qualification standards shall be met.

3. For tools categorized as TQL-5, the tool qualification process shall follow either EUROCAE ED-76 / RTCA DO-200B tool qualification standards, or the supplier's previous tool qualification process approved under EUROCAE ED-76 / RTCA DO-200A.

NOTE: *The previous tool qualification data collected using EUROCAE ED-76 / RTCA DO-200A tool qualification standards, or a tool's service history, can be used as an alternate method of compliance to some RTCA DO-330 / EUROCAE ED-215 objectives if qualification is being performed to EUROCAE ED-76A / RTCA DO-200B standards. EUROCAE ED-215 / RTCA DO-330 provides additional information regarding alternative methods for tool qualification.*

2.4.6 Defining Data Security Requirements

Transmission of data via electronic/digital means (e.g., FTP sites, web downloads, or email) may be subject to malicious attack that can corrupt the integrity of data for its intended use. Provision of means to mitigate the intentional corruption of digitally transmitted data may already exist within the organizational construct and operating procedures of participating entities. This section provides requirements to address data security. [Appendix C.8](#), Data Security, provides guidelines on data security assurance techniques.

The objective of data security is to ensure that data is received from a known source and that there is no intentional corruption during processing and exchange of data.

In order to support the requirements of [Section 2.4.1](#), items 1, 3, and 12, as related to intentional corruption, records shall be maintained to show what data security provisions have been implemented.

Provisions supporting this objective may include:

1. Implementation of technical data security measures to provide authentication and prevent intentional corruption during exchange of data (e.g., secure hashes, secure transmissions, digital signatures) (See [Appendix C.8.1](#)).
2. Implementation of organizational data security measures to protect processing resources and prevent intentional corruption during processing of data (See [Appendix C.8.2](#)).

2.5 DEFINING QUALITY MANAGEMENT REQUIREMENTS

The prerequisite to the QM requirements is the adoption of a set of documented procedures that cover all aspects of aeronautical data processing. These have been defined in the preceding sections. Supporting these procedures are quality management procedures that ensure:

1. Data accepted from a supplier meets the agreed DQRs;
2. Valid data processing procedures are applied;
3. Procedures are adhered to and there is no unauthorized deviation from the procedures; and,
4. Reviews and controls are in place to ensure quality.

The means used to specify the QM requirements is not intended to be prescriptive. Compliance can be demonstrated by any QM structure which meets the requirements of this standard; however the establishment of a QMS shall be formally declared, exercised, and confirmed through review/audit.

In the following sections, the phrase "plans and procedures" includes the following:

1. Compliance plan;
2. DQRs; and,
3. Data processing, including:
 - a. Procedures;
 - b. Configuration Management;
 - c. Competencies; and,
 - d. Tools.

2.5.1 Quality Management Procedure Requirements

The QM procedures shall:

1. Define the criteria used for the review of plans and procedures, including the maximum interval between reviews;
2. Define the criteria used for the review of personnel training records including the maximum interval between reviews;
3. Identify who will have the authority to approve plans and procedures;
4. Identify who will have the authority to ensure that personnel have satisfied competency requirements; and,
5. Identify who will have the authority to authorize tools for use.

NOTE: *There is no requirement for all reviews to be completed at the same periodic rate.*

2.5.2 Quality Management Control

All plans and procedures, including changes, shall be reviewed and approved prior to their use as described in the QM procedures. This review shall include a review of the ability of data suppliers to supply the new data with the required data quality, if applicable.

The current version of the approved procedures is referred to as the authorized version of the procedures.

If unauthorized deviations from the procedures are discovered, corrective action shall be taken. The corrective action may include changing the procedures and/or the competency requirements.

All personnel who carry out any of the procedures shall be qualified to apply those procedures. The personnel shall have access to the authorized version of the procedures. If changes to the procedures are approved, the personnel shall be notified of the changes. Obsolete versions of documents shall not be used.

All tools, including updated versions of tools, shall be reviewed and approved prior to their use as described in the QM procedures.

Records of procedures, personnel, and tools shall be kept to allow identification of the procedures, personnel, and tools employed in the production of each delivery of data to a user.

2.5.3 Review

Records of all reviews shall be maintained. The records shall:

1. Identify the date of the review;
2. Identify who conducted the review;
3. Identify the item(s) reviewed; and,
4. Identify any non-conformities or deficiencies and how they were resolved.

2.5.3.1 Event-Driven

The plans and procedures shall be reviewed when there is a proposal to supply new data, changes in the procedures (e.g., for improvements) or changes in any tools. Where such a review identifies that changes to the procedures are required, these shall be implemented prior to initial delivery of the new data. This review shall include an evaluation of the ability of data suppliers to supply the new data with the required data quality.

The records of competencies shall be reviewed for new personnel or personnel assigned new tasks. Personnel shall be authorized as having the necessary competencies before participating in the data process.

Review of each new or modified tool shall determine the need for the tool to undergo qualification as described in [Section 2.4.5](#).

When a data error is detected, either internally or reported by users, action shall be taken in a timely manner to correct the procedures, competencies, or tools to ensure that the error will not be repeated (See [Appendix C.7](#)).

2.5.3.2 Periodic

All plans and procedures that define the data processing and QM requirements shall periodically be reviewed as defined in the QM procedures to ensure their continuing ability to support the DQRs.

The records of competency for personnel on the various data processing tasks shall periodically be reviewed as defined in the QM procedures to confirm the personnel have the required competencies identified in the data processing procedures.

Tools are periodically reviewed as part of reviewing plans and procedures to confirm the continuing ability of the tool to meet the DQRs.

If the responsibility of achieving data quality is partially discharged by receiving data from an accredited supplier, the accreditation of suppliers against this standard shall periodically be confirmed.

All internally detected and user reported data errors that are attributed to local processing and maintenance of data, shall be reviewed periodically as defined in the QM procedures. These reviews shall consider implications on the data processing procedures or QM procedures. If action is taken as a result of a review, the action shall be recorded.

All periodic reviews shall include a review of all problems recorded by personnel during the use of the procedures and/or tools, and all recorded data errors attributed to the subject of the review. The impact of any deficiencies on the quality of the aeronautical data shall be assessed and corrective action shall be taken if necessary to ensure that data meets the DQRs.

2.5.4 Document Control Requirements

The following requirements apply to all documents required by the QMS. Each distinct version of a document shall be assigned a unique identification and be placed under document control. Document control procedures shall identify the documents to be maintained under document control in order to support traceability and records requirements.

The Document Control Procedures shall define:

1. The means by which documents are reviewed and approved prior to release;
2. The means by which changes and revisions are clearly identified and authorized;
3. The means to ensure only relevant versions of applicable documents are available for use;
4. The means used to ensure documents remain legible and identifiable;
5. The means used to ensure external documents (e.g., customer supplied documents or contractor procedures) are identified and controlled;
6. The means used to prevent "unintended" use of obsolete documents;
7. The means used to control access to documents to authorized users; and,
8. The means used to identify and archive obsolete documents until destroyed.

2.5.5 Quality Records

A quality record provides evidence demonstrating conformance to specific requirements and/or the effective operation of a QMS. Quality records may be in the form of any type of media (e.g., hard copy or electronic media).

Quality records are also used to identify if procedures are modified to correct deficiencies.

Where procedures require that records be kept:

1. Retention times of such records shall be established and recorded;
2. Records shall be legible and identifiable to the product involved; and,
3. Records shall be retrievable from reliable facilities that minimize loss and provide a low probability of deterioration.