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## Abstract

The purpose of this document is to support the implementation of the Commission Regulation (EU) 73/2010, by way of providing a guide to bring about a harmonised interpretation of its provisions.

## Keywords

<table>
<thead>
<tr>
<th>SES Implementation Support</th>
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<th>Status</th>
<th>Intended for</th>
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<table>
<thead>
<tr>
<th>AUTHORITY</th>
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<tbody>
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</tbody>
</table>
# DOCUMENT CHANGE RECORD

The following table records the complete history of the successive editions of the present document.

<table>
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<tr>
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<th>EDITION DATE</th>
<th>REASON FOR CHANGE</th>
<th>PAGES AFFECTED</th>
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<tr>
<td>1.3</td>
<td>12-04-10</td>
<td>Preliminary release</td>
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<td>12-10-15</td>
<td>New revised version</td>
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</tbody>
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CONTENTS

DOCUMENT CHARACTERISTICS ............................................................................ 2
DOCUMENT APPROVAL .......................................................................................... 3
DOCUMENT CHANGE RECORD .............................................................................. 4
CONTENTS ................................................................................................................ 5
LIST OF FIGURES ................................................................................................... 14
LIST OF TABLES ..................................................................................................... 15
EXECUTIVE SUMMARY .......................................................................................... 17

1. Introduction .................................................................................................... 19
   1.1 General ........................................................................................................ 19
   1.2 Purpose of the document ........................................................................... 20
   1.3 Conventions ................................................................................................ 20
   1.4 Abbreviations .............................................................................................. 20
   1.5 Definitions .................................................................................................... 22
      1.5.1 Common Dataset ......................................................................................... 22
      1.5.2 Unified Modelling Language (UML) ............................................................ 23
      1.5.3 Data Storage .............................................................................................. 23
      1.5.4 Data Handling .......................................................................................... 23
      1.5.5 Data Processing ........................................................................................ 23
      1.5.6 Data Transfer ........................................................................................... 23
      1.5.7 Make Available ........................................................................................ 23
   1.6 Reference material ........................................................................................ 23

2. Overview of the ADQ IR ................................................................................. 26
   2.1 Objective and Background to the ADQ IR ....................................................... 26
   2.2 Structure of the ADQ IR ................................................................................ 27
   2.3 Updates to the ADQ IR .................................................................................. 27

3. Citations and Recitals .................................................................................... 29
   3.1 Purpose and Regulatory Base ........................................................................ 29
      3.1.1 Citations ................................................................................................... 29
      3.1.2 Recitals .................................................................................................... 29
   3.2 Specific Content ............................................................................................ 29
      3.2.1 Citations ................................................................................................... 29
      3.2.2 Recitals .................................................................................................... 30
4. ARTICLE 1 - SUBJECT MATTER
   4.1 Regulatory Basis of Article 1
   4.2 Article 1
      4.2.1 Article 1

5. ARTICLE 2 - SCOPE
   5.1 Regulatory Basis of Article 2
   5.2 Article 2
      5.2.1 Article 2(1)
      5.2.2 Article 2(2)
      5.2.3 Article 2(3)

6. ARTICLE 3 - DEFINITIONS
   6.1 Purpose and Regulatory Basis of Article 3
   6.2 Aeronautical Data
      6.2.1 Definition in Regulation
      6.2.2 Source
      6.2.3 Clarifications
   6.3 Aeronautical Information
      6.3.1 Definition in Regulation
      6.3.2 Source
      6.3.3 Clarifications
   6.4 Data Quality
      6.4.1 Definition in Regulation
      6.4.2 Source
      6.4.3 Clarifications
   6.5 Accuracy
      6.5.1 Definition in Regulation
      6.5.2 Source
      6.5.3 Clarifications
   6.6 Resolution
      6.6.1 Definition in Regulation
      6.6.2 Source
      6.6.3 Clarifications
   6.7 Integrity
      6.7.1 Definition in Regulation
      6.7.2 Source
      6.7.3 Clarifications
   6.8 Integrated Aeronautical Information Package (IAIP)
      6.8.1 Definition in Regulation
      6.8.2 Source
      6.8.3 Clarifications
   6.9 Obstacle Data
      6.9.1 Definition in Regulation
      6.9.2 Source
      6.9.3 Clarifications
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.10 Terrain Data</td>
<td>Definition in Regulation</td>
<td>47</td>
</tr>
<tr>
<td>6.10.1 Terrain Data</td>
<td>Source</td>
<td>47</td>
</tr>
<tr>
<td>6.10.2 Terrain Data</td>
<td>Clarifications</td>
<td>47</td>
</tr>
<tr>
<td>6.11 Aerodrome Mapping Data</td>
<td>Definition in Regulation</td>
<td>48</td>
</tr>
<tr>
<td>6.11.1 Aerodrome Mapping Data</td>
<td>Source</td>
<td>48</td>
</tr>
<tr>
<td>6.11.2 Aerodrome Mapping Data</td>
<td>Clarifications</td>
<td>48</td>
</tr>
<tr>
<td>6.12 Survey Data</td>
<td>Definition in Regulation</td>
<td>48</td>
</tr>
<tr>
<td>6.12.1 Survey Data</td>
<td>Source</td>
<td>48</td>
</tr>
<tr>
<td>6.12.2 Survey Data</td>
<td>Clarifications</td>
<td>48</td>
</tr>
<tr>
<td>6.13 Procedure Design</td>
<td>Definition in Regulation</td>
<td>48</td>
</tr>
<tr>
<td>6.13.1 Procedure Design</td>
<td>Source</td>
<td>48</td>
</tr>
<tr>
<td>6.13.2 Procedure Design</td>
<td>Clarifications</td>
<td>49</td>
</tr>
<tr>
<td>6.14 Aeronautical Information Service Provider</td>
<td>Definition in Regulation</td>
<td>49</td>
</tr>
<tr>
<td>6.14.1 Aeronautical Information Service Provider</td>
<td>Source</td>
<td>49</td>
</tr>
<tr>
<td>6.14.2 Aeronautical Information Service Provider</td>
<td>Clarifications</td>
<td>49</td>
</tr>
<tr>
<td>6.15 Next Intended User</td>
<td>Definition in Regulation</td>
<td>49</td>
</tr>
<tr>
<td>6.15.1 Next Intended User</td>
<td>Source</td>
<td>49</td>
</tr>
<tr>
<td>6.15.2 Next Intended User</td>
<td>Clarifications</td>
<td>49</td>
</tr>
<tr>
<td>6.16 Direct Electronic Connection</td>
<td>Definition in Regulation</td>
<td>50</td>
</tr>
<tr>
<td>6.16.1 Direct Electronic Connection</td>
<td>Source</td>
<td>50</td>
</tr>
<tr>
<td>6.16.2 Direct Electronic Connection</td>
<td>Clarifications</td>
<td>50</td>
</tr>
<tr>
<td>6.17 Data Item</td>
<td>Definition in Regulation</td>
<td>50</td>
</tr>
<tr>
<td>6.17.1 Data Item</td>
<td>Source</td>
<td>50</td>
</tr>
<tr>
<td>6.17.2 Data Item</td>
<td>Clarifications</td>
<td>50</td>
</tr>
<tr>
<td>6.18 NOTAM</td>
<td>Definition in Regulation</td>
<td>50</td>
</tr>
<tr>
<td>6.18.1 NOTAM</td>
<td>Source</td>
<td>50</td>
</tr>
<tr>
<td>6.18.2 NOTAM</td>
<td>Clarifications</td>
<td>51</td>
</tr>
<tr>
<td>6.19 Digital NOTAM</td>
<td>Definition in Regulation</td>
<td>51</td>
</tr>
<tr>
<td>6.19.1 Digital NOTAM</td>
<td>Source</td>
<td>51</td>
</tr>
<tr>
<td>6.19.2 Digital NOTAM</td>
<td>Clarifications</td>
<td>51</td>
</tr>
<tr>
<td>6.20 Data Originator</td>
<td>Definition in Regulation</td>
<td>51</td>
</tr>
<tr>
<td>6.20.1 Data Originator</td>
<td>Source</td>
<td>51</td>
</tr>
<tr>
<td>6.20.2 Data Originator</td>
<td>Clarifications</td>
<td>52</td>
</tr>
<tr>
<td>6.21 Data Origination</td>
<td>Definition in Regulation</td>
<td>52</td>
</tr>
<tr>
<td>6.21.1 Data Origination</td>
<td></td>
<td>52</td>
</tr>
</tbody>
</table>
6.21.2 Source ...........................................................................................................52
6.21.3 Clarifications ..............................................................................................52

6.22 Period of Validity ...........................................................................................53
  6.22.1 Definition in Regulation ...........................................................................53
  6.22.2 Source .......................................................................................................53
  6.22.3 Clarifications ............................................................................................53

6.23 Data Validation ..............................................................................................53
  6.23.1 Definition in Regulation ...........................................................................53
  6.23.2 Source .......................................................................................................53
  6.23.3 Clarifications ............................................................................................53

6.24 Data Verification ............................................................................................54
  6.24.1 Definition in Regulation ...........................................................................54
  6.24.2 Source .......................................................................................................54
  6.24.3 Clarifications ............................................................................................54

6.25 Critical Data ..................................................................................................54
  6.25.1 Definition in Regulation ...........................................................................54
  6.25.2 Source .......................................................................................................54
  6.25.3 Clarifications ............................................................................................54

6.26 Essential Data ................................................................................................55
  6.26.1 Definition in Regulation ...........................................................................55
  6.26.2 Source .......................................................................................................55
  6.26.3 Clarifications ............................................................................................55

7. ARTICLE 4 AND ANNEX I – DATASET ..................................................................56
  7.1 Regulatory Basis of Article 4 .......................................................................56
  7.2 Article 4 .........................................................................................................56
    7.2.1 Article 4(1) .............................................................................................56
    7.2.2 Annex I Part A - IAIP, Aerodrome Mapping and Electronic Obstacle Data57
    7.2.3 Annex I Part B (Electronic Terrain Datasets) .........................................64
    7.2.4 Annex I Part C (Metadata) ..................................................................65

8. ARTICLE 5 AND ANNEX II - DATA exchange FORMATS ..................................71
  8.1 Regulatory Basis of Article 5 .......................................................................71
  8.2 Article 5 .........................................................................................................71
    8.2.1 Article 5(1) .............................................................................................71
    8.2.2 Article 5(2) .............................................................................................73
    8.2.3 Article 5(3) .............................................................................................74
    8.2.4 Article 5(4) .............................................................................................75
  8.3 Annex II ...........................................................................................................76
    8.3.1 Annex II Part A - IAIP, Aerodrome Mapping and Electronic Obstacle Data76
    8.3.2 Annex II Part B - Electronic Terrain Data ...............................................77

9. ANNEX III – PROVISIONS REFERRED TO IN ARTICLES AND ANNEXES...79
  9.1 Regulatory Basis ............................................................................................79
  9.2 Principles and Definitions .............................................................................79
  9.3 Explanation of Approach .............................................................................79
  9.4 Implementation Considerations .....................................................................80
9.5 Reference 1 – ICAO Annex 15 Section 3.7 ......................................................... 80
9.6 Reference 2 – ICAO Annex 15 Section 1.2.1 ...................................................... 80
9.7 Reference 3 – ICAO Annex 15 Section 1.2.2 ...................................................... 80
9.8 Reference 4 – ICAO Annex 15 Chapter 4 ........................................................... 80
9.9 Reference 5 – ICAO Annex 15 Chapter 4.3 ........................................................ 81
9.10 Reference 6 – ICAO Annex 15 Chapter 4.4 ...................................................... 81
9.11 Reference 7 – ICAO Annex 15 Chapter 5 ........................................................... 81
9.12 Reference 8 – ICAO Annex 15 Chapter 6.2 ...................................................... 81
9.13 Reference 9 – ICAO Annex 15 Chapter 10.1 ...................................................... 81
9.14 Reference 9a – ICAO Annex 15 Chapter 10.2 .................................................... 81
9.15 Reference 10 – ICAO Annex 15 Appendix 1 ..................................................... 81
9.16 Reference 11 – ICAO Annex 15 Appendix 7 ..................................................... 82
9.17 Reference 12 – ICAO Annex 15 Appendix 8 ..................................................... 82
9.18 Reference 13 – OMG’s UML Specification ......................................................... 82
9.19 Reference 14 – ISO 19107 ................................................................................... 82
9.20 Reference 15 – ISO 19115 ................................................................................... 82
9.21 Reference 16 – ISO 19139 ................................................................................... 82
9.22 Reference 17 – ISO 19118 ................................................................................... 82
9.23 Reference 18 – ISO 19136 ................................................................................... 82
9.24 Reference 19 – ISO 19757 Part 3 ........................................................................ 83
9.25 Reference 20 – ICAO Doc 9674 ........................................................................ 83
9.26 Reference 21 – ICAO Doc 9674 Section 7.3.2 .................................................... 83
9.27 Reference 22 – ISO 27002 ................................................................................... 83
9.28 Reference 23 – ISO 28000 ................................................................................... 83
9.29 Reference 24 – EUROCAE ED-99A .................................................................... 83
9.30 Reference 25 – ISO 19110 ................................................................................... 83

10. ARTICLE 6 AND ANNEX IV - DATA QUALITY .............................................. 84
10.1 Regulatory Basis of Article 6 ............................................................................. 84
10.2 Article 6 ........................................................................................................... 84
  10.2.1 Article 6(1) .................................................................................................... 84
  10.2.2 Article 6(2) .................................................................................................... 85
  10.2.3 Article 6(3) .................................................................................................... 86
  10.2.4 Article 6(4) .................................................................................................... 88
  10.2.5 Article 6(5) .................................................................................................... 88
  10.2.6 Article 6(6) .................................................................................................... 89
  10.2.7 Article 6(7) .................................................................................................... 91
  10.2.8 Article 6(8) .................................................................................................... 92
10.3 Annex IV ......................................................................................................... 93
  10.3.1 Annex IV Part A - Data quality requirements .................................................. 93
  10.3.2 Annex IV Part B – Evidence Requirements .................................................... 97
  10.3.3 Annex IV Part C – Formal Arrangements ....................................................... 101
  1.1.1 Annex IV Part D – Data Origination ............................................................... 107
  1.1.2 Annex IV Part E – Data Process Requirements .............................................. 111
  1.1.3 Annex IV Part F – Error Reporting and Rectification Requirements ...... 112
11. ARTICLE 7 - Consistency, timeliness and personnel performance ........... 116
   11.1 Regulatory Basis of Article 7 ................................................................. 116
   11.2 Article 7 ...................................................................................................... 116
       11.2.1 Article 7(1) ................................................................................... 116
       11.2.2 Article 7(2) ................................................................................... 117
       11.2.3 Article 7(3) ................................................................................... 118
       11.2.4 Article 7(4) ................................................................................... 118
       11.2.5 Article 7(5) ................................................................................... 120

12. ARTICLE 8 AND ANNEX V - TOOLS AND SOFTWARE requirements ..... 122
   12.1 Regulatory Basis of Article 8 ................................................................. 122
   12.2 Article 8 ..................................................................................................... 122
       12.2.1 Article 8 ......................................................................................... 122
   12.3 Annex V - Tools and Software Requirements Referred to in Article 8 .... 123
       12.3.1 Annex V (1) .................................................................................. 123
       12.3.2 Annex V (2) .................................................................................. 124
       12.3.3 Annex V (3) .................................................................................. 125
       12.3.4 Annex V (4) .................................................................................. 125
       12.3.5 Annex V (5) .................................................................................. 126
       12.3.6 Annex V (6) .................................................................................. 126

13. ARTICLE 9 AND ANNEX VI - DATA PROTECTION .................................. 128
   13.1 Regulatory Basis of Article 9 ................................................................. 128
   13.2 Article 9 ..................................................................................................... 128
       13.2.1 Article 9(1) .................................................................................. 128
       13.2.2 Article 9(2) .................................................................................. 129
   13.3 Annex VI - Data Protection Requirements Referred to in Article 9 ....... 130
       13.3.1 Annex VI (1) .................................................................................. 130
       13.3.2 Annex VI (2) .................................................................................. 131
       13.3.3 Annex VI (3) .................................................................................. 131
       13.3.4 Annex VI (4) .................................................................................. 132

   14.1 Regulatory Basis of Article 10 ................................................................. 134
   14.2 Article 10 ..................................................................................................... 134
       14.2.1 Article 10(1) .................................................................................. 134
       14.2.2 Article 10(2) .................................................................................. 135
       14.2.3 Article 10(3) .................................................................................. 136
       14.2.4 Article 10(4) .................................................................................. 136
   14.3 Annex VII ..................................................................................................... 137
       14.3.1 Annex VII Part A - Quality, Safety and Security Management Requirements Referred to in Article 10 ................................. 137
       14.3.2 Annex VII Part B – Safety Management Objectives ......................... 138
       14.3.3 Annex VII Part C – Security Management Objectives ...................... 139

15. ARTICLE 11 AND ANNEX VIII - CONFORMITY OR SUITABILITY FOR USE OF CONSTITUENTS ................................................................. 141
15.1 Regulatory Basis of Article 11 ................................................................. 141
15.2 Article 11 .................................................................................................. 142
  15.2.1 Article 11(1) ....................................................................................... 142
15.3 Annex VIII - Requirements for the Assessment of the Conformity or Suitability for Use of Constituents Referred to in Article 11 .................................................. 144
   15.3.1 Annex VIII (1) .................................................................................. 144
   15.3.2 Annex VIII (2) .................................................................................. 144
   15.3.3 Annex VIII (3) .................................................................................. 145
   15.3.4 Annex VIII (4) .................................................................................. 145
16. ARTICLE 12 AND ANNEXES IX and X - VERIFICATION OF SYSTEMS .... 146
16.1 Regulatory Basis of Article 12 ................................................................. 146
16.2 Article 12 .................................................................................................. 146
  16.2.1 Article 12(1) ....................................................................................... 146
  16.2.2 Article 12(2) ....................................................................................... 147
16.3 Annex IX - Conditions Referred to in Article 12 ........................................ 147
  16.3.1 Annex IX (1) ....................................................................................... 148
  16.3.2 Annex IX (2) ....................................................................................... 148
  16.3.3 Annex IX (3) ....................................................................................... 149
  16.3.4 Annex IX (4) ....................................................................................... 150
  16.3.5 Annex IX (5) ....................................................................................... 150
16.4 Annex X .................................................................................................... 151
  16.4.1 Annex X Part A - Requirements for the Verification of Systems Referred to in Article 12(1) ........................................................................................................... 151
  16.4.2 Annex X Part B - Requirements for the Verification of Systems Referred to in Article 12(2) ........................................................................................................... 154
17. ARTICLE 13 - ADDITIONAL REQUIREMENTS ........................................ 159
17.1 Regulatory Basis of Article 13 ................................................................. 159
17.2 Article 13 .................................................................................................. 159
  17.2.1 Article 13 ........................................................................................... 159
18. Article 14 and ANNEX XI - Transitional Provisions ............................ 164
18.1 Regulatory Basis of Article 14 ................................................................. 164
18.2 Article 14 .................................................................................................. 164
  18.2.1 Article 14(1) ....................................................................................... 164
  18.2.2 Article 14(2) ....................................................................................... 165
  18.2.3 Annex XI ........................................................................................... 166
19. ARTICLE 15 - ENTRY INTO FORCE .......................................................... 168
19.1 Regulatory Basis of Article 15 ................................................................. 168
19.2 Article 15 .................................................................................................. 168
  19.2.1 Article 15(1) ....................................................................................... 168
  19.2.2 Article 15(2) ....................................................................................... 169
20. Implementation Planning Guidance ...................................................... 171
20.1 Rationale/Need ......................................................................................... 171
20.2 ESSIP/LSSIP ........................................................................................... 171
20.3 Guidance on the Planning of the Implementation of the ADQ Regulation

20.3.1 General

20.3.2 State Level

20.3.3 Organisation Level

20.4 Support to Stakeholders

20.4.1 ADQ Implementation Support Cell

20.4.2 Front-Line Support

20.4.3 Second Line Support - Subject Matter Experts

20.4.4 Awareness and Training

20.4.5 Website

20.4.6 ADQ Guide - Maintenance

20.4.7 Further ADQ Guidance Material

21. Audit and Compliance Guidance

21.1 Rationale / Need

21.2 Conduct of an Audit

21.2.1 Guidance

21.3 Assessing Compliance

21.3.1 Initial Assessment

21.3.2 Internal Audit

21.3.3 External Audit

22. Specific Guidance Material

22.1 ADQ IR Other Supporting Guidance

22.1.1 ADQ Formal Arrangement

22.1.2 Cyclic Redundancy Checks

22.1.3 Digital Signatures

22.1.4 Encryption

ANNEX A – ADQ REGULATORS WORKING GROUP (ARWG) COMMON UNDERSTANDINGS

A.1 Common Understanding 01/2013 Application of the provisions of Commission Regulation (EU) 73/2010 to NOTAM

A.2 Common Understanding 03/2013 Scope of Article 6(1) of the Commission Regulation (EU) 73/2010

A.3 Common Understanding 04/2013 Commission Regulation (EU) 73/2010 and Exchange of Electronic Terrain Datasets

A.4 Common Understanding 05/2013 Commission Regulation (EU) 73/2010 and Aerodrome Operators


ANNEX B – DATASET, DATA EXCHANGE FORMAT AND METADATA
B.1 General guidelines are available at the ADQ Library: ................................. 203
B.2 Detailed, technical supplementary material is available at: ............................. 203
B.3 Information on AIXM Business rules is available at: ...................................... 203

ANNEX C – FORMAL ARRANGEMENT TEMPLATE ........................................... 204
C.1 The ADQ Formal Arrangement Template is available in MS Word format at the ADQ Library: ................................................................. 204
C.2 Further guidelines are provided via the same webpage: ................................. 204

ANNEX D – ANNOTATION OF DATA NON COMPLIANT WITH THE ADQ IR .... 205
D.1 The Guidelines for the Annotation of data not compliant with Commission Regulation (EU) No 73/2010 (ADQ) (Ed 1.0) is available at the ADQ Library: 205

ANNEX E – SAFETY OBJECTIVES AND SAFETY ASSESSMENT IN AIS ........ 206
E.1 The EUROCONTROL Guidance for the implementation of safety management objectives and safety assessments falling within the scope of EU Regulation73/2010 (Edition 2.0) is available at the ADQ Library: .......................... 206
LIST OF FIGURES

Figure 1: ADQ IR Structure......................................................................................................... 27
Figure 2 - En-route Navaids in AIP............................................................................................. 59
Figure 3 – Confidence Level....................................................................................................... 69
Figure 4 - Example of EATMN Representation........................................................................ 142
Figure 5 – CRC Applied to Whole Record .............................................................................. 184
Figure 6 – CRC Applied to Selected Fields .............................................................................. 184
LIST OF TABLES

Table 1 Explanation of Citations ................................................................................................ 29
Table 2 Explanation of Recitals ................................................................................................. 33
EXECUTIVE SUMMARY

Commission Regulation (EU) 73/2010, of 26 January 2010, laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky, was adopted by the European Commission has a driver to achieve aeronautical data and aeronautical information of appropriate quality which is required to ensure safety and support new concepts of operation within the European air traffic management network (EATMN).

The purpose of this document is to support the implementation of the Commission Regulation (EU) 73/2010, by way of providing a guide to bring about a harmonised interpretation of its provisions.

The Guide is intended to be applicable for use by anybody who is required to demonstrate compliance with the Commission Regulation (EU) 73/2010 or who is responsible for overseeing implementation and audit of those who must comply.
1. **Introduction**

1.1 **General**

The European Organisation for the Safety of Air Navigation (EUROCONTROL) was mandated to develop an interoperability Implementing Rule (IR) that supplements and strengthens the requirements of the International Civil Aviation Organisation’s (ICAO) Annex 15 [RD 10] in order to achieve aeronautical data and information of sufficient quality to support current and future flight operations.

The resultant Aeronautical Data Quality (ADQ) Implementing Rule has now been adopted by the European Commission as Regulation 73/2010 and entered into the Official Journal of the European Union (OJEU) on 27th January 2010 [RD 6]. Upon adoption, the Implementing Rule becomes European regulation and is, hereafter, referred to as the ADQ IR.

The overall objective of the ADQ IR is to achieve aeronautical data and information of sufficient quality to be a key enabler of the European Air Traffic Management Network (EATMN).

In terms of scope, the aeronautical data and information process chain extends from the original data sources (e.g. surveyors, procedure designers, etc.), through Aeronautical Information Services (AIS) and publication, to the end users of the aeronautical data and information, using aeronautical applications.

Existing ICAO Annex 15 [RD 10] integrity level requirements provide a baseline for acceptable aeronautical data and information quality. It was, therefore, necessary to develop a draft implementing rule to supplement and strengthen the relevant, existing requirements of ICAO Annex 15 [RD 10]:

- To ensure the implementation of provisions for ensuring aeronautical data and information quality (accuracy, resolution, integrity and timeliness).
- To describe the performance requirements for how aeronautical data should be originated, transferred from one party to another and how aeronautical data should be automatically handled and processed to become aeronautical information. In particular, provisions should ensure achievement of the necessary levels of integrity, security and validation.

Specifically to achieve the necessary levels of integrity, security and validation, the provisions of the ADQ IR address the following:

- Data may need to be originated using appropriate software support. This includes the logging of survey data and the calculation and validation of derived co-ordinates, for example, those associated with Area Navigation (RNAV) procedures.
- Aeronautical data and information transfer should be conducted in a manner that ensures the risk of error is sufficiently low as to enable the safe use of the aeronautical data and information for flight operations. This requires, inter alia, appropriate automated aeronautical data and information handling techniques that prevent aeronautical data and information being corrupted, and also requires that aeronautical data and information is not supplied to the Requesting or Publishing Authorities on paper or other format/medium which requires the data and information to be input manually (i.e. re-typed) into the automated data processing system.
- Protection shall be employed for aeronautical data and information transmission to prevent inadvertent or deliberate modification.
- Aeronautical data and information needs to be validated for correctness, completeness and to check the consistency of the data fields.
1.2 Purpose of the document

The purpose of this document, the ‘ADQ Guide’, is to support the implementation of the ADQ IR, by way of providing a guide to bring about a harmonised interpretation of the ADQ IR. The Guide provides a rationale for each of the provisions, outlines to whom they apply and outlines possible means of compliance.

The Guide is intended to be applicable for use by anybody who is required to demonstrate compliance with the ADQ IRIR or who is responsible for overseeing implementation and audit of those who must comply.

The ADQ Guide shall proactively support stakeholders during their work towards ADQ compliance, in particular to support the initiation of the required implementation actions. Some chapters will continue to be expanded, based on more material becoming available. In addition, stakeholders are encouraged to provide comments and suggestions for enhancements so that practical experience can be fully taken into account in the ADQ Guide.

Some terms that are used in the text of the document may require further explanations. In those cases the definition is given in Section 1.5 of the Guide.

1.3 Conventions

The following drafting conventions are used within this document:

- Use of the operative verb "shall" indicate that the guidance must be implemented to achieve the minimum objectives of the ADQ IR;
- Use of the operative verb "should" indicates that implementation of the guidance is recommended to achieve the best possible implementation of the ADQ IR;
- Use of the operative verb "may" indicates optional items.

1.4 Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADI</td>
<td>Aeronautical Data Integrity</td>
</tr>
<tr>
<td>ADQ</td>
<td>Aeronautical Data Quality</td>
</tr>
<tr>
<td>ADQi WG</td>
<td>Aeronautical Data Quality Implementation Working Group</td>
</tr>
<tr>
<td>AIC</td>
<td>Aeronautical Information Circular</td>
</tr>
<tr>
<td>AIM</td>
<td>Aeronautical Information Management</td>
</tr>
<tr>
<td>AIP</td>
<td>Aeronautical Information Publication</td>
</tr>
<tr>
<td>AIRAC</td>
<td>Aeronautical Information Regulation And Control</td>
</tr>
<tr>
<td>AIS</td>
<td>Aeronautical Information Services</td>
</tr>
<tr>
<td>AISP</td>
<td>Aeronautical Information Services Provider</td>
</tr>
<tr>
<td>AIXM</td>
<td>Aeronautical Information Exchange Model</td>
</tr>
<tr>
<td>AIXS</td>
<td>Aeronautical Information Exchange Specification</td>
</tr>
<tr>
<td>AMD</td>
<td>Aerodrome Mapping Data</td>
</tr>
<tr>
<td>AMDB</td>
<td>Aerodrome Mapping Database</td>
</tr>
<tr>
<td>ANSP</td>
<td>Air Navigation Service Provider</td>
</tr>
<tr>
<td>ARWG</td>
<td>ADQ Regulators Working Group</td>
</tr>
<tr>
<td>A-SMGCS</td>
<td>Advanced Surface Movement Guidance and Control System</td>
</tr>
<tr>
<td>ATN</td>
<td>Aeronautical Telecommunication Network</td>
</tr>
</tbody>
</table>
1.5 Definitions

1.5.1 Common Dataset

A means in which a single definition of the aeronautical data and information to be collected, processed and made available is defined, such that it an interoperable definition is used throughout the Single European Sky (SES) region.
1.5.2 Unified Modelling Language (UML)

The Unified Modelling Language (UML) is used to help specify, visualize, and document models of software systems, including their structure and design, in a way that meets the requirements of the intended solution. Using any one of the large number of UML-based tools on the market, a future application’s requirements can be analysed a solution designed that meets them, with the results represented using UML 2.0’s thirteen standard diagram types.

1.5.3 Data Storage

Means the act of entering aeronautical data and information into a repository in which it is held pending further use.

1.5.4 Data Handling

Means any action which requires interaction with aeronautical data and information regardless of whether the aeronautical data and information may be altered by that interaction, or not.

1.5.5 Data Processing

Means any action which requires interaction with aeronautical data and information which results in its alteration or the creation of new aeronautical data and/or aeronautical information.

1.5.6 Data Transfer

Means the act of passing aeronautical data and information from one person/organisation to another.

1.5.7 Make Available

Means the act of providing aeronautical data and information to the next intended user, either by provision of aeronautical data and information directly or through the provision of facilities by which the aeronautical data and information may be accessed.

1.6 Reference material


[RD 8] EUROCAE ED-119 / RTCA DO-291 Interchange Standards for Terrain, Obstacle, and Aerodrome Mapping Data


[RD 10] ICAO Annex 15 Aeronautical Information Services


[RD 14] ISO 19011:2011 Guidelines for quality and/or environmental management system auditing


[RD 17] ISO 19157:2013 Geographic information — Data quality


[RD 27] OGC 07-036 OpenGIS Geography Markup Language (GML) — Encoding Standard

[RD 28] OGC 10-129r1 OGC Geography Markup Language (GML) — Extended schemas and encoding rules

[RD 29] EUROCONTROL-SPEC-151 EUROCONTROL Specification for Aeronautical Information Exchange


[RD 32] EUROCONTROL-SPEC-152 EUROCONTROL Specification for Data Quality Requirements

[RD 33] EUROCONTROL-SPEC-146 EUROCONTROL Specification for the Electronic Aeronautical Information Publication (eAIP)
[RD 34] EUROCONTROL-GUID-0158 EUROCONTROL Terrain and Obstacle Data Manual

[RD 35] EUROCONTROL-GUID-0137 EUROCONTROL Guidelines on conformity assessment for the interoperability Regulation of the single European sky

[RD 36] EUROCAE ED-76A / RTCA DO-200B Standards for Processing Aeronautical Data
2. Overview of the ADQ IR

2.1 Objective and Background to the ADQ IR

The overall objective of the ADQ IR is to achieve aeronautical data and information of sufficient quality to be a key enabler of the EATMN.

In terms of scope, the aeronautical data and information process chain extends from the original data sources (e.g. surveyors, procedure designers, etc), through AIS and publication, to the end use of the aeronautical data and information either by human users or aeronautical applications. Such applications and databases include, but are not limited to, navigation, flight planning, and terrain and obstacle databases. The responsibility for the publication of aeronautical data and information is held by States.

Post-publication aeronautical data and information quality issues involving industry are being addressed by the European Aviation Safety Agency (EASA) through the draft Opinion 02/2015 Data Providers.

Existing ICAO Annex 15 [RD 10] requirements do address some quality measures and define integrity level requirements for some aeronautical data and information. Whilst this provides a baseline for acceptable aeronautical data and information quality, there has been much debate amongst States as to how they achieve these requirements, most notably integrity. It was, therefore, considered necessary to develop a regulation to supplement and strengthen the relevant, existing requirements of ICAO Annex 15 [RD 10]:

1) to ensure the implementation of provisions for ensuring aeronautical data and information quality (accuracy, resolution, integrity and timeliness);

2) to describe the performance requirements for how data should be originated, transferred from one party to another and how aeronautical data and information should be automatically handled and processed. In particular, provisions should ensure achievement of the necessary levels of integrity, security and validation.

Specifically to achieve the necessary levels of integrity, security and validation, provisions have been developed to address the following:

1) data may need to be originated using appropriate software support. This will include the logging of survey data and the calculation and validation of derived co-ordinates, for example, data associated with RNAV procedures;

2) aeronautical data and information transfer should be conducted in a manner that ensures the risk of error is sufficiently low as to enable the safe use of the aeronautical data and information for flight operations. This requires, inter alia, appropriate automated aeronautical data and information handling techniques that prevent the data and information being corrupted, and also requires that the data and information is not supplied to the Requesting or Publishing Authorities on paper or other format/medium which requires the data and information to be input manually (i.e. re-typed) into the automated data processing system;

3) protection shall be employed for aeronautical data and information transmission to prevent inadvertent or deliberate modification;

4) aeronautical data and information needs to be validated for correctness, completeness and to check the validity of information in the data fields.

The ADQ IR, therefore, strives to achieve aeronautical data and information which meets its minimum quality requirements through the application of process management, i.e. defining provisions for the origination, processing and publication of aeronautical data and information which, if compliance with these is demonstrated, should provide a sufficiently high degree of confidence that the data quality requirements, including integrity, have been achieved.
2.2 Structure of the ADQ IR

The ADQ IR comprises the following:

1) Citation and recitals which place the ADQ IR within its legal framework;
2) Fifteen Articles which contain the provisions against which compliance is necessary;
3) Eleven Annexes which support the main Articles and which provide lower-level requirements for compliance.

The overall structure of the ADQ IR is provided in Error! Reference source not found.

2.3 Updates to the ADQ IR


This amending Regulation was mainly used to align the ADQ IR with the changes introduced by the Fourteenth Edition (July 2013) of ICAO Annex 15, which incorporates Amendment No 37. In this regard, the amendments made to the ADQ IR included the update of some of the ADQ IR definitions from Article 3 and the update of the ADQ IR references to ICAO Annex 15 that are listed in Annex III.

Regulation 1029/2014 [RD 7] was also used to update the ADQ IR references to other EC Regulations and ISO standards to ensure coherence with the latest numbering and edition of these regulations and standards.

After the publication of Regulation 1029/2014 [RD 7] the official reference to the ADQ IR should read:


The amendments made by Regulation 1029/2014 [RD 7] do not have any impact on the level of requirements of the ADQ IR and do not require changes to any eventual implementation activity already in course.
The text of this Guide was updated to reflect the changes introduced by Regulation 1029/2014 [RD 7].
3. **Citations and Recitals**

3.1 **Purpose and Regulatory Base**

3.1.1 **Citations**

Citations appear at the beginning of the Preamble and their purpose is to indicate the legal basis of the Regulation; i.e. they confer the competence to adopt the Regulation in question. The legal wording of Citations is specified in the European Commission regulatory drafting guidelines and they all begin with the phrase, “Having regard to”. There are three Citations within the ADQ IR and their inclusion is explained in more detail in section 3.2.1 below.

3.1.2 **Recitals**

European Commission Regulations must state the rationale on which they are based so that any person can establish the circumstances in which the Commission has developed the Regulation in question. This provides the opportunity for regulated parties to defend their interests by disputing a Regulation and for the historical facts to be clearly displayed.

The Purpose of the Recitals is to set out concise reasons for the chief provisions of the enacting terms, without reproducing or paraphrasing them. Recitals also provide an important opportunity to indicate the intent of the Regulation (or parts of) where this cannot easily be stated within the Enacting Terms.

The statement of reasons begins with the word, “Whereas:”

The specific Recitals within the ADQ IR are detailed in section 3.2.2 below, with appropriate explanations provided under the ‘Remarks’ column.

3.2 **Specific Content**

3.2.1 **Citations**

<table>
<thead>
<tr>
<th>Citation</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Having regard to the Treaty establishing the European Community,</td>
<td>The Treaty establishing the European Community constitutes the general basis for the action that is being taken.</td>
</tr>
<tr>
<td>Having regard to Regulation (EC) No 552/2004 of the European Parliament</td>
<td>The direct legal basis of the ADQ IR is found in the interoperability Regulation and specifically within Article 3(1) which states that IRs for interoperability shall be drawn up, whenever necessary, to achieve, in a coherent way, the objectives of the interoperability Regulation.</td>
</tr>
<tr>
<td>and of the Council of 10 March 2004 on the interoperability of the</td>
<td></td>
</tr>
<tr>
<td>European air traffic management network (the interoperability Regulation)</td>
<td></td>
</tr>
<tr>
<td>1, and in particular Article 3(1) thereof,</td>
<td></td>
</tr>
<tr>
<td>Having regard to the Regulation (EC) No 549/2004 of the European</td>
<td>The ADQ IR was developed by EUROCONTROL as a result of a mandate issued by the European Commission. This Citation provides the legal basis for decisions regarding the adoption of the results of such mandate work within the Community.</td>
</tr>
<tr>
<td>Parliament and of the Council of 10 March 2004 laying down the framework</td>
<td></td>
</tr>
<tr>
<td>for the creation of the Single European Sky (the framework Regulation)</td>
<td></td>
</tr>
<tr>
<td>2, and in particular Article 8(2) thereof,</td>
<td></td>
</tr>
</tbody>
</table>

*Table 1 Explanation of Citations*
### 3.2.2 Recitals

<table>
<thead>
<tr>
<th>No</th>
<th>Recital</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Whereas: Aeronautical data and aeronautical information of appropriate quality are required to ensure safety and support new concepts of operation within the European air traffic management network (hereinafter EATMN).</td>
<td>This details the key requirement for the ADQ Regulation, repeating the wording from the SES interoperability Regulation.</td>
</tr>
<tr>
<td>2</td>
<td>The International Civil Aviation Organisation (hereinafter ICAO) has defined aeronautical data and aeronautical information quality requirements in terms of accuracy, resolution and integrity that should be met and maintained within the EATMN when processing aeronautical data and aeronautical information.</td>
<td>This recognises the ICAO standards as a baseline, and it supports the scope of the Regulation and the definition of aeronautical data and information quality used.</td>
</tr>
<tr>
<td>3</td>
<td>Those ICAO requirements are considered to provide a sufficient baseline for current data quality requirements but there are known deficiencies that should be addressed, notably to support future applications.</td>
<td>This provides the reason for the approach to the Regulation, which is to strengthen and complement the ICAO baseline to support SES objectives, where necessary.</td>
</tr>
<tr>
<td>4</td>
<td>Annex 15 to the Convention on International Civil Aviation (hereinafter the Chicago Convention) should provide the main baseline for the data quality requirements. References to provisions of Annex 15 to the Chicago Convention should not automatically imply a reference to Annex 4 to the Chicago Convention or other Annexes to the Chicago Convention.</td>
<td>This specifically reinforces ICAO Annex 15 as the main baseline for the requirements of the Regulation. However, it also emphasises that references to ICAO material contained within any of the Annex 15 provisions that are specifically referred to in the ADQ Regulation, must not be assumed to apply. Where required, the ADQ IR makes specific references to other relevant Annexes.</td>
</tr>
<tr>
<td>5</td>
<td>Examination of the current situation has demonstrated that the quality requirements relating to aeronautical data and aeronautical information are not always being met within the EATMN, in particular the accuracy and integrity requirements.</td>
<td>This provides further rationale and justification for the need for the targeted action within the provisions.</td>
</tr>
<tr>
<td>6</td>
<td>A significant amount of paper-based, manual activity still takes place within the aeronautical data chain, which leads to significant opportunities for the introduction of errors and the degradation of data quality. Measures should therefore be adopted to improve the situation.</td>
<td>This cites a key problem identified within the aeronautical data and information chain and is a main reason behind the provisions in the Regulation on aeronautical data and information quality process requirements.</td>
</tr>
<tr>
<td>No</td>
<td>Recital</td>
<td>Remarks</td>
</tr>
<tr>
<td>----</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>7</td>
<td>EUROCONTROL has been mandated in accordance with Article 8(1) of Regulation (EC) No 549/2004 to develop requirements supplementing and strengthening ICAO Annex 15 in order to achieve aeronautical information of sufficient quality. This Regulation is based on the resulting mandate report of 16 October 2007.</td>
<td>This is a specific reference to the mandate process which gave EUROCONTROL the authority to develop the draft IR on behalf of the European Commission and refers to the Aeronautical Data Integrity (ADI) mandate Final Report.</td>
</tr>
<tr>
<td>8</td>
<td>In accordance with the requirements of Regulation (EC) No 552/2004, aeronautical information should be provided progressively in an electronic form, based on a commonly agreed and standardised dataset. These requirements should eventually be applicable to all aeronautical data and aeronautical information within the scope of this Regulation.</td>
<td>This provides a key reason for the interoperability provisions included within the Regulation and supports the transitional provisions. It also allows the European Commission to initiate further possible action, once the conditions are appropriate, for all aeronautical data and information to be covered. At the moment, for example, Digital Notice to Airmen (NOTAM) is excluded.</td>
</tr>
<tr>
<td>9</td>
<td>This Regulation should not cover military operations and training as referred to in Article 1(2) of Regulation(EC) No 549/2004.</td>
<td>This Recital is a standard wording within SES Regulations to ensure that the status of the Military is properly recognised, i.e. they are generally not subject to SES Regulation except in circumstances such as those covered by Recital (10) below.</td>
</tr>
<tr>
<td>10</td>
<td>Military organisations providing aeronautical information for use in general air traffic operations are an essential part of the aeronautical data process and Member States should ensure that the quality of such data is sufficient to meet its intended use.</td>
<td>Notwithstanding Recital (9), this reinforces the important part the Military has to play in achieving aeronautical data and information quality. It is specifically aimed at the level of “Member States”, who are the only parties that can ensure that those Military organisations providing aeronautical data and information for civil operations are properly involved.</td>
</tr>
<tr>
<td>11</td>
<td>The timely provision and publication of new or amended aeronautical data and aeronautical information in accordance with the amendments and update cycle requirements of ICAO and Member States, are considered essential to support the achievement of data quality.</td>
<td>This addresses the key aspect of ‘timeliness’, which is missing from the ICAO Data Quality definition, but which is recognised by the SES mandate as being of importance. Timeliness is addressed within the enacting terms of the Regulation.</td>
</tr>
<tr>
<td>No</td>
<td>Recital</td>
<td>Remarks</td>
</tr>
<tr>
<td>----</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>12</td>
<td><strong>Member States should exercise effective management and control over all aeronautical data and aeronautical information origination activities to ensure that data is provided with sufficient quality to meet its intended use.</strong></td>
<td>It was not practicable to specifically identify all entities originating data within the Regulation itself but there is a need for all originated data to have a sufficient level of quality. This Recital highlights the Member States’ responsibilities in this respect and complements the obligation placed on Aeronautical Information Services Providers (AISPs) in the Regulation. It also supports the inclusion of data origination within the scope of the applicability of the Regulation.</td>
</tr>
<tr>
<td>13</td>
<td><strong>The constituents and procedures that are used by originators of data need to be interoperable with the systems, constituents and procedures used by aeronautical information service providers in order to enable safe, seamless and efficient operation of the EATMN.</strong></td>
<td>This Recital justifies the extension of the scope of the Regulation beyond ANSPs, to include the vital data origination area within the Regulation.</td>
</tr>
<tr>
<td>14</td>
<td><strong>With a view to maintaining or enhancing existing safety levels of operations, Member States should be required to ensure that the parties concerned carry out a safety assessment including hazard identification, risk assessment and mitigation processes. Harmonised implementation of these processes to the systems covered by this Regulation requires the identification of specific safety requirements for all interoperability and performance requirements.</strong></td>
<td>This is standard text designed to explain and justify the inclusion of Safety Requirements within the enacting terms of the Regulation.</td>
</tr>
<tr>
<td>15</td>
<td><strong>In accordance with Article 3(3)(d) of Regulation (EC) No 552/2004, implementing rules for interoperability should describe the specific conformity assessment procedures to be used to assess the conformity or suitability for use of constituents as well as the verification of systems.</strong></td>
<td>This is standard text designed to explain and justify the inclusion of Conformity Assessment Requirements within the enacting terms of the Regulation.</td>
</tr>
<tr>
<td>16</td>
<td><strong>This Regulation has an impact on a wide range of parties. It should therefore take into account the individual capabilities and levels of involvement within the data chain of the parties, to ensure that provisions are applied progressively to achieve required data quality.</strong></td>
<td>There are many transitional provisions and aspects of different applicability within the Regulation, and this Recital explains the main reasons for those.</td>
</tr>
<tr>
<td>No</td>
<td>Recital</td>
<td>Remarks</td>
</tr>
<tr>
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<td>---------</td>
</tr>
<tr>
<td>17</td>
<td><strong>The measures provided in this Regulation are in accordance with the opinion of the Single Sky Committee.</strong></td>
<td>This confirms that the Regulation provisions have been subject to the Single Sky Committee review process and are, in effect, accepted by the Committee.</td>
</tr>
</tbody>
</table>

*Table 2 Explanation of Recitals*
4. **ARTICLE 1 - SUBJECT MATTER**

4.1 **Regulatory Basis of Article 1**

European Union drafting guidelines state that, where appropriate, an Article shall be included at the beginning of the Regulation to define the subject matter and scope of the Regulation. Due to the complexity of the ADQ IR, the European Union Legal Service has determined that the subject matter and scope shall be included under two separate Articles.

4.2 **Article 1**

Article 1 sets out the subject matter of the ADQ IR. European Union guidelines state that this part shall describe what the Regulation addresses. The following sections outline the specific provisions and requirements of Article 1.

4.2.1 **Article 1**

4.2.1.1 **Text of Provision**

*This Regulation lays down the requirements on the quality of aeronautical data and aeronautical information in terms of accuracy, resolution and integrity.*

4.2.1.2 **Applicability**

This provision applies to the scope of the ADQ IR, as described under Article 2. However, no specific obligations arise because it only describes the general subject matter of the ADQ IR.

4.2.1.3 **Rationale / Need for Provision**

The rationale for this article is to provide readers with information that enables them to determine, from the outset, whether or not they will be impacted by the ADQ IR. Whilst this is partially evident from the title of the ADQ IR, Article 1 elaborates what is meant by data quality. The type of aeronautical data and information covered is then explained in Article 2(1).

4.2.1.4 **Explanation of Provision**

Article 1 defines the overall subject of the ADQ IR but also states that the attributes of data quality considered within the provisions are consistent with those used by ICAO within ICAO Annex 15 [RD 10]. Although the SES interoperability Regulation [RD 4] introduces the requirement for aeronautical data and information to be provided in a ‘timely’ manner, it was decided to deal with the timeliness aspects as a separate issue. The original mandate from the European Commission to EUROCONTROL clearly establishes ICAO Annex 15 [RD 10] as the baseline and it was considered important not to deviate from the ICAO definition of data quality within this provision.

4.2.1.5 **Implementing the Provision**

There is no specific guidance necessary on how to implement this provision as no obligations are placed on stakeholders.

4.2.1.6 **Means of Compliance**

There are no means of compliance directly associated with this specific provision.
5. **ARTICLE 2 - SCOPE**

### 5.1 Regulatory Basis of Article 2

European Union drafting guidelines state that, where appropriate, an Article shall be included at the beginning of the Regulation to define the subject matter and scope of the Regulation. Due to the complexity of the ADQ IR, the EU Legal Service has determined that the subject matter and scope shall be included under two separate Articles.

### 5.2 Article 2

Article 2 sets out the scope of the ADQ IR. The European Union drafting guidelines state that the scope of the Regulation shall refer "to the categories of situations of fact and the persons to which the act applies". In this Regulation, this means the systems, constituents, parties and scope of the aeronautical data and information chain to which the ADQ IR is applicable. The following sections outline the specific provisions and requirements of Article 2.

#### 5.2.1 Article 2(1)

**Text of Provision**

*This Regulation shall apply to EATMN systems, their constituents and associated procedures involved in the origination, production, storage, handling, processing, transfer and distribution of aeronautical data and aeronautical information.*

*It shall apply to the following aeronautical data and aeronautical information:*

(a) the integrated aeronautical information package (hereinafter IAIP) defined in Article 3 point (7) made available by Member States, with the exception of aeronautical information circulars;

(b) electronic obstacle data, or elements thereof, where made available by Member States;

(c) electronic terrain data, or elements thereof, where made available by Member States;

(d) aerodrome mapping data, where issued by Member States.

**Applicability**

Article 2(1) describes the overall applicability of the ADQ IR. The provision makes the ADQ IR applicable to any EATMN system, constituent or procedure that is involved in any of the individual operations described. The specific terms used in the provision are defined and explained below in more detail.

Due to the SES context of the terms used in Article 2(1), the ADQ IR is primarily applicable to ANSPs. However, it should be noted that the actual scope of the ADQ IR goes beyond ANSPs to include non-ANSP entities, such as procedure designers and surveyors. This is explicit in Article 2(2) and other specific provisions, and effectively extends the requirements to other parties to ensure the essential interoperability of aeronautical data and information with the EATMN. Failure to include data originators would seriously undermine the ability of the ADQ IR to achieve data quality at the point of origination and would not achieve the objectives of the SES mandate. The inclusion of data originators was strongly supported by stakeholders.
5.2.1.3 Rationale / Need for Provision

The SES interoperability Regulation [RD 4] states that the EATMN, its systems and their constituents and associated procedures shall meet its essential requirements. The ADQ IR is an Implementing Regulation of the interoperability Regulation [RD 4] and has been developed to meet its essential requirements, as a minimum. This provision is, therefore, necessary to ensure that the scope meets at least that of the overarching SES Regulation.

Moreover, it is also needed to define the specific ADQ-related operations with which the EATMN systems, constituents and procedures are associated.

Article 2(1) is also necessary to further elaborate the specific subject matter of the ADQ IR in terms of the aeronautical data and information that are to be covered by its provisions. The aeronautical data and information chosen for inclusion within the ADQ IR are those that were considered essential to achieve the required data quality performance to meet the SES requirements, including the need to support new concepts of operations, such as RNAV and Advanced Surface Movement Guidance and Control Systems (A-SMGCS).

5.2.1.4 Explanation of Provision

The ADQ IR itself does not include definitions for, ‘systems’, ‘constituents’ and ‘procedures’, as these are already defined within the SES framework Regulation [RD 3]. However, for clarity, the definitions of these terms are provided below and further explanations have been added.

In the context of the ADQ Regulation, the ‘EATMN’ means, specifically, the systems and procedures for aeronautical information services, as identified in Annex I of the SES interoperability Regulation [RD 4] as one of the eight systems of EATMN. The term ‘EATMN’ is only applicable to ANSPs and ‘System’ means the aggregation of airborne and ground-based constituents, as well as space-based equipment that provides support for air navigation services, for all phases of flight. In the context of the interoperability Regulation [RD 4], the term ‘system’ is applicable only to ANSPs’ systems that are subject to certification by the National Supervisory Authorities (NSAs).

‘Constituents’ means tangible objects, such as hardware, and intangible objects, such as software, upon which the interoperability of the EATMN depends. In the context of the ADQ IR, the constituents are those that specifically make up the systems and procedures for aeronautical information services and, as stated above, are limited to those of the ANSPs.

‘Procedure’, means a standard method for either the technical or the operational use of systems, in the context of agreed and validated concepts of operation requiring uniform implementation throughout the EATMN. In the context of the ADQ IR, the procedures are those that are specifically associated with the systems and procedures for aeronautical information services and, as stated above, are limited to those of the ANSPs. The list, ‘origination, production, storage, handling, processing, transfer and distribution of aeronautical data and information’ was selected as it effectively describes all of the individual operations undertaken within the aeronautical data chain that can impact the quality of aeronautical data and information.

Whilst the terms ‘EATMN systems, their constituents and associated procedures’ can only be directly applicable to ANSPs, it was considered essential to extend the scope of the ADQ IR to cover also other entities that may interface, directly or indirectly, with the ANSP systems and procedures for aeronautical information services. This is explicitly done in Article 2(2) which identifies other entities that may also be involved in the origination, production, storage, handling, processing, transfer and distribution of aeronautical data and aeronautical information. Even if they are not part of the EATMN, these entities, therefore, also fall under the scope of the ADQ IR.

The Integrated Aeronautical Information Package (IAIP) is included as a mandatory requirement, except for Aeronautical Information Circulars (AICs) because they are only advisory in nature. The IAIP is the core product of the aeronautical data process and, therefore, must be included within the ADQ IR. The definition of the specific elements of the IAIP is exactly as specified within ICAO Annex 15 [RD 10].
Chapter 10 and Appendix 8 of the ICAO Annex 15 [RD 10] define the requirements for the provision of electronic Terrain and Obstacle Data (TOD). It is up to the States to decide on the approach taken (compliance, filing of differences...) to address these ICAO requirements and the ADQ IR does not mandate the provision of TOD. However, if the State decides to make TOD available to the user community, it shall ensure that the origination, production, storage, handling, processing, transfer and distribution of the TOD is done through the full application of the relevant ADQ IR provisions. This is why it was decided to use the term “where made available”.

Chapter 11 of the ICAO Annex 15 [RD 10] defines the requirements for the provision of Aerodrome Mapping Data (AMD). It is up to the States to decide on the approach taken (compliance, filing of differences...) to address these ICAO requirements and the ADQ IR does not mandate the provision of AMD. However, if the State decides to make AMD available to the user community, it shall ensure that the origination, production, storage, handling, processing, transfer and distribution of the AMD is done through the full application of the relevant ADQ IR provisions. This is why it was decided to use the term “where made available”.

It should be noted that the scope of the ADQ IR is described in two different Articles, Article 2(1) and Article 2(2), which cannot be read in isolation. This means that the ADQ IR provisions are applicable to the aeronautical data and aeronautical information that is made available (in any of the IAIP elements, in TOD or in AMD) only if the data is provided by any of the parties referred to in Article 2(2).

5.2.1.5 Implementing the Provision

The Aeronautical Information Service Provider (AISP) is responsible, in coordination with his National Supervisory Authority (NSA), to define which of the elements (software and hardware) used to provide aeronautical information services shall be interoperable between themselves. These elements are the ones that should be considered as ‘constituents’ of the EATMN systems and procedures for aeronautical information services. These constituents are therefore included in the EATMN representation of the systems and procedures for aeronautical information services and they shall comply with all the relevant ADQ IR provisions. Particularly, these constituents shall be subject to certification through the conformity assessment process, as described in Article 11 and Article 12 of the ADQ IR.

AISP and NSA should carefully consider which elements need to be included in the EATMN representation of the systems and procedures for aeronautical information services. Whilst it is difficult to determine a one-fits-all criterion, a recommended starting point is to take into consideration if a possible non-conformity of the specific element (hardware or software) may jeopardise the compliance of the overall system.

Entities other than the ANSP (and which are also referred to in Article 2(2)) should consider if any of its activities is related with the origination, production, storage, handling, processing, transfer and distribution of aeronautical data and aeronautical information that is made available in any of the products referred to in Article 2(1). If that is the case then these entities are considered to be within the scope of the ADQ IR and, as regulated parties, shall do the necessary to comply with all the relevant provisions.

NOTAM is one of the elements contained in the IAIP and as such the NOTAM system, its constituents and associated procedures should, in principle, be subject to the ADQ IR requirements. However, it is acknowledged that, due to its specific nature (i.e. timely constraints for the distribution of information), the implementation of the ADQ IR provisions in the NOTAM system presents several challenges and need to be approached in a pragmatic manner.

This topic was discussed within the ADQ Implementation Working Group (ADQi WG) and the results of this discussion were used as input for the ADQ Regulators Working Group (ARWG) Common Understanding 01/2013 Application of the provisions of Commission Regulation (EU) 73/2010 to NOTAM (the text of the CU is transposed in Annex A.1.).
Because it is recognised that a full implementation of the ADQ IR to the traditional NOTAM system is not easily achieved, this should serve as a motivation to consider the future evolution of this system in order to bring it closer to the digital concepts. In this regard the Digital NOTAM Project can be exploited.

Whenever a State decides to make TOD and/or AMD available, it must do so in accordance with the requirements of the ADQ IR by ensuring that all the parties involved in the origination, production, storage, handling, processing, transfer and distribution of the TOD and AMD comply with all the relevant provisions.

5.2.1.6 Means of Compliance

The EUROCONTROL Guidelines on conformity assessment for the interoperability Regulation of the single European sky [RD 35] may be used to support the ANSP and the NSA to define the constituents of the EATMN system and procedures for aeronautical information services.

The EUROCONTROL TOD Manual [RD 34] should be consulted for guidance on the provision of TOD.

To clarify the requirements for AMD the Eurocae ED-119B Interchange Standards for Terrain, Obstacle and Aerodrome Mapping Data [RD 8] and Eurocae ED-99A User Requirements for Aerodrome Mapping Information [RD 9] should be considered. It should however be noted that these standards are currently being reviewed under the framework of Eurocae WG 44.

To support the implementation of the ADQ provisions in the NOTAM system the ARWG Common Understanding 01/2013 Application of the provisions of Commission Regulation (EU) 73/2010 to NOTAM (the text of the CU is transposed in Annex A.1.) may be considered.

5.2.2 Article 2(2)

5.2.2.1 Text of Provision

This Regulation shall apply to the following parties:

(a) air navigation service providers;

(b) operators of those aerodromes and heliports, for which instrument flight rules (IFR) or Special-visual flight rules (VFR) procedures have been published in national aeronautical information publications;

(c) public or private entities providing, for the purposes of this Regulation:

(i) services for the origination and provision of survey data;

(ii) procedure design services;

(iii) electronic terrain data;

(iv) electronic obstacle data.

5.2.2.2 Applicability

Article 2(2) makes the ADQ IR applicable to the entities named within its text. Explanations of the exact meaning and intent of the provision are provided below.

5.2.2.3 Rationale / Need for Provision

Article 2(2) is essential to define exactly to which parties the ADQ IR applies.
5.2.2.4 **Explanation of Provision**

European Union drafting requirements state that the applicability must be based on clearly identifiable legal identities, as far as possible. The terms selected within Article 2(2) to identify those parties are, as far as practicable, those already defined or well recognised within the SES context, i.e. ANSPs and Aerodrome Operators.

There are, in fact, many more parties involved in the aeronautical data chain than could be specifically mentioned within ADQ Regulation. Within the data origination area, for example, there can be many hundreds of parties that originate occasional items of data; for example, mobile phone and wind farm companies. It would be extremely difficult to identify these parties individually and the cost impacts of placing the full obligations of the ADQ IR on parties that produce such small amounts of data would be difficult to justify. Therefore, the ADQ IR sets out to make its provisions specifically applicable to those parties that supply the bulk of the aeronautical data and information, on a regular basis, and that can be clearly identified. Aeronautical data and aeronautical information that is provided by any party other than the ones referred in Article 2(2) will fall under the remit of Article 6(5) which will be explained in the respective Chapter within this Guide.

The following paragraphs explain to whom the ADQ IR is applicable.

In the context of Article 2(2)(a), air navigation service provider (ANSP), as defined by the SES framework Regulation [RD 3], means: ‘any public or private party providing air navigation services for general air traffic’.

‘Air navigation services’, as defined by the SES framework Regulation [RD 3], means air traffic services; communication, navigation and surveillance services; meteorological services for air navigation; and aeronautical information services.

Consequently, this means that the ADQ IR applies to all those entities providing the above services within the context of the SES framework Regulation [RD 3].

In the specific context of the ADQ IR, the Aeronautical Information Service Provider (AISP) is naturally the main focus of applicability within the ANSP However other services within the ANSPs are also key generators of aeronautical data and therefore, the data origination part of their operation must be subject to the ADQ IR. It should be noted that the ADQ IR sometimes refers to ANSPs generically and then to AISPs separately. This is deliberate as the ADQ IR tries to place obligations on specific parties whenever this is possible. This is in keeping with European Union drafting guidelines.

In the context of Article 2(2)(b), ‘operators of those aerodromes and heliports that have published instrument flight rules (IFR) or Special visual flight rules (SVFR) procedures in national AIPs’ means that the ADQ IR is not applicable to the operators of aerodromes and heliports with only Visual Flight Rules (VFR) operations. To apply the provisions of the ADQ IR to such entities, in addition to existing ICAO requirements, could not be justified. Excluding these entities from the scope of the ADQ IR significantly reduces its impact without adversely affecting the achievement of sufficient data quality to meet intended use. However, as soon as an aerodrome or heliport publishes an Instrument Flight Rules (IFR) or Special VFR (SVFR) procedure, the ADQ IR becomes applicable to it, as such procedures demand higher data quality.

Concerning the situation where data related to aerodromes/heliports with only Visual Flight Rules (VFR) operations are published in the national AIP, the ARWG agreed that the ADQ IR “does not apply to the operators of those aerodromes/heliports [...] even if those aerodromes/heliports are referenced inside the AIP”. The inclusion of the data for these aerodromes and heliports in the AIP shall be considered under the scope of Article 6(5).
Moreover, the ARWG also agreed that, even if an aerodrome/heliport is referenced in an IFR procedure published in the AIP, the aerodrome/heliport operator is only considered under the scope of the ADQ IR if its tools, software or procedures are “directly involved in the origination, production, storage, handling, processing, transfer or distribution of the aeronautical data or aeronautical information that is published [...]”. This excludes situations like cloud breaking procedures where the aerodrome may be referenced but it is never directly involved in the handling of the relevant data.

These ARWG conclusions are included in Common Understanding 05/2013 Commission Regulation (EU) 73/2010 and Aerodrome Operators which can be read in full in ANNEX A of this Guide.

In the context of Article 2(2)(c),

(c) public or private entities providing, for the purposes of this Regulation:

(i) services for the origination and provision of survey data;
(ii) procedure design services;
(iii) electronic terrain data;
(iv) electronic obstacle data.

means that these are private companies or publicly owned organisations that are not integral parts of the ANSPs or aerodromes authorities, and that are providing the services or data described. This could, for example, refer to a surveying company under contract to an aerodrome to survey runway elements, a procedure design company under contract to the ANSP to provide IFR procedures for the national aerodromes or a National Geodetic Agency with an agreement with the national Civil Aviation Authority for the provision of terrain data for the entire State territory.

5.2.2.5 Implementing the Provision

There are no obligations contained within this provision requiring specific implementation guidance. The understanding of the applicability is, however, critical to the correct implementation of the whole ADQ Regulation.

5.2.2.6 Means of Compliance

There are no means of compliance directly associated with this specific provision.

5.2.3 Article 2(3)

5.2.3.1 Text of Provision

This Regulation shall apply up to the moment when the aeronautical data and/or aeronautical information are made available by the aeronautical information service provider to the next intended user.

In the case of distribution by physical means, this Regulation shall apply up to the moment when the aeronautical data and/or aeronautical information has been made available to the organisation responsible for providing the physical distribution service.

In the case of automatic distribution through the use of a direct electronic connection between the aeronautical information service provider and the entity receiving the aeronautical data and/or aeronautical information, this Regulation shall apply:

(a) up to the moment when the next intended user accesses and extracts aeronautical data and/or aeronautical information held by the aeronautical information service provider; or
(b) up to the moment when the aeronautical data and/or aeronautical information is delivered by the aeronautical information service provider, into the next intended user’s system.

5.2.3.2 Applicability
This provision is applicable to all parties described under Article 2(2) and to the scope of the data chain described within the provision itself. This is explained in more detail below.

5.2.3.3 Rationale / Need for Provision
The overall aeronautical data chain starts at origination of the data and ends, ultimately, with its end use. The ADQ IR covers only part of this data chain. To ensure that regulated parties understand the scope of their responsibilities, it is essential to precisely describe the end point of the ADQ Regulation.

It should be noted that there was considered to be no need to provide a specific provision that describes the start point of the ADQ IR as this is implicit within other provisions and, particularly, in those that describe data origination obligations. However, for clarity, the ADQ IR commences at the point at which the entity responsible for the official request for a data origination activity creates that official request. For example, the ADQ IR is applicable from the point that an aerodrome operator issues the official request to a surveyor, or an aviation authority issues the official request to a procedure designer, etc.

5.2.3.4 Explanation of Provision
The SES ADI mandate to EUROCONTROL implied that the scope of the ADQ IR should be consistent with that of ICAO Annex 15 [RD 10]. This is considered to be to the point of publication; i.e., to the point where the aeronautical data and information is delivered by the AISP to the next intended user. In order to support the identification of responsibilities, it was necessary to define the exact end points of the ADQ Regulation, both in terms of delivery by physical means and also by electronic means.

The term ‘next intended user’ is used within ICAO Annex 15 [RD 10] but its meaning is only implied. It is, therefore, formally defined within the ADQ IR to avoid any ambiguity. Nevertheless, its meaning is exactly as it is understood within ICAO Annex 15 [RD 10].

Distribution by ‘physical means’ effectively refers to transfer by such means as postal or courier services. For example, the end point of the scope of the ADQ IR would occur when an AIP is delivered to the responsible postal service. Aeronautical data and information in digital format, such as that included on a CD-ROM, but sent out using postal or courier services, is still considered to be ‘physical distribution’.

Direct electronic connection refers to a digital delivery method where aeronautical data and information is transferred automatically, system-to-system, from the AISP. There are two possible methods:

1) when the next intended user accesses the aeronautical data and information and takes it; this is sometimes known as the ‘pull’ method. For example, if the AISP were to make access available to its IAIP through a website, the users would visit the site at their convenience and access the relevant material, i.e. pull the aeronautical data and information they require.

2) when the AISP delivers the aeronautical data and information to the next intended user’s computer system; this is sometimes known as the ‘push’ method. In this case, the point of delivery occurs when the aeronautical data and information has been delivered and the next intended user’s system has confirmed receipt of it without loss of quality.
For example, the AISP system could establish a remote connection to a client system and transfer the aeronautical data and information using an application which confirms that the aeronautical data and information is correctly received at the client end. Such an approach may be implemented using web technology where servlets are used to ensure correct reception at the client end.

5.2.3.5 Implementing the Provision

There is no specific guidance necessary on how to implement this provision as it merely describes the exact end points of the scope of the ADQ Regulation. The understanding of the end points is, however, critical to the correct implementation of the whole ADQ IR.

5.2.3.6 Means of Compliance

There are no means of compliance directly associated with this specific provision.
6. **ARTICLE 3 - DEFINITIONS**

6.1 **Purpose and Regulatory Basis of Article 3**

For the sake of legal clarity, it has been necessary to define specific words and terms in the ADQ IR. In some cases, the definitions are included to limit or extend the ordinary meaning given to some terms. Only those definitions necessary to understand and apply the ADQ IR correctly are included.

Generally, all terms used in a Regulation should be given their meaning in everyday or specialised language. Convention dictates that definitions should be respected throughout a Regulation and defined terms must be used in a uniform manner, and their content must not diverge from the definition given. Definitions must not be contrary to the ordinary meaning of the terms to which they refer.

It should be noted that some definitions in the ADQ IR have been sourced from existing ICAO documentation and they are not repeated verbatim. Moreover, terms that are already defined in related, higher level Regulations, such as the framework Regulation (EC) No 549/2004 [RD 3], are not repeated. This is in line with the drafting requirements of the European Commission.

Nonetheless, where some familiar terms have been included as definitions because slight changes needed to be made to aid clarity, the meaning and intent of the original definition have not been altered.

6.2 **Aeronautical Data**

6.2.1 **Definition in Regulation**

*A representation of aeronautical facts, concepts or instructions in a formalised manner suitable for communication, interpretation or processing.*

6.2.2 **Source**

Taken from ICAO Annex 15 [RD 10], Chapter 1.1 – Definitions.

6.2.3 **Clarifications**

The term aeronautical data refers to data that has been created for aviation purposes and applies to the data from the point of origination to the point prior to its publication. Only when aeronautical data has been through the process of being validated and verified, compiled into a publication and published, is it considered to be aeronautical information.

6.3 **Aeronautical Information**

6.3.1 **Definition in Regulation**

*Information resulting from the assembly, analysis and formatting of aeronautical data.*

6.3.2 **Source**

Taken from ICAO Annex 15 [RD 10], Chapter 1.1 – Definitions.

6.3.3 **Clarifications**

The term aeronautical information relates to aeronautical data that has been validated, verified, put into context and presented in a manner that the end user may utilise.
For example, the threshold point of a runway is received by the aeronautical information service as aeronautical data. Only once it has been through the process of being validated and verified, compiled into a product, such as the AIP, and published, is it considered to be aeronautical information.

In essence, aeronautical data should not be used operationally, but aeronautical information can be.

6.4 Data Quality

6.4.1 Definition in Regulation

A degree or level of confidence that the data provided meets the requirements of the data user in terms of accuracy, resolution and integrity.

6.4.2 Source

Taken from ICAO Annex 15 [RD 10], Chapter 1.1 – Definitions.

6.4.3 Clarifications

The word “quality” is often used incorrectly, with many believing that data and information should be of perfect quality. Whilst clearly desirable, such an approach is not cost effective as the quality of the item in question may far exceed that needed for the task for which it will be used. For example, the “need” may be to know the length of a runway to identify whether an aircraft may safely land upon it. Given the tolerances with which the weight of the aircraft is known, its ability to land on the required point and to brake with a certain force, the accuracy with which the runway length is measured may not need to be significantly tight, e.g. ±1m. The provision of this data to a higher degree of accuracy, whilst incurring increased origination costs, will bring no operational benefit.

Data quality is normally described by ICAO in terms of three separate measures: accuracy, resolution and integrity.

6.5 Accuracy

6.5.1 Definition in Regulation

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

6.5.2 Source

Taken from ICAO Annex 15 [RD 10], Chapter 1.1 – Definitions.

6.5.3 Clarifications

To better understand accuracy, let us take the example of a runway and assume that its true length is 4,500m precisely. If the length was to be measured, then it is highly unlikely that it would be measured at this exact distance; rather, it may be measured as, 4,501.52m, for example, which includes an accuracy error of 1.52m.

However, for measured items, if we knew the precise length, we would not need to measure it in the first place. How, therefore, do we know the accuracy of a point, which is required to be included in the associated metadata? Most measurement techniques will give a statistical accuracy, which is based upon a confidence level. This is the reason for ICAO providing the following note to the definition:
“For measured positional data the accuracy is normally expressed in terms of a distance from a stated position within which there is a defined confidence of the true position falling.”

For aeronautical data, we are typically required to achieve a 95% confidence level that the accuracy requirement has been met. This means that for 95% of the measured values, their difference to the truth does not exceed the specified accuracy requirement. Those who measure data will normally confirm this in one of two ways:

1) A statement of what accuracy is achieved with a 95% confidence level, i.e. this figure must be equal to or smaller than the required accuracy.
   For example, a surveyor may provide survey data with the guarantee that the accuracy of measurement is 0.27m with a 95% confidence level, i.e. 95% of the values will be within 0.27m of their true value.

2) A statement of the confidence with which the accuracy requirement is met, i.e. this figure must be equal to or bigger than the required confidence level.
   For example, a surveyor may provide survey data with the guarantee that the confidence level for an accuracy of measurement of 0.30m is 96.2% confidence level, i.e. 96.2% of the values will be within 0.30m of their true value.

### 6.6 Resolution

#### 6.6.1 Definition in Regulation

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

#### 6.6.2 Source

Taken from ICAO Annex 15 [RD 10], Chapter 1.1 – Definitions.

#### 6.6.3 Clarifications

Resolution relates to the number of digits to which a value is expressed and this may specify either the resolution of the integral part (the element to the left of a decimal place) or of the fraction part (the element to the right of a decimal place). Although often thought of purely from a publication perspective, it applies equally to all aeronautical data and information whether it is for use in display / publication, or not.

It should be noted that there is often confusion over how accuracy and resolution are applied. The order of resolution is typically one decimal place more that that needed to represent the accuracy of a value. For example, if a data item has a required accuracy of 0.1m, the resolution will normally be 0.01m. This ensures that a value which meets the accuracy requirements does not fail to meet the requirement when stored or published.

To give an example, if a length must be measured with an accuracy of 1m, the resolution would be 0.1m. This does not mean that the value measured should be rounded to the nearest 1m. If such an approach was taken, there would be no guarantee that the required accuracy had been maintained.

To express this numerically, a length may, in reality, be 39.1m. In measuring the length, it is measured to be 38.4m. This is a difference of 0.7m from its true value which is acceptable as this is well within the permissible 1m error. However, if the length is rounded to the nearest 1m this would give a measured value of 38m which is 1.1m from the true value and is outside the permissible accuracy.
Whilst such rounding may not affect the ability of an entire dataset to meet its required confidence level, rounding should be treated with care and, as far as is practicable, not applied after origination unless the publication requirements necessitate it.

6.7 Integrity

6.7.1 Definition in Regulation

A degree of assurance that a data item and its value have not been lost or altered since the data origination or authorised amendment.

6.7.2 Source

Derived from ICAO Annex 15 [RD 10], Chapter 1.1 – Definitions.

6.7.3 Clarifications

The term Integrity is used within ICAO and the ADQ IR to mean the integrity of data. It relates to a measure that a data item retains its originally assigned value and that it has not been lost, altered or corrupted unintentionally.

The ICAO Annexes classify data, based upon the potential risk resulting from the use of corrupted data items, as either routine data, essential data or critical data, each with their own requirement for maintaining integrity (see ICAO Annex 15 [RD 10] Chapter 3.3.3).

It should be noted that the integrity classification has no bearing on how wrong the aeronautical data and information may be if integrity is lost. A loss of integrity may lead to a data value being incorrect by a small amount or by several orders of magnitude.

6.8 Integrated Aeronautical Information Package (IAIP)

6.8.1 Definition in Regulation

A package in paper, or electronic media, which consists of the following elements:

a) aeronautical information publications (hereinafter AIP), including amendments;

b) supplements to the AIP;

c) the NOTAM, as defined in point 17 and pre-flight information bulletins;

d) aeronautical information circulars; and

e) checklists and lists of valid NOTAMS.

6.8.2 Source

Taken from ICAO Annex 15 [RD 10], Chapter 1.1 – Definitions.

6.8.3 Clarifications

The IAIP is well understood and the definition provided by ICAO clearly states its content.
6.9 Obstacle Data

6.9.1 Definition in Regulation

Data concerning all fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight or that stand outside those defined surfaces and that have been assessed as being a hazard to air navigation.

6.9.2 Source

Taken from ICAO Annex 15 [RD 10], Chapter 1.1 – Definitions.

6.9.3 Clarifications

Obstacle is used to refer to any object which may be considered to be hazardous to flight operations. An obstacle may be man-made, such as a building, or naturally occurring, such as a tree. Furthermore, an obstacle may be permanent (i.e. always existing in the same location) or mobile. In this latter case, the obstacle will be represented by an area in which it may be found. There is no guarantee that it will always exist, in all cases. The following should be considered with regards to mobile obstacles:

1) Some are always present within a defined region, for example, a dock crane which is constrained to operating along the limited track available;
2) Some may only be present at times, for example, lorries travelling along a motorway.

It should be noted, however, that the term “obstacle” can cause confusion and differs depending upon the point of view and perspective of the individual.

For example, a procedure designer has clearly defined assessment surfaces that dictate what an obstacle is and these surfaces will end relatively close to the aerodrome. If we now consider an en-route obstacle of 150m, for example, located many kilometres from any aerodrome, many procedure designers would not consider this to be an obstacle.

6.10 Terrain Data

6.10.1 Definition in Regulation

Data about the surface of the earth containing naturally occurring features such as mountains, hills, ridges, valleys, bodies of water, permanent ice and snow, and excluding obstacles.

6.10.2 Source

Taken from ICAO Annex 15 [RD 10], Chapter 1.1 – Definitions.

6.10.3 Clarifications

There has been much debate regarding what constitutes terrain within the EUROCONTROL TOD Working Group. The reader is advised to refer to the TOD Manual [RD 34] issued by EUROCONTROL for further clarification of terrain and its representation in digital form.

It should be noted that the ICAO definition also provides the following note:

“In practical terms, depending on the method of data collection used, terrain represents the continuous surface that exists at the bare Earth, the top of the canopy or something in-between, also known as “first reflective surface.”
6.11 Aerodrome Mapping Data

6.11.1 Definition in Regulation
Data collected for the purpose of compiling aerodrome mapping information.

6.11.2 Source
Taken from ICAO Annex 15 [RD 10], Chapter 1.1 – Definitions.

6.11.3 Clarifications
Aerodrome Mapping Data (AMD) refers to a digital dataset that provides the information needed to provide a representation of the facilities available at an aerodrome. These facilities include, but are not limited to, runways, taxiways, stands, markings and lighting.

The term AMD is often used interchangeably with the phrase Aerodrome Mapping Database (AMDB). Strictly speaking, AMD represents the data and information which may be contained within an aeronautical database and provided as a specialised data product, such as the AMDB (based on EUROCAE ED-99A [RD 9] and EUROCAE ED-119 [RD 8]).

6.12 Survey Data

6.12.1 Definition in Regulation
Geospatial data that is determined by measurement or survey.

6.12.2 Source
This definition has been created as a consequence of the ADQ IR in order to allow a clear and unambiguous understanding of its meaning and intent to be gained by users of the ADQ IR and its supporting material.

6.12.3 Clarifications
Data may be originated in one of a number of ways, one of which is through measurement, usually resulting from the process of survey. Within the context of the ADQ Regulation, Survey Data is used to define any data whose value is determined through such means.

Measurements will typically relate to positions, distances, lengths, widths, bearings and angles, etc.

6.13 Procedure Design

6.13.1 Definition in Regulation
The combination of aeronautical data with specific flight instructions to define instrument arrival and/or departure procedures that ensure adequate standards of flight safety.

6.13.2 Source
This definition has been created as a consequence of the ADQ IR in order to allow a clear and unambiguous understanding of its meaning and intent to be gained by users of the ADQ IR and its supporting material.
6.13.3 Clarifications
Where flights operate under IFR to and from an aerodrome, rules are required which define, for both the Flight Management System (FMS) of aircraft and the pilots, how the aircraft should behave in its arrival or departure. There are many different types of rules which are suited to differing modes of operation but, in essence, these are described as flight procedures. Flight procedures are created by an expert who will utilise numerous sources of data, operating minima and guidance material to create them. This act is referred to as Procedure Design.

6.14 Aeronautical Information Service Provider

6.14.1 Definition in Regulation
The organisation responsible for the provision of an aeronautical information service, certified in accordance with the requirements of Commission Implementing Regulation (EU) No 1035/2011¹.

6.14.2 Source
This definition has been created as a consequence of the drafting of the ADQ Regulation, in order to allow a clear and unambiguous understanding of its meaning and intent to be gained by those affected by the ADQ IR and its supporting material.

6.14.3 Clarifications
Within each State, a body is designated, by the State, as the official provider of the AIS and this body is referred to, within the context of the ADQ Regulation, as the Aeronautical Information Service Provider (AISP).

The AISP should be the body that is certified against the AIS elements of the SES common requirements [RD 1].

6.15 Next Intended User

6.15.1 Definition in Regulation
The entity that receives the aeronautical information from the aeronautical information service provider.

6.15.2 Source
This definition has been created as a consequence of the ADQ IR in order to allow a clear and unambiguous understanding of its meaning and intent to be gained by users of the ADQ IR and its supporting material.

6.15.3 Clarifications
The ICAO SARPS often refer to “distribution to the next intended user” and confusion existed over which person or organisation this actually represented. This has been clarified through this definition which makes it explicit that the next intended user is the person or organisation that receives aeronautical data and information directly from the AISP.

¹ OJ L 271, 18.10.2011, p. 23–41
6.16  Direct Electronic Connection

6.16.1 Definition in Regulation

A digital connection between computer systems such that data may be transferred between them without manual interaction.

6.16.2 Source

This definition has been created as a consequence of the ADQ IR in order to allow a clear and unambiguous understanding of its meaning and intent to be gained by users of the ADQ IR and its supporting material.

6.16.3 Clarifications

This definition resulted from the need to explicitly identify the occurrence when aeronautical data and information is delivered by electronic means from one system to another system by their interconnection. Means of achieving this include:

1) Private networks;
2) Internet connections;
3) Virtual private networks.

Section 8.2.1 of this Guide provides additional explanation on direct electronic connection.

6.17  Data Item

6.17.1 Definition in Regulation

A single attribute of a complete dataset, which is allocated a value that defines its current status.

6.17.2 Source

This definition has been created as a consequence of the drafting of the ADQ IR in order to allow a clear and unambiguous understanding of its meaning and intent to be gained by those affected by the ADQ IR and its supporting material.

6.17.3 Clarifications

A data item is a piece of aeronautical data and is associated with a value.

For example, the ‘elevation of the threshold of Runway 26 at an Aerodrome’ is a data item. The actual measured elevation, for example, 33m is the value associated with that data item.

A data item is used to characterise a feature, in this case an aerodrome.

Data items typically exist for many years whilst the value associated with them may change one or more times during that lifetime.

6.18  NOTAM

6.18.1 Definition in Regulation

A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.
6.18.2 Source
Taken from ICAO Annex 15 [RD 10], Chapter 1.1 – Definitions.

6.18.3 Clarifications
Notice to Airmen (NOTAM) provide a means of communicating small changes or supplementary information to the AIP in an expedient manner. As such, NOTAM messages allow for the fast distribution of information whenever it is necessary to give due warning of any change or occurrence, at short notice.

NOTAM messages are short (typically a maximum of 1800 characters) and are human readable.

Information published by NOTAM should be valid for a maximum of three months and not contain extensive text and/or graphics. If this criteria cannot be met, an AIP Amendment should be used for permanent information and an AIP Supplement for temporary information.

NOTAM were traditionally disseminated via the Aeronautical Telecommunications Network (ATN), however, today, other means are often used in parallel, such as databases, internet and high-speed, high bandwidth private networks. NOTAM is generically used to refer to the family of electronic messages which include:

1) NOTAM;
2) SNOWTAM;
3) ASHTAM.

6.19 Digital NOTAM

6.19.1 Definition in Regulation
A data set that contains the information included in a NOTAM in a structured format which can be fully interpreted by an automated computer system without human interpretation.

6.19.2 Source
This definition has been created as a consequence of the ADQ IR in order to allow a clear and unambiguous understanding of its meaning and intent to be gained by users of the ADQ IR and its supporting material.

6.19.3 Clarifications
The usefulness of traditional NOTAM messages cannot be questioned as they have supported aviation operations for many years. However, with the advancement of technology, the introduction of computers and the availability of high-speed / high bandwidth networks, the usefulness of NOTAM may be enhanced by their move to a computer literate form.

Digital NOTAM is used to refer to a means of providing NOTAM messages in a truly digital environment, i.e. one in which the recipient may be a system that automatically interprets, without ambiguity, the content of the Digital NOTAM and may apply the information it contains to operational systems, such that users are presented with the latest, up-to-date information in a seamless manner and without the need to familiarise themselves with the traditional NOTAM.

6.20 Data Originator

6.20.1 Definition in Regulation
An entity responsible for data origination.
6.20.2 Source
This definition has been created as a consequence of the ADQ IR in order to allow a clear and unambiguous understanding of its meaning and intent to be gained by those affected by the ADQ IR and its supporting material.

6.20.3 Clarifications
At some point in time, a data value is associated with a data item and somebody has created this value. The creation may be establishment of the first value for a data item or a new, modified value. The person or organisation that undertakes this role is the data originator.

The data originator should not be confused with the person who requests the data, i.e. the person who creates the data item in the first instance. The latter is most likely undertaken by the body responsible for requesting the data origination activity.

In many cases, the data originator will create the values for many data items at the same time. For example, an aerodrome survey will establish new or updated values for all the data items associated with the aerodrome, not just a single item.

The data originator should also not be confused with the entity providing the data. Whilst at a specific point these maybe the same, there are occasions where the entity providing the data is not the data originator. For example, when a surveyor provides the data to the aerodrome the surveyor and the entity providing the data are the same; however, when the aerodrome provides that same data to the AISP it becomes the entity providing the data, but the data originator is still the surveyor.

6.21 Data Origination

6.21.1 Definition in Regulation
The creation of a new data item with its associated value, the modification of the value of an existing data item or the deletion of an existing data item.

6.21.2 Source
This definition has been created as a consequence of the ADQ IR in order to allow a clear and unambiguous understanding of its meaning and intent to be gained by those affected by the ADQ IR and its supporting material.

6.21.3 Clarifications
At some point in time, a data value is associated with a data item and the creation of this value is the act of data origination. The creation may be the establishment of the first value for a data item or a new value which modifies an existing value. It should be noted that the cancellation of a data item (i.e. its deletion) is also an act of data origination as the need to change the status of existing data item has been originated.

Data origination should not be confused with the act of ‘creating’ the data item in the first instance. The data item is created when it is first identified that a value will need to be measured or derived. For example, the construction of a new runway will result in the creation of its associated data items, such as the threshold points, runway identifier and length. In the case of the threshold point, the act of data origination is when a surveyor actually measures the location of the threshold and creates the associated value for the data item.
6.22 Period of Validity

6.22.1 Definition in Regulation

The period between the date and time on which aeronautical information is published and the date and time on which the information ceases to be effective.

6.22.2 Source

This definition has been created as a consequence of the ADQ IR in order to allow a clear and unambiguous understanding of its meaning and intent to be gained by users of the ADQ IR and its supporting material.

6.22.3 Clarifications

Aeronautical data and information normally has three key dates associated with it:

1) The date on which the message / publication conveying the aeronautical data and information is valid (the start of validity);
2) The date on which the aeronautical data and information conveyed in the message / publication becomes effective (the start of effectivity);
3) The date on which the effectivity of the aeronautical data and information conveyed in the message / publication ends (the end of effectivity).

The Period of Validity is defined as the period from (a) to (c). In some cases, for information which is immediately effective, (a) and (b) may be the same. (c) may, of course, be set as indefinite for permanent aeronautical data and information.

This period is important as it defines the period in which aeronautical data and information is of potential use. The period between (a) and (b) is often used for planning future operations and would equate to, as an example, the period between a NOTAM being issued to notify of a runway closure for maintenance and the actual closure.

6.23 Data Validation

6.23.1 Definition in Regulation

The process of ensuring that data meets the requirements for the specified application or intended use.

6.23.2 Source

This definition has been created as a consequence of the ADQ IR in order to allow a clear and unambiguous understanding of its meaning and intent to be gained by users of the ADQ IR and its supporting material.

6.23.3 Clarifications

The terms validation and verification are often confused. Validation is the process of checking if something satisfies a certain criterion, i.e., that the product is adequate for its intended use. Data validation is, for example, the process of confirming that if a data item meets its required characteristics, that it will be useable for those applications for which the aeronautical data and information is intended and, further, that the processes and procedures in place are adequate to ensure that these characteristics should be achieved.
For example, Data Validation would ensure that the required accuracy, resolution and integrity of a threshold point, meet the requirements of those applications that use threshold points and that the operating procedures will provide an adequate level of assurance that these criteria are met.

6.24 Data Verification

6.24.1 Definition in Regulation

The evaluation of the output of an aeronautical data process to ensure correctness and consistency with respect to the inputs and applicable data standards, rules and conventions used in that process.

6.24.2 Source

This definition has been created as a consequence of the ADQ IR in order to allow a clear and unambiguous understanding of its meaning and intent to be gained by users of the ADQ IR and its supporting material.

6.24.3 Clarifications

The terms validation and verification are often confused. Verification is the process of checking that the data value meets its quality requirements. The intent of this ADQ IR is that this is achieved through assurance that the correct processes and procedures, etc. have been applied in creating the data value.

Data verification is, therefore, the process of confirming that all the required processes have been applied to the aeronautical data and information in its origination, processing and / or publication. For example, Data Verification would ensure that processes applied in originating and processing a threshold point allow the integrity classification associated with it to be met.

6.25 Critical Data

6.25.1 Definition in Regulation

Data as classified under point (c) of the integrity classification defined in Chapter 1, Section 1.1 of Annex 15 to the Chicago Convention on International Civil Aviation (hereinafter the Chicago Convention).

6.25.2 Source

Makes reference to the ICAO Annex 15 [RD 10], Chapter 1 Section 1.1 point (c) definition.

6.25.3 Clarifications

According to the ICAO Annex 15 [RD 10], Chapter 1 Section 1.1 point (c), there is a high probability when using corrupted critical data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe.

This classification is assigned to those data items where an integrity error would lead to a significant risk that the operation of the aircraft would be compromised. Whilst from an ICAO perspective this definition focuses on “continued safe flight and landing”, in general, the risk to the aircraft, its passengers and its surrounding environment should be considered even when the aircraft is on the ground, for example, taxiing.
6.26 Essential Data

6.26.1 Definition in Regulation

Data as classified under point (b) of the integrity classification defined in Chapter 1, Section 1.1 of Annex 15 to the Chicago Convention.

6.26.2 Source

Makes reference to the ICAO Annex 15 [RD 10], Chapter 1 Section 1.1 point (b) definition.

6.26.3 Clarifications

According to ICAO Annex 15 [RD 10], Chapter 1 Section 1.1 point (b), there is a low probability when using corrupted essential data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe.

This level is assigned to those data items where an integrity error would lead to a low risk that the operation of the aircraft would be compromised. Whilst from an ICAO perspective this definition focuses on “continued safe flight and landing”, in general, the risk to the aircraft, its passengers and its surrounding environment should be considered even when the aircraft is on the ground, for example, taxiing.
7. **ARTICLE 4 AND ANNEX I – DATASET**

7.1 **Regulatory Basis of Article 4**

Article 4 establishes provisions that require the parties to provide aeronautical data and information in accordance with a defined dataset. This provision exists to ensure that a defined scope of aeronautical data and information is provided and supports the requirement of the ADI Mandate for States to use a common dataset. The phrase common dataset is used to indicate that the datasets used throughout the SES States should comprise a single, defined, harmonised content.

The ADQ IR is not able to specify a particular dataset, rather it must specify the performance requirements of the utilised dataset; in other words, specify the rules for the dataset specification. These rules are defined in Annex I to the ADQ Regulation.

7.2 **Article 4**

The following sections outline the specific provisions and requirements of Article 4 and provide guidance as to acceptable means of compliance.

7.2.1 **Article 4(1)**

7.2.1.1 **Text of Provision**

The parties referred to in Article 2(2) shall provide aeronautical data and aeronautical information in accordance with the dataset specifications described in Annex I.

7.2.1.2 **Applicability**

This Article is applicable to all actors who fall under the terms of the ADQ Regulation. See section 5.2.2.

7.2.1.3 **Rationale/Need for Provision**

One key component of the ADQ IR is the ability for actors in the aeronautical data chain to digitally exchange aeronautical data and information in a seamless and interoperable manner. The provision of data using a commonly agreed and standardised data set specification is essential to achieve this objective and to fully support SES initiatives, such as the use of FABs.

7.2.1.4 **Explanation of Provision**

Article 4(1) ensures that all parties are using a core, common dataset specification for providing aeronautical data and information, promoting interoperability.

Annex I, referred, provides the key performance requirements against which the common dataset specification must be defined. These requirements are outlined in 7.2.2.

Because the ADQ IR has an impact on a wide range of parties, it is accepted that not all these regulated entities will have the same level of requirements. This means that a specific party may wish to use a data set specification that is more in accordance with its own obligations. For example, whilst the data set specification used by an AISP shall cover the entire content of the AIP (in order to allow the AISP to provide a dataset that includes all the data items published in the AIP), an aerodrome operator may use a sub-part of the data set specification to cover only those data items for which it is responsible. The usage of different data set specifications is acceptable as long as these specifications ensure the interoperability between them.
7.2.1.5 Implementing the Provision(s)

The Aeronautical Information Exchange Model (AIXM) is becoming the *de facto* standard for the modelling and exchange of aeronautical data and information. The Conceptual Model of its most recent version, AIXM 5.1, fully complies with the performance requirements of Annex I of the ADQ Regulation. It is, therefore, recommended to all regulated parties to consider its use to facilitate the interoperability of the EATMN.

The ADQi WG is currently developing guidelines to support the mapping of aerodrome related data to AIXM 5.1. This will allow the aerodrome operators to use AIXM 5.1 without the need to implement the complete AIXM 5.1 Conceptual Model. These guidelines will be incorporated in this Guide in ANNEX B.

7.2.1.6 Means of Compliance

The EUROCONTROL Specification for Aeronautical Information Exchange [RD 29] and its associated guidance material provides support for the implementation of this specific provision. Moreover, the Specification makes the bridge to support implementation of this provision through AIXM 5.1, Annex I.

The following sections outline the specific provisions and requirements of Annex I and provide guidance as to acceptable means of compliance.

7.2.2 Annex I Part A - IAIP, Aerodrome Mapping and Electronic Obstacle Data

Part A of Annex I provides requirements for the definition of a dataset specification for the following components:

1) IAIP
   The content of the IAIP as defined by ICAO Annex 15 [RD 10], with the exception of AIC. The IAIP dataset may also contain aeronautical data and information that a State elects to publish which is not required by ICAO.

2) Aerodrome Mapping Data
   AMD made available by the State, as defined by ICAO Annex 15 [RD 10] Chapter 11.

3) Electronic Obstacle Data
   Digital datasets of obstacle data made available by the State, as defined by ICAO Annex 15 [RD 10] Chapter 10 and Appendix 8.

7.2.2.1 Annex I Part A (a)

7.2.2.1.1 Text of Requirement

The aeronautical data and aeronautical information referred to in points (a), (b) and (d) of the second subparagraph of Article 2(1) shall be provided according to a common dataset specification which shall:

   (a) be documented either:
       - by using the unified modelling language (UML), specified in the document referred to in point 13 of Annex III, in the form of class diagrams and associated definitions for classes, attributes, associations and lists of values, or
       - by using a feature catalogue specified in accordance with the ISO standard referred to in point 25 of Annex III;
7.2.2.1.2 Analysis of Requirement

This requirement ensures that the datasets are documented and that this documentation is provided in an open and interoperable manner through the utilisation of international standards. Two choices exist for the means by which the dataset is documented:

1) The first choice is the Unified Modelling Language which is a standard means of describing data items and their interrelationships. The standard was developed by the Object Management Group (OMG) and has been adopted by the International Organisation for Standardisation (ISO) and the International Electrotechnical Commission (IEC) as an international standard: ISO/IEC 19501:2005 “Information technology - Open Distributed Processing -- Unified Modelling Language (UML)” [RD 23].

2) The second option allows for the specification to be documented using a feature catalogue. A feature catalogue is a full definition of data, including descriptions of the feature types and feature attributes that it comprises, including the relationships between the features. This provision requires that the feature catalogue is provided in accordance with ISO 19110:2005 “Geographic information -- Methodology for feature cataloguing” [RD 16].

7.2.2.1.3 Means of Compliance

The AIXM 5.1 Conceptual Model is specified using the Unified Modelling Language (UML). It models the important features, properties (attributes and associations) and business rules that make up aeronautical information. As such, it can be used as the basis for the design of an AIM database.

Introduction to UML is part of the syllabus of the course Implementing Aeronautical Data Quality (ADQ) [IM-ADQ] provided by the EUROCONTROL Training Institute in Luxembourg.

The EUROCONTROL Specification for Aeronautical Data Exchange [RD 29] and its associated guidance material provides support for the implementation of this specific provision. Moreover the Specification makes the bridge to support implementation of this provision through AIXM 5.1.

7.2.2.2 Annex I Part A (b)

7.2.2.2.1 Text of Requirement

The aeronautical data and aeronautical information referred to in points (a), (b) and (d) of the second subparagraph of Article 2(1) shall be provided according to a common dataset specification which shall:

(b) define, as individual data elements, each aeronautical feature for which the information is requested to be published in accordance with the ICAO standards referred to in point 10 of Annex III and the Eurocae document referred to in point 24 of Annex III;

7.2.2.2.2 Analysis of Requirement

This requirement mandates the level at which the dataset is described. Each aeronautical feature published within either the AIP or included within AMD needs to be described separately. For example, the AIP includes routes, Navigation Aids (Navaids) and runways, etc. Quite simply, the dataset definition must contain all the aeronautical data and information that a State publishes in its AIP and within AMD, if it makes it available.

It is, therefore, necessary that, when developing the dataset specification, the organisation considers, in detail, the contents of ICAO Annex 15 [RD 10] Appendix 1 and EUROCAE ED-99A [RD 9].

7.2.2.2.3 Means of Compliance

The EUROCONTROL Specification for Aeronautical Data Exchange [RD 29] and its associated guidance material provides support for the implementation of this specific provision. Moreover, the Specification makes the bridge to support implementation of this provision through AIXM 5.1.

### 7.2.2.3 Annex I Part A (c)

#### 7.2.2.3.1 Text of Requirement

The aeronautical data and aeronautical information referred to in points (a), (b) and (d) of the second subparagraph of Article 2(1) shall be provided according to a common dataset specification which shall:

- (c) provide for each attribute the definition of its allowable values in the form of a data type, a range of values or an enumerated list;

#### 7.2.2.3.2 Analysis of Requirement

Each aeronautical feature will comprise one or more attributes. In the context of the ADQ Regulation, attributes are defined as data items. For example, if we take en-route Navaids, ICAO Annex 15 [RD 10] Appendix 1, provides the following requirement:

**ENR 4.1 Radio navigation aids — en-route**

A list of stations providing radio navigation services established for en-route purposes and arranged alphabetically by name of the station, including:

1) name of the station and magnetic variation to the nearest degree and for VOR, station declination to the nearest degree used for technical line-up of the aid;

2) identification;

3) frequency/channel for each element;

4) hours of operation;

5) geographical coordinates in degrees, minutes and seconds of the position of the transmitting antenna;

6) elevation of the transmitting antenna of DME to the nearest 30 m (100 ft); and

7) remarks.

*Figure 2 - En-route Navaids in AIP*
Here we can see that the dataset must include the following attributes for en-route Navaids:

1) Navaid name;
2) Magnetic variation;
3) Station declination;
4) Navaid Identifier;
5) Frequency or channel;
6) Hours of operation;
7) Latitude;
8) Longitude;
9) Elevation;
10) Remarks.

For some of these attributes, we can see there are constraints imposed on the values by the very nature of the attribute. For example, a frequency will be constrained by the possible frequency band that the particular type of Navaid may operate within. In addition, some of the types, such as hours of operation, naturally have generic constraints such as 24 hours a day. These must also be included within the dataset definition.

7.2.2.3 Means of Compliance

The AIXM 5.1 Conceptual Model lists all the attributes for each feature, including any constraints on the permissible values.

The EUROCONTROL Specification for Aeronautical Data Exchange [RD 29] and its associated guidance material provides support for the implementation of this specific provision. Moreover the Specification makes the bridge to support implementation of this provision through AIXM 5.1.

7.2.2.4 Annex I Part A (d)

7.2.2.4.1 Text of Requirement

The aeronautical data and aeronautical information referred to in points (a), (b) and (d) of the second subparagraph of Article 2(1) shall be provided according to a common dataset specification which shall:

(d) include the definition of a temporal model, UTC based, which can express the complete lifecycle of an aeronautical feature:

- from the creation date and time to the date and time of permanent withdrawal;
- including the permanent changes that create new baselines for that feature.

7.2.2.4.2 Analysis of Requirement

The dataset definition must allow for the inclusion of temporality for each feature, based upon the use of Coordinated Universal Time (UTC). Each feature must allow the association of dates and times, in order to record:

1) The creation of the feature;
2) The permanent withdrawal (cancellation) of the feature;
3) Any changes associated with the values of the attributes associated with the feature.

This information allows a database, developed in compliance with the dataset specification, to contain fully temporal aeronautical data and information, and allows the recreation / creation of a situation for any point in the past or future.
7.2.2.4.3 Means of Compliance

AIXM 5.1 includes an exhaustive temporality model, at feature level, that is compliant with the requirements. AIXM 5.1 is able to communicate both permanent changes, such as those that occur at AIRAC cycles and temporary situations, typically promulgated through NOTAM.

The EUROCONTROL Specification for Aeronautical Data Exchange [RD 29] and its associated guidance material provides support for the implementation of this specific provision. Moreover the Specification makes the bridge to support implementation of this provision through AIXM 5.1.

7.2.2.5 Annex I Part A (e)

7.2.2.5.1 Text of Requirement

The aeronautical data and aeronautical information referred to in points (a), (b) and (d) of the second subparagraph of Article 2(1) shall be provided according to a common dataset specification which shall:

(e) include the definition of the rules that may constrain the possible values of the feature properties or the temporal variation of these values. This shall include, as a minimum:

- constraints that impose accuracy, resolution and integrity for positional (horizontal and vertical) data;
- constraints that impose the timeliness of the data.

7.2.2.5.2 Analysis of Requirement

This provision introduces the need for the dataset specification to include the rules that constrain the attributes of a feature. Rules must be included to:

1) Constrain the accuracy, resolution and integrity for positional data/information

   Rules may be used to define the acceptable bounds that are associated with each attribute. Depending upon the nature of the attribute, the constraints may vary. For example, for a textual value, accuracy and resolution would not be appropriate. Constraints may, for example, restrict the length of a runway to having a minimum and maximum value.

2) Constrain and impose the timeliness of the aeronautical data and information

   Business rules may be used to determine the time constraints for aeronautical data and information in terms of its period of effectivity and the amount of prior notification needed in advance of a change.

7.2.2.5.3 Means of Compliance

The AIXM Conceptual Model includes rules and plausibility checks on the data. For example:

- Each runway should be within 25 NM of the aerodrome reference point (data plausibility check)
- Any new 5-letter waypoint identifier shall be unique world-wide (mandatory rule)

The EUROCONTROL Specification for Aeronautical Data Exchange [RD 29] and its associated guidance material provides support for the implementation of this specific provision. Moreover the Specification makes the bridge to support implementation of this provision through AIXM 5.1.

7.2.2.6 Annex I Part A (f)

7.2.2.6.1 Text of Requirement

The aeronautical data and aeronautical information referred to in points (a), (b) and (d) of the second subparagraph of Article 2(1) shall be provided according to a common dataset specification which shall:
(f) apply a naming convention for features, attributes and associations, which avoids the use of abbreviations;

7.2.2.6.2 Analysis of Requirement

In describing the features, attributes and associations (relationships) that make up the dataset specification, the names used are required to follow a naming convention and should not make use of abbreviations. For example, the word “Aerodrome” should be used rather than the abbreviation “AD”.

7.2.2.6.3 Means of Compliance

The EUROCONTROL Specification for Aeronautical Data Exchange [RD 29] and its associated guidance material provides support for the implementation of this specific provision. Moreover the Specification makes the bridge to support implementation of this provision through AIXM 5.1.

7.2.2.7 Annex I Part A (g)

7.2.2.7.1 Text of Requirement

The aeronautical data and aeronautical information referred to in points (a), (b) and (d) of the second subparagraph of Article 2(1) shall be provided according to a common dataset specification which shall:

(g) base the description of geometrical elements (point, curve, surface) on the ISO standard referred to in point 14 of Annex III;

7.2.2.7.2 Analysis of Requirement

All elements of the dataset which relate to geometrical elements must be described in accordance with ISO 19107:2003 “Geographic information – Spatial schema” [RD 15]. This standard specifies conceptual schemas for describing the spatial characteristics of geographic features, and a set of spatial operations consistent with these schemas.

For example, the standard defines a point type of GM_Point and describes it as:

“GM_Point is the basic data type for a geometric object consisting of one and only one point.”

By complying with these basic elements, the interoperability of the resultant dataset is greatly enhanced and enables the use of Commercial Off-the-Shelf (COTS) products to visualise the geometric elements.

7.2.2.7.3 Means of Compliance

The AIXM Conceptual Model makes full use of the GML standard by using a set of GML features to express the geometrical elements of the Model.

The EUROCONTROL Specification for Aeronautical Data Exchange [RD 29] and its associated guidance material provides support for the implementation of this specific provision. Moreover the Specification makes the bridge to support implementation of this provision through AIXM 5.1.

7.2.2.8 Annex I Part A (h)

7.2.2.8.1 Text of Requirement

The aeronautical data and aeronautical information referred to in points (a), (b) and (d) of the second subparagraph of Article 2(1) shall be provided according to a common dataset specification which shall:

(h) base the description of the metadata information on the ISO standard referred to in point 15 of Annex III;
7.2.2.8.2 Analysis of Requirement

Metadata is, to quote the ISO definition, “data about data”, i.e. it is data that describes a dataset. For example, if we take a surveyed obstacle, metadata could provide the date of survey and the acquisition method used. There is often debate as to the dividing line between data and metadata. From the perspective of ADQ, the divide between these is not so important, provided that the dataset describes, in its entirety, all elements needed to cover both.

ISO 19115:2014 “Geographic information - Metadata” [RD 18] identifies the metadata features required to describe digital, geographic data and information. To base the description on the ISO Standard, the encoding of the metadata items that are required by the ADQ IR should be mapped to the features and attributes that are already defined in the ISO Standard.

7.2.2.8.3 Means of Compliance

The Aeronautical Data Quality Implementation Working Group (ADQi WG) is currently developing guidance material to support the mapping between the metadata items that are required by the ADQ IR and the metadata features defined in the ISO 19115:2014 [RD 18]. This guidance material will be included in ANNEX B of this Guide.

The EUROCONTROL Specification for Aeronautical Data Exchange [RD 29] and its associated guidance material provides support for the implementation of this specific provision. Moreover the Specification makes the bridge to support implementation of this provision through AIXM 5.1.

7.2.2.9 Annex I Part A (i)

7.2.2.9.1 Text of Requirement

The aeronautical data and aeronautical information referred to in points (a), (b) and (d) of the second subparagraph of Article 2(1) shall be provided according to a common dataset specification which shall:

(i) include the metadata items listed in Annex I, Part C.

7.2.2.9.2 Analysis of Requirement

This requirement specifies the minimum metadata elements that the dataset must include. See Annex I Part C for full details of the required metadata.

There is debate concerning the amount and detail of metadata that should be transmitted and carried over in each exchange of data. To address this question, the ARWG issued the Common Understanding 06/2014 Provisions of Commission Regulation (EU) 73/2010 for Metadata. This Common Understanding was built on the opinion that the ADQ IR defines which metadata items shall be specified (i.e. defined as part of the data set specification) and how they shall be exchanged (i.e. implemented through the data exchange format) between the regulated parties. However, there are neither any specific requirements that define which specific metadata items shall be exchanged during each data transfer, nor how much detail or volume of metadata should be forwarded. The Common Understanding then suggests that these should be defined within the Formal Arrangements established between the relevant parties to govern each data exchange.


7.2.2.9.3 Means of Compliance

Common Understanding 06/2014 Provisions of Commission Regulation (EU) 73/2010 for Metadata includes the conclusions from the ARWG concerning the handling of the metadata.

Because the AIXM 5.1 Conceptual Model does not include the features and attributes required to encode directly all the metadata elements defined in Annex I, Part C of the ADQ IR, it is possible to include within an AIXM 5.1 dataset the metadata elements from the ISO 19115:2014 [RD 18]. For this purpose the AIXM 5.1 Conceptual Model re-uses directly the MD_Metadata element defined in the ISO 19115:2014 [RD 18].
Nevertheless, it should be noted that some of the metadata items required by the ADQ IR may still be mapped directly to specific features and attributes from the AIXM 5.1 Conceptual Model. In these cases the preference is given to use these elements instead of the elements from the ISO Standard.

The ADQi WG is currently developing guidance material to support the encoding of the metadata items required by the ADQ Regulation. The guidelines will include further clarification of what is required and how to map these metadata items to the ISO 19115:2014 [RD 18] elements and to elements of the AIXM 5.1 Conceptual Model. This guidance material will be included in this Guide in ANNEX B.

The EUROCONTROL Specification for Aeronautical Data Exchange [RD 29] and its associated guidance material provides support for the implementation of this specific provision. Moreover the Specification makes the bridge to support implementation of this provision through AIXM 5.1.

### 7.2.3 Annex I Part B (Electronic Terrain Datasets)

Part B of Annex I provides requirements for the definition of a dataset for digital terrain data which the State makes available, and as defined by ICAO Annex 15 [RD 10] Chapter 10 and Appendix 8.

#### 7.2.3.1 Annex I Part B (a)

**Text of Requirement**

The electronic terrain data referred to in point (c) of the second subparagraph of Article 2(1) shall:

(a) be provided digitally in accordance with the ICAO standards referred to in points 9, 9a and 12 of Annex III;

**Analysis of Requirement**

At the time of writing the ADQ Regulation the exact requirements of the terrain dataset were not fully known. As a result, the provisions have been drafted at a higher level than for other aeronautical data and information.

This requirement simply states that the dataset for terrain data shall comply with the ICAO requirements in ICAO Annex 15 [RD 10] Sections 10.1 Coverage areas and requirements for data provision and 10.2 Terrain data set — content, numerical specification and structure and Appendix 8 Appendix 8 (Terrain and obstacle data requirements)

**Means of Compliance**

The TOD Manual [RD 34] provides guidance concerning the conceptual (i.e. the dataset specification) to be used for terrain datasets.

#### 7.2.3.2 Annex I Part B (b)

**Text of Requirement**

The electronic terrain data referred to in point (c) of the second subparagraph of Article 2(1) shall:

(b) include the metadata items listed in Annex I, Part C.

**Analysis of Requirement**

This requirement specifies some of the metadata attributes that the dataset must include. See Annex I Part C for full details of the required metadata

**Means of Compliance**

The TOD Manual [RD 34] provides guidance concerning the conceptual model to be used for terrain datasets and how the metadata elements should be described.
7.2.4  Annex I Part C (Metadata)

Part C of Annex I provides requirements for the provision of metadata to support the data content of the dataset defined in Parts A and B of Annex I.

### 7.2.4.1 Annex I Part C (a)

#### Text of Requirement

*The metadata for the dataset specifications defined in Part A and Part B shall include the following items, as a minimum:*

(a)  the data originator of the data;

#### Analysis of Requirement

This requirement mandates that the metadata record, for each data item, details of the originator of the data. Given that data and information relating to a single feature may come from differing sources, care must be taken to ensure that adequate provision is made to allow for the differing originators. For example, for a Navaid, the originator of the position may be a surveyor, whilst the frequency may come from a government department responsible for spectrum allocation.

The ADQi WG is currently developing guidance material to support the encoding of the metadata items required by the ADQ Regulation. The guidelines will include further clarification of what is required and how to map these metadata items to the ISO 19115:2014 [RD 18] elements and to elements of the AIXM 5.1 Conceptual Model. This guidance material will be included in this Guide in ANNEX B.

#### Means of Compliance

ANNEX B of the Guide will include guidance material.

### 7.2.4.2 Annex I Part C (b)

#### Text of Requirement

*The metadata for the dataset specifications defined in Part A and Part B shall include the following items, as a minimum:*

(b)  amendments made to the data;

#### Analysis of Requirement

This requirement mandates that the metadata records, for each data item, details of any changes made to its associated value. This information will be used to allow users to identify changes to aeronautical data and information over its lifetime.

These amendments should record what aeronautical data and information changed and when.

The ADQi WG is currently developing guidance material to support the encoding of the metadata items required by the ADQ Regulation. The guidelines will include further clarification of what is required and how to map these metadata items to the ISO 19115:2014 [RD 18] elements and to elements of the AIXM 5.1 Conceptual Model. This guidance material will be included in this Guide in ANNEX B.

#### Means of Compliance

ANNEX B of the Guide will include guidance material.

### 7.2.4.3 Annex I Part C (c)

#### Text of Requirement

*The metadata for the dataset specifications defined in Part A and Part B shall include the following items, as a minimum:*
7.2.4.3.2 Analysis of Requirement

This requirement mandates that the metadata records any interaction with the aeronautical data and information and who the actor was. Interaction is any action which may affect the quality of the aeronautical data and information, including amendment and approval.

The viewing of aeronautical data and information, with no means of modifying or approving it, is not classified as interaction.

The ADQi WG is currently developing guidance material to support the encoding of the metadata items required by the ADQ Regulation. The guidelines will include further clarification of what is required and how to map these metadata items to the ISO 19115:2014 [RD 18] elements and to elements of the AIXM 5.1 Conceptual Model. This guidance material will be included in this Guide in ANNEX B.

7.2.4.3.3 Means of Compliance

ANNEX B of the Guide will include guidance material.

7.2.4.4 Annex I Part C (d)

7.2.4.4.1 Text of Requirement

The metadata for the dataset specifications defined in Part A and Part B shall include the following items, as a minimum:

(d) details of any validation and verification of the data that has been performed;

7.2.4.4.2 Analysis of Requirement

In processing aeronautical data and information, it will be subject to various validation and verification processes, intended to ensure that it meets its requirements.

This provision requires that the metadata elements makes adequate allowance for those who interact with aeronautical data and information to record the validation and verification processes that they apply to the aeronautical data and information.

The ADQi WG is currently developing guidance material to support the encoding of the metadata items required by the ADQ Regulation. The guidelines will include further clarification of what is required and how to map these metadata items to the ISO 19115:2014 [RD 18] elements and to elements of the AIXM 5.1 Conceptual Model. This guidance material will be included in this Guide in ANNEX B.

7.2.4.4.3 Means of Compliance

ANNEX B of the Guide will include guidance material.

7.2.4.5 Annex I Part C (e)

7.2.4.5.1 Text of Requirement

The metadata for the dataset specifications defined in Part A and Part B shall include the following items, as a minimum:

(e) effective start date and time of the data;

7.2.4.5.2 Analysis of Requirement

All data included within the dataset must include information relating to the period for which the aeronautical data and information is effective. A start of effectivity and end of effectivity, each comprising a date and time, should be associated with each item.

It should be noted that the end of effectivity may be recorded as “permanent” for any data items considered effective until otherwise notified.
The ADQi WG is currently developing guidance material to support the encoding of the metadata items required by the ADQ Regulation. The guidelines will include further clarification of what is required and how to map these metadata items to the ISO 19115:2014 [RD 18] elements and to elements of the AIXM 5.1 Conceptual Model. This guidance material will be included in this Guide in ANNEX B.

7.2.4.5.3 Means of Compliance

ANNEX B of the Guide will include guidance material

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### 7.2.4.6 Annex I Part C (f)

#### 7.2.4.6.1 Text of Requirement

*The metadata for the dataset specifications defined in Part A and Part B shall include the following items, as a minimum:*

(f) for geospatial data:
- the earth reference model used;
- the co-ordinate system used.

#### 7.2.4.6.2 Analysis of Requirement

The dataset is required to record, for each geospatial data item, the earth reference model and co-ordinate system used.

The “true” surface of the earth is the geoid. This takes account of gravity and rotation and most closely corresponds to Mean Sea Level. The geoid is a conventional reference surface for heights. The global geoid model specified for aviation, by ICAO, is Earth Gravitational Model - 1996 (EGM-96). Local geoid models also exist which take into account a global model and local gravity. An ellipsoid is the best fit of a geoid.

A reference system is the theoretical definition of a particular co-ordinate system and a datum is the minimum set of parameters to define the location and orientation of a local reference system with respect to a global reference system. In other words, datums are used to fit an ellipsoid to a geoid to minimise the differences between the two, over an area of interest.

Different reference systems / co-ordinate systems are applied world-wide to provide the most accurate description of a local area. However, for harmonisation purposes, World Geodetic System 1984 (WGS-84) has been adopted as the common reference system for aviation purposes and co-ordinates are published in accordance with this.

The ADQi WG is currently developing guidance material to support the encoding of the metadata items required by the ADQ Regulation. The guidelines will include further clarification of what is required and how to map these metadata items to the ISO 19115:2014 [RD 18] elements and to elements of the AIXM 5.1 Conceptual Model. This guidance material will be included in this Guide in ANNEX B.

7.2.4.6.3 Means of Compliance

ANNEX B of the Guide will include guidance material

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### 7.2.4.7 Annex I Part C (g)

#### 7.2.4.7.1 Text of Requirement

*The metadata for the dataset specifications defined in Part A and Part B shall include the following items, as a minimum:*

(g) for numerical data:
- the statistical accuracy of the measurement or calculation technique used;
7.2.4.7.2 Analysis of Requirement

The dataset is required to record, for each numerical data item, the following three metadata items:

1) The statistical accuracy of the numerical value, i.e. the maximum error (horizontal and/or vertical) that may be applicable to the value when the confidence level is taken into account (see c) below)

2) The recorded resolution of the value, i.e. the number of decimal places of significance, of the value

   It should be noted that, for example, a value of 10.00 can have a resolution of two decimal places. The fact that the first and second decimal positions are zero is of no consequence. Statistically, 1 in every 100 measurements will have these two digits as a zero.

   It should also be considered that, in order not to reduce accuracy by rounding, the resolution will normally be one decimal place more than that needed to reflect the accuracy. For example, if the accuracy requirement is 0.5m, the resolution should be recorded as 0.01.

3) The recorded level of confidence that the item has achieved its required accuracy

   The statistical principles governing the determination of a two-dimensional position consider a circular normal distribution around the real location of the measured data. Because there is no 100% certainty that what is measured reflects reality, the statistical calculation aims to determine the probability that the measurement falls inside a circle of a certain radius, centred on the true position of the item being measured.

   For example, if a single point were to be surveyed 100 times using the Global Positioning System (GPS), over a similar number of days, each day will, in all likelihood, provide a slightly different measurement to the day before and the day after. The typical requirement for aeronautical data is for a 95% confidence level. In this instance, we would be looking for a minimum of 95 of the measured values to fall within a circle, centred on the true value, whose radius is the accuracy requirement. Figure 3 graphically represents this concept.
The ADQi WG is currently developing guidance material to support the encoding of the metadata items required by the ADQ Regulation. The guidelines will include further clarification of what is required and how to map these metadata items to the ISO 19115:2014 [RD 18] elements and to elements of the AIXM 5.1 Conceptual Model. This guidance material will be included in this Guide in ANNEX B.

### 7.2.4.7.3 Means of Compliance

ANNEX B of the Guide will include guidance material.

### 7.2.4.8 Annex I Part C (h)

#### 7.2.4.8.1 Text of Requirement

The metadata for the dataset specifications defined in Part A and Part B shall include the following items, as a minimum:

(h) details of any functions applied if data has been subject to conversion/transformation;

#### 7.2.4.8.2 Analysis of Requirement

Some data may need to be calculated or transformed and this requirement is for the dataset to allow this information to be recorded.

To provide an example, a runway length is normally calculated from the surveyed threshold points. This may result in the runway length being calculated in metres but it may be necessary to publish the information in both metres and feet.

To achieve this transformation, the standard conversion specified in ICAO Annex 5 may be applied (1 foot = 0.3048 metres). The fact that this conversion has been applied and the value used should be recorded as metadata.
In some cases, a mathematical transformation may be needed to transform co-ordinates referenced to a local system into co-ordinates in WGS-84, for example. In this case, details of the transformation performed would need to be provided as metadata.

The ADQi WG is currently developing guidance material to support the encoding of the metadata items required by the ADQ Regulation. The guidelines will include further clarification of what is required and how to map these metadata items to the ISO 19115:2014 [RD 18] elements and to elements of the AIXM 5.1 Conceptual Model. This guidance material will be included in this Guide in ANNEX B.

7.2.4.8.3 Means of Compliance

ANNEX B of the Guide will include guidance material.

7.2.4.9 Annex I Part C (i)

7.2.4.9.1 Text of Requirement

The metadata for the dataset specifications defined in Part A and Part B shall include the following items, as a minimum:

(i) details of any limitations on the use of the data.

7.2.4.9.2 Analysis of Requirement

This requirement is for the issuing organisation to record any limitation on the use of the aeronautical data and information in the metadata. This may be as a result of uncertainty over the fitness for use of the aeronautical data and information or as a result of restrictions imposed by a body, such as the data originator or the CAA.

The ADQi WG is currently developing guidance material to support the encoding of the metadata items required by the ADQ Regulation. The guidelines will include further clarification of what is required and how to map these metadata items to the ISO 19115:2014 [RD 18] elements and to elements of the AIXM 5.1 Conceptual Model. This guidance material will be included in this Guide in ANNEX B.

7.2.4.9.3 Means of Compliance

ANNEX B of the Guide will include guidance material.
8. **ARTICLE 5 AND ANNEX II - DATA exchange FORMATS**

8.1 **Regulatory Basis of Article 5**

Article 5 establishes provisions for the digital exchange of aeronautical data and information between parties in the data chain, between ANSPs and for the publication of aeronautical data and information by the AISP. This includes the format to be used for the exchange of aeronautical data and information.

The ADQ IR is not able to specify a particular format, rather it must specify the performance requirements for the format; in other words, specify the rules for the format. These rules are defined in Annex II to the ADQ Regulation.

8.2 **Article 5**

The following sections outline the specific provisions and requirements of Article 5 and provide guidance as to acceptable means of compliance.

8.2.1 **Article 5(1)**

8.2.1.1 **Text of Provision**

The parties referred to in Article 2(2) shall ensure that the aeronautical data and aeronautical information referred to in Article 1(2) are transferred between themselves by direct electronic connection.

8.2.1.2 **Applicability**

This provision applies to all those parties named in Article 2(2), namely:

"air navigation service providers;
operators of those aerodromes and heliports, for which instrument flight rules (IFR) or Special-visual flight rules (VFR) procedures have been published in national aeronautical information publications;
public or private entities providing, for the purposes of this Regulation:

(i) services for the origination and provision of survey data;
(ii) procedure design services;
(iii) electronic terrain data;
(iv) electronic obstacle data."

This provision will, therefore, apply to all parties involved in the origination, processing and publication of aeronautical data and information.

8.2.1.3 **Rationale / Need for Provision**

It has long been understood that the common practice of transmitting aeronautical data and information between parties in a format that requires its manual re-entry is a significant factor in the loss of data integrity and, therefore, in the reduction of data quality.

To prevent this situation, this provision requires that aeronautical data and information is provided between these parties using a direct electronic connection.
8.2.1.4 Explanation of Provision

The provision requires that whenever aeronautical data and information is passed between parties, it is done so using a direct electronic connection, i.e. that the systems available to each party are connected via some form of network that permits the aeronautical data and information to be passed from one system to the other electronically.

The interpretation of what can be considered as a direct electronic connection is subject to debate. It is acknowledged that it is not always possible to establish a connection that would strictly adhere to the definition given in Article 3(15). In order to define the rules that should be used to harmonise and constrain the eventual deviations to this definition, the ARWG created the Common Understanding 08/2014 Provisions of Commission Regulation (EU) 73/2010 for electronic data exchange.

Within this Common Understanding, direct electronic connection means a specific configuration where the data exchanged in a standardised format is automatically ingested into the recipient system without any manual interaction with the data itself (this shall avoid error prone copy/paste actions or the retying of data). The Common Understanding 08/2014 Provisions of Commission Regulation (EU) 73/2010 for electronic data exchange can be read in full in ANNEX II of this Guide.

8.2.1.5 Implementing the Provision

It is recommended that the parties choose a connection which is commensurate with the frequency and amount of aeronautical data and information that will be exchanged.

Consideration must also be given to the quality of the communications link provided. In order for the quality of aeronautical data and information to not be impacted, the link must offer a high degree of availability and integrity itself, otherwise aeronautical data and information may be corrupted or delayed during transmission.

For some communications links, for example, between a major aerodrome and the ANSP, permanent private networks may be justified and may already exist. For a minor aerodrome where the need to provide aeronautical data and information is very limited, a public internet connection may be sufficient.

Whilst the ideal implementation of this provision would include a direct electronic connection between computer systems (through a private or public network) to facilitate the exchange of datasets in a standardised format, it is nevertheless acknowledged that this is not always pragmatically possible.

As stated above, the ARWG Common Understanding 08/2014 Provisions of Commission Regulation (EU) 73/2010 for electronic data exchange intend to harmonise the execution of implementation solutions that are used when a strict adherence to the definition from Article 3(15) is not feasible.

One of the possible solutions that are identified in the Common Understanding is email. It is well known that email is currently widely used to exchange aeronautical data and aeronautical information. Whilst it is recognised that email would not strictly fit into the ADQ IR definition of direct electronic connection, trying to rashly stop its usage could reveal counterproductive. That is why the Common Understanding accepts the use of email to exchange aeronautical data and aeronautical information, but defines certain obligations aimed to mitigate some of the risks inherent to its use:

- The data shall be provided in an attached file that may be automatically ingested into the recipient system without any manual interaction with the data itself (no re-type or copy/paste);
- The reception of the data shall be confirmed to the supplier.
The above considerations are only part of the full content of the Common Understanding 08/2014 Provisions of Commission Regulation (EU) 73/2010 for electronic data exchange. The full text can be read in ANNEX A of this Guide.

8.2.1.6 Means of Compliance


8.2.2 Article 5(2)

8.2.2.1 Text of Provision

Air navigation service providers shall ensure that the aeronautical data and aeronautical information referred to in the second subparagraph of Article 2(1) are transferred between themselves in accordance with the data exchange format requirements laid down in Annex II.

8.2.2.2 Applicability

This requirement applies to ANSPs only.

The applicability of this provision to the exchange of data between entities that are organisationally within the same ANSP was discussed by the ARWG. It was concluded, in Common Understanding 08/2014 Provisions of Commission Regulation (EU) 73/2010 for electronic data exchange, that “data suppliers exchanging data within the confines of an ANSP is not considered as a data exchange activity between separate ANSPs. Therefore Article 5(2) is not applicable.”

The above considerations are only part of the full content of the ARWG Common Understanding 08/2014 Provisions of Commission Regulation (EU) 73/2010 for electronic data exchange. The full text can be read in ANNEX A of this Guide.

8.2.2.3 Rationale / Need for Provision

The provision is introduced to ensure that when aeronautical data and information is exchanged between ANSPs it is done so in a fully interoperable manner.

8.2.2.4 Explanation of Provision

The provision requires that whenever any aeronautical data and information included in the dataset defined by Article 1 is exchanged by ANSPs, it is done so using an interoperable dataset which is compliant with the specification defined in Annex II.

8.2.2.5 Implementing the Provision

In implementing this provision, the ANSP must:

1) Define exchange formats in compliance with Annex II

The implementation of this Annex is covered in detail in section 8.3.

The Aeronautical Information Exchange Model (AIXM) is becoming the de facto standard for the modelling and exchange of aeronautical data and information. The XML Schema of its most recent version, AIXM 5.1, fully complies with the performance requirements of Annex II of the ADQ Regulation. It is, therefore, recommended to all ANSPs to consider its use to facilitate the interoperability of the EATMN. Despite the fact that this provision is only applicable to ANSPs, its use by other regulated parties shall nevertheless be encouraged and facilitated whenever possible. The extension of the usage of this standardised data exchange format would greatly benefit the full scale interoperability of the EATMN.
2) Exchange aeronautical data and information in accordance with this format
   Exchange the aeronautical data and information in the defined format from one system to
   another, utilising a direct electronic connection.

8.2.2.6 Means of Compliance

data exchange includes the ADQ Regulators Working Group conclusions concerning the
applicability of exchange formats.

The EUROCONTROL Specification for Aeronautical Information Exchange [RD 29] and its
associated guidance material provides support for the implementation of this specific provision.
Moreover the Specification makes the bridge to support implementation of this provision through
AIXM 5.1.

8.2.3 Article 5(3)

8.2.3.1 Text of Provision

   Member States may exclude digital NOTAM from the data exchange format referred to
   in paragraph 2.

8.2.3.2 Applicability

This requirement applies to Member States.

8.2.3.3 Rationale / Need for Provision

At the time of developing the ADQ IR there was not yet a mature Digital NOTAM concept.
Consequently, the decision was taken to allow a Member State the flexibility to determine whether
they wished to provide the data set that contains the information included in a NOTAM in a
standardised exchange format, or not.

Meanwhile, the EUROCONTROL Digital NOTAM Project was further developed and it is now
reaching a mature state. It aims to provide the standards, the framework, resources and a
substantiated proof-of-concept for the full ECAC-wide implementation of the digital NOTAM
concept. Within this concept the encoding is based on AIXM 5.1, which is fully compatible with the
requirements of Annex II of the ADQ IR.

The development of the EUROCONTROL Digital NOTAM Project will bring many benefits both to
the ANSP and to the airspace users (e.g. graphical visualisation instead of simple text). Whilst this
ADQ IR provision may be used as a temporary measure, it should not serve to discourage the
State to explore further the opportunities that are brought by the Digital NOTAM.

The decision of the State will determine whether the other affected parties in the State need to
address the provisions related to Digital NOTAM.

8.2.3.4 Explanation of Provision

The provision allows a Member State to release the ANSP from the obligation to exchange the
data set that contains the information included in a NOTAM in a data exchange format that is in
accordance with the data exchange format requirements laid down in Annex II.

8.2.3.5 Implementing the Provision

No implementation is necessary.
8.2.3.6 Means of Compliance

No specific means of compliance are needed for this requirement. The reading of the ARWG Common Understanding 01/2013 Application of the provisions of Commission Regulation (EU) 73/2010 to NOTAM is recommended.

8.2.4 Article 5(4)

8.2.4.1 Text of Provision

Aeronautical information service providers shall ensure that all aeronautical data and aeronautical information within the AIPs, AIP amendments and AIP supplements provided by a Member State are made available to the next intended user, as a minimum:

(a) in accordance with the publication requirements identified in the ICAO standards referred to in points 4 and 8 of Annex III;

(b) in a way that allows the content and format of the documents to be directly readable on a computer screen; and

(c) in accordance with the data exchange format requirements specified in Annex II.

8.2.4.2 Applicability

This requirement applies to AISPs only.

8.2.4.3 Rationale / Need for Provision

The provision requires the AISPs to publish the aeronautical data and information that is included in the State AIP (including amendments and supplements) in a number of formats which should, when all provided, meet the needs of the disparate users of aeronautical data and information.

8.2.4.4 Explanation of Provision

The provision requires the AISPs to make the aeronautical data and information included in the State AIP, AIP amendments and AIP supplements available in three formats:

1) As the traditional AIP, i.e. according with the requirements from ICAO Annex 15 [RD 10], which is currently predominantly a paper product;

2) As an electronic representation that can be read through a computer screen;

3) As a digital dataset, compliant with the requirements of Annex II.

8.2.4.5 Implementing the Provision

In order to comply with part a) of the provision, the AISPs must provide a traditional, paper-based AIP. Such products are well understood by AISPs and, as a result, are not covered further in this document.

For part b) of the provision, an electronic (computer literate) version of the AIP must be provided. Whilst it is recognised that any electronic version that can be displayed in a computer screen may be acceptable (e.g. Microsoft Word, Adobe PDF…), it is recommended the usage of a more standardised and interactive format.

The EUROCONTROL Specification for the electronic AIP is now used by many States to provide to the airspace users community a standard and interactive way to visualise its AIP.

For part c), the digital datasets specified in Article 5(2) shall be provided.
8.2.4.6 Means of Compliance

The means of compliance for this requirement are as follows:

1) For part a), the traditional products prepared by AISPs are the means of compliance for this provision;

2) For part b), an electronic publication prepared in accordance with the EUROCONTROL Specification for the Electronic Aeronautical Information Publication (eAIP) [RD 33] is a possible means of compliance for this provision;

3) For part c), see the Means of Compliance for the data exchange format in Chapter 8.2.2 of this Guide.

8.3 Annex II

The following sections outline the specific provisions and requirements of Annex II and provide guidance as to possible means of compliance.

8.3.1 Annex II Part A - IAIP, Aerodrome Mapping and Electronic Obstacle Data

Annex II Part A specifies the requirements for describing the format for exchanging the elements of the IAIP, AMD and electronic obstacle data.

8.3.1.1 Annex II Part A

8.3.1.1.1 Text of Requirement

The aeronautical data and aeronautical information referred to in points (a), (b) and (d) of the second subparagraph of Article 2(1) shall be formatted in accordance with a common specification, which shall:

- use the extensible markup language (XML) specification as defined in the ISO Standard referred to in Annex III point 17 for data encoding;

- be expressed in the form of an XML Schema; in addition, a schematron as defined in the ISO standard referred to in point 19 of Annex III may be used for expressing business rules;

- enable the exchange of data for both individual features and feature collections;

- enable the exchange of baseline information as a result of permanent changes;

- be structured in accordance with the features, attributes and associations of the dataset definition described in Annex I, Part A; the mapping rules shall be documented;

- implement strictly the enumerated lists of values and range of values defined for each attribute in the data set;

- comply with the geography mark-up language (GML) specification, as defined in the reference referred to in point 18 of Annex III, for the encoding of geographical information.

Regarding the ISO standards, the relevant certificate issued by an appropriately accredited organisation, shall be considered as a sufficient means of compliance. The parties referred to in Article 2(2) shall accept the disclosure of the documentation related to the certification to the national supervisory authority upon the latter’s request.

8.3.1.1.2 Analysis of Requirement

This requirement specifies that an exchange specification shall be utilised which:
1) Is defined using Extensible Markup Language (XML);
2) Specifies the exchange format using an XML Schema;
3) Allows a single feature or a set of features to be exchanged. For example, the format should allow a single runway, multiple runways or an entire aerodrome to be exchanged;
4) Supports the provision of static aeronautical data and information (e.g. baseline aeronautical data and information) changes;
5) Matches the structure of the dataset defined in Annex I Part A, in terms of the features, attributes and associations that were outlined in Annex II. A mapping must be provided which allows the user to navigate from the dataset definition to the exchange format;
6) Enforces the limiting of values, be it data ranges or enumerated types. For example, a runway bearing should be limited to the range 0 to 360 degrees. A enumerated type may be a code type, such as Very High Frequency Omnidirectional Range (VOR), Distance Measuring Equipment (DME), TACTical Navigation (TACAN), etc., for a Navaid;
7) Have all geographical elements described using the GML vocabulary of XML. This allows Geographic Information System (GIS) tools to utilise the aeronautical data and information in an open and interoperable manner.

The Aeronautical Information Exchange Model (AIXM) is becoming the de facto standard for the modelling and exchange of aeronautical data and information. The XML Schema of its most recent version, AIXM 5.1, fully complies with the performance requirements stated above. It is thus recommended to all ANSPs to consider its use to facilitate the interoperability of the EATMN.

8.3.1.1.3 Means of Compliance

The EUROCONTROL Specification for Aeronautical Information Exchange [RD 29] and its associated guidance material provides support for the implementation of this specific provision. Moreover the Specification makes the bridge to support implementation of this provision through AIXM 5.1.

8.3.2 Annex II Part B - Electronic Terrain Data

Annex II Part B specifies the requirements for the format to be used for exchanging electronic terrain data.

8.3.2.1 Annex II Part B

8.3.2.1.1 Text of Requirement

The electronic terrain data referred to in point (c) of the second subparagraph of Article 2(1) shall be provided in a common format compliant with the ISO standards referred to in points 14 to 18 of Annex III.

Regarding the ISO standards, the relevant certificate issued by an appropriately accredited organisation, shall be considered as a sufficient means of compliance. The parties referred to in Article 2(2) shall accept the disclosure of the documentation related to the certification to the national supervisory authority upon the latter’s request.

8.3.2.1.2 Analysis of Requirement


These standards, which are part of the ISO 19100 series of standards, are used to define interoperable and open data formats, which allow compliant products to utilise the data, thus promoting the electronic provision, processing and use of data.
8.3.2.1.3 Means of Compliance

The TOD Working Group revised and clarified the existing terrain formats, the list of formats provided by the national geodetic agencies and the terrain formats preferred by the users.

The TOD Working Group was of the common view that there was no single outstanding terrain format which would satisfy all requirements of the ISO 19100 series as required by the ADQ IR.

Nevertheless, the TOD Working Group, in order to harmonise the provision of terrain datasets, will mention in the TOD Manual that the users had expressed a preference for the GeoTIFF and Shape format with metadata.

The conclusions of the TOD Working Group were recognised by the ARWG within the Common Understanding 04/2013 Commission Regulation (EU) 73/2010 and Exchange of Electronic Terrain Datasets. The Common Understanding is available in ANNEX A of the Guide.
9. ANNEX III – PROVISIONS REFERRED TO IN ARTICLES AND ANNEXES

9.1 Regulatory Basis

According to European Union regulatory drafting guidelines, a reference should be made to an external provision if it makes it possible to simplify the text of the Regulation, i.e. by not having to repeat the content of the external provisions in the Regulation. In the case of the ADQ Regulation, with such an extensive scope, the use of references is essential to avoid the repetition of a significant amount of material.

9.2 Principles and Definitions

To understand the approach used concerning references, there is one principle and two basic definitions that need to be understood:

1) A ‘Static Reference’ refers to a specific text, on a specific date. This is achieved by stating the title, reference of the provision and the source, and then specifying, where appropriate, the amendment status.

2) A ‘Dynamic Reference’ is one where the provision that is cited is always taken to be the provision, together with any associated amendments. These references can lead to the risk of such provisions being indeterminate, as they vary according to any subsequent amendments.

Material referenced in a European Union Regulation is made mandatory through that reference.

9.3 Explanation of Approach

Annex II I of the ADQ IR contains all of the required references. Each reference is then cross-referred to from the relevant Articles and Annexes of the ADQ Regulation.

All of the references are ‘Static’ because European Union drafting guidelines state that, in principle, references from European Union regulatory material to non-European Union material are ‘Static’. The use of ‘Static References’ also minimises the impact of the Regulation on States, as a ‘Dynamic Reference’ would make provisions and any subsequent amendments mandatory.

The use of a separate Annex for the references in the ADQ IR was necessary due to the large number of references that needed to be listed. Moreover, as ‘Static References’ must be reviewed and updated each time a source document is amended, it is much easier to manage the maintenance of such references in a separate Annex.

Each reference contains sufficient information for its basic subject matter and content to be understood without consulting the actual referenced material.

It was impracticable to present all of the specific ICAO references concerning aeronautical data and information. For example, there are data accuracy requirements throughout ICAO Annexes 4, 10, 11, 14 and 15. Annex 10, Volume 1, alone extends to several hundreds of pages. To list all of the specific references would require many pages of content, which would then make the ADQ IR unreadable.

The approach adopted for references was, therefore, to restrict specific ‘data quality’ related references to just ICAO Annex 15 [RD 10] and to use the term ‘and other relevant ICAO standards/provisions’ within relevant parts of the regulatory text to address other source material. This is consistent with the particular reference made to ICAO Annex 15 [RD 10] within the SES ADI Mandate.
References for all other subject matter, such as ISO standards, are specific and are included in Annex III.

It should be noted that the ADQ IR was developed when ICAO Annex 15, including Amendment 34, was the most recent and applicable edition. Since that time, ICAO Annex 15 had several amendments and some of the other standards referenced evolved and had new versions released. In September 2014 the European Commission published the Commission Implementing Regulation (EU) No 1029/2014 of 26 September 2014 amending Regulation (EU) No 73/2010 laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky [RD 7]. This regulation was mainly published to amend the references in Annex III of the ADQ IR to reflect the changes introduced by the most recent amendment to ICAO Annex 15 [RD 10] (Amendment 37) and by the revisions and re-numbering of some of the other referenced standards.

The amendments to the references that were introduced by Regulation 1029/2014 are not considered to have impacted the content of the remaining text of the ADQ IR.

### 9.4 Implementation Considerations

Regulated parties should check the status of the references within Annex III during implementation planning and then during implementation itself. The ADQ IR will be subject to further amendment, as and when necessary, to take account of changes to source material.

Member States should specifically take account of the impact of the ADQ IR on any ICAO ‘Differences’ that they may have notified, as they will be required to take whatever action is necessary to implement the provisions of the ADQ Regulation. In particular, the transitional requirements of Article 14 of the ADQ IR must be taken into account when considering the impact of any existing ICAO ‘Differences’.

### 9.5 Reference 1 – ICAO Annex 15 Section 3.7

Chapter 3, Section 3.7 (Quality management system) of Annex 15 to the Chicago Convention — Aeronautical Information Services (Fourteenth edition — July 2013, incorporating Amendment No 37).

See [RD 10].

### 9.6 Reference 2 – ICAO Annex 15 Section 1.2.1

Chapter 1, Section 1.2.1 (Horizontal reference system) of Annex 15 to the Chicago Convention — Aeronautical Information Services (Fourteenth edition — July 2013, incorporating Amendment No 37).

See [RD 10].

### 9.7 Reference 3 – ICAO Annex 15 Section 1.2.2

Chapter 1, Section 1.2.2 (Vertical reference system) of Annex 15 to the Chicago Convention — Aeronautical Information Services (Fourteenth edition — July 2013, incorporating Amendment No 37).

See [RD 10].

### 9.8 Reference 4 – ICAO Annex 15 Chapter 4

Chapter 4 (Aeronautical Information Publications (AIP)) of Annex 15 to the Chicago Convention — Aeronautical Information Services (Fourteenth edition — July 2013, incorporating Amendment No 37).
9.9 Reference 5 – ICAO Annex 15 Chapter 4.3
Chapter 4, Section 4.3 (Specifications for AIP Amendments) of Annex 15 to the Chicago Convention — Aeronautical Information Services (Fourteenth edition — July 2013, incorporating Amendment No 37).
See [RD 10].

9.10 Reference 6 – ICAO Annex 15 Chapter 4.4
Chapter 4, Section 4.4 (Specifications for AIP Supplements) of Annex 15 to the Chicago Convention — Aeronautical Information Services (Fourteenth edition — July 2013, incorporating Amendment No 37).
See [RD 10].

9.11 Reference 7 – ICAO Annex 15 Chapter 5
Chapter 5 (NOTAM) of Annex 15 to the Chicago Convention — Aeronautical Information Services (Fourteenth edition — July 2013, incorporating Amendment No 37).
See [RD 10].

9.12 Reference 8 – ICAO Annex 15 Chapter 6.2
Chapter 6, Section 6.2 (Provision of information in paper copy form) of Annex 15 to the Chicago Convention — Aeronautical Information Services (Fourteenth edition — July 2013, incorporating Amendment No 37).
See [RD 10].

9.13 Reference 9 – ICAO Annex 15 Chapter 10.1
Chapter 10, Section 10.1 (Coverage areas and requirements for data provision) of Annex 15 to the Chicago Convention — Aeronautical Information Services (Fourteenth edition — July 2013, incorporating Amendment No 37).
See [RD 10].

9.14 Reference 9a – ICAO Annex 15 Chapter 10.2
Chapter 10, Section 10.2 (Terrain data set — content, numerical specification and structure) of Annex 15 to the Chicago Convention — Aeronautical Information Services (Fourteenth edition — July 2013, incorporating Amendment No 37).
See [RD 10].

9.15 Reference 10 – ICAO Annex 15 Appendix 1
Appendix 1 (Contents of Aeronautical Information Publication (AIP)) of Annex 15 to the Chicago Convention — Aeronautical Information Services (Fourteenth edition — July 2013, incorporating Amendment No 37).
See [RD 10].
9.16 Reference 11 – ICAO Annex 15 Appendix 7
Appendix 7 (Aeronautical data publication resolution and integrity classification) of Annex 15 to the Chicago Convention — Aeronautical Information Services (Fourteenth edition — July 2013, incorporating Amendment No 37).
See [RD 10].

9.17 Reference 12 – ICAO Annex 15 Appendix 8
Appendix 8 (Terrain and obstacle data requirements) of Annex 15 to the Chicago Convention — Aeronautical Information Services (Fourteenth edition — July 2013, incorporating Amendment No 37).
See [RD 10].

9.18 Reference 13 – OMG’s UML Specification

9.19 Reference 14 – ISO 19107
See [RD 15].

9.20 Reference 15 – ISO 19115

Note: Published in EU No 1029/2014, however, the latest edition is from 2014.
See [RD 18].

9.21 Reference 16 – ISO 19139
See [RD 22].

9.22 Reference 17 – ISO 19118
See [RD 19].

9.23 Reference 18 – ISO 19136
See [RD 21].

9.25 Reference 20 – ICAO Doc 9674
See [RD 12].

9.26 Reference 21 – ICAO Doc 9674 Section 7.3.2
See [RD 12].

9.27 Reference 22 – ISO 27002

9.28 Reference 23 – ISO 28000

Note: Published in EU No 1029/2014. According to the ISO official webpage the edition date is 15.9.2007 and the additional text remark is not provided there.

9.29 Reference 24 – EUROCAE ED-99A
See [RD 9].

9.30 Reference 25 – ISO 19110
See [RD 16].
10. ARTICLE 6 AND ANNEX IV - DATA QUALITY

10.1 Regulatory Basis of Article 6

Article 6 establishes provisions that are intended to ensure that the aeronautical data and information published within States achieves a common, consistent level of quality.

Data Quality, as defined, relates to the need for it to meet its requirements in terms of accuracy, resolution and integrity. Whilst integrity must be assured throughout the whole data chain, accuracy and resolution requirements may only be met at the point of origination of the data. Subsequent to this, a loss of integrity would result in the accuracy and resolution requirements no longer being complied with.

This Article, therefore, presents provisions which mandate how data is originated and processed, such that the resultant products contain aeronautical data and information with a sufficient level of confidence that they meet their data quality requirements.

10.2 Article 6

The following sections outline the specific provisions and requirements of Article 6 and provide guidance as to acceptable means of compliance.

10.2.1 Article 6(1)

10.2.1.1 Text of Provision

*Member States shall ensure that air navigation service providers comply with the data quality requirements specified in Annex IV, Part A.*

10.2.1.2 Applicability

This provision is directly applicable to “Member States”, in effect those within each State who are empowered to enforce the ADQ IR. In most cases, this will be the CAA but, in some cases, this power may remain at the governmental level, with a body such as the Ministry of Transport.

10.2.1.3 Rationale / Need for Provision

This provision places the obligation on the State to ensure that the data quality requirements of the ADQ IR are complied with by the ANSPs who provide services for and on behalf of the State in question.

10.2.1.4 Explanation of Provision

Compliance with the data quality requirements laid down in Annex IV, Part A of the ADQ IR is mandatory for ANSPs and it is the responsibility of the Member State to ensure this compliance.

10.2.1.5 Implementing the Provision

The Member State should adopt a specific set of data quality requirements and should put in place the adequate measures to ensure that the ANSP complies with them.

The ANSP will have to put in place the adequate processes to comply with the set of data quality requirements adopted by the Member State.
Despite the fact that this provision only mention the ANSP, the Member State should also exercise effective management and control over all aeronautical data and aeronautical information origination activities. As such, it is recommended that the Member State extends the applicability of the adopted set of data quality requirements to the other parties. This may be achieved through appropriate complementary national legislation.

The scope of this provision was discussed within the ARWG that concluded the the “scope of Article 6(1) of the Regulation is currently limited to the scope of the data included in ICAO Annex 15, Appendix 7 and other relevant ICAO SARPs”. This conclusion is expressed in Common Understanding 03/2013 Scope of Article 6(1) of the Commission Regulation (EU) 73/2010.

The Common Understanding also concludes that “A process shall be established to address known deficiencies (and identify potential new ones) of the data quality requirements published in Appendix 7 of the ICAO Annex 15 and in other relevant ICAO SARPs, notably to support future concepts of operation”.

The above considerations are only part of the full content of the ARWG Common Understanding., the full text is available in ANNEX A of this Guide.

The EUROCONTROL Specification for Data Quality Requirements [RD 32] was published as a possible means of compliance to Article 6(1) and Annex IV, Part C. It includes the Harmonised List which lists the data items and their corresponding data quality requirements. The Harmonised List follows the principles that are agreed in the ARWG Common Understanding and is currently limited to data items already included in ICAO Annex 15, Appendix 7 and other relevant ICAO SARPs. It also includes the description of the process to establish new data quality requirements and update the Harmonised List.

For the sake of the interoperability of the EATMN the number of different sets of data quality requirements used by the States should be reduced to a minimum. Instead of creating their own sets of data quality requirements it is recommended that States adopt the Harmonised List and identify within it any eventual national difference.

10.2.1.6 Means of Compliance

No specific means of compliance is identified for this provision as compliance is achieved through meeting the requirements laid down in Annex IV, Part A. For these requirements, the EUROCONTROL Specification for Data Quality Requirements [RD 32] may be used to support implementation.

10.2.2 Article 6(2)

10.2.2.1 Text of Provision

When providing aeronautical data and/or aeronautical information, the parties referred to in Article 2(2) shall comply with the evidence requirements specified in Annex IV, Part B.

10.2.2.2 Applicability

This provision applies to all those parties named in Article 2(2), namely:

“air navigation service providers;
operators of those aerodromes and heliports, for which instrument flight rules (IFR) or Special-visual flight rules (VFR) procedures have been published in national aeronautical information publications;
public or private entities providing, for the purposes of this Regulation:
(i) services for the origination and provision of survey data;
(ii) procedure design services;
(iii) electronic terrain data;
(iv) electronic obstacle data."

This provision will, therefore, apply to all parties involved in the origination, processing and publication of aeronautical data and information.

10.2.2.3 Rationale / Need for Provision

Provisions should not be overly detailed, the detail being provided within the Annexes to the ADQ Regulation. This provision, therefore, makes the detailed requirements of Annex IV Part B mandatory by reference.

10.2.2.4 Explanation of Provision

By mandating evidence requirements that must be adhered to, this provision is enforcing that those involved in the aeronautical data chain ensure the quality of the aeronautical data and information that they provide.

10.2.2.5 Implementing the Provision

Implementation of this provision is achieved when all aeronautical data and information prepared by the applicable parties is done so in compliance with the evidence requirements outlined in Annex IV Part B. No specific implementation guidance for this provision is provided here and the reader is referred to the specific requirements of Annex IV Part B.

10.2.2.6 Means of Compliance

No specific means of compliance is identified for this provision as compliance is brought about through achieving the requirements laid down in Annex IV, Part B. For these requirements, the EUROCONTROL Specification for Data Assurance Levels (DAL) [RD 30] may be used to support implementation.

10.2.3 Article 6(3)

10.2.3.1 Text of Provision

When exchanging aeronautical data and/or aeronautical information between themselves, the parties referred to in Article 2(2), shall establish formal arrangements in accordance with the requirements specified in Annex IV, Part C.

10.2.3.2 Applicability

This provision applies to all those parties named in Article 2(2), namely:

“air navigation service providers;
operators of those aerodromes and heliports, for which instrument flight rules (IFR) or Special-visual flight rules (VFR) procedures have been published in national aeronautical information publications;
public or private entities providing, for the purposes of this Regulation:
(i) services for the origination and provision of survey data;
(ii) procedure design services;
(iii) electronic terrain data;
(iv) electronic obstacle data.”
This provision will, therefore, apply to all parties involved in the origination, processing and publication of aeronautical data and information.

10.2.3.3 Rationale / Need for Provision

One clear weakness that had been identified in many organisations relates to the formal definition of what aeronautical data and information should be provided, when, how and to what quality. ICAO Annex 15 [RD 10], already required arrangements to be established for the provision of aeronautical data and information to the AIS, with paragraph 3.1.5 stating that “Each contracting State shall ensure that formal arrangements are established between originators of aeronautical data and aeronautical information and the aeronautical information service in relation to the timely and complete provision of aeronautical data and aeronautical information.”. It was clear, however, that this standard was not always applied and was not far-reaching enough.

To address this weakness, this provision strengthens the ICAO standard.

10.2.3.4 Explanation of Provision

The provision requires that formal arrangements be established between parties that exchange aeronautical data and information. This means that for any interface between organisations (and indeed within organisations, if so wished), across which aeronautical data and information is passed, an arrangement must be established.

“Formal arrangements" is meant to indicate that the agreement must be documented and agreed (e.g. signed) by the parties. The arrangement must include all the elements specified within Annex IV, Part C.

Formal arrangements are normally bi-lateral (between two parties) but may, if preferred, be established as tri-lateral agreements with, for example, the NSA playing the role of arbiter and enforcer.

In order to implement this provision, the parties involved in the exchange of aeronautical data and information must formally document the interface in accordance with the requirements of Annex IV, Part C. It is recommended that the receiving party takes the lead in preparing the agreements. This recommendation is made for a number of reasons, including:

1) The recipient of aeronautical data and information is normally more aware of their requirements for the aeronautical data and information than the provider;

2) The recipient of aeronautical data and information normally interfaces with more than one provider and, hence, can make a saving through economy of scale.

10.2.3.5 Means of Compliance

No specific means of compliance is identified for this provision, however, general guidance may be offered.

The nature of any agreement will be dependent upon the nature of the interface between the two parties. For example, a survey company may be contracted for a single survey, or to perform all necessary surveys for a defined period.

For a longer-term relationship, it is recommended that some form of ADQ Formal Arrangements established.

Where a shorter-term arrangement is needed, an ADQ Formal Arrangement may be used but the effort to agree such a document may not be practicable. Instead, it may be more suitable to establish a simple agreement document.

The ADQi WG developed a formal arrangement template that includes all the elements required by Annex IV, Part C. The ADQi WG Formal Arrangement Template is included in ANNEX IV of this Guide.
10.2.4 Article 6(4)

10.2.4.1 Text of Provision

When acting as data originators, the parties referred to in Article 2(2), shall comply with the data origination requirements detailed in Annex IV, Part D.

10.2.4.2 Applicability

This provision applies to all those parties named in Article 2(2), namely:

“air navigation service providers;

operators of those aerodromes and heliports, for which instrument flight rules (IFR) or Special-visual flight rules (VFR) procedures have been published in national aeronautical information publications;

public or private entities providing, for the purposes of this Regulation:

(i) services for the origination and provision of survey data;
(ii) procedure design services;
(iii) electronic terrain data;
(iv) electronic obstacle data.”

This provision will, therefore, apply to all parties involved in the origination of aeronautical data and information.

10.2.4.3 Rationale / Need for Provision

There is a clear need for aeronautical data to be originated in a consistent and formalised manner which results in it achieving a defined level of quality. This provision therefore introduces requirements to ensure that the origination of aeronautical data is performed against clearly defined requirements, as laid down in Annex IV, Part D.

10.2.4.4 Explanation of Provision

The provision requires all parties listed in Article 2(2) that originates aeronautical data to do so in accordance with the detailed requirements specified by Annex IV, Part D.

10.2.4.5 Implementing the Provision

Implementation of this provision is achieved when all aeronautical data originated by the applicable parties is done so in compliance with the requirements outlined in Annex IV, Part D. No specific implementation guidance for this provision is provided here and the reader is referred to the specific requirements of Annex IV, Part D.

10.2.4.6 Means of Compliance

The EUROCONTROL Specification for the Origination of Aeronautical Data [RD 31] is considered a means of compliance for this provision and meets the requirements specified in Annex IV, Part D.

10.2.5 Article 6(5)

10.2.5.1 Text of Provision

Aeronautical information service providers shall ensure that aeronautical data and aeronautical information provided by data originators not referred to in Article 2(2) are made available to the next intended user with sufficient quality to meet the intended use.
10.2.5.2 Applicability
This provision applies to organisations not specifically referred to in Article 2(2) but which act as a data originator for any aeronautical data which the State makes available through the AIS.

This could include:
1) Operators of aerodromes and heliports for which IFR or SVFR procedures have not been published in the national AIP, or;
2) An institution which provides a geoid model which is used as part of the vertical reference system for co-ordinates published in the AIP;
3) An institution which operates a permanent GPS reference network which may be used to determine the differential solution in a GPS-based survey.

10.2.5.3 Rationale / Need for Provision
There must be a clear statement as to who takes overall responsibility for the quality of aeronautical data and information when provided by parties not directly covered by the scope of the ADQ Regulation. This provision places the responsibility on the AISP.

10.2.5.4 Explanation of Provision
It is the responsibility of the AISP that all aeronautical data and information is provided with sufficient quality or, in other words, the recipients of aeronautical data and information can assume sufficient data quality (for the intended use) when receiving aeronautical data and information from AISPs.

10.2.5.5 Implementing the Provision
To support the implementation of this provision, the ARWG issued Common Understanding 10/2014 Implementation of Article 6(5) of the Commission Regulation (EU) 73/2010.

According to the Common Understanding, the AISP shall ensure that verification and validation procedures are in place to evaluate the quality of the data that was provided by data originators not referred to in Article 2(2).

The Common Understanding also recommends that the AISP should endeavour to establish formal arrangements with the entities that are responsible for providing the data. Since those are not mandatory through the ADQ IR, it is also recommended that the State regulator establishes national policy and/or regulation to support the discussion and establishment of these formal arrangements.

The above considerations are only part of the full content of the ARWG Common Understanding. The full text is available in Annex A.7 of this Guide.

10.2.5.6 Means of Compliance
The Common Understanding 10/2014 Implementation of Article 6(5) of the Commission Regulation (EU) 73/2010 includes the conclusions and guidelines from the ADQ Regulators Working Group to support the AISP to implement this provision (the text of the CU is transposed in Annex A.7).

10.2.6 Article 6(6)

10.2.6.1 Text of Provision
When acting as the entity responsible for the official request for a data origination activity, the parties referred to in Article 2(2) shall ensure that:

(a) the data are created, modified or deleted in compliance with their instructions;

(b) without prejudice to Annex IV, Part C, their data origination instructions contain, as a minimum:

...
(i) an unambiguous description of the data that are to be created, modified or deleted;
(ii) confirmation of the entity to which the data are to be provided;
(iii) the date and time by which the data are to be provided;
(iv) the data origination report format to be used by the data originator.

10.2.6.2 Applicability

This provision applies to all those parties named in Article 2(2), namely:
“air navigation service providers;
operators of those aerodromes and heliports, for which instrument flight rules (IFR) or Special-visual flight rules (VFR) procedures have been published in national aeronautical information publications;
public or private entities providing, for the purposes of this Regulation:
(i) services for the origination and provision of survey data;
(ii) procedure design services;
(iii) electronic terrain data;
(iv) electronic obstacle data.”

This provision will, therefore, apply to all parties who may request aeronautical data to be originated.

10.2.6.3 Rationale / Need for Provision

A data item may be created with a high-level of confidence that it meets its data quality requirements and have its integrity maintained throughout its life, but, if the instruction that requested the aeronautical data to be originated was not correctly formulated, the wrong data, relating to the wrong facility, for example, may be originated.

This provision lays down requirements for the request for the origination of aeronautical data that are intended to assist in ensuring that the data origination is performed, as intended, by the requesting authority.

It should be noted that, in this context, the decision to withdraw a facility is interpreted as an act of origination, i.e., that new metadata for a piece of data is created (i.e. end of validity).

10.2.6.4 Explanation of Provision

Often it is not clear what exactly has to be surveyed/measured. For example, different domains (aerodrome, surveyor, etc.) may have different terms for, or understanding of, the same real-world object, for different applications.

It is, therefore, essential that when a body requests the origination of aeronautical data, that they are clear and explicit in their requirement and that a common nomenclature is used to describe the request.

This provision requires that those requesting aeronautical data origination take basic steps to ensure that their request may be properly and precisely understood.

10.2.6.5 Implementing the Provision

Consideration should be given to the introduction of instructions for aeronautical data creation, modification or deletion, such as through a survey manual. The manual should focus on the feature capture rules for the specific data items to which it relates.
Generalisation processes, or the process of abstraction, are very important for those lacking domain knowledge. Feature capture rules are also crucial for harmonised datasets. They help promote consistent quality over time and allow independence from one single data provider. Besides such generic rules for each task, the area of interest and, if known, the objects of interest must be provided also. Due to constraints on the effectivity of aeronautical data and information, the date and time for the new/amended dataset must be specified. Finally, the provision also requests that the format for data quality reporting is defined in the task description.

The entity which is requesting aeronautical data must be able to demonstrate that a procurement process has been established which includes detailed instructions, as given here and in Annex IV Part C. It should be apparent that a data originator must also be able to provide evidence that the instructions are well understood, the necessary processes are in place (like error reporting) and the (software) tools are tested before use, etc.

### 10.2.6.6 Means of Compliance

The EUROCONTROL Specification for the Origination of Aeronautical Data [RD 31] provides some guidance for the specification of origination requirements for some surveyed and derived data items but this must be enhanced by States to cover the full range of items which are originated within their State. For terrain and obstacle data, the TOD Manual [RD 34] provides guidance to define a specification for the request of this data.

### 10.2.7 Article 6(7)

#### 10.2.7.1 Text of Provision

The parties referred to in Article 2(2) shall comply with the data process requirements laid down in Annex IV, Part E.

#### 10.2.7.2 Applicability

This provision applies to all those parties named in Article 2(2), namely:

- "air navigation service providers;
- operators of those aerodromes and heliports, for which instrument flight rules (IFR) or Special-visual flight rules (VFR) procedures have been published in national aeronautical information publications;
- public or private entities providing, for the purposes of this Regulation:
  (i) services for the origination and provision of survey data;
  (ii) procedure design services;
  (iii) electronic terrain data;
  (iv) electronic obstacle data."

This provision will, therefore, apply to all parties involved in the origination, processing and publication of aeronautical data and information.

#### 10.2.7.3 Rationale / Need for Provision

Key to the maintenance of data integrity, and hence demonstration of compliance with the requirements specified, are the processes that the aeronautical data and information is subjected to. It is these processes that may be used to provide sufficient assurance that the aeronautical data and information meets a level of integrity. If the processes are correctly defined and applied, the high-levels of integrity needed to safely support flight operations may be met.

This provision mandates the parties involved to comply with the detailed data processing requirements outlined in Annex IV, Part E which have been specified to give a sufficient level of assurance that for critical and essential data items, that the required integrity levels have been reached.
10.2.7.4 Explanation of Provision
The provision requires that all parties listed in Article 2(2) process aeronautical data and information in accordance with the detailed requirements specified by Annex IV, Part E.

10.2.7.5 Implementing the Provision
Implementation of this provision is achieved when the applicable parties process aeronautical data and information in compliance with the detailed requirements outlined in Annex IV, Part E. No specific implementation guidance for this provision is provided here and the reader is referred to the specific requirements of Annex IV, Part E.

10.2.7.6 Means of Compliance
No specific means of compliance is identified for this provision as compliance is achieved through meeting the requirements laid down in Annex IV, Part E. For the requirements in Annex IV, Part E, the EUROCONTROL Specification for Data Assurance Levels [RD 30] includes objectives that may be used to support the implementation of these provisions.

10.2.8 Article 6(8)

10.2.8.1 Text of Provision
The parties referred to in Article 2(2) shall ensure that error reporting, feedback and rectification mechanisms are established and operated in accordance with the requirements laid down in Annex IV, Part F.

10.2.8.2 Applicability
This provision applies to all those parties named in Article 2(2), namely:

"air navigation service providers;
operators of those aerodromes and heliports, for which instrument flight rules (IFR) or Special-visual flight rules (VFR) procedures have been published in national aeronautical information publications;
public or private entities providing, for the purposes of this Regulation:
(i) services for the origination and provision of survey data;
(ii) procedure design services;
(iii) electronic terrain data;
(iv) electronic obstacle data."

This provision will, therefore, apply to all parties involved in the origination, processing and publication of aeronautical data and information.

10.2.8.3 Rationale / Need for Provision
A process that seeks to offer a high-quality result must identify errors and correct them. Some errors will be identified before the output of the processes are complete but others may be identified after the process has completed, i.e. by the customers of the process.

It is essential that mechanisms exist to allow identified errors to be reported, analysed, corrected and, if appropriate, for the process to be amended to prevent similar errors in the future.

This provision mandates that the applicable parties have processes in place that comply with the detailed requirements specified in Annex IV, Part F for the feedback and correction of errors in aeronautical data and information.
### 10.2.8.4 Explanation of Provision

The provision requires that all parties listed in Article 2(2) have in place and operate specific mechanisms to identify, feedback and correct errors identified in aeronautical data and information in accordance with the detailed requirements specified by Annex IV, Part F.

### 10.2.8.5 Implementing the Provision

Implementation of this provision is achieved when the applicable parties have data error feedback processes, in compliance with the detailed requirements outlined in Annex IV, Part F. No specific implementation guidance for this provision is provided here and the reader is referred to the specific requirements of Annex IV, Part F.

### 10.2.8.6 Means of Compliance

No specific means of compliance is identified for this provision as compliance is achieved through meeting the requirements laid down in Annex IV, Part F. For these requirements, the EUROCONTROL Specification for Data Assurance Levels [RD 30] includes objectives that may be used to support the implementation of these provisions.

### 10.3 Annex IV

The following sections outline the specific provisions and requirements of Annex IV and provide guidance as to acceptable means of compliance.

#### 10.3.1 Annex IV Part A - Data quality requirements

Annex IV Part A provides detailed requirements that must be met in order for a State to achieve the quality requirements for the aeronautical data and information that it makes available.

##### 10.3.1.1 Annex IV Part A (1)

#### 10.3.1.1.1 Text of Requirement

Data quality requirements for each data item within the scope of aeronautical data and aeronautical information referred to in the second subparagraph of Article 2(1) shall be as defined by the ICAO standards referred to in Annex III point 11 and other relevant ICAO standards without prejudice to point 2 of this Annex.

##### 10.3.1.1.2 Analysis of Requirement

This requirement is for aeronautical data and information identified within the scope of Article 2(1) to have its data quality requirements identified. Article 2(1) identifies the following aeronautical data and information:

- **a)** the integrated aeronautical information package as defined in Article 3(7) made available by Member States, with the exception of aeronautical information circulars;
- **b)** electronic obstacle data, or elements thereof, where made available by Member States;
- **c)** electronic terrain data, or elements thereof, where made available by Member States;
- **d)** aerodrome mapping data, where issued by Member States.
It should be remembered that the aeronautical data and information that is within the scope of the ADQ IR includes non-numerical aeronautical data and information, as well as numerical aeronautical data and information. In essence, for numerical aeronautical data and information, accuracy, resolution and integrity requirements must be identified. For non-numerical aeronautical data and information, only integrity requirements are required. Annex III point (11) refers to Appendix 7 of ICAO Annex 15 [RD 10] within which some data quality requirements are defined. Other ICAO Annexes and documents also contain requirements that form the quality requirements for aeronautical data and information.

The mention of this requirement being without prejudice to point (2) indicates that the parties are required to address both point (1) and point (2), i.e. if the assessment performed in point 2 associates a more stringent data quality requirement than ICAO has defined for a data item, the more stringent requirement applies.

As discussed in Chapter 10.2.1 the Common Understanding 03/2013 Scope of Article 6(1) of the Commission Regulation (EU) 73/2010 concluded that the “scope of Article 6(1) of the Regulation is currently limited to the scope of the data included in ICAO Annex 15, Appendix 7 and other relevant ICAO SARPs”

10.3.1.1.3 Means of Compliance

The primary means of compliance for this provision is the ICAO material itself and the parties involved are recommended to review this material to ascertain the DQRs applicable to their aeronautical data and information.

For the means of compliance for Annex IV Part A (2), EUROCONTROL has developed the EUROCONTROL Specification for Data Quality Requirements [RD 32]. This document contains requirements for aeronautical data and information data items within the above scope and, therefore, reflects the criteria found within the ICAO material referenced.

The Common Understanding 03/2013 Scope of Article 6(1) of the Commission Regulation (EU) 73/2010 provides the rationale for the definition of the scope of this provision.

10.3.1.2 Annex IV Part A (2)

10.3.1.2.1 Text of Requirement

Data quality requirements for a data item within the scope of aeronautical data and aeronautical information referred to in the second subparagraph of Article 2(1) shall be established based on a safety assessment of the intended uses of the data item where:

(a) a data item is not defined by the ICAO data quality standards referred to in point 11 of Annex III and other relevant ICAO standards; or

(b) the data quality requirements for a data item are not met by the ICAO data quality standards referred to in point 11 of Annex III and other relevant ICAO standards.

10.3.1.2.2 Analysis of Requirement

There are differences of opinion over whether the integrity definitions contained within the ICAO Annexes apply to all aeronautical data and information or to just the data items covered within the Appendices, such as Appendix 7 to ICAO Annex 15 [RD 10].

As already stated above the Common Understanding 03/2013 Scope of Article 6(1) of the Commission Regulation (EU) 73/2010 concluded that the “scope of Article 6(1) of the Regulation is currently limited to the scope of the data included in ICAO Annex 15, Appendix 7 and other relevant ICAO SARPs”

All measured and calculated aeronautical data and information should have an accuracy associated with it which provides an indication to the user as to the tolerances that have been applied in originating the data and which may impact the operations undertaken using the aeronautical data and information.
Numerical aeronautical data and information also requires a resolution to be specified, i.e. the number of digits used to represent the value. This is typically one decimal place more than the accuracy requirement. For example, if a data item requires an accuracy of 0.5m, the resolution will typically be 0.01.

It should be noted that the resolution requirements for charts are often different to those for tabular data publication. This is a result of human factors issues when using the chart and the differing perspectives from which the aeronautical data and information is being assessed. For example, a pilot operating VFR does not require aeronautical data and information to fractions of seconds, whereas an FMS does.

10.3.1.2.3 Means of Compliance

The effort required assessing the data quality requirements for all aeronautical data and information is significant. Furthermore, it is highly desirable that the data quality requirements are harmonised across the SES States. Consequently, EUROCONTROL has developed the EUROCONTROL Specification for Data Quality Requirements [RD 32] which provides two key elements to aid States in complying with this requirement:

1) Guidance as to how a State may determine the data quality requirements for aeronautical data and information;
2) An assessed set of data quality requirements for aeronautical data and information under the scope of Article 1(2), named “Harmonised List”, established through safety assessment or directly extracted from the ICAO SARPS, which a State may adopt if so wished and which would, if adopted, bring harmonisation in Europe.

10.3.1.3 Annex IV Part A (3)

10.3.1.3.1 Text of Requirement

The data quality requirements for the data items referred to in point 2 shall be developed in accordance with a standardised process describing the methodology for the derivation and validation of these requirements prior to publication, taking due account of the potential impact on relevant ICAO provisions.

10.3.1.3.2 Analysis of Requirement

In order to comply with this requirement, States must use a standard, documented process to determine the data quality requirements for each data item. This process must fully document the methodology employed in making the assessment. Consideration should be given to documenting:

1) Who is involved in the assessment, for example, the domains of expertise that should be included;
2) The conduct of the meeting;
3) What data items qualify for assessment;
4) How the meeting will make decisions as to the quality attributes that will be assigned to a data item;
5) How the results will be documented;
6) Who, if anybody, will review the findings.

10.3.1.3.3 Means of Compliance

Each State will have its own specific operational and institutional situations that will impact compliance with this requirement, therefore, no specific means of compliance is provided.
Nonetheless, the EUROCONTROL Specification for Data Quality Requirements [RD 32] provides guidance, an assessed list of data quality requirements and a proposed assessment methodology which a State may utilise in determining its own process.

### 10.3.1.4 Annex IV Part A (4)

#### 10.3.1.4.1 Text of Requirement

Where a data item has more than one intended use, only the most stringent data quality requirements, arising from the safety assessment referred to in point 2, shall be applied to it.

#### 10.3.1.4.2 Analysis of Requirement

Different uses of aeronautical data and information have differing quality requirements and this requirement ensures that this is addressed in the assessment performed in Annex IV Part A (3).

To give an example, a runway threshold is of little or no importance to VFR operations; the pilot simply needs to know where the aerodrome is and what runway he/she will be using. To this end, providing the threshold point to a relatively low accuracy and with a low integrity level is acceptable, given the operations conducted will have no reliance upon this information. However, the same threshold point, if used by a procedure designer, becomes more important as this is the “end-point” for the procedure and must be known to a much higher accuracy. For Precision Area Navigation (PRNAV), the position of the threshold point is needed to an even higher accuracy. As a result, the data quality requirements would need to reflect the need for the accuracy to be greater in the case where PRNAV is in operation.

In assessing the data quality requirements, all possible uses of the aeronautical data and information must be considered. In the example above, establishing the quality requirements solely on the basis of VFR flights would not adequately meet the needs of procedure design, for example.

#### 10.3.1.4.3 Means of Compliance

The EUROCONTROL Specification for Data Quality Requirements [RD 32] outlines a methodology for determining the data quality requirements for each published data item which takes into account multiple uses for a single data item.

### 10.3.1.5 Annex IV Part A (5)

#### 10.3.1.5.1 Text of Requirement

Data quality requirements shall be defined to cover the following for each data item within the scope of aeronautical data and aeronautical information referred to in the second subparagraph of Article 2(1):

(a) the accuracy and resolution of the data;

(b) the integrity level of the data;

(c) the ability to determine the origin of the data;

(d) the level of assurance that data is made available to the next intended user prior to its effective start date/time and not removed before its effective end date/time.

#### 10.3.1.5.2 Analysis of Requirement

This requirement outlines what attributes must be specified for the data quality requirements. These are:
1) The accuracy requirement;
2) The resolution requirement;
3) The integrity level;
4) The ability to determine the origin, i.e. the need for traceability;
5) The degree of assurance that the aeronautical data and information will be provided in advance of its start of effectivity and remain available until its end of effectivity, i.e the need for timeliness

Together, these attributes will ensure that the aeronautical data and information is suitable for its intended use.

10.3.1.5.3 Means of Compliance

No specific means of compliance exists for this requirement. The State must ensure that, within the process defined in Annex IV Part A (3), the data quality requirements identified here are addressed.

10.3.1.6 Annex IV Part A (6)

10.3.1.6.1 Text of Requirement

All of the data items needed to support each application dataset and/or a valid sub-set of the dataset shall be defined.

10.3.1.6.2 Analysis of Requirement

This requirement ensures that for either a complete dataset (e.g. an AIP) or a sub-set (e.g. data relating to one of more Navaids only), a complete definition of what aeronautical data and information must be included is defined. This may then be used to support requirements where completeness of aeronautical data and information is assessed.

10.3.1.6.3 Means of Compliance

No specific means of compliance exists for this requirement, although the datasets identified in ARTICLE 2 - SCOPE meet this requirement.

10.3.2 Annex IV Part B – Evidence Requirements

Annex IV Part B provides requirements for the organisations within the data chain to define documented processes that meet the DQRs for the aeronautical data and information for which they are responsible, gather evidence that they comply with the processes, and utilise staff who are suitably trained and tools that are fit for purpose.

10.3.2.1 Annex IV Part B (a)

10.3.2.1.1 Text of Requirement

Arguments and evidence shall be generated to show that:

(a) accuracy and resolution requirements are complied with at data origination and maintained through to publication to the next intended user, including, whenever the resolution of a data item is reduced or changed, or the data is translated into a different co-ordinate system or unit of measurement;

10.3.2.1.2 Analysis of Requirement

Whilst Annex IV Part A has determined the data quality requirements for each data item, this requirement necessitates that, at the point of origination, evidence is gathered to demonstrate that the accuracy and resolution requirements have been met. The requirement further requests that arguments can be provided to show that the accuracy and resolution produced at data origination are not degraded during data processing.
10.3.2.1.3 Means of Compliance

The EUROCONTROL Specification for Data Assurance Levels [RD 30] provides a possible means of compliance for this provision.

The means of complying with the evidence requirements will be dependent upon the type of aeronautical data and the manner in which it was originated.

For example, if aeronautical data is calculated, then the calculation applied may be mathematically proven to give an answer with a degree of accuracy and to a given resolution. For most surveyed (measured) data, the data collection technique utilised will have a statistical accuracy and resolution that, within a defined degree of confidence, may be used.

However, whatever the data type and means of origination, the evidence should be associated, as metadata, with the aeronautical data itself.

10.3.2.2 Annex IV Part B (b)

10.3.2.2.1 Text of Requirement

Arguments and evidence shall be generated to show that:

(b) the origin and change history for each data item is recorded and available for audit;

10.3.2.2.2 Analysis of Requirement

This requirement necessitates that, as aeronautical data and information is passed from actor to actor within the data chain, an audit trail is maintained to record:

1) Who first originated the aeronautical data;
2) Who interacted with the aeronautical data and information;
3) If any changes are made:
4) what change is made and the values before and after the change;
5) If applicable, the calculation formula used.
6) Which software tool (if applicable) and which version has been used for processing the aeronautical data and information.

For each record, the date, time and organisation involved should be recorded.

Although not specifically mentioned in the requirement, it is highly recommended that any approval / quality checks that the aeronautical data and information are subjected to are also recorded, even though the aeronautical data and information itself should not be changed by such acts.

10.3.2.2.3 Means of Compliance

The EUROCONTROL Specification for Data Assurance Levels [RD 30] provides a possible means of compliance for this provision.

Evidence, comprising the audit trail, should be maintained as metadata and should be associated with the aeronautical data and information itself.

10.3.2.3 Annex IV Part B (c)

10.3.2.3.1 Text of Requirement

Arguments and evidence shall be generated to show that:

(c) the aeronautical data or aeronautical information is complete or any missing items are declared;
10.3.2.3.2 Analysis of Requirement

Whilst some missing aeronautical data and information may be very obvious, for example, a missing frequency for a Navaid, other missing aeronautical data and information may be less clear. An example of missing aeronautical data or information that is not necessarily obvious is stand data at an aerodrome. If aeronautical data relating to only one or two stands amongst many is missing, the user may not notice the deficiency.

It is recommended to provide adequate information about the coverage of a dataset so that an “non-local” user of the aeronautical data and information is able to easily identify within what scope “complete” means. For example, is the dataset complete for an IFR aerodromes or all aerodromes, including VFR only.

This requirement ensures that the providers of aeronautical data and information make a clear statement as to the completeness of the aeronautical data and information they provide, highlighting any items which are missing.

10.3.2.3.3 Means of Compliance

The EUROCONTROL Specification for Data Assurance Levels [RD 30] provides a possible means of compliance for this provision.

A statement relating to the completeness of aeronautical data and information should be provided as metadata associated with the delivery of the dataset.

10.3.2.4 Annex IV Part B (d)

10.3.2.4.1 Text of Requirement

Arguments and evidence shall be generated to show that:

(d) all data origination, production, storage, handling, processing, transfer or distribution processes used for each data item are defined and adequate for the assigned level of integrity of the data item;

10.3.2.4.2 Analysis of Requirement

Several obligations are introduced by this requirement, as follows:

1) Processes for any task which interacts with aeronautical data and information must be defined;
2) The processes must be documented;
3) The defined processes must be assessed to ensure that they are of a suitable standard to achieve their intended purpose and to contribute to the achievement of the data quality requirements for the aeronautical data and information to which they relate;
4) That evidence must exist to demonstrate points a) to c).

10.3.2.4.3 Means of Compliance

The EUROCONTROL Specification for Data Assurance Levels [RD 30] provides a possible means of compliance for this provision.

It is recommended that these processes are defined by each organisation as part of their Quality Management System (QMS) and that the necessary evidence of compliance is gathered and confirmed through the audits undertaken. Such audits should be conducted by both internal and external parties.

10.3.2.5 Annex IV Part B (e)

10.3.2.5.1 Text of Requirement

Arguments and evidence shall be generated to show that:
(e) data validation and verification processes are adequate for the assigned integrity level of the data item;

10.3.2.5.2 Analysis of Requirement

This requirement, in some ways, duplicates that of Annex IV Part B (d) but also reinforces it by specifically introducing the need for the processes to include validation and verification of aeronautical data and information that are adequate to meet the defined integrity requirements of the aeronautical data and information.

10.3.2.5.3 Means of Compliance

The EUROCONTROL Specification for Data Assurance Levels [RD 30] provides a possible means of compliance for this provision.

It is recommended that these processes are defined by each organisation as part of their QMS and that the necessary evidence of compliance is gathered and confirmed through the use of audit. Such audits should be conducted by both internal and external parties.

10.3.2.6 Annex IV Part B (f)

10.3.2.6.1 Text of Requirement

Arguments and evidence shall be generated to show that:

(f) manual or semi-automated data processes are performed by trained and qualified staff, with clearly defined roles and responsibilities that are recorded in the organisation’s quality system;

10.3.2.6.2 Analysis of Requirement

It is a fact that it is normally the human in the system which poses the greatest risk that a data item and its value are altered such that it may no longer, meets its data quality requirements. However, the human is essential to identify problems that automated systems cannot. The ADQ IR has acknowledged that whilst some processes may be fully automated, for many processes, the interaction of members of staff will remain necessary for the foreseeable future.

This requirement mandates that wherever members of staff are interacting with the aeronautical data and information, either in a fully manual process, or as part of a semi-automated process, that they are fully trained and qualified for the roles that they fulfil.

10.3.2.6.3 Means of Compliance

In order to comply with this requirement, an organisation must:

1) Clearly identify the roles and responsibilities needed to support the defined processes;

2) Identify the key skills, competences and qualifications needed to fulfil each role;

3) Ensure that the members of staff assigned the identified roles meet the needs identified in point b);

4) Provide training where a deficiency is identified at point c);

5) Take steps to mitigate any risk to aeronautical data and information where a member of staff is employed in a process when they have not yet been provided any necessary training to meet the needs of point b).

Most QMSs introduce the need for staff competency management, with an associated need to maintain, for example, training records.

It is, therefore, recommended that the processes defined to meet this requirement are documented as part of each organisation’s QMS and that the necessary evidence is confirmed by audit, conducted by both internal and external parties.
The EUROCONTROL Specification for Data Assurance Levels [RD 30] provides a possible means of compliance for this provision.

### 10.3.2.7 Annex IV Part B (g)

#### Text of Requirement

Arguments and evidence shall be generated to show that:

(g) all tools and/or software used to support or implement the processes are validated as fit for purpose in accordance with Annex V;

#### Analysis of Requirement

The data processes associated with an automated environment will result in the more prevalent use of tools and software applications, and introduce other risks to the quality of aeronautical data and information which must be mitigated.

The typical mitigation is through validation and verification processes, where processes ensure that the tool or application behaves as it was designed to and that its design meets the purpose for which it is intended.

This requirement mandates that the organisations that utilise tools or software applications validate that they are fit for purpose.

#### Means of Compliance

The EUROCONTROL Specification for Data Assurance Levels [RD 30] provides a possible means of compliance for this provision.

### 10.3.2.8 Annex IV Part B (h)

#### Text of Requirement

Arguments and evidence shall be generated to show that:

(h) an effective error reporting, measurement and corrective action process is in operation in accordance with Part F.

#### Analysis of Requirement

When errors are identified, there is a need to identify the cause, correct the error and ensure that anybody that needs to be made aware of the error is notified. If the cause of the error is such that preventative action may be taken to prevent a reoccurrence of a similar error, this should be taken. This may, for example, take the form of further training or a revision to processes.

This requirement mandates that the organisation addresses errors detected in a manner compliant with the requirements of Annex IV, Part F.

#### Means of Compliance

The EUROCONTROL Specification for Data Assurance Levels [RD 30] provides a possible means of compliance for this provision.

### 10.3.3 Annex IV Part C – Formal Arrangements

Formal arrangements allow a solid baseline against which a data provider and a data receiver may reasonably expect the exchange of aeronautical data and information to take place.

Annex IV Part C outlines requirements for the minimum content of such arrangements which are mandated by Article 6.
10.3.3.1 Annex IV Part C (a)

10.3.3.1.1 Text of Requirement

*Formal arrangements shall include the following minimum content:*

(a) the scope of aeronautical data or aeronautical information to be provided;

10.3.3.1.2 Analysis of Requirement

When establishing a formal arrangement for the provision of aeronautical data and information, it is essential that the arrangement precisely defines the scope of aeronautical data and information that it covers. This requirement ensures that this scope is recorded as part of the arrangement.

10.3.3.1.3 Means of Compliance

As discussed in Article 6(3), the nature of a formal arrangement will vary from situation to situation. For a longer-term relationship, it is recommended that some form of ADQ Formal Arrangement is established. The ADQi WG developed a formal arrangement template that includes all the elements required in Annex IV, Part C. The ADQi WG Formal Arrangement Template is included in ANNEX C of this Guide.

10.3.3.2 Annex IV Part C (b)

10.3.3.2.1 Text of Requirement

*Formal arrangements shall include the following minimum content:*

(b) the accuracy, resolution and integrity requirements for each data item supplied;

10.3.3.2.2 Analysis of Requirement

A formal arrangement for the provision of aeronautical data and information must define the quality requirements for the aeronautical data and information that will be passed between the signatories to the arrangement. Such an approach ensures that all parties have a common understanding of the levels of expectation. The data quality requirements for all aeronautical data and information that is included under the scope defined in Annex IV Part C (a) must be defined. This requirement ensures that this information is recorded as part of the arrangement.

10.3.3.2.3 Means of Compliance

As discussed in Article 6(3), the nature of a formal arrangement will vary from situation to situation. For a longer-term relationship, it is recommended that some form of ADQ Formal Arrangement is established. The ADQi WG developed a formal arrangement template that includes all the elements required in Annex IV, Part C. The ADQi WG Formal Arrangement Template is included in ANNEX C of this Guide.

10.3.3.3 Annex IV Part C (c)

10.3.3.3.1 Text of Requirement

*Formal arrangements shall include the following minimum content:*

(c) the required methods for demonstrating that the data provided conforms with the specified requirements;

10.3.3.3.2 Analysis of Requirement

It must be demonstrated that aeronautical data and information meets its requirements at each stage of the process, with no actor passing on aeronautical data and information which is not “fit for purpose”. The formal arrangement requires the documentation of the methods that shall be applied by the data provider to demonstrate this compliance.

The method applied should be mutually agreeable to both parties and, hence, form the standard against which aeronautical data and information may be verified by the recipient, if so desired.
10.3.3.3 Means of Compliance

As discussed in Article 6(3), the nature of a formal arrangement will vary from situation to situation. For a longer-term relationship, it is recommended that some form of ADQ Formal Arrangement is established. The ADQi WG developed a formal arrangement template that includes all the elements required in Annex IV, Part C. The ADQi WG Formal Arrangement Template is included in ANNEX C of this Guide.

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Formal arrangements shall include the following minimum content:

(d) the nature of action to be taken in the event of discovery of a data error or inconsistency in any data provided;

10.3.3.4.2 Analysis of Requirement

In any transaction, there is a possibility of a failure occurring and the mechanisms that should be used to identify, notify and correct failures in aeronautical data and information provision should be agreed and documented. It is also important that the parties are mutually aware of the impact of errors on the recipient's processes.

It is also recommended that, at this point, elevation mechanisms are identified and agreed, such that if either party fails in their duties and responsibilities under the arrangement, that there is a common understanding of the steps that should be taken to elevate failure, in a manner that is proportionate to the problem.

This requirement ensures that this information is recorded as part of the arrangement.

10.3.3.5 Means of Compliance

As discussed in Article 6(3), the nature of a formal arrangement will vary from situation to situation. For a longer-term relationship, it is recommended that some form of ADQ Formal Arrangement is established. The ADQi WG developed a formal arrangement template that includes all the elements required in Annex IV, Part C. The ADQi WG Formal Arrangement Template is included in ANNEX C of this Guide.

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Formal arrangements shall include the following minimum content:

(e) the following minimum criteria for notification of data changes:

- criteria for determining the timeliness of data provision based on the operational or safety significance of the change;
- any prior notice of expected changes;
- the means to be adopted for notification.

10.3.3.5.2 Analysis of Requirement

Some types of aeronautical data and information will take longer to process and prepare for publication, than others. For example, the time to modify and approve an AIP change for a telephone number will be significantly less than for a change of runway length, which will also require new procedures to be published and charts to be updated. Whilst it would be possible for a State to declare the longest period necessary for the provision of all aeronautical data and information supplied by a particular data provider, to the AISP, this is not considered practicable and it is, therefore, recommended that for differing types of aeronautical data and information, differing dates by which they must be provided to the AISP are established.
The due dates at the AISP may be established by the AISP and will consider the time it takes for the AISP to process the aeronautical data and information and any requirements for the change to be published in accordance with the Aeronautical Information Regulation And Control (AIRAC) cycle.

Once these dates are determined, their impact must be reflected throughout the data chain, with increasing amounts of notice, in advance of the effective date, being required for more complex changes to published aeronautical data and information. For example, if the AISP determines that it needs changed aeronautical data and information 90 days before its effective date, the body that provides that aeronautical data and information, e.g. the CAA, may need any input that it requires for the change, 95 days in advance of the effective date.

This requirement is for the establishment of dates, in advance of the effective date, for differing aeronautical data and information, and for their inclusion within the formal arrangement.

It also establishes the need to document within the arrangement any notice of expected change, and the method by which the notification of change must be provided. This may assist those bodies further along the data chain to better plan the necessary resources to accommodate the change.

10.3.3.5.3 Means of Compliance

As discussed in Article 6(3), the nature of a formal arrangement will vary from situation to situation. For a longer-term relationship, it is recommended that some form of ADQ Formal Arrangement is established. The ADQi WG developed a formal arrangement template that includes all the elements required in Annex IV, Part C. The ADQi WG Formal Arrangement Template is included in ANNEX C of this Guide.

10.3.3.6 Annex IV Part C (f)

10.3.3.6.1 Text of Requirement

Formal arrangements shall include the following minimum content:

(f) the party responsible for documenting data changes;

10.3.3.6.2 Analysis of Requirement

This requirement is needed to ensure that where third-parties are involved in aeronautical data and information provision, that those parties who are involved in the formal arrangement are aware. For example, it may be a surveyor that documents the changes needed, yet the formal arrangement may exist between the AIS and an Aerodrome Authority.

10.3.3.6.3 Means of Compliance

As discussed in Article 6(3), the nature of a formal arrangement will vary from situation to situation. For a longer-term relationship, it is recommended that some form of ADQ Formal Arrangement is established. The ADQi WG developed a formal arrangement template that includes all the elements required in Annex IV, Part C. The ADQi WG Formal Arrangement Template is included in ANNEX C of this Guide.

10.3.3.7 Annex IV Part C (g)

10.3.3.7.1 Text of Requirement

Formal arrangements shall include the following minimum content:

(g) the means to resolve any potential ambiguities caused where different formats are used to exchange aeronautical data or aeronautical information;
10.3.3.7.2 Analysis of Requirement

If aeronautical data and information is exchanged in different formats, this can lead to confusion and possible error. This requirement ensures that, although the use of different formats is not prohibited, the different formats are at least understood and the means by which any ambiguities are resolved is documented as part of the arrangement.

Nonetheless, it is recommended that, in so far as is possible, the use of only one single, common format is agreed. Where this is not possible, it is recommended that that the use of a very limited set of formats is agreed.

10.3.3.7.3 Means of Compliance

As discussed in Article 6(3), the nature of a formal arrangement will vary from situation to situation. For a longer-term relationship, it is recommended that some form of ADQ Formal Arrangement is established. The ADQi WG developed a formal arrangement template that includes all the elements required in Annex IV, Part C. The ADQi WG Formal Arrangement Template is included in ANNEX C of this Guide.

10.3.3.8 Annex IV Part C (h)

10.3.3.8.1 Text of Requirement

Formal arrangements shall include the following minimum content:

(h) any limitations on the use of data;

10.3.3.8.2 Analysis of Requirement

For a number of reasons, a data provider may wish to place limitations on the use of aeronautical data and information. This may be a result of the aeronautical data and information being considered suspect (of unknown or inferior quality) or for commercial reasons. An example of the latter case may be the provision of topographical information which is only to be used for the preparation of charts, and not for re-sale as topographical data.

Such limitations must be documented in the arrangement, such that all parties fully understand the limitations that apply to the aeronautical data and information provided.

10.3.3.8.3 Means of Compliance

As discussed in Article 6(3), the nature of a formal arrangement will vary from situation to situation. For a longer-term relationship, it is recommended that some form of ADQ Formal Arrangement is established. The ADQi WG developed a formal arrangement template that includes all the elements required in Annex IV, Part C. The ADQi WG Formal Arrangement Template is included in ANNEX C of this Guide.

10.3.3.9 Annex IV Part C (i)

10.3.3.9.1 Text of Requirement

Formal arrangements shall include the following minimum content:

(i) requirements for the production of quality reports by data providers to facilitate verification of data quality by the data users;
10.3.3.9.2 Analysis of Requirement

The formal arrangement should capture the need for the data provider to provide reports which can be used to verify the aeronautical data and information received. These reports could include:

1) Descriptions of the process used to validate the aeronautical data and information;
2) Reports of the results of the aeronautical data and information validation;
3) Any information provided to the data provider that supports the data which they have, in turn, utilised in the origination or validation processes.

10.3.3.9.3 Means of Compliance

As discussed in Article 6(3), the nature of a formal arrangement will vary from situation to situation. For a longer-term relationship, it is recommended that some form of ADQ Formal Arrangement is established. The ADQi WG developed a formal arrangement template that includes all the elements required in Annex IV, Part C. The ADQi WG Formal Arrangement Template is included in ANNEX C of this Guide.

10.3.3.10 Annex IV Part C (j)

10.3.3.10.1 Text of Requirement

*Formal arrangements shall include the following minimum content:*

(j) metadata requirements;

10.3.3.10.2 Analysis of Requirement

Metadata forms an essential element of the ADQ IR as it is necessary to fully understand the context of the aeronautical data and information. This requirement ensures that the formal arrangements established between a data provider and receiver fully document the metadata that is expected to accompany the aeronautical data and information.

The metadata requested should be in compliance with the dataset definitions contained in Annex I Part C.

10.3.3.10.3 Means of Compliance

As discussed in Article 6(3), the nature of a formal arrangement will vary from situation to situation. For a longer-term relationship, it is recommended that some form of ADQ Formal Arrangement is established. The ADQi WG developed a formal arrangement template that includes all the elements required in Annex IV, Part C. The ADQi WG Formal Arrangement Template is included in ANNEX C of this Guide.

10.3.3.11 Annex IV Part C (k)

10.3.3.11.1 Text of Requirement

*Formal arrangements shall include the following minimum content:*

(k) contingency requirements concerning the continuity of data provision.

10.3.3.11.2 Analysis of Requirement

The formal arrangements must include the plans that are to be executed to ensure the continued provision of aeronautical data and information in the event of a failing in the normal methodology for aeronautical data and information provision. This contingency planning should address both institutional and technical aspects, for example:

1) The assignment of a deputy to approve aeronautical data and information in the event of the non-availability of the defined approval authority; or,
2) Secondary means for the delivery of aeronautical data and information when the planned means cannot be used as a result of a technical failure, for example.
10.3.3.11.3 Means of Compliance

As discussed in Article 6(3), the nature of a formal arrangement will vary from situation to situation. For a longer-term relationship, it is recommended that some form of ADQ Formal Arrangement is established. The ADQi WG developed a formal arrangement template that includes all the elements required in ANNEX IV, Part C. The ADQi WG Formal Arrangement Template is included in ANNEX C of this Guide.

1.1.1 Annex IV Part D – Data Origination

The data origination phase is, to a degree, the most critical in the data chain. No matter how sound the data chain and the extent of the steps taken to assure integrity, if the aeronautical data is wrong to start with, the resultant aeronautical data and information may be wrong. Such a situation is often referred to as “rubbish in, rubbish out”.

Annex IV Part D outlines requirements that determine the minimum requirements that must be met in originating aeronautical data which falls under the scope of Article 6. These requirements ensure that steps are taken to ensure that the correct request for aeronautical data is made at the beginning of the data chain and that the aeronautical data resulting from that request is generated correctly, be it by measurement or calculation.

10.3.3.12 Annex IV Part D (1)

10.3.3.12.1 Text of Requirement

The surveying of radio navigation aids and the origination of calculated or derived data whose coordinates are published in the AIP shall be carried out in accordance with appropriate standards and at least in accordance with the relevant ICAO provisions referred to in point 20 of Annex III.

10.3.3.12.2 Analysis of Requirement

This requirement covers the origination of the spatial property of data items published in the AIP. This explicit statement acknowledges that the spatial property of a data item (the coordinates) requires different origination processes than other properties. In order to comply with this requirement, the minimum standard to be followed with respect to aeronautical data origination is Annex III point (20) which refers to ICAO Doc 9674 “WGS-84 Manual” [RD 12]. Data items or certain survey techniques may not be covered in this Manual since it has not been adapted to address the latest amendments of ICAO Annex 15, in particular with respect to electronic TOD. ICAO Doc 9674 “WGS-84 Manual” [RD 12] has primarily been written for surveyors and focuses on real, existing data items. Processes for the calculation of coordinates or the derivation of coordinates for procedures, are covered in Doc 8168, Volume II [RD 11].

10.3.3.12.3 Means of Compliance

The EUROCONTROL Specification for the Origination of Aeronautical Data [RD 31] provides a possible means of compliance as this specification is based on the ICAO Doc 9674 “WGS-84 Manual” [RD 12] but also covers more modern survey techniques, as well as the processes for the origination of calculated or derived aeronautical data.

10.3.3.13 Annex IV Part D (2)

10.3.3.13.1 Text of Requirement

All surveyed data shall be referenced to WGS-84 as specified in the ICAO provisions referred to in point 2 of Annex III.
10.3.3.13.2 Analysis of Requirement

WGS-84 is the common horizontal reference frame which must be used as the basis for aeronautical data. There are two main reasons for this requirement: a) when everyone in the data chain uses the same reference frame, there is no need for data transformation and, as a result, a potential degradation of quality (or loss of integrity) and b) a consistent reference frame allows a greater level of automation in data processing, by reducing the necessary process steps. There may be operational limitations to using WGS-84 as the reference system in the entire data processing chain. In such cases, it must be clear which reference system is used in which processing step, and corresponding metadata (for traceability) and transformation information shall be provided. One of the key issues herein is the difficulty to distinguish between coordinates provided in WGS-84 and those provided in another "wide-area" reference system, like International Terrestrial Reference Frame (ITRF), European Terrestrial Reference Frame (ETRF) or even North American Datum (NAD).

10.3.3.13.3 Means of Compliance

The EUROCONTROL Specification for the Origination of Aeronautical Data [RD 31] provides a possible means of compliance as this specification is based on the ICAO Doc 9674 “WGS-84 Manual” [RD 12] but also covers more modern survey techniques, as well as the processes for the origination of calculated or derived aeronautical data.

10.3.3.14 Annex IV Part D (3)

10.3.3.14.1 Text of Requirement

A geoid model, sufficient to meet the ICAO provisions referred to in point 3 of Annex III and the aeronautical data and aeronautical information quality requirements specified in Annex IV, shall be used in order that all vertical data (surveyed, calculated or derived) may be expressed relative to mean sea level via the Earth Gravitational Model 1996. A 'geoid' means the equipotential surface in the gravity field of the Earth, which coincides with the undisturbed mean sea level extended continuously through the continents.

10.3.3.14.2 Analysis of Requirement

The ellipsoid which is used as part of the definition of a Geodetic Datum, such as WGS-84, could be used as a reference surface. The Ellipsoidal Height is the orthogonal distance between a point and the reference ellipsoid. Therefore, it does not take into account the Earth's gravity field.

For most applications, the ellipsoidal height which is derived from GPS measurements is not useful. A geoid model must be applied to create heights referring to sea level. The geoid is the equipotential surface of the earth's gravity field, chosen at a certain level (approximately Mean Sea Level (MSL)) which serves as the reference surface for height measurements. Globally, the difference in elevation between the geoid and geocentric ellipsoid is between ± 100m.

Global and local geoids are differentiated between. Global geoids consider only the short and middle-wave part of the earth's gravity field. Global geoids are used when consistent orthometric heights over long distances (continent or earth surveying) are required. The global geoid model specified for aviation, by ICAO and the ADQ Regulation, is EGM-96. Due to its global extent, it does not cover all local variations, for which local, best fitting geoid models have been determined and may also be used for certain datasets.

The requirement specifies MSL using the EGM-96 geoid model as the height reference system. When some elements are provided using a different geoid model as a result of the SARPS in ICAO Annex 15 [RD 10] (resolution of threshold height 0.1m), then corresponding metadata and transformation information shall be provided.

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2 A local planar coordinate system is generally used in the photogrammetric stereo compilation.
10.3.3.14.3 Means of Compliance
The EUROCONTROL Specification for the Origination of Aeronautical Data [RD 31] provides a possible means of compliance as this specification provides guidance on aeronautical data origination in EGM-96 and transformations between a local best fitting geoid and EGM-96.

10.3.3.15 Annex IV Part D (4)
10.3.3.15.1 Text of Requirement
Surveyed, calculated and derived data shall be maintained throughout the lifetime of each data item.

10.3.3.15.2 Analysis of Requirement
Traceability (the ability to determine the origin of the aeronautical data) is a key quality requirement in the aviation domain. This requirement places the obligation on the actors involved in aeronautical data origination for sufficient information to be captured so that it can then be retained throughout the lifetime of each data item so that its history can be reconstructed. For instance, if the location of a Navaid is surveyed using local benchmark points, by means of conventional terrestrial survey, the coordinates of the benchmark points and the raw measurements (angle and distance) must be kept, together with the coordinates of the Navaid.

Depending on the organisation of the data origination activity, a significant challenge may be seen to maintain a link and to provide traceability between a data item created at a point in the past and its existence at a later date having been passed through potentially many different processes and organisation. The traceability requirement should, therefore, be taken into account when defining a formal arrangement.

10.3.3.15.3 Means of Compliance
The EUROCONTROL Specification for the Origination of Aeronautical Data [RD 31] provides a possible means of compliance for this provision.

10.3.3.16 Annex IV Part D (5)
10.3.3.16.1 Text of Requirement
Survey data categorised as critical or essential data shall be subject to a full initial survey, and thereafter shall be monitored for changes on a yearly basis, as a minimum. Where changes are detected, re-survey of the relevant data shall be undertaken.

10.3.3.16.2 Analysis of Requirement
In current AIPs, many data items have an unknown origin but may have been and continue to be in use for many years. In order to ensure data quality and integrity quickly, this requirement specifies that survey data categorised as critical or essential data must be re-surveyed. This means the aeronautical data and information cannot be transferred from existing publications. Using the term “survey data” ensures that only data items that physically exist, in the real world, are subject to this requirement (i.e. navaids, obstacles, runways). Other critical or essential coordinate data, such as for restricted airspaces, where the coordinates are derived or calculated, are not subject to this requirement.

The requirement acknowledges that notification procedures for changes to aeronautical data and information may fail and, as a result, sufficient evidence cannot be provided that the quality of a data item has not degraded over the time. To help mitigate this, the requirement places the obligation on the owner of critical or essential data items to monitor for changes on a yearly basis, as a minimum.

10.3.3.16.3 Means of Compliance
The EUROCONTROL Specification for the Origination of Aeronautical Data [RD 31] provides a possible means of compliance for this provision.
10.3.3.17  Annex IV Part D (6)

10.3.3.17.1  Text of Requirement

The following electronic survey data capture and storage techniques shall be employed:

(a) reference point coordinates shall be loaded to the surveying equipment by digital data transfer;
(b) the measurements in the field shall be stored digitally;
(c) raw data shall be digitally transferred and loaded into the processing software.

10.3.3.17.2  Analysis of Requirement

Manual data entry is one of the highest risk points in the data chain today and this requirement seeks to address this weakness by ensuring that no aeronautical data is entered manually in any survey processes. Existing benchmark points which are used in a survey (base for differential GPS, free stationing) must be loaded to the equipment by digital data transfer. Only survey equipment which is capable of registering all measurements digitally and which does not need any manual input can fulfil these obligations. The requirement further mandates that the recorded values are digitally transferred to the processing computer. Different transfer methods, like removable storage or direct electronic connections are well established to fulfil these obligations.

It is recommended that a well-defined and documented exchange format is used between the office system and survey equipment to ensure the correct exchange of aeronautical data.

10.3.3.17.3  Means of Compliance

The EUROCONTROL Specification for the Origination of Aeronautical Data [RD 31] provides a possible means of compliance for this provision.

10.3.3.18  Annex IV Part D (7)

10.3.3.18.1  Text of Requirement

All survey data categorised as critical data shall be subject to sufficient additional measurement to identify survey errors not detectable by single measurement.

10.3.3.18.2  Analysis of Requirement

For critical data, the high integrity level should be reflected in the data acquisition process. In surveying, the process of redundant independent measurements is well known. With additional measurements, the probability of detecting an erroneous data item (usually a systematic or gross error) is very high, resulting in data with a greater reliability. In such a process, the same object (i.e. the coordinates of the data items) is collected two or more times, based on independent surveys. There are different ways to provide independent measurements, depending on the surveyed object and the survey method used.

10.3.3.18.3  Means of Compliance

The EUROCONTROL Specification for the Origination of Aeronautical Data [RD 31] provides a possible means of compliance as it contains guidance on survey techniques to deliver aeronautical data of the required quality level.

10.3.3.19  Annex IV Part D (8)

10.3.3.19.1  Text of Requirement

Aeronautical data and aeronautical information shall be validated and verified prior to use in deriving or calculating other data.
10.3.3.19.2 Analysis of Requirement

The quality of the aeronautical data and information must be measured by applying data validation and verification tasks. Since a spatial data item is often unique, there is no way of comparing a new, surveyed object against an already existing one. The fitness for use is determined by comparing a data item against its data quality requirements. Therefore, data validation cannot only be based on the evaluation of the spatial accuracy, as is often the case with surveyed data, but must also encompass tests on resolution and timeliness. As has been mentioned earlier, the integrity of a data item cannot be directly validated and must be determined by verifying all the processes in the data chain, up to the first appearance of the data item (i.e. the data item with associated coordinates and, where required, additional item properties).

10.3.3.19.3 Means of Compliance

The EUROCONTROL Specification for the Origination of Aeronautical Data [RD 31] provides a possible means of compliance for aeronautical data and information validation as it contains guidance on data quality evaluation procedures. It is recommended that, together with the data quality requirements, appropriate data quality evaluation procedures, on the data provider side, become part of the formal arrangement.

The ISO standard 19157 [RD 17] provides guidance on data validation methods for spatial data and examples of data quality test cases for different data quality requirements.

It is also recommended that the verification processes are defined by each organisation acting as a data provider, as part of its QMS, and that the necessary evidence of compliance is gathered and confirmed through the use of audits. Such audits should be conducted by both internal and external parties.

1.1.2 Annex IV Part E – Data Process Requirements

Annex IV Part E introduces requirements that processes, either manual, automated or both, are designed to minimise and reduce the risk of errors being introduced or perpetuated.

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<th>10.3.3.20</th>
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10.3.3.20.1 Text of Requirement

Where processes or parts of processes used in the origination, production, storage, handling, processing, transfer and distribution of aeronautical data and aeronautical information are subject to automation they shall be:

(a) automated to a level commensurate with the context of the data process;
(b) automated to optimise the allocation and interaction of human and machine to achieve a high degree of safety and quality benefits of the process;
(c) designed to avoid the introduction of data errors;
(d) designed to detect errors in received/input data.

10.3.3.20.2 Analysis of Requirement

This requirement establishes basic considerations that must be taken into account when specifying and implementing automation of functions, whether it be by developing a bespoke system or procuring an existing product.
To address each element in turn:

1) The system must ensure that the level of automation is consistent with the data process that it fulfils.

2) The system should strive to find the optimum balance between automation which removes the risk of human error and human interaction to identify errors undetectable by an automated system alone.

3) The design should be such that the risk of the system itself introducing errors is minimised. For example, the system design should ensure that any calculations performed are specified so that floating point operations will not lead to rounding errors which adversely affect data quality.

4) The design of the system should allow, as far as practicable, for aeronautical data and information received or input to be checked for errors. For example, co-ordinates could be checked for plausibility (e.g. the runway threshold points lie within the aerodrome boundary and the angle between them matches the known runway direction / bearing.

10.3.3.20.3 Means of Compliance

No specific means of compliance is identified for this provision. Nevertheless, the EUROCONTROL Specification for Data Assurance Levels [RD 30] defines objectives that may be used to support the implementation of this provision.

10.3.3.21 Annex IV Part E (2)

10.3.3.21.1 Text of Requirement

Where aeronautical data and aeronautical information is entered manually, it shall be subject to independent verification to identify any errors that may have been introduced.

10.3.3.21.2 Analysis of Requirement

Manual data entry is one of the highest risk points in the data chain today and this requirement seeks to address this weakness by ensuring that whenever aeronautical data and information is manually entered, it is verified for correctness. The requirement further mandates that this verification is performed by an independent person or process.

10.3.3.21.3 Means of Compliance

No specific means of compliance is identified for this provision. Nevertheless, the EUROCONTROL Specification for Data Assurance Levels [RD 30] defines objectives that may be used to support the implementation of this provision, notably by recommending that:

1) Where systems are employed, the need to independently enter (double entry) or check aeronautical data and information entry shall be an inherent part of the system design;

2) Where manual processes are employed, operating procedures shall ensure that independent verification is performed and recorded.

1.1.3 Annex IV Part F – Error Reporting and Rectification Requirements

Annex IV Part F introduces requirements relating to the identification, recording and correction of problems and errors with aeronautical data and information.

10.3.3.22 Annex IV Part F (a)

10.3.3.22.1 Text of Requirement

The error reporting, measurement and corrective action mechanisms shall ensure that:
(a) problems identified during aeronautical data and aeronautical information origination, production, storage, handling and processing, or those identified by users after publication, are recorded and reported to the aeronautical information service provider;

10.3.3.22.2 Analysis of Requirement

Any problem identified with aeronautical data and information during the phases identified (origination, production, storage, handling and processing) or in a publication that has been issued by a party must be:

1) Recorded by the party which identifies the error, such that an audit trail may be maintained;
2) Reported to the party supplying the aeronautical data and information (which after publication will be the AISP), such that it may take action to ensure that the problem is rectified.

It should be noted that the requirement appears to also apply to those parties that are not within the scope of the ADQ Regulation, who cannot be compelled to comply. It is, therefore, suggested that the publishing party develops a means of reporting errors which ultimately brings compliance with the ADQ Regulation, without direct jurisdiction over the end-user. For example, an error reporting form could be used which requires the user of a publication to record the error and return it to the publishing AISP.

10.3.3.22.3 Means of Compliance

No specific means of compliance is identified for this provision. Nevertheless, the EUROCONTROL Specification for Data Assurance Levels [RD 30] defines objectives that may be used to support the implementation of this provision.

10.3.3.23 Annex IV Part F (b)

10.3.3.23.1 Text of Requirement

The error reporting, measurement and corrective action mechanisms shall ensure that:

(b) all problems reported with the aeronautical data and aeronautical information are analysed by the aeronautical information service provider and the necessary corrective actions are determined;

10.3.3.23.2 Analysis of Requirement

The AISP is required to analyse the problem reported and determine the action necessary to correct the problem. Typical actions will normally include:

1) Confirming that the problem really exists (it may not be possible for the AISP to do this alone and may need consultation with other parties);
2) Identifying where in the data chain the problem was introduced;
3) Reporting errors in aeronautical data and information provided by other parties, to the party concerned;
4) Working with the relevant stakeholders within the organisation to assess how the problem can be resolved and implement necessary corrective action;
5) Establishing a means of notifying users of the problem with the aeronautical data and information, and providing any essential information related to it prior to the problem being permanently resolved.

10.3.3.23.3 Means of Compliance

No specific means of compliance is identified for this provision. Nevertheless, the EUROCONTROL Specification for Data Assurance Levels [RD 30] defines objectives that may be used to support the implementation of this provision.
10.3.3.24 Annex IV Part F (c)

Text of Requirement

The error reporting, measurement and corrective action mechanisms shall ensure that:
(c) all errors, inconsistencies and anomalies detected in critical and essential aeronautical data and aeronautical information are urgently resolved;

Analysis of Requirement

This requirement stipulates that errors found that impact aeronautical data items that are defined as being essential or critical are urgently corrected. Such errors could, as a worst case, result in an incident or accident.

It should be noted, however, that the ADQ IR does not stipulate the method by which they are corrected, i.e. the problem may be corrected permanently, rather than by a temporary means. For example, a NOTAM may be used to correct an error in the AIP, with an AIP Amendment being issued in due course.

The ADQ IR does not stipulate a timeframe for resolving the error. It is, therefore, suggested that the NSA, in coordination with the AISP, ANSP and key data providers, establishes a policy for the State which defines a target time for correction of such errors.

Means of Compliance

No specific means of compliance is identified for this provision. Nevertheless, the EUROCONTROL Specification for Data Assurance Levels [RD 30] defines objectives that may be used to support the implementation of this provision.

10.3.3.25 Annex IV Part F (d)

Text of Requirement

The error reporting, measurement and corrective action mechanisms shall ensure that:
(d) affected data users are warned of errors by the aeronautical information service provider by the most effective means, taking into account the integrity level of the aeronautical data and aeronautical information and using the notification criteria agreed in the formal arrangements in accordance with Annex IV, Part C point (d);

Analysis of Requirement

This requirement links closely with points b) and c). Where aeronautical data and information has been published with an error, the users must be notified by the most expedient means.

Although the ADQ IR makes mention of the integrity of the aeronautical data and information, it is advised that the operational significance of the aeronautical data and information is also considered. This may be achieved through the use of formal arrangements.

Means of Compliance

No specific means of compliance is identified for this provision. Nevertheless, the EUROCONTROL Specification for Data Assurance Levels [RD 30] defines objectives that may be used to support the implementation of this provision.

10.3.3.26 Annex IV Part F (e)

Text of Requirement

The error reporting, measurement and corrective action mechanisms shall ensure that:
(e) error feedback from data users and other aeronautical data and aeronautical information providers is facilitated and encouraged;
10.3.3.26.2 Analysis of Requirement
This requirement ensures that the AISP takes steps to encourage the users of aeronautical data and information to report any problems or errors that they may encounter.

10.3.3.26.3 Means of Compliance
No specific means of compliance is identified for this provision. Nevertheless, the EUROCONTROL Specification for Data Assurance Levels [RD 30] defines objectives that may be used to support the implementation of this provision.

10.3.3.27 Annex IV Part F (f)

10.3.3.27.1 Text of Requirement
The error reporting, measurement and corrective action mechanisms shall ensure that:

(f) error rates for aeronautical data and aeronautical information are recorded on each occasion that aeronautical data and aeronautical information is transferred between the parties referred to in Article 2(2);

10.3.3.27.2 Analysis of Requirement
Records of the number of errors and the total number of data items provided in each exchange of aeronautical data and information between a data provider and the data receiver must be kept to fulfil this requirement. Such statistics will allow later analysis of possible trends in error introduction and assist in correcting repetitive errors.

10.3.3.27.3 Means of Compliance
No specific means of compliance is identified for this provision. Nevertheless, the EUROCONTROL Specification for Data Assurance Levels [RD 30] defines objectives that may be used to support the implementation of this provision.

10.3.3.28 Annex IV Part F (g)

10.3.3.28.1 Text of Requirement
The error reporting, measurement and corrective action mechanisms shall ensure that:

(g) error rates for those errors detected prior to transfer and those reported after transfer can be identified separately.

10.3.3.28.2 Analysis of Requirement
This requirement further elaborates the requirement established at points e) and f) by stipulating that the statistics for errors detected before and after publication are recorded separately and, hence, allow a true picture of aeronautical data and information publication error rates from the entire data chain, under the scope of the ADQ Regulation.

10.3.3.28.3 Means of Compliance
No specific means of compliance is identified for this provision. Nevertheless, the EUROCONTROL Specification for Data Assurance Levels [RD 30] defines objectives that may be used to support the implementation of this provision.
11. **ARTICLE 7 - Consistency, timeliness and personnel performance**

11.1 **Regulatory Basis of Article 7**

Article 7 establishes provisions to ensure that aeronautical data and information is made available in a consistent manner, is processed by staff who are adequately competent for the tasks that they perform and that all actors within the data chain are aware of the requirements for publication.

11.2 **Article 7**

The following sections outline the specific provisions and requirements of Article 7 and provide guidance as to acceptable means of compliance.

11.2.1 **Article 7(1)**

11.2.1.1 **Text of Provision**

Where aeronautical data or aeronautical information is duplicated in the AIP of more than one Member State, the aeronautical information service providers responsible for those AIPs shall establish mechanisms to ensure consistency between the duplicated information.

11.2.1.2 **Applicability**

This requirement applies to AISPs only.

11.2.1.3 **Rationale / Need for Provision**

Whilst ICAO Annex 15 [RD 10] states in paragraph 4.2.1.1 “Each AIP shall not duplicate information within itself or from other sources.”, this requirement is clearly not practicable. Duplication exists in many forms, both within an AIP, across AIPs and across other sources.

For example:

1) The location of a Navaid used for en-route and approach may exist in the En-route and Aerodrome sections of the AIP, as well as within charts and, possibly, other State publications;

2) The location of some points along a defined air route are often included in two States’ publications. This duplication may include points located on the Flight Information Region (FIR) boundary and those located just across the border which provide an indication of the continuing direction of the route.

It is essential that where such duplication exists, that the same value is published in each source.

11.2.1.4 **Explanation of Provision**

The provision requires the AISPs to establish processes that ensure that duplicated values are consistently published.

11.2.1.5 **Implementing the Provision**

The AISPs must establish mechanisms to ensure consistency across different data sources. This will require that a process is defined that ensures consistency within the State’s publications and, as part of the co-ordination with other States, that agreed and consistent values are published in the affected publications of the different States.
It is understood that any process may fail, at times, and it is therefore recommended that the mechanisms established include monitoring to identify any instances where different values are published and steps to both prevent future occurrences and to correct the erroneously published aeronautical data and information by the most expedient means.

### 11.2.1.6 Means of Compliance

The Library of the ADQi WG provides some examples of agreements signed by neighbouring States to ensure the consistency of data that is published in both States AIPs.

### 11.2.2 Article 7(2)

#### 11.2.2.1 Text of Provision

Aeronautical information service providers shall ensure that aeronautical data and aeronautical information items published in the AIP of their Member State are annotated to indicate those that do not meet the data quality requirements laid down in this Regulation.

#### 11.2.2.2 Applicability

This requirement applies to AISPs only.

#### 11.2.2.3 Rationale / Need for Provision

There may be cases when an AISP must publish aeronautical data and information despite the fact that it knows it does not achieve the data quality requirements or there is no evidence available to give a sufficiently high degree of assurance that the requirements are met.

In such cases, it is of great importance that the user of the aeronautical data and information is aware of the deficiency.

#### 11.2.2.4 Explanation of Provision

The provision requires the AISP to annotate any aeronautical data and information which is published in the State AIP(s), for which it is responsible, that does not fully comply with the data quality requirements.

#### 11.2.2.5 Implementing the Provision

The ADQ Regulators Working Group (ARWG) discussed this provision to clarify when a data item shall be considered as not meeting the data quality requirements laid down in the Regulation. The conclusions of this discussion are captured in the Common Understanding 11/2015 Implementation of Article 7(2) of the Commission Regulation (EU) 73/2010, which text is available in Annex A.8 of this guide.

The EUROCONTROL Guidelines for the Annotation of data not compliant with Commission Regulation (EU) No 73/2010 (ADQ) provide a method that could be used for the annotation of non-compliant data. For the sake of harmonisation, the AISPs should consider these guidelines before developing their own method. This document is included in ANNEX D – of this Guide.

#### 11.2.2.6 Means of Compliance

The ARWG Common Understanding 11/2015 Implementation of Article 7(2) of the Commission Regulation (EU) 73/2010 should be considered to clarify some elements of this provision (the text of the CU is transposed in Annex A.8)
The EUROCONTROL Guidelines for the Annotation of data not compliant with Commission Regulation (EU) No 73/2010 (ADQ) is a possible means of compliance with this provision.

### 11.2.3 Article 7(3)

#### 11.2.3.1 Text of Provision

Aeronautical information service providers shall ensure that the most current update cycles applicable to AIP amendments and AIP supplements are made publicly available.

#### 11.2.3.2 Applicability

This requirement applies to AISPs only.

#### 11.2.3.3 Rationale / Need for Provision

Whilst a publication may be issued which contains high-quality data, its content may be worthless if a user unwittingly makes use of an out-of-date publication.

This provision requires the AISP to make information publicly available that allows the users of aeronautical data and information to determine whether they have the latest and most current publications available for use.

#### 11.2.3.4 Explanation of Provision

This provision requires the AISP to make publicly available information relating to the latest update cycles for the AIP. In essence, anybody must be able to easily access information relating to the latest status of the AIP, including the numbers of the most currently applicable AIP Amendments and AIP Supplements.

#### 11.2.3.5 Implementing the Provision

The required information may be conveyed by a number of differing means, some of which are required by ICAO, such as the monthly, printed, plain-language list of valid NOTAM which includes an indication of the latest AIP Amendments, AIC issued and a checklist of valid AIP Supplements.

The internet provides a high-speed and easily updated mechanism but is not available to everybody. EUROCONTROL’s European AIS Database (EAD) provides a reference database against which users may check their publication but, once again, this is not available to all.

It is recommended that the AISP assesses its client base to determine which mechanism best suits its particular client base. It is highly likely that providing the information by more than a single means will be preferable.

#### 11.2.3.6 Means of Compliance

No specific means of compliance is identified for this provision.

### 11.2.4 Article 7(4)

#### 11.2.4.1 Text of Provision

The parties referred to in Article 2(2) shall ensure that their personnel responsible for tasks in the provision of aeronautical data or aeronautical information are made aware of and apply:

(a) the requirements for AIP amendments, AIP supplements and NOTAM laid down in the ICAO standards referred to in points (5), (6) and (7) of Annex III ;
11.2.4.2 Applicability

This provision applies to all those parties named in Article 2(2), namely:

"air navigation service providers;

operators of those aerodromes and heliports, for which instrument flight rules (IFR) or Special-visual flight rules (VFR) procedures have been published in national aeronautical information publications;

public or private entities providing, for the purposes of this Regulation:

(i) services for the origination and provision of survey data;

(ii) procedure design services;

(iii) electronic terrain data;

(iv) electronic obstacle data."

This provision will, therefore, apply to all parties involved in the origination, processing and publication of aeronautical data and information.

11.2.4.3 Rationale / Need for Provision

Whilst the purpose and content of the AIP are typically well understood by the AISP, it has often been seen that those who operate further up the data chain do not have the same level of awareness, in particular, those who originate aeronautical data. This is particularly true with regards the AIRAC cycle, where new aeronautical data and information is often provided too late for publication, becomes effective mid-cycle (causing major problems to operations) or planned changes are cancelled too late to prevent the aeronautical data and information being disseminated.

There is, therefore, a need for all actors involved in the data chain to have a good understanding of the requirements of ICAO Annex 15 [RD 10] which relate to the AIP, its amendment by AIP Amendments and Supplements, the use of NOTAM and the amendment cycles used to update it.

11.2.4.4 Explanation of Provision

All the parties identified must ensure that they, and their staff, fully understand the requirements for publication of aeronautical data and information and the update cycles that apply to it.

11.2.4.5 Implementing the Provision

Implementation of this provision is mainly achieved through training and awareness. It is suggested that Member States hold awareness day(s) at which the requirements for aeronautical data and information are presented, the methods of publication addressed and the timeliness issues discussed.

A clear indication of notice periods for aeronautical data and information provision should be considered, keeping in mind that some types of aeronautical data and information may require more notice than other types.

It is essential that the performance of parties against the requirements is monitored and, where a deficiency is found, that the root cause is addressed. Given that the data chain comprises many steps and actors, late delivery to the AISP may not be caused by a failure of the party who actually provides the aeronautical data and information to the AISP.
11.2.4.6 Means of Compliance

The Library of the ADQi WG provides some examples of course syllabus and competence schemas that are used to establish a framework for aeronautical data/information training.

11.2.5 Article 7(5)

11.2.5.1 Text of Provision

Without prejudice to Implementing Regulation (EU) No 1035/2011, the parties referred to in Article 2(2) shall ensure that their personnel responsible for tasks in the provision of aeronautical data or aeronautical information are adequately trained, competent and authorised for the job they are required to do.’

11.2.5.2 Applicability

This provision applies to all those parties named in Article 2(2), namely:

“air navigation service providers;

operators of those aerodromes and heliports, for which instrument flight rules (IFR) or Special-visual flight rules (VFR) procedures have been published in national aeronautical information publications;

public or private entities providing, for the purposes of this Regulation:

(i) services for the origination and provision of survey data;

(ii) procedure design services;

(iii) electronic terrain data;

(iv) electronic obstacle data.”

This provision will, therefore, apply to all parties involved in the origination, processing and publication of aeronautical data and information.

11.2.5.3 Rationale / Need for Provision

There is a clear risk to the quality of aeronautical data and information if those involved in its origination, processing or publication are not adequately trained or competent to undertake the tasks that they are required to perform.

11.2.5.4 Explanation of Provision

This provision requires the parties to ensure that the staff they employ are competent at the jobs that they perform, that they are provided with the necessary training for the tasks that they undertake and that they are only authorised to undertake tasks for which they are competent and trained.

11.2.5.5 Implementing the Provision

It is recommended that the parties develop a skills matrix for each role that exists within their organisation. This should identify the skills and competencies that those who fulfil the role must have, and any specific training that is necessary.

The skills matrix must be developed at a reasonable level of detail, for example, separately listing the roles that perform tasks from those that approve the resultant work.
Each member of staff who may fulfil the role should then be assessed against the skills matrix and any deficiencies identified. A record should be kept of this assessment. Where any deficiencies are identified, training should be provided and mitigating steps taken before the training can be provided, to ensure that any risks are sufficiently minimised. For example, another member of staff may be asked to oversee tasks that another, as yet untrained, member of staff is performing.

11.2.5.6 Means of Compliance

The Library of the ADQi WG provides some examples of course syllabus and competence schemas that are used to establish a framework for aeronautical data/information training.
12. **ARTICLE 8 AND ANNEX V - TOOLS AND SOFTWARE requirements**

12.1 **Regulatory Basis of Article 8**

Article 8 establishes provisions to ensure that any tools including software tools used for the support or automation of aeronautical data and information processing are adequately qualified as fit for purpose. Tools have the potential to both identify and contribute to aeronautical data and information errors and to fail to detect errors in aeronautical data and information. The need to ensure that the tools and software are robust is particularly applicable to support and processing tools and software that is used for critical and essential data items.

12.2 **Article 8**

The following sections outline the specific provisions and requirements of Article 8 and provide guidance as to acceptable means of compliance.

12.2.1 **Article 8**

12.2.1.1 Text of Provision

The parties referred to in Article 2(2) shall ensure that all tools and software used to support the origination, production, storage, handling, processing and transfer of aeronautical data and/or aeronautical information comply with the requirements laid down in Annex V.

12.2.1.2 Applicability

This Article is applicable to all actors who fall under the terms of the ADQ Regulation, the parties to which it is applicable being specified in Article 2(2). See section 5.2.2 for an explanation of these parties.

12.2.1.3 Rationale / Need for Provision

With the move to a more automated AIS process, there will be an increased reliance on the use of tools and software. Whilst this will assist in the reduction of human errors and, hence, aid an overall reduction in issues regarding data quality, it could result in a shift of risk away from humans to the tools and software used.

As a result, it is acknowledged that there is a need to closely control the use of tools and software, to ensure that the risk that they pose to a loss of data quality is suitably small.

These provisions, and its associated Annex, are intended to provide this degree of assurance.

12.2.1.4 Explanation of Provision

The provision mandates that any tools or software which are used in the data chain for aeronautical data and information are compliant with the requirements laid down by Annex V.
In the context of this Article, the data chain means those elements of the process which relate to:
1) Data Origination;
2) Data Production;
3) Data Storage;
4) Data Handling;
5) Data Processing; and
6) Data Transfer.

It is considered that any action related to aeronautical data and information which falls within the scope of this Regulation (see Section 5.2.1), will fall within one of these categories. As such, it is assumed that any person or organisation who interacts with aeronautical data and information prior to its publication and who makes use of software or tools, must comply with this Article.

12.2.1.5 Implementing the Provision

Fundamental to achieving compliance with this provision is an understanding of to which tools or software the provision applies. To this end, organisations are recommended to, firstly, perform an audit of their processes to establish which tools and software are in use.

Once this list has been established, an assessment must be performed to determine for what purpose(s) the tools or software are used. The results of this assessment may then be used to ascertain which requirements of Annex V apply.

It must then be ensured that tools and software are specified, procured / developed, validated and verified, in accordance with the appropriate requirements of Annex V.

12.2.1.6 Means of Compliance

There is no specific means of compliance for this Article, rather, compliance may be achieved through compliance with each requirement laid down in Annex V. For the requirements in Annex V, Part E, the EUROCONTROL Specification for Data Assurance Levels [RD 30] includes objectives that may be used to support the implementation of these provisions.

12.3 Annex V - Tools and Software Requirements Referred to in Article 8

The following sections outline the specific provisions and requirements of Annex V and provide guidance as to acceptable means of compliance.

12.3.1 Annex V (1)

12.3.1.1 Text of Requirement

Tools used to support or automate aeronautical data and aeronautical information processes shall meet the requirements of points 2 and 3, where the tool:
- has the potential to create errors in critical or essential data items;
- is the sole means of detecting errors in critical or essential data items;
- is the sole means of detecting discrepancies between multiple versions of manually entered data.
12.3.1.2 Analysis of Requirement

The requirement establishes three cases whereby tools must be compliant with points 2) and 3) of the Annex. These may be simply described as:

1) Where the tool can introduce errors;
2) Where it is used to identify errors and is the only means of doing so;
3) Where it is used to confirm the correctness of manually entered aeronautical data and information, where multiple entries are made, and no other means are employed.

In all three cases, the tool is considered to be of great importance in ensuring and maintaining data quality.

12.3.1.3 Means of Compliance

No specific means of compliance is identified for this provision. Nevertheless, the EUROCONTROL Specification for Data Assurance Levels [RD 30] defines objectives that may be used to support the implementation of this provision.

Notably, the EUROCONTROL Specification for Data Assurance Levels [RD 30] defines objectives for the classification and qualification of tools and software developed to support or automate aeronautical data and information processing. The classification scheme considers both the use of the tool, as specified in this provision, as well as the general requirements for the assurance of data integrity, as defined in Annex IV Part B (g).

12.3.2 Annex V (2)

12.3.2.1 Text of Requirement

For the tools referred to in point 1, performance, functionality and integrity level requirements shall be defined to ensure that the tool performs its function within the data process without adversely impacting the quality of aeronautical data or aeronautical information.

12.3.2.2 Analysis of Requirement

There is a need to ensure that the data quality requirements of the aeronautical data and information on which tools will be applied, are considered in the development, procurement and/or validation of tools.

For each tool which is identified in the requirements of Annex V(1), a set of requirements needs to be determined which ensure that the tool is suitable for its most rigorous application, i.e. for originating or processing aeronautical data and information with the most stringent quality requirements.

12.3.2.3 Means of Compliance

It is recommended that, for each tool that qualifies under point 1, a formal statement of requirements is prepared in the form of a User Requirement Document. Such a document should lay down what is expected of the tool and should be independent of the decision to procure or develop the tool.

Many development methodologies exist by which requirements may be captured, analysed and approved, and the reader is advised to determine a suitable methodology which is appropriate to their organisation.
No specific means of compliance is identified for this provision. Nevertheless, the EUROCONTROL Specification for Data Assurance Levels [RD 30] defines objectives that may be used to support the implementation of this provision. Notably it defines a series of objectives for the specification of tool operating requirements (functionality and performance), as well as a method for assigning a tool qualification level (integrity).

### 12.3.3 Annex V (3)

#### 12.3.3.1 Text of Requirement

The tools referred to in point 1 shall be validated and verified against the requirements referred to in point 2.

#### 12.3.3.2 Analysis of Requirement

Having identified a set of requirements for a tool, it is essential that the resultant tool, whether developed in-house, procured as a bespoke tool or bought as “off-the-shelf” is confirmed to comply with these requirements.

This requirement ensures such assurance by compelling those who utilise tools to confirm their operation (functionality and performance) through the application of both validation and verification tests, which are commensurate with the level of integrity required.

#### 12.3.3.3 Means of Compliance

No specific means of compliance is identified for this provision. Nevertheless, the EUROCONTROL Specification for Data Assurance Levels [RD 30] defines objectives that may be used to support the implementation of this provision.

The EUROCONTROL Specification for Data Assurance Levels [RD 30] defines the objectives that need to be addressed in the verification and validation of tools, based on the assigned tool qualification level. With respect to software-based tools, objectives are defined for the assignment of Software Assurance Levels and the procurement of software tools but detailed objectives for software development are not addressed as there is a wide range of compliant approaches available.

### 12.3.4 Annex V (4)

#### 12.3.4.1 Text of Requirement

The tools referred to in point 1, which are implemented fully or partially in software, shall satisfy the following additional requirements:

- the software requirements shall correctly state what is required by the software in order to satisfy the tool requirements;
- all software requirements shall be traceable to the tool requirements referred to in point 2;
- the validation and verification of software, as defined in points 5 and 6 respectively, shall be applied to a known executable version of the software in its target operating environment.
12.3.4.2 Analysis of Requirement

The requirement places three obligations, each of which may be addressed in isolation, as follows:

1) The requirements that define the software shall be correctly formed, such that the tool developed against these requirements correctly implements the needs of the tool identified.

2) The requirements for the software shall be traceable to the requirements identified for the resultant tool, and as specified in Annex V (2). No requirements specified for the software should be derived from anything other than these requirements.

3) When the validation and verification of implemented software is undertaken, there shall be a clear and documented understanding of the version of the software and the operating environment on which the tests are performed. For the operating environment, the exact versions of all software utilised, such as the operating system, device drivers etc., along with the build state of the hardware used, should be recorded.

12.3.4.3 Means of Compliance

No specific means of compliance is identified for this provision. Nevertheless, the EUROCONTROL Specification for Data Assurance Levels [RD 30] defines objectives that may be used to support the implementation of this provision. Notably it defines a series of objectives for determining software requirements and traceability to these requirements and why they are needed, and how these requirements are addressed in the implementation of the operational version of the software.

12.3.5 Annex V (5)

12.3.5.1 Text of Requirement

The validation of software means the process of ensuring that software meets the requirements for the specified application or intended use of the aeronautical data or aeronautical information.

12.3.5.2 Analysis of Requirement

There is no requirement in this statement. It simply provides a definition and, hence, no means of compliance is needed.

12.3.5.3 Means of Compliance

Not applicable.

12.3.6 Annex V (6)

12.3.6.1 Text of Requirement

The verification of software means the evaluation of the output of an aeronautical data and/or aeronautical information software development process to ensure correctness and consistency with respect to the inputs and applicable software standards, rules and conventions used in that process.

12.3.6.2 Analysis of Requirement

There is no requirement in this statement. It simply provides a definition and, hence, no means of compliance is needed.
12.3.6.3 Means of Compliance

Not applicable.
13. **ARTICLE 9 AND ANNEX VI - DATA PROTECTION**

13.1 **Regulatory Basis of Article 9**

Aeronautical data and information is critical to the safe operation of flight, whether it is being utilised in the cock-pit or on the ground, by applications such as Air Traffic Control.

Typically in the past, aeronautical data and information was treated as being in the public domain and, as such, it was afforded little protection, often being made available in paper form. With a move to the digital provision and use of aeronautical data and information, increasingly without human intervention, this situation is no longer satisfactory. Aeronautical data and information may become corrupted or, in an extreme situation, deliberately altered, potentially with catastrophic consequences.

Article 9, and its associated Annex VI, introduces requirements that ensure aeronautical data and information is protected against accidental or malicious alteration.

13.2 **Article 9**

The following sections outline the specific provisions and requirements of Article 9 and provide guidance as to acceptable means of compliance.

13.2.1 **Article 9(1)**

13.2.1.1 **Text of Provision**

>The parties referred to in Article 2(2) shall ensure that aeronautical data and aeronautical information are protected in accordance with the requirements laid down in Annex VI.

13.2.1.2 **Applicability**

This provision applies to all those parties named in Article 2(2), namely:

- "air navigation service providers;

- operators of those aerodromes and heliports, for which instrument flight rules (IFR) or Special-visual flight rules (VFR) procedures have been published in national aeronautical information publications;

- public or private entities providing, for the purposes of this Regulation:

  (i) services for the origination and provision of survey data;

  (ii) procedure design services;

  (iii) electronic terrain data;

  (iv) electronic obstacle data."

This provision will, therefore, apply to all parties involved in the origination, processing and publication of aeronautical data and information.

13.2.1.3 **Rationale / Need for Provision**

Aeronautical data and information may suffer a loss of quality during storage and transmission as a result of interference from a number of factors, some accidental and some potentially deliberate.
This provision introduces the need for the parties involved in the origination, processing and publication of aeronautical data and information to take steps to ensure that the quality of the aeronautical data and information is not degraded by such acts or, if it is, that there is a suitably high degree of assurance that the degradation will be identified.

13.2.1.4 **Explanation of Provision**

The provision requires all aeronautical data and information which the parties originate, receive, store and/or transmit to be protected in accordance with the requirements specified in Annex VI, namely:

1) Protection against corruption through the use of Cyclic Redundancy Checks (CRCs);
2) Protection against unauthorised access or amendment;
3) Provision of a means of authenticating data providers.

13.2.1.5 **Implementing the Provision**

This provision is met by complying with the requirements outlined in Annex VI.

13.2.1.6 **Means of Compliance**

No specific means of compliance is identified for this provision.

13.2.2 **Article 9(2)**

13.2.2.1 **Text of Provision**

The parties referred to in Article 2(2) shall ensure that traceability is maintained on each data item during its period of validity and for at least 5 years following the end of that period or until 5 years after the end of the period of validity for any data item calculated or derived from it, whichever is later.

13.2.2.2 **Applicability**

This provision applies to all those parties named in Article 2(2), namely:

"air navigation service providers;
operators of those aerodromes and heliports, for which instrument flight rules (IFR) or Special-visual flight rules (VFR) procedures have been published in national aeronautical information publications;

public or private entities providing, for the purposes of this Regulation:

(i) services for the origination and provision of survey data;
(ii) procedure design services;

(iii) electronic terrain data;
(iv) electronic obstacle data."

This provision will, therefore, apply to all parties involved in the origination, processing and publication of aeronautical data and information.

13.2.2.3 **Rationale / Need for Provision**

ICAO specifies that aeronautical data and information should be traceable from its point of origination to its point of publication, in other words, at any stage, the history of aeronautical data and information should be available for analysis. Such analysis may, for example, be needed following an incident or accident.
This provision reinforces this requirement and strengthens it by adding the need to maintain traceability for a period of five years after the aeronautical data and information is no longer valid, or five years after all aeronautical data and information derived or calculated from it ceases to be valid.

13.2.2.4 Explanation of Provision
For each operation, the party involved must record details of the action undertaken. The date and time of the operation, the person involved and the action undertaken must be recorded, as a minimum. Operations should not only be considered as actions that alter the aeronautical data and information, but also those that approve aeronautical data and information. It is not considered necessary to record operations where aeronautical data and information is simply viewed, provided there is no possibility that the aeronautical data and information can be altered, at this stage.

13.2.2.5 Implementing the Provision
The implementation of this provision may be met in a number of ways and it is for the State to determine the method which is most appropriate to its day-to-day operations. The operations made should be recorded as metadata associated with the aeronautical data and information itself.

13.2.2.6 Means of Compliance
No specific means of compliance is identified for this provision.

13.3 Annex VI - Data Protection Requirements Referred to in Article 9
The following sections outline the specific provisions and requirements of Annex VI and provide guidance as to acceptable means of compliance.

13.3.1 Annex VI (1)

13.3.1.1 Text of Requirement

All data transferred in an electronic format shall be protected against loss or alteration of data by the application of the CRC32Q algorithm as referred to in point 21 of Annex III. The cyclic redundancy check (hereinafter CRC) value shall be applied before the final verification of the data prior to storage or transfer.

13.3.1.2 Analysis of Requirement
The requirement calls for aeronautical data and information to be protected through the use of a CRC, whenever it is transferred electronically. A CRC is a means of providing a high-degree of assurance that if aeronautical data and information becomes corrupted, this may be identified.

The requirement calls for the use of the CRC32Q algorithm. This is a 32-bit algorithm which offers a single-bit, undetected error rate of 1x10^-11.

The CRC32Q algorithm’s polynomial is defined as:

\[ \text{CRC-32Q} = 1 + x + x^3 + x^5 + x^7 + x^8 + x^{14} + x^{16} + x^{22} + x^{24} + x^{31} + x^{32} \]

The requirement further specifies that this value is applied before final data verification, prior to storage or transfer, i.e. that the data verification is performed on the aeronautical data and information to which the CRC was applied. Such an approach helps to ensure that verification is performed on the correct aeronautical data and information.

3 It is highly recommended that CRCs are also applied whenever aeronautical data and information is stored, not only at its point of exchange.
There is some concern with the fact that the CRC32Q algorithm is hard-coded into the regulatory provisions. This could somehow undermine the implementation of other alternatives for data protection using more up-to-date standards to ensure data security which also include the data integrity aspect.

There is a generalised opinion that the ADQ IR should not prescribe a specific technology to meet the required performance goals but it should rather enable implementation by using more than one technical solution.

This topic is currently under discussion within the ARWG.

13.3.1.3 Means of Compliance

No specific means of compliance is identified for this provision. Nevertheless, the EUROCAE ED76A Standards for Processing Aeronautical Data [RD 36] includes generic information on the usage of CRC.

13.3.2 Annex VI (2)

13.3.2.1 Text of Requirement

Where the physical size of data exceeds that which may be protected at the required level of integrity by a single CRC, multiple CRC values shall be used.

13.3.2.2 Analysis of Requirement

A single CRC Value (CRCV) is only suitable for the protection of data up to a particular size. In the case of the CRC32Q algorithm, protection is offered for data packets up to 12112 bits or 1514 bytes.

In order to ensure that an adequate level of protection is afforded to aeronautical data and information when it exceeds this limit, this requirement introduces the need to protect aeronautical data and information with multiple CRCVs when a single CRCV will not suffice.

A description of considerations to be made when adopting a CRC policy and the use of multiple CRCVs may be found in the CRC section of the Chapter 22 Specific Guidance Material.

13.3.2.3 Means of Compliance

No specific means of compliance is identified for this provision. Nevertheless, the EUROCAE ED76A Standards for Processing Aeronautical Data [RD 36] includes generic information on the usage of CRC.

13.3.3 Annex VI (3)

13.3.3.1 Text of Requirement

Aeronautical data and aeronautical information shall be given an appropriate level of security protection during storage and when exchanged between the parties referred to in Article 2(2), to ensure that the data cannot be accidentally changed or subjected to unauthorised access and/or alteration at any stage.
13.3.3.2 Analysis of Requirement

Whilst the use of CRCs, as introduced in Annex VI (1) and Annex VI (2), will allow those involved to identify the corruption of aeronautical data and information, they will not protect against accidental changes performed during data operations, i.e. at a point where aeronautical data and information changes are being made and before the CRCVs are calculated, or against malicious changes. This latter case results from the fact that the CRC algorithms are publically available and, consequently, should somebody wish to deliberately alter a data value without authorisation, it is simple to then recalculate the CRCV and, in effect, hide the action.

Through this requirement, the affected parties are obliged to protect aeronautical data and information, such that only those who are authorised to access and/or make changes to the aeronautical data and information are able to do so. As the scope of the requirement is “at any stage”, which includes transmission, the aeronautical data and information needs to be encrypted, effectively hiding the content from unauthorised viewing, making alteration difficult and introducing a very high-degree of assurance that any alteration will be identifiable.

13.3.3.3 Means of Compliance

No specific means of compliance has been planned although the use of a publically available encryption algorithm, using public and private keys, is recommended. It must be considered that for encryption to work, recipients of aeronautical data and information must have access to a means of decrypting the aeronautical data and information. Therefore, a suitable mechanism must be provided to allow the information needed to decrypt the aeronautical data and information, typically a public key, to be obtained.

See section 22.1.4 for more information on encryption.

EUROCAE ED76A [RD 36] includes generic information on the usage of encryption algorithms.

13.3.4 Annex VI (4)

13.3.4.1 Text of Requirement

The storage and transfer of aeronautical data and aeronautical information shall be protected by a suitable authentication process such that recipients are able to confirm that the data or information has been transmitted by an authorised source.

13.3.4.2 Analysis of Requirement

Once again, this requirement introduces mitigation for a risk that is introduced by the move to electronic data provision.

Traditionally, aeronautical data and information was provided by paper, typically on letter headed paper and carrying the signature of the person authorised to provide the aeronautical data and information. This would then be checked against a list of approved signatories.

When information is provided in electronic form, the confirmation of written signatures is obviously not possible. Furthermore, email addresses may be forged, making it difficult to authenticate the source simply by looking at who sent the information.

To provide a means by which the recipient of aeronautical data and information may be assured that it is provided by an approved source, this requirement mandates those who transmit aeronautical data and information, or make it available for download, to provide a means by which the source of the aeronautical data and information can be authenticated.
13.3.4.3 Means of Compliance

No specific means of compliance has been planned although the use of a publically available digital signature facility, using public and private keys, is recommended. It must be considered that for such signatures to work, recipients of aeronautical data and information must be able to access a means to authenticate the source of the aeronautical data and information. Therefore, a suitable mechanism must be provided to allow the information needed to authenticate the source of the aeronautical data and information, typically a public key, to be obtained.

See section 22.1.3 for more information on digital signatures.


14.1 Regulatory Basis of Article 10

Article 10, and its associated Annex VII, introduces requirements that ensure parties implement and operate a QMS supporting the scope of their aeronautical data and information activities and addressing objectives related to safety and aeronautical data and information security.

14.2 Article 10

The following sections outline the specific provisions and requirements of Article 10 and provide guidance as to acceptable means of compliance.

14.2.1 Article 10(1)

14.2.1.1 Text of Provision

*Without prejudice to Implementing Regulation (EU) No 1035/2011, the parties referred to in Article 2(2) shall implement and maintain a quality management system covering their aeronautical data and aeronautical information provision activities, in accordance with the requirements laid down in Annex VII, Part A.*

14.2.1.2 Applicability

This provision applies to all those parties named in Article 2(2), namely:

“air navigation service providers;

operators of those aerodromes and heliports, for which instrument flight rules (IFR) or Special-visual flight rules (VFR) procedures have been published in national aeronautical information publications;

public or private entities providing, for the purposes of this Regulation:

(i) services for the origination and provision of survey data;
(ii) procedure design services;
(iii) electronic terrain data;
(iv) electronic obstacle data.”

This provision will, therefore, apply to all parties involved in the origination, processing and publication of aeronautical data and information.

14.2.1.3 Rationale / Need for Provision

This provision reinforces the need for all parties to implement a QMS, as required by ICAO Annex 15 [RD 10].

14.2.1.4 Explanation of Provision

A QMS defines the organisation’s managing structure, roles and responsibilities, and procedures and processes needed to achieve the overall data quality objectives.

14.2.1.5 Implementing the Provision

This provision is met by complying with the requirements outlined in Annex VII Part A.
14.2.1.6 Means of Compliance
The ADQ IR recognises that an ISO 9001 certification shall be considered as a means of compliance to this provision.

14.2.2 Article 10(2)

14.2.2.1 Text of Provision
The parties referred to in Article 2(2) shall ensure that the quality management system referred to in paragraph 1 of this article defines procedures to meet the safety management objectives defined in Annex VII, Part B and the security management objectives in Annex VII, Part C.

14.2.2.2 Applicability
This provision applies to all those parties named in Article 2(2), namely:
- "air navigation service providers;
- operators of those aerodromes and heliports, for which instrument flight rules (IFR) or Special-visual flight rules (VFR) procedures have been published in national aeronautical information publications;
- public or private entities providing, for the purposes of this Regulation:
  (i) services for the origination and provision of survey data;
  (ii) procedure design services;
  (iii) electronic terrain data;
  (iv) electronic obstacle data."

This provision will, therefore, apply to all parties involved in the origination, processing and publication of aeronautical data and information.

14.2.2.3 Rationale / Need for Provision
This provision strengthens the requirements for quality management, by adding the need to meet the objectives of safety and security management that are applicable to aeronautical data and information origination, processing and publication.

These objectives are the basis for assuring that both safety and security are afforded priority as part of the data quality assurance arrangements employed by the parties.

14.2.2.4 Explanation of Provision
All parties referred to in 14.2.2.2 must address those safety and security management objectives defined in Annex VII Parts B and C which are applicable to their organisation. Satisfaction of these objectives ensures that appropriate consideration is given to the impact of data quality issues on air traffic safety and the impact of security issues on the integrity of aeronautical data and information.

14.2.2.5 Implementing the Provision
This provision is met by complying with the requirements outlined in Annex VII Part C.

Implementation of a separate Safety or Security Management System is not required (nor precluded) by the ADQ Regulation, as not all aspects of such systems need be implemented to gain compliance with the ADQ Regulation's provisions for AIS.
14.2.2.6 Means of Compliance
The EUROCONTROL Guidance for the implementation of safety management objectives and safety assessments falling within the scope of EU Regulation 73/2010 may be used to support the implementation of this provision. This document is included in ANNEX E.

14.2.3 Article 10(3)

14.2.3.1 Text of Provision
The parties referred to in Article 2(2) shall ensure that any changes to the existing systems referred to in the first subparagraph of Article 2(1) or the introduction of new systems are preceded by a safety assessment, including hazard identification, risk assessment and mitigation, conducted by the parties concerned.

14.2.3.2 Applicability
This provision applies to EATMN systems, their constituents and associated procedures involved in the origination, production, storage, handling, processing, transfer and distribution of aeronautical data and information.

14.2.3.3 Rationale / Need for Provision
All EATMN systems that have the potential to impact air traffic safety must be assessed to ensure that the risks to safety are acceptable. This also applies to those systems involved in the origination, processing and publication of aeronautical data and information, since certain errors in this data and information (as defined in ICAO Annex 15 [RD 10]) have the potential to jeopardise the “continued safe flight and landing of an aircraft”.

14.2.3.4 Explanation of Provision
Any change to or addition of an EATMN system, constituent or procedure, which falls within the scope of Article 2(1), must be assessed for its potential impact on air traffic safety. However, it is not always possible to identify the full impact of specific aeronautical data and information errors and, as such, the ADQ IR also identifies in Article 10(4) below, the safety requirements that must be considered (as a minimum) as part of the assessment. The safety assessments should identify how these safety requirements are satisfied and, consequently, assure the risk to safety is reduced to an acceptable level.

14.2.3.5 Implementing the Provision
The implementation of this provision may be met in a number of ways and it is for the State to determine the method which is most appropriate to its day-to-day operations.

14.2.3.6 Means of Compliance
The EUROCONTROL Guidance for the implementation of safety management objectives and safety assessments falling within the scope of EU Regulation 73/2010 may be used to support the implementation of this provision. This document is accessible in ANNEX E.

14.2.4 Article 10(4)

14.2.4.1 Text of Provision
During the safety assessment, the requirements referred to in Article 7(3), Annex I, Annex II and points 1 and 2 of Part A of Annex IV shall be considered as safety requirements and shall be taken into consideration, as a minimum.
14.2.4.2 Applicability
This provision applies to EATMN systems, their constituents and associated procedures involved in the origination, production, storage, handling, processing, transfer and distribution of aeronautical data and information.

14.2.4.3 Rationale / Need for Provision
As discussed in paragraph 14.2.3.4 of this Guide, it is not always possible to identify the full impact of specific aeronautical data and information errors on air traffic safety, from an AISP perspective, as detailed knowledge of the application(s) using the aeronautical data and information is needed. The ADQ IR addresses this issue by identifying the minimum safety requirements that need to be considered.

14.2.4.4 Explanation of Provision
Various data quality requirements are defined for aeronautical data and information within the ICAO Annexes. Many of these requirements can be considered as safety requirements, for the purposes of the safety assessment referred to in Article 10(3). However, consideration should also be given to any additional data quality requirements that are identified in order to comply with Annex IV Part A (2).

14.2.4.5 Implementing the Provision
This provision must be considered as part of the implementation of Article 10(3).

14.2.4.6 Means of Compliance
The EUROCONTROL Guidance for the implementation of safety management objectives and safety assessments falling within the scope of EU Regulation 73/2010 may be used to support the implementation of this provision. This document is accessible in ANNEX E.

14.3 Annex VII
The following sections outline the specific provisions and requirements of Annex VII and provide guidance as to acceptable means of compliance.

14.3.1 Annex VII Part A - Quality, Safety and Security Management Requirements Referred to in Article 10
Annex VII Part A introduces the fundamental quality objectives of the QMS for organisations involved in the origination, production, storage, processing, transfer and distribution of aeronautical data and information.

14.3.1.1 Annex VII Part A (1)

14.3.1.1.1 Text of Requirement
A quality management system supporting the origination, production, storage, handling, processing, transfer and distribution of aeronautical data and aeronautical information shall:
- define the quality policy in such a way as to meet the needs of different users as closely as possible;
- set up a quality assurance programme that contains procedures designed to verify that all operations are being conducted in accordance with applicable requirements, standards and procedures, including the relevant requirements of this Regulation;
- provide evidence of the functioning of the quality system by means of manuals and monitoring documents;
- appoint management representatives to monitor compliance with, and adequacy of, procedures to ensure safe and efficient operational practices;
- perform reviews of the quality system in place and take remedial actions, as appropriate.

14.3.1.1.2 Analysis of Requirement

This provision reinforces the high-level objectives of a QMS, which is required by ICAO Annex 15 [RD 10].

A QMS defines the organisation’s managing structure, roles and responsibilities, documented procedures and processes, and monitoring activities needed to achieve these overall data quality objectives.

14.3.1.1.3 Means of Compliance

The ADQ IR recognises an ISO 9001 Certificate as a mean of compliance to this provision.

14.3.1.2 Annex VII Part A (2)

14.3.1.2.1 Text of Requirement

An EN ISO 9001 certificate, issued by an appropriately accredited organisation, shall be considered as a sufficient means of compliance to the requirements of point 1. The parties referred to in Article 2(2) shall accept the disclosure of the documentation related to the certification to the national supervisory authority upon the latter’s request.

14.3.1.2.2 Analysis of Requirement

EN ISO 9001 is a recognised baseline standard for quality management within all kinds of organisations. ISO 9001 certification does not guarantee the quality of aeronautical data and information or aeronautical data and information products but is the minimum requirement for assurance that the high-level quality management objectives are implemented successfully within an organisation.

14.3.1.2.3 Means of Compliance

No specific means on compliance has been identified for this provision. The exact nature of ISO certification and its renewal is determined by the national accreditation bodies.

14.3.2 Annex VII Part B – Safety Management Objectives

Annex VII Part B introduces the fundamental safety management objectives to be implemented in the QMS for organisations involved in the origination, production, storage, processing, transfer and distribution of aeronautical data and information.

14.3.2.1 Annex VII Part B (1)

14.3.2.1.1 Text of Requirement

The safety management objectives shall be:

- to minimise the contribution to the risk of an aircraft accident arising from data errors as far as reasonably practicable;
- to promote awareness of safety around the organisation by sharing lessons arising from safety activities and by involving all staff to propose solutions to identified

safety issues and improvements to assist the effectiveness and efficiency of the processes;
- to ensure that a function is identified within the organisation being responsible for
development and maintenance of the safety management objectives;
- to ensure that records are kept and monitoring is carried out to provide safety
assurance of their activities;
- to ensure improvements are recommended, where needed, to provide assurance
of the safety of activities.

14.3.2.1.2 Analysis of Requirement

This provision strengthens the requirements for quality management by adding the need to meet
safety management objectives applicable to aeronautical data and information origination,
processing and publication. These objectives are taken from ESARR 3 and provide the basis for
assuring that safety is afforded priority as part of the QMS adopted by each entity.

Satisfaction of the safety management objectives ensures that appropriate consideration is given
to the impact of data quality issues on air traffic safety and that a safety-aware culture exists within
the organisation. All entities within the data chain are required, as a minimum, to ensure that the
above safety management objectives are included within their QMS.

14.3.2.1.3 Means of Compliance

The EUROCONTROL Guidance for the implementation of safety management objectives and
safety assessments falling within the scope of EU Regulation 73/2010 may be used to support the
implementation of this provision. This document is accessible in ANNEX E.

14.3.2.2 Annex VII Part B (2)

14.3.2.2.1 Text of Requirement

The achievement of the safety management objectives shall be afforded the highest
priority over commercial, operational, environmental or social pressures.

14.3.2.2.2 Analysis of Requirement

This provision strengthens the requirements for quality management by adding the need to meet
safety management objectives applicable to aeronautical data and information origination,
processing and publication. This objective is taken from ESARR 3 and provides the basis for
assuring that the safety management objectives are not suspended, reduced or ceased due to
other financial or peer pressures on the organisation. The implementation of safety management
objectives may be met in a number of ways and it is for Member States to determine the level of
assurance required. However, once the level of assurance is agreed with the NSA, for an
organisation, any deviations must be approved.

14.3.2.2.3 Means of Compliance

The EUROCONTROL Guidance for the implementation of safety management objectives and
safety assessments falling within the scope of EU Regulation 73/2010 may be used to support the
implementation of this provision. This document is accessible in ANNEX E.

14.3.3 Annex VII Part C – Security Management Objectives

Annex VII Part C introduces the fundamental security management objectives to be implemented
in the QMS for organisations involved in the origination, production, storage, processing, transfer
and distribution of aeronautical data and information.
14.3.3.1 Annex VII Part C

14.3.3.1.1 Text of Requirement

The security management objectives shall be:
- to ensure the security of aeronautical data and aeronautical information received, produced or otherwise employed so that it is protected from interference and access to it is restricted only to those authorised;
- to ensure that the security management measures of an organisation meet appropriate national or international requirements for critical infrastructure and business continuity, and international standards for security management, including the ISO standards referred to in points 22 and 23 of Annex III.

Regarding the ISO standards, the relevant certificate issued by an appropriately accredited organisation, shall be considered as a sufficient means of compliance. The parties referred to in Article 2(2) shall accept the disclosure of the documentation related to the certification to the national supervisory authority upon the latter’s request.

14.3.3.1.2 Analysis of Requirement

The security of both the facilities for handling aeronautical data and information and the aeronautical data and information itself is a key requirement for all organisations that are responsible for managing, processing and exchanging aeronautical data and information. The security of the aeronautical data and information may be compromised at a number of levels within an organisation. This may result in disruption of the organisation's business or aeronautical data and information processing, thus compromising its ability to deliver the requisite quality of aeronautical data and information in a timely manner. A more subtle breach of security may result in the introduction of aeronautical data and information errors that may not be detected until in operation, compromising the safety of operations.

ANSPs participating in aeronautical data and information processing are already required to implement and operate a security management system commensurate with the DAL of aeronautical data and information they are managing. All entities within the data chain are required, as a minimum, to ensure that the above security management objectives are included within their QMSs.

14.3.3.1.3 Means of Compliance

No specific means of compliance were identified to this provision.
15. **ARTICLE 11 AND ANNEX VIII - CONFORMITY OR SUITABILITY FOR USE OF CONSTITUENTS**

15.1 **Regulatory Basis of Article 11**

The framework Regulation [RD 3] defines the European air traffic management network as “EATMN means the collection of systems listed in Annex I to Regulation (EC) No 552/2004 of the European Parliament and of the Council of 10 March 2004 on the interoperability of the European air traffic management network (the interoperability Regulation) [RD 4] enabling air navigation services in the Community to be provided, including the interfaces at boundaries with third countries”.

The interoperability Regulation [RD 4] subdivides EATMN into eight systems which must comply with the essential requirements and with relevant implementing rules for interoperability.

Annex I point 7 of the interoperability Regulation [RD 4] defines “Systems and procedures for aeronautical information services” as part of the EATMN systems.

An important concept to understand the conformity assessment requirements laid down in the interoperability regulation [RD 4] and in the ADQ IR is the notion of constituent. The framework Regulation [1] defines constituents as “tangible objects such as hardware and intangible objects such as software upon which the interoperability of EATMN depends”; and the ADQ IR defines that its scope includes all elements “involved in the origination, production, storage, handling, processing, transfer and distribution of aeronautical data and aeronautical information”.

According to the EUROCONTROL conformity assessment guidelines [RD 35], the AISP “must determine which elements of their environment represent EATMN constituents and systems in order to perform their verification of compliance tasks. In other words, they need to map their real-world systems in terms of EATMN constituents and EATMN systems for which they will apply conformity assessment procedures. This mapping is defined as the EATMN representation.”

The following example of a representation of the systems and procedures for aeronautical information services does not intend to give a unique or complete list of systems and constituents within the AISP. The actual representation will strongly depend on each national, individual context and specific infrastructure of a given organisation.
The starting point to implement the conformity assessment requirements of the ADQ IR should be to identify which are the elements (hardware and software) that the AISP should include as constituents of the EATMN systems and procedures for aeronautical information services.

The AISP is responsible, in coordination with his national supervisory authority (NSA), to define which of the elements (software and hardware) used to provide aeronautical information services shall be interoperable between themselves. These elements will be considered as constituents of the EATMN system and procedures for aeronautical information services and will be subject to the conformity assessment requirements.

The manufacturer of the elements (software and hardware) that are placed on the EU market with the specific purpose to be used in the origination, production, storage, handling, processing, transfer and distribution of aeronautical data and aeronautical information, and which were identified as constituents of the EATMN system and procedures for aeronautical information, shall assess the conformity or suitability for use of the constituent and issue an EC declaration of conformity or suitability for use.

This assessment shall be done in accordance with the requirements laid down in Article 11 of the ADQ IR and it shall demonstrate the conformity (or suitability for use) of the constituent with, at the minimum, the essential requirements of the interoperability Regulation [RD 4] and the interoperability, performance, quality and safety requirements of the ADQ IR.

AISP and NSA should carefully consider which elements need to be included in the EATMN representation of the systems and procedures for aeronautical information services. Whilst it is difficult to determine a one-fits-all criterion, a recommended starting point is to take into consideration if a possible non-conformity of the specific element (hardware or software) may jeopardise the compliance of the overall system.

### 15.2 Article 11

The following sections outline the specific provisions and requirements of Article 11 and provide guidance as to acceptable means of compliance.

#### 15.2.1 Article 11(1)

**Text of Provision**

*Before issuing EC declarations of conformity or suitability for use as referred to in Article 5 of Regulation (EC) No 552/2004, manufacturers of constituents of the systems referred to in the first subparagraph of Article 2(1) of this Regulation, or their authorised...*
representatives established in the Union, shall assess the conformity or suitability for use of those constituents in compliance with the requirements laid down in Annex VIII.

15.2.1.2 Applicability

This Article is applicable to the manufacturers (or their authorised representatives, established in the European Union) of constituents of the systems involved in the origination, production, storage, handling, processing, transfer and distribution of aeronautical data and information.

As manufacturers are not specifically mentioned as a regulated party under Article 2(2) of the ADQ Regulation, and, as such, cannot be made accountable for it, it is the responsibility of the ANSP to ensure that the manufacturers of the constituents of the systems in use, and which are covered by this Regulation, adhere to the provisions of Article 11.

15.2.1.3 Rationale / Need for Provision

The interoperability Regulation [RD 4] requires manufacturers (or their authorised representatives established in the European Community) to deliver their EATMN products (i.e. those that have an interoperability function) with an EC DoC or an EC DSU.

15.2.1.4 Explanation of Provision

This Article extends specific provisions of the interoperability Regulation [RD 4]. Article 5(1) of the interoperability Regulation [RD 4] states:

“Constituents shall be accompanied by an EC declaration of conformity or suitability for use.”

and continues in Article 5(2)

“The manufacturer, or its authorised representative established in the Community, shall ensure and declare, by means of the EC declaration of conformity or suitability for use, that he has applied the provisions laid down in the essential requirements and in the relevant implementing rules for interoperability.”

According to Article 2(19) of the SES framework Regulation [RD 3] “Constituents’ means tangible objects, such as hardware, and intangible objects, such as software, upon which the interoperability of the EATMN depends”.

In the context of the ADQ Regulation, the ‘EATMN’ means, specifically, the systems and procedures for aeronautical information services.

The manufacturer (or its authorised representative established in the Community) is responsible for verifying a constituent’s compliance with the specific requirements of the ADQ Regulation. This leads to the completion of an EC DoC or an EC DSU through self-assessment, a notified body or both.

15.2.1.5 Implementing the Provision

A detailed description of all the processes involved in the demonstration of compliance with the single European sky interoperability Regulation [RD 4] is given in the EUROCONTROL Guidelines on conformity assessment for the interoperability Regulation of the single European sky [RD 35].

The provisions of the interoperability Regulation [RD 4], depicted in the guidelines, together with the provisions of Annex VIII of this Regulation, shall set the baseline for the conformity assessment of the constituents referred to in this Article.

15.2.1.6 Means of Compliance

No specific means on compliance has been identified for this provision.
15.3 Annex VIII - Requirements for the Assessment of the Conformity or Suitability for Use of Constituents Referred to in Article 11

The following sections outline the specific provisions and requirements of Annex VII and provide guidance as to acceptable means of compliance.

15.3.1 Annex VIII (1)

15.3.1.1 Text of Requirement

The verification activities shall demonstrate the conformity of constituents with the interoperability, performance, quality and safety requirements of this Regulation, or their suitability for use whilst these constituents are in operation in the test environment.

15.3.1.2 Analysis of Requirement

This requirement specifically places the obligation on the manufacturer (or its authorised representative established in the European Community) to set up a test environment where all those constituents planned to be employed in an AIS data chain system, enabling the provision of air navigation services in the European Community, shall be tested before integration in an operational environment.

This test environment shall be set up in such a way as to allow the constituents to be tested against the provisions of the ADQ IR, namely those related to interoperability and performance (Chapter II), and quality and safety (Chapter III), as appropriate.

15.3.1.3 Means of Compliance

No specific means on compliance has been identified for this provision.

15.3.2 Annex VIII (2)

15.3.2.1 Text of Requirement

The manufacturer, or its authorised representative established in the Union, shall manage the conformity assessment activities and shall in particular:

- determine the appropriate test environment;
- verify that the test plan describes the constituents in the test environment;
- verify that the test plan provides full coverage of applicable requirements;
- ensure the consistency and quality of the technical documentation and the test plan;
- plan the test organisation, staff, installation and configuration of test platform;
- perform the inspections and tests as specified in the test plan;
- write the report presenting the results of inspections and tests.

15.3.2.2 Analysis of Requirement

This requirement defines particular provisions that the manufacturer, or its authorised representative, established in the European Union, shall take into consideration when assessing the conformity of the system or its constituents.
15.3.2.3 Means of Compliance

The EUROCONTROL Guidelines on conformity assessment for the interoperability Regulation of the single European sky [RD 35] provide useful guidelines for defining a procedure for the verification of compliance of constituents.

15.3.3 Annex VIII (3)

15.3.3.1 Text of Requirement

The manufacturer, or its authorised representative established in the Union, shall ensure that the constituents involved in the origination, production, handling, processing, transfer and distribution of aeronautical data and aeronautical information integrated in the test environment meet the interoperability, performance, quality and safety requirements of this Regulation.

15.3.3.2 Analysis of Requirement

This provision requires that those EATMN constituents that are used in setting up the test environment are also compliant with the provisions of the ADQ Regulation, namely those relating to interoperability and performance (Chapter II), and quality and safety (Chapter III), as appropriate.

15.3.3.3 Means of Compliance

No specific means on compliance has been identified for this provision.

15.3.4 Annex VIII (4)

15.3.4.1 Text of Requirement

Upon satisfying completion of verification of conformity or suitability for use, the manufacturer, or its authorised representative established in the Union, shall under its responsibility draw up the EC declaration of conformity or suitability for use, specifying notably the requirements of this Regulation met by the constituent and its associated conditions of use in accordance with point 3 of Annex III to Regulation (EC) No 552/2004.

15.3.4.2 Analysis of Requirement

To formalise the assessment of conformity or suitability for use, the manufacturer (or its authorised representative, established in the European Community) shall issue an EC Declaration of Conformity (DoC) or an EC Declaration of Suitability for Use (DSU). These documents shall accompany each constituent.

15.3.4.3 Means of Compliance

A full description of an adequate methodology for the production of these declarations is given in the EUROCONTROL Guidelines on conformity assessment for the interoperability Regulation of the single European sky [RD 35].
16. **ARTICLE 12 AND ANNEXES IX and X - VERIFICATION OF SYSTEMS**

16.1 **Regulatory Basis of Article 12**

The ANSP is responsible to ensure and declare compliance of its systems and procedures for aeronautical information services with the interoperability Regulation [RD 4] and with the ADQ IR. Evidence of compliance shall be provided to the national supervisory authority before the system is put into service.

This evidence should be captured in the Technical File (TF) which will accompany the EC Declaration of Verification of Systems (DoV) as proof that the defined system meets the applicable regulatory baseline.

16.2 **Article 12**

The following sections outline the specific provisions and requirements of Article 12 and provide guidance as to acceptable means of compliance.

### 16.2.1 Article 12(1)

#### 16.2.1.1 Text of Provision

*Air navigation service providers which can demonstrate or have demonstrated that they fulfil the conditions set out in Annex IX shall conduct a verification of the systems referred to in the first subparagraph of Article 2(1) in accordance with the requirements laid down in Annex X, Part A.*

#### 16.2.1.2 Applicability

This Article applies to ANSPs only. It should be noted that the ANSP function includes AISPs.

#### 16.2.1.3 Rationale / Need for Provision

As discussed above, there is a need to verify systems and this may either be performed by the ANSP or by an external body. This provision relates to those organisations that elect to perform verification in-house.

#### 16.2.1.4 Explanation of Provision

This provision requires those ANSPs who are able to comply, or who have complied with the requirements of Annex IX, to verify their systems in accordance with Annex X. Annex IX lays down strict requirements for the governance of who and how a verification may be performed by an ANSP. See section 16.3 for a full analysis of these requirements.

#### 16.2.1.5 Implementing the Provision

The first step in achieving compliance with this requirement is to assess the organisation’s ability to comply with the requirements of Annex IX. If the organisation is unable to do so, then this requirement may not be met and compliance with Article 12(2) must be achieved instead.

More details on achieving compliance with Annex IX may be found in section 16.3.

Once the ANSP establishes that it is able to perform a verification activity itself, for each system, the verification must be undertaken in accordance with the requirements of Annex X.

More details on achieving compliance with Annex X may be found in section 16.3.5.2.
It should be noted that although the provisions do not truly reflect the intent, there is no intended prohibition on an organisation who is able to verify its systems itself subcontracting this work to a notified body.

**16.2.1.6 Means of Compliance**

There is no specific means of complying with this provision; rather, compliance is achieved through meeting the needs of Annex IX (section 16.3) and Annex X (section 16.4).

**16.2.2 Article 12(2)**

**16.2.2.1 Text of Provision**

*Air navigation service providers which cannot demonstrate that they fulfil the conditions set out in Annex IX shall subcontract to a notified body a verification of the systems referred to in the first subparagraph of Article 2(1). This verification shall be conducted in accordance with the requirements laid down in Annex X, Part B.*

**16.2.2.2 Applicability**

This Article applies to ANSPs only. It should be noted that the ANSP function includes AISPs.

**16.2.2.3 Rationale / Need for Provision**

As discussed above, there is a need to verify systems and this may either be performed by the ANSP or by an external notified body. This provision relates to those organisations who elect to have a notified body perform the verification.

**16.2.2.4 Explanation of Provision**

Annex IX lays down strict requirements for the governance of who and how a verification may be performed by an ANSP. See section 16.3 for a full analysis of these requirements.

Article 12(2) requires those ANSPs who are unable to comply with these requirements to have the verification activity performed by an external, notified body.

**16.2.2.5 Implementing the Provision**

Once the ANSP establishes that it is not able to perform a verification activity itself, for each system, it shall select a notified body to perform these verification activities on its behalf. This verification must be undertaken in accordance with the requirements of Annex X.

The list of notified bodies is maintained by the Commission on the Nando web site and published in the Official Journal of the European Union.

More details on achieving compliance with Annex X may be found in section 16.3.5.2.

**16.2.2.6 Means of Compliance**

There is no specific means of complying with this provision; rather, compliance is achieved through the verification of systems, by a notified body, against the requirements of Annex X (section 16.4).

**16.3 Annex IX - Conditions Referred to in Article 12**

The following sections outline the specific provisions and requirements of Annex IX and provide guidance as to acceptable means of compliance.

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5 http://ec.europa.eu/enterprise/newapproach/nando/index.cfm
16.3.1 Annex IX (1)

16.3.1.1 Text of Requirement

The air navigation service provider must have in place reporting methods within the organisation that ensure and demonstrate impartiality and independence of judgement in relation to the verification activities.

16.3.1.2 Analysis of Requirement

This requirement mandates the ANSP to provide evidence that the verification process applied is free from any influence that may affect the decision regarding the compliance of a system. In this regard, influence can be defined as that from entities outside the verification process or from individuals tasked with undertaking the verification.

This evidence should demonstrate that the process is such that influence may not be exerted and that the judgements made have been achieved without influence.

16.3.1.3 Means of Compliance

It is recommended that the means to comply with this requirement is a documented verification process/procedure, included as part of the QMS, which ensures influence is not applied to affect the outcome of the verification, and that evidence is recorded to this effect.

It is, however, acknowledged that it is hard to provide evidence of something which does not happen. As such, consideration should be given to the output of the verification process being a certificate of compliance, signed by those who undertook the process, which includes a statement that the decision was made without influence. This may also be supported by an independent mechanism, by which individuals may report that they believe influence is being exerted in the process, without fear of recrimination.

16.3.2 Annex IX (2)

16.3.2.1 Text of Requirement

The air navigation service provider must ensure that the personnel involved in verification processes carry out the checks with the greatest possible professional integrity and the greatest possible technical competence, and are free of any pressure and incentive, in particular of a financial type, which could affect their judgment or the results of their checks, in particular from persons or groups of persons affected by the results of the checks.

16.3.2.2 Analysis of Requirement

This requirement may be regarded as an accumulation of several of the other requirements found in Annex IX.

The personnel involved in the verification process must have professional integrity, e.g. they will perform the tasks requested to the best of their ability. This is a difficult requirement to capture in working processes and procedures, and so, it is recommended that the organisation make use of reviews, annual appraisals and the line-management chain to monitor the performance of personnel to ensure that they are working to a high standard and that there is no decline in this standard, for any reason.
The personnel involved in the verification process must have the greatest possible technical competence, e.g. they must be highly trained (formal and vocational) and technically equipped to perform the verification tasks requested. This provision must be placed in the context of the work undertaken and the nature of the organisation. The phrase “greatest possible technical competence” could be taken to mean that the most highly skilled verification experts in the world must be used - a situation which is obviously not practicable. Rather, the organisation must ensure that a sufficient standard is achieved and that the activity is carried out with a suitable degree of professionalism.

The personnel involved in the verification process must be free of any pressure and incentive, in particular of a financial type, which could affect their judgment or the results of their checks, in particular from persons or groups of persons affected by the results of the checks, i.e., the personnel involved must not have any factors, external to the verification, that may impact the decision that is made at the end of the verification process. To this end, the organisation must take steps to ensure that no pressure is applied to the personnel undertaking the verification. Some are easily within the control of the organisation, such as ensuring remuneration is not linked to the speed or decision making of verification processes. Others are more difficult to control, such as ensuring that pressure is not applied from outside the organisation. Here, ensuring that there are simple procedures in place through which personnel may report pressure on their decision making, without fear of recrimination, can assist.

16.3.2.3 Means of Compliance

No specific means of compliance for this provision is identified.

16.3.3 Annex IX (3)

16.3.3.1 Text of Requirement

The air navigation service provider must ensure that the personnel involved in verification processes, have access to the equipment that enables them to properly perform the required checks.

16.3.3.2 Analysis of Requirement

In order to correctly verify a system, equipment may be needed to allow the necessary testing to be undertaken. For example, in testing a NOTAM system, it may be necessary for dummy NOTAM messages to be fed to the system, as if they were being received from a NOTAM switch.

Should such equipment not be made available, those tasked with undertaking the verification may not be able to carry this out fully and, therefore, be able to make a decision as to a system’s suitability, based upon fact.

The ANSP is therefore mandated, by this provision, to ensure that the necessary equipment is made available to those undertaking the verification.

16.3.3.3 Means of Compliance

No specific means of compliance for this provision is identified. It is recommended that the process for verification requires all necessary equipment to be identified and, that, when the system verification is complete, a certificate of compliance is issued which acknowledges that all necessary equipment was made available.
16.3.4 Annex IX (4)

16.3.4.1 Text of Requirement

The air navigation service provider must ensure that the personnel involved in verification processes, have sound technical and vocational training, satisfactory knowledge of the requirements of the verifications they have to carry out, adequate experience of such operations, and the ability required to draw up the declarations, records and reports to demonstrate that the verifications have been carried out.

16.3.4.2 Analysis of Requirement

Fundamentally, this requirement mandates the ANSP to ensure that those personnel who are involved in the verification of systems are adequately trained to undertake the task which they are requested to perform. In essence, if they are not suitably trained to verify a system, any judgement that they make may be incorrect and have significant consequences for the organisation and/or aeronautical data and information published.

Key to the requirement is the phrase “sound technical and vocational training”, i.e., it is understood that the verification of systems is not something that may be trained in a classroom. The staff involved must have a deep understanding of the function that the system performs, the technology used to develop it, the requirements against which it is being verified, and knowledge of sound systems verification practices.

From the perspective of complying with this requirement, ANSPs are only required to do what is already required today under the ISO 9001 QMS, namely:

1) Identify the skills and competences that are required to undertake the task;
2) Ensure that those undertaking the tasks are suitably qualified;
3) Provide training where there is a gap between the skills needed and those held.

16.3.4.3 Means of Compliance

The means of compliance for this provision is a suitably documented and accredited ISO 9001 QMS which covers system verification activities.

16.3.5 Annex IX (5)

16.3.5.1 Text of Requirement

The air navigation service provider must ensure that the personnel involved in verification processes, are able to perform their checks with impartiality. Their remuneration shall not depend on the number of checks carried out, or on the results of such checks.

16.3.5.2 Analysis of Requirement

Quite simply, this provision means that those staff involved in the verification of systems shall not be offered any incentive, financial or otherwise, to perform the their task quickly, or to give a particular result for the verification tests.

This requirement does provide a certain degree of duplication over some elements of Annex IX (2).

16.3.5.3 Means of Compliance

No specific means of compliance for this provision is identified.
16.4 Annex X

Annex X sets the requirements for the verification of systems, as required by Article 12. The requirements are established for the situation where the ANSP performs the verification (Part A) and where a notified body is used (Part B).

16.4.1 Annex X Part A - Requirements for the Verification of Systems Referred to in Article 12(1)

Annex X Part A provides the requirements for the verification of systems when the testing is performed by the ANSP itself.

16.4.1.1 Annex X Part A (1)

16.4.1.1.1 Text of Requirement

The verification of systems identified in Article 2(1) shall demonstrate the conformity of these systems with the interoperability, performance and safety requirements of this Regulation in an assessment environment that reflects the operational context of these systems.

16.4.1.1.2 Analysis of Requirement

This requirement sets the basic minimum requirements for the verification of the system in question. In essence, the verification must demonstrate that the system is compliant with the provisions of the ADQ IR which relate to systems, namely the interoperability, performance and safety requirements.

Key here is the word “demonstrate”, i.e. the verification must prove that the system is compliant, and further, this must be proven in an environment that reflects the operational environment of the system. In other words, the testing must be performed in a manner which is similar to that in which the system will normally be used. For example, if the system requires extensive human interaction, the environment within which it is tested should reflect that, for example, reflecting the lighting and noise levels under which the human interaction takes place, etc.

It is, therefore, recommended that as part of the verification, an “environment” declaration is made which describes the test environment utilised. This should include, as a minimum:

1) Hardware build state;
2) Software build state;
3) Operating system used;
4) Light levels;
5) Noise levels;
6) Interfaces used (e.g. NOTAM switch).

16.4.1.1.3 Means of Compliance

No specific means of compliance for this provision is identified.

16.4.1.2 Annex X Part A (2)

16.4.1.2.1 Text of Requirement

The verification of systems identified in Article 2(1) shall be conducted in accordance with appropriate and recognised testing practices.
16.4.1.2.2 **Analysis of Requirement**

Various standards and methodologies exist for the verification of systems and this requirement mandates the ANSP to utilise one that is appropriate. In this instance, “appropriate” is used to indicate a practice that:

1) Suits the system, in terms of its intended functionality;
2) Matches the hardware, software and operating platform in use;
3) Provides a cost-effective means of verifying the system, allowing effort to be concentrated on those system functions which have the possibility to affect the quality of aeronautical data and information.

16.4.1.2.3 **Means of Compliance**

No specific means of compliance for this provision is identified. It is recommended that the ANSP assesses the available industry standards to determine which is most appropriate to the requirements.

### 16.4.1.3 **Annex X Part A (3)**

#### 16.4.1.3.1 **Text of Requirement**

Test tools used for the verification of systems identified in the first subparagraph of Article 2(1) shall have appropriate functionalities.

#### 16.4.1.3.2 **Analysis of Requirement**

This requirement requires the ANSP to ensure that the test tools in use provide the functionality needed to fully verify the system. This does not, however, mean that the test tools need be verified as this could present a situation whereby there is an endless process of testing test tools.

Instead, the test tools should be assessed to ensure that they provide an adequate coverage of the functionality needed to replicate the real-world operational use of the system. Should, during the verification, a fail situation be encountered, both the system under test and the test tool should be considered as possible causes. Once the cause is found, it should be corrected and the testing resumed with whatever level of retesting is considered necessary. Although this is not an ideal situation, whereby only validated and verified test tools would be used, it does offer a pragmatic and cost-effective solution.

#### 16.4.1.3.3 **Means of Compliance**

No specific means of compliance for this provision is identified.

### 16.4.1.4 **Annex X Part A (4)**

#### 16.4.1.4.1 **Text of Requirement**

The verification of systems identified in the first subparagraph of Article 2(1) shall produce the elements of the technical file required by point 3 of Annex IV to Regulation (EC) No 552/2004 including the following elements:

- description of the implementation;
- the report of inspections and tests achieved before putting the system into service.

#### 16.4.1.4.2 **Analysis of Requirement**

This requirement reinforces the provisions already defined in the interoperability Regulation [RD 4] concerning the documents that shall, as a minimum, be included in the TF which will accompany the EC DoV.
16.4.1.5.1 Text of Requirement

The air navigation service provider shall manage the verification activities and shall in particular:

- determine the appropriate simulated operational and technical environment reflecting the operational environment;
- verify that the test plan describes the integration of systems identified in the first subparagraph of Article 2(1) in an operational and technical assessment environment;
- verify that the test plan provides full coverage of the applicable interoperability, performance and safety requirements of this Regulation;
- ensure the consistency and quality of the technical documentation and the test plan;
- plan the test organisation, staff, installation and configuration of the test platform;
- perform the inspections and tests as specified in the test plan;
- write the report presenting the results of inspections and tests.

16.4.1.5.2 Analysis of Requirement

This requirement defines particular provisions that the ANSP shall take into consideration when establishing and conducting a conformity assessment test plan.

16.4.1.5.3 Means of Compliance

The EUROCONTROL Guidelines on conformity assessment for the interoperability Regulation of the single European sky [RD 35] provide useful guidelines for defining a procedure for the verification of the compliance of systems.

16.4.1.6.1 Text of Requirement

The air navigation service provider shall ensure that the systems identified in the first subparagraph of Article 2(1) under its responsibility meet the interoperability, performance and safety requirements of this Regulation.

16.4.1.6.2 Analysis of Requirement

In this case, it is the responsibility of the ANSP to ensure compliance of its systems and procedures for aeronautical information services with the ADQ IR before they are put into service. In particular, the ANSP shall ensure that all the provisions relating to interoperability and performance (Chapter II), and quality and safety (Chapter III), as appropriate, are met.

16.4.1.6.3 Means of Compliance

The EUROCONTROL Guidelines on conformity assessment for the interoperability Regulation of the single European sky [RD 35] provide useful guidelines for defining a procedure for the verification of the compliance of systems.
16.4.1.7 Annex X Part A (7)

16.4.1.7.1 Text of Requirement

Upon satisfying completion of verification of conformity, air navigation service providers shall draw up the EC declaration of verification of system and submit it to the national supervisory authority together with the technical file as required by Article 6 of Regulation (EC) No 552/2004.

16.4.1.7.2 Analysis of Requirement

At the end of the process, the ANSP must produce under its own authority an EC DoV with the corresponding TF, which will be sent to the NSA before the system is put into service.

16.4.1.7.3 Means of Compliance

The Means of Compliance for this requirement are an appropriate DoV and the corresponding TF. The EUROCONTROL Guidelines on conformity assessment for the interoperability Regulation of the single European sky [RD 35] provide useful guidelines for completing a DoV and a TF.

16.4.2 Annex X Part B - Requirements for the Verification of Systems Referred to in Article 12(2)

Annex X part B provides the requirements for the verification of systems when the testing is performed by a notified body, rather than the ANSP itself.

As with the New Legislative Framework, the interoperability Regulation [RD 4] allows Member States to appoint notified bodies that are entitled to provide conformity assessment services to ANSPs in relation to their verification of compliance obligations.

The list of notified bodies is maintained by the European Commission on the Nando web site and published in the OJEU.

It should be noted that, in essence, the requirements are broadly the same as those found in Annex X Part A.

16.4.2.1 Annex X Part B (1)

16.4.2.1.1 Text of Requirement

The verification of systems identified in the first subparagraph of Article 2(1) shall demonstrate the conformity of these systems with the interoperability, performance and safety requirements of this Regulation in an assessment environment that reflects the operational context of these systems.

16.4.2.1.2 Analysis of Requirement

This requirement sets the basic minimum requirements for the verification of the system in question. In essence, the verification must demonstrate that the system is compliant with the provisions of the ADQ IR which relate to systems, namely the interoperability, performance and safety requirements.

Key here is the word “demonstrate”, i.e. the verification must prove that the system is compliant, and further, this must be proven in an environment that reflects the operational environment of the system. In other words, the testing must be performed in a manner which is similar to that in which the system will normally be used. For example, if the system requires extensive human interaction, the environment within which it is tested should reflect that, for example, reflecting the lighting and noise levels under which the human interaction takes place, etc.

It is, therefore, recommended that as part of the verification testing, an “environment” declaration is made which describes the test environment utilised.
This should include, as a minimum:

1) Hardware build state;
2) Software build state;
3) Operating system used;
4) Light levels;
5) Noise levels;
6) Interfaces used (e.g. NOTAM switch).

16.4.2.1.3 Means of Compliance

No specific means of compliance for this provision is identified.

16.4.2.2 Annex X Part B (2)

16.4.2.2.1 Text of Requirement

The verification of systems identified in the first subparagraph of Article 2(1) shall be conducted in accordance with appropriate and recognised testing practices.

16.4.2.2.2 Analysis of Requirement

Various standards and methodologies exist for the verification of systems and this requirement mandates the notified body to utilise one that is appropriate. In this instance, “appropriate” is used to indicate a practice that:

1) Suits the system, in terms of its intended functionality;
2) Matches the hardware, software and operating platform in use;
3) Provides a cost-effective means of verifying the system, allowing effort to be concentrated on those system functions which have the possibility to affect the quality of aeronautical data and information.

16.4.2.2.3 Means of Compliance

The verification of systems that are covered by Article 2(1) of the ADQ IR shall be conducted in a manner that is compliant with the provisions of the interoperability Regulation [RD 4], particularly with the provisions of point 2 of Annex IV. The EUROCONTROL Guidelines on conformity assessment for the interoperability Regulation of the single European sky [RD 35] provide useful guidelines for defining a procedure for the verification of the compliance of systems.

16.4.2.3 Annex X Part B (3)

16.4.2.3.1 Text of Requirement

Test tools used for the verification of systems identified in the first subparagraph of Article 2(1) shall have appropriate functionalities.

16.4.2.3.2 Analysis of Requirement

This requirement requires the Notified Body to ensure that the test tools in use provide the functionality needed to fully verify the system. This does not, however, mean that the test tools need be verified as this could present a situation whereby there is an endless process of testing test tools.
Instead, the test tools should be assessed to ensure that they provide an adequate coverage of the functionality needed to replicate the real-world operational use of the system. Should, during the verification, a fail situation be encountered, both the system under test and the test tool should be considered as possible causes. Once the cause is found, it should be corrected and the testing resumed with whatever level of retesting is considered necessary. Although this is not an ideal situation, whereby only validated and verified test tools would be used, it does offer a pragmatic and cost-effective solution.

16.4.2.3.3 Means of Compliance

No specific means of compliance for this provision is identified.

16.4.2.4 Annex X Part B (4)

16.4.2.4.1 Text of Requirement

The verification of systems identified in the first subparagraph of Article 2(1) shall produce the elements of the technical file required by point 3 of Annex IV of Regulation (EC) No 552/2004 including the following elements:

- description of the implementation;
- the report of inspections and tests achieved before putting the system into service.

16.4.2.4.2 Analysis of Requirement

This Requirement reinforces the provisions already defined in the interoperability Regulation [RD 4] concerning the documents that shall, as a minimum, be included in the TF which will accompany the EC DoV.

16.4.2.4.3 Means of Compliance

The contents of the technical file shall comply with the provisions of point 3 of Annex IV to the interoperability Regulation [RD 4]. The EUROCONTROL Guidelines on conformity assessment for the interoperability Regulation of the single European sky [RD 35] provide useful guidelines on how to complete a TF in Annex X Part B (5).

16.4.2.4.4 Text of Requirement

The air navigation service provider shall determine the appropriate operational and technical assessment environment reflecting the operational environment and shall have verification activities performed by a notified body.

16.4.2.4.5 Analysis of Requirement

Even in the case where the verification activities are performed by a notified body, it is the responsibility of the ANSP to determine which elements of their environment represent the EATMN systems and procedures for aeronautical information services and to which of these constituents the verification of compliance tasks apply (i.e. the EATMN Representation).

16.4.2.4.6 Means of Compliance

The EUROCONTROL Guidelines on conformity assessment for the interoperability Regulation of the single European sky [RD 35] define the concept of EATMN representation.

16.4.2.5 Annex X Part B (6)

16.4.2.5.1 Text of Requirement

The notified body shall manage the verification activities and shall in particular:

- verify that the test plan describes the integration of systems identified in the first subparagraph of Article 2(1) in an operational and technical assessment environment;
- verify that the test plan provides full coverage of the applicable interoperability, performance and safety requirements of this Regulation;
- ensure the consistency and quality of the technical documentation and the test plan;
- plan the test organisation, staff, installation and configuration of the test platform;
- perform the inspections and tests as specified in the test plan;
- write the report presenting the results of inspections and tests.

16.4.2.5.2 Analysis of Requirement

This requirement defines particular provisions that the notified body shall take into consideration when establishing and conducting a conformity assessment test plan.

16.4.2.5.3 Means of Compliance

The EUROCONTROL Guidelines on conformity assessment for the interoperability Regulation of the single European sky [RD 35] provide useful guidelines for defining a procedure for the verification of the compliance of systems.

16.4.2.6 Annex X Part B (7)

16.4.2.6.1 Text of Requirement

The notified body shall ensure that the systems identified in the first subparagraph of Article 2(1) operated in an operational assessment environment meet the interoperability, performance and safety requirements of this Regulation.

16.4.2.6.2 Analysis of Requirement

In this case, it is the responsibility of the notified body to ensure compliance of the systems and procedures for aeronautical information services with the ADQ IR before they are put into service. In particular, the notified body shall ensure that all the provisions relating to interoperability and performance (Chapter II), and quality and safety (Chapter III), as appropriate, are met.

16.4.2.6.3 Means of Compliance

The EUROCONTROL Guidelines on conformity assessment for the interoperability Regulation of the single European sky [RD 35] provide useful guidelines for defining a procedure for the verification of the compliance of systems.

16.4.2.7 Annex X Part B (8)

16.4.2.7.1 Text of Requirement

Upon satisfying completion of verification tasks, the notified body shall draw up a certificate of conformity in relation to the tasks it carried out.

16.4.2.7.2 Analysis of Requirement

A notified body is obliged to provide a 'certificate' in relation to the tasks it has performed for the ANSP. This certificate shall include all the relevant elements to allow the ANSP to issue the EC DoV, including the TF.

16.4.2.7.3 Means of Compliance

The EUROCONTROL Guidelines on conformity assessment for the interoperability Regulation of the single European sky [RD 35] provide useful guidelines for defining a procedure for the verification of the compliance of systems.
16.4.2.8  Annex X Part B (9)

16.4.2.8.1  Text of Requirement

Then the air navigation service provider shall draw up the EC declaration of verification of system and submit it to the national supervisory authority together with the technical file as required by Article 6 of Regulation (EC) No 552/2004.

16.4.2.8.2  Analysis of Requirement

Even in the case where a notified body performs the conformity assessment tasks, at the end of the process it is to the responsibility of the ANSP to produce under its own authority an EC DoV, with the corresponding TF which will be sent to the NSA before the system is put into service.

16.4.2.8.3  Means of Compliance

The Means of Compliance with this requirement are an appropriate DoV and the corresponding TF. The EUROCONTROL Guidelines on conformity assessment for the interoperability Regulation of the single European sky [RD 35] provide useful guidelines for completion of a DoV and a TF.
17. ARTICLE 13 - ADDITIONAL REQUIREMENTS

17.1 Regulatory Basis of Article 13

Annex I of the SES common requirements Regulation [RD 1] lays down general requirements for the provision of air navigation services, which include AIS. These general requirements include the need for ANSPs to have procedures to support the maintenance of safety and quality management, and security. As the ADQ IR is also applicable to non-ANSP entities, such as surveying companies, Article 13 was included to extend the relevant obligations in Annex I of the common requirements Regulation, to these non-ANSP entities, without the need for them to be categorised as an ANSP and issued with a European Commission certificate to provide air navigation services by a NSA. The aim of Article 13 is to further support compliance of all regulated parties with the requirements related to procedures to support the maintenance of safety and quality management, and security.

17.2 Article 13

The following sections outline the specific provisions and requirements of Article 13 and provide guidance on acceptable means of compliance.

17.2.1 Article 13

17.2.1.1 Text of Provision

The parties referred to in Article 2(2) (b) and (c) shall:

(a) ensure the security clearance of their personnel responsible for tasks in the origination, production, storage, handling, processing, transfer and distribution of aeronautical data or aeronautical information, as appropriate;

(b) ensure that their personnel responsible for tasks in the provision of aeronautical data or aeronautical information are made duly aware of the requirements laid down in this Regulation;

(c) develop and maintain operations manuals containing the necessary instructions and information to enable their personnel responsible for tasks in the provision of aeronautical data or aeronautical information to apply this Regulation;

(d) ensure that the manuals referred to in point (c) are accessible and kept up-to-date and that their update and distribution are subject to appropriate quality and documentation configuration management;

(e) ensure that the working methods and operating procedures comply with this Regulation.
17.2.1.2 Applicability

Article 13 is applicable to:

1) operators of those aerodromes and heliports, for which IFR or SVFR procedures have been published in national AIPs;

2) public or private entities providing, for the purposes of this Regulation:
   a) services for the origination and provision of survey data;
   b) procedure design services;
   c) electronic terrain data;
   d) electronic obstacle data.

It should be noted that this Article is not applicable to ANSPs, as adequate, similar obligations are already placed on ANSPs by the common requirements Regulation [RD 1]. The focus of Article 13 is on the entities considered to be an 'Operating Organisation', which is defined in the common requirements Regulation [RD 1].

See section 5.2.2 (Article 2(2)) for more details of these applicable parties.

17.2.1.3 Rationale/Need for Provision

The provisions in Article 13 are necessary to ensure that personnel of those non-ANSP entities ('Operating Organisations'), who are subject to the ADQ Regulation, are made aware of the regulatory requirements they must meet, through the provision of adequate training, the availability of accessible and up-to-date operations manuals, as well as the definition of working methods and operating procedures. In addition, Article 13 ensures that the relevant requirements for the security clearance of personnel are applied to all regulated parties within the context of aeronautical data and information provision.

Article 13 is complementary to the need for a QMS, as specified in Article 10 and Annex VII of the ADQ Regulation, laying down a number of key procedural elements that should be found within a QMS.

17.2.1.4 Explanation of Provision

Firstly, this provision relates to the management, control and facilitation of personnel by non-ANSP ('Operating Organisation') regulated parties. 'Personnel' relates to those staff undertaking a role that may impact the quality of aeronautical data and information, either through their job requirements or through an ability to access and amend the aeronautical data and information.

Five key requirements are introduced by Article 13, as follows:

1) Security Clearance:

   This Article relates to those organisations that are not ANSPs but provide aeronautical data and information, and to the people they employ. The scope and applicability of the security measures are the same as for an ANSP and are determined by the risk analysis of the aeronautical data and information handled, its processing, storage and transmission, and are not affected by the type or size of the organisation or the proportion of work undertaken which contributes to the final AIP product. However, the way it is implemented should be proportionate and appropriate, and this is dealt with in 18.2.1.5.
2) Awareness of Regulation:

The ADQ IR sets out a number of requirements that impact the day-to-day operations of the regulated parties and their personnel. This particular requirement obliges regulated parties to ensure that their staff are suitably aware of the ADQ Regulation, and the obligations that it places upon them and the organisation as a whole. This is especially important for those organisations that may not regularly provide aeronautical data and information, and where general awareness of the aeronautical data and information regulatory framework may not be high.

3) Operating Manuals:

This requirement obliges the regulated parties to document day-to-day operations in a series of operating manuals, which must outline how the tasks undertaken are to be performed.

4) Accessibility and Maintenance of Manuals:

This requirement obliges the regulated parties to ensure that the operating manuals explained in sub-paragraph (c) above are made easily accessible to their personnel and kept up-to-date. The latest versions of the operating manuals must always be available to those who need to use them.

5) Compliance with Regulation:

This general requirement is intended to ensure that the operating procedures and working practices employed by the regulated parties satisfy the detailed requirements of the ADQ Regulation.

17.2.1.5 Implementing the Provision

1) Security Clearance:

The objective of the provision is

- to protect the aeronautical data and information, its confidentiality, integrity, availability and ensure an authorisation to possess, transmit and receive it; and
- to protect the aviation organisations and infrastructure from malicious damage.

The security measures employed may be a combination of organisational, physical, procedural and technical, but the foundation of them all is establishing trust in the staff employed. The staff have the potential to subvert any other measures used and, therefore, security clearance of staff, to establish a degree of trustworthiness which is proportionate to the required DAL is essential.

Some organisations may be small or only deal with a small amount of relevant aeronautical data and information. Therefore, in the interests of proportionality it may be possible to have procedures for the origination and checking of aeronautical data and information and for limiting access (for instance to computers and networks) so that not all staff to have the same level of clearance. Also, the requirements for the security clearance overlap with the checking process for staff when they are recruited and in their annual reviews as part of the organisation’s QMS (EN ISO 9001). There is, therefore, the opportunity for integration of some of the administration of security, with quality and safety.

Each organisation must also comply with its own national data protection and privacy laws, as they apply to employment law, and so the provision for security clearance must allow some flexibility in its implementation.
2) Awareness of Regulation:
Regulated parties must ensure that all their personnel are aware of the ADQ IR and its impact on both the organisation, as a whole, and on the roles of individuals employed within it. This awareness must be achieved by implementing a systematic process to ensure that both existing personnel and those joining the organisation are made aware of the ADQ Regulation, and that these personnel understand the specific regulatory requirements related to their roles. Access should also be provided to relevant guidance material, to support the achievement of this required awareness.

In the case of existing personnel, a workshop or joint briefing session may be considered as a means of promulgating knowledge of the ADQ Regulation, as a whole, and, particularly, when it first enters into force. In order to ensure that all personnel are aware of the impact on their work, this may then be followed by a series of discussions held with representatives of each function to best determine in detail how compliance may be achieved, for example, through the provision of additional training, etc., at the working level.

For new personnel, awareness should be provided through systematic induction training and specific job-related training.

Regulated parties should keep formal records that outline the manner in which this awareness was achieved, and which show how each relevant member of staff has been trained.

3) Operating Manuals:
A series of operating manuals must be prepared and then maintained which outline those processes and procedures that must be adhered to by personnel working with aeronautical data and information that falls within the scope of the ADQ Regulation. These manuals should highlight the tasks that must be undertaken, the processes that should be applied and any specific areas of risk and mitigations that exist.

4) Accessibility and Maintenance of Manuals:
Operating manuals within the organisation must be provided to all personnel who are required to operate in accordance with them. The manuals must be kept fully up-to-date to reflect the latest version of the ADQ IR and its associated specifications and guidelines. The manuals must also be kept up-to-date to reflect the operations of the regulated parties concerned. Within the manuals, it must be possible to identify their latest amendment status and how they link to the ADQ IR and the associated means of compliance, etc.

A documented and auditable process by which operations manuals are regularly reviewed, updated and disseminated is strongly recommended. This should include a system whereby urgent/critical updates and/or temporary changes can be notified to personnel without delay.

The use of an Intranet site through which the latest manuals and notices are made accessible to all personnel, is also recommended.

5) Compliance with Regulation:
This requirement obliges regulated parties to ensure that their operations are conducted in a manner that complies with the provisions of the ADQ Regulation. The regulated parties must, therefore, establish a mechanism by which they are able to determine and demonstrate their compliance. Traceability of compliance can be mapped directly to the provisions of the ADQ IR itself, or to the requirements contained within relevant Specifications, adopted as means of compliance to the ADQ Regulation. Demonstration of compliance with the requirements of Specifications provides a presumption of conformity with the relevant provisions of the Regulations that they support. In the case of the ADQ Regulation, it should be noted that there are several Specifications, each covering particular elements of the regulatory requirements.

A typical method of demonstrating compliance is through the conduct of audits against the provisions of the ADQ IR and/or Specification requirements. This may be performed either by internal personnel or, preferably, by an external body.
Member States or other potential customers of regulated parties, such as ANSPs, may introduce individual methods of checking compliance. These would also be captured in the SLAs or contractual arrangements between the parties, as referred to in Annex IV, Part C, (Formal Arrangements) of the ADQ Regulation.

Two methods of audit may be foreseen:

- An audit of the conduct of the operations against the regulatory requirements, or;
- An audit of the conduct of the operations against a set of operating procedures, which have been determined to comply with provisions of the ADQ Regulation. Documentary evidence to show the traceability between the procedures and the regulatory requirements should be provided.

The latter audit method is recommended as it allows the regulated parties to determine precisely how the provisions impact their operations and how the provisions are met within the context of their day-to-day activities.

Self-declaration of compliance (i.e. through internal audit) should be accompanied by strong documentary evidence to support the declaration of compliance.

17.2.1.6 Means of Compliance

1) Security Clearance:
There are no means of compliance that relate specifically to this provision but those for ANSPs also apply here.

2) Awareness of Regulation:
There are no means of compliance directly associated with this specific provision.

3) Operating Manuals:
In accordance with Article 10 and Annex VII, Part A, of the ADQ Regulation:

“…the parties…shall implement and maintain a quality management system covering their aeronautical data and aeronautical information provision activities…”

“An EN ISO 9001 certificate, issued by an appropriately accredited organisation, shall be considered as a sufficient means of compliance…”

The operating processes and procedures that would be required under an ISO 9001 certificate would provide an adequate means of compliance.

4) Accessibility and Maintenance of Manuals:
In accordance with Article 10 and Annex VII, Part A of the ADQ Regulation:

“…the parties…shall implement and maintain a quality management system covering their aeronautical data and aeronautical information provision activities…”

“An EN ISO 9001 certificate, issued by an appropriately accredited organisation, shall be considered as a sufficient means of compliance…”

An ISO 9001 certificate specifically require a documented process to outline the means by which processes and procedures are reviewed, updated and disseminated. Such a procedure would provide an adequate means of compliance.

5) Compliance with Regulation:
There are no means of compliance directly associated with this specific provision.

18.1 Regulatory Basis of Article 14

Regulations must provide stakeholders with sufficient time to adapt, especially where the Regulations place new obligations on existing situations. In this particular case, there is a vast quantity of aeronautical data and information that has already been derived and published prior to the ADQ IR coming into force, and which will not have been subject to the new requirements. In addition, some States have notified related ‘differences’ to some of the ICAO requirements referenced in the ADQ Regulation, which they will now need to address in order that they can achieve full compliance with the ADQ Regulation.

Therefore, a suitable transition period for the ADQ IR is required in which to allow stakeholders a reasonable opportunity to apply the new requirements to the ‘existing’ aeronautical data and information that they publish. Article 14 specifies these transitional arrangements.

18.2 Article 14

The following sections outline the specific provisions and requirements of Article 14 and provide guidance as to acceptable means of compliance.

18.2.1 Article 14(1)

18.2.1.1 Text of Provision

Member States which, prior to the entry into force of this Regulation, have notified a relevant difference to ICAO in accordance with Article 38 of the Chicago Convention, may maintain their national provisions on the subjects listed in Annex XI to this Regulation until 30 June 2014 at the latest.

18.2.1.2 Applicability

This Article is applicable to all actors who fall under the terms of the ADQ Regulation.

18.2.1.3 Rationale / Need for Provision

The ADQ IR makes some of the ICAO Annex 15 provisions mandatory by reference. It is a general principle of the interoperability Regulation [RD 4] that individual Member States are not allowed to depart from prescriptions in interoperability IRs and resultant regulation and that interoperability IRs should rely on ICAO standards. However, during the development of, and consultation on, the draft regulatory prescriptions for the ADQ Regulation, some European Union Member States stated that they wished to maintain their general ‘right’ to notify ‘differences’ to ICAO provisions in accordance with the framework Regulation [RD 3], which lays down:

"The application of this Regulation and of the measures referred to in Article 3 shall be without prejudice of the rights and duties of Member States under the 1944 Chicago Convention on International Civil Aviation."

In order to scope the actual extent of the issue, EUROCONTROL conducted a detailed study on specific notified ‘differences’ to ICAO Annex 15 that could affect the application of the ADQ IR by Member States, by the date of application of 1 July 2013. The study revealed that current ‘differences’ to ICAO Annex 15 provisions referenced in the ADQ IR would only affect compliance with the requirements for the use of CRCs, as laid down in Article 9 and Annex VI. Furthermore, the study highlighted that the existing ‘differences’ were not expected to be applicable after 1 July 2014.
Therefore, it was decided that a transitional provision should be permitted in the ADQ IR to allow Member States an additional period of one year after the date of application of the ADQ IR in which to make the necessary arrangements to remove the ‘difference’ from the ICAO Annex 15 provisions for the use of CRCs.

18.2.1.4 Explanation of Provision

There are three key points of the transitional provision contained in Article 14(1), for application by Member States:

- The transitional arrangement provided by Article 14(1) only applies to a notified ‘difference’ to the ICAO Annex 15 provision that is specified in Annex XI concerning the use of CRCs for aeronautical data and information protection;

- Member States wishing to continue with a ‘difference’ against the ICAO Annex 15 provision for the use of CRCs (specified in Annex XI) after 1 July 2013, and hence defer compliance with the ADQ IR on this specific issue, must have notified the ‘difference’ to ICAO prior to the entry into force of the ADQ IR (i.e. prior to the 20th day after publication of the ADQ IR in the OJEU);

- Compliance with the ICAO Annex 15 provision for the use of CRCs (specified in Annex XI) must be achieved by Member States by 1 July 2014, at the latest (i.e. Member States will no longer be able to have a ‘difference’ with the requirements after 30 June 2014).

18.2.1.5 Implementing the Provision

There is no specific implementation of this provision as it is achieved by compliance with Article 9(1) and Annex VI. The reader is, however, referred to Article 10 and Annex VII - Quality, Safety AND Security Management Requirements and 20 Implementation Planning Guidance of this guide.

18.2.1.6 Means of Compliance

There is no specific means of compliance for this Article. For those Member States with a relevant, notified ‘difference’ under the terms of Article 14(1), compliance with Article 9(1) by the 1st July 2014 will result in compliance with Article 14(1).

18.2.2 Article 14(2)

18.2.2.1 Text of Provision

Aeronautical data and aeronautical information published before 1 July 2013 and not amended shall be brought in line with this Regulation by 30 June 2017 at the latest.

18.2.2.2 Applicability

This Article is applicable to all actors who fall under the terms of the ADQ Regulation.

18.2.2.3 Rationale / Need for Provision

The ADQ IR predominantly relates to the adoption of processes and systems for aeronautical data and information, all of which must be in place by the 1st July, 2013. However, the output of these processes and systems is aeronautical data and information, and this is required by the ADQ IR to have a known level of quality.

It is recognised that a wealth of current, valid aeronautical data and information will already exist within the States prior to the entry into force of the ADQ Regulation, much of which will have been published without full compliance with the new requirements. It was, therefore, considered unreasonable to expect States to re-originate, process and publish all this existing aeronautical data and information by the application date of 1st July 2013.
As a result, a transitional period has been permitted in Article 14(2), which allows existing aeronautical data and information published before the application date of 1st July 2013 to be utilised beyond this date, for a period of four years.

### 18.2.2.4  Explanation of Provision

There are four key points of the transitional provision contained in Article 14(2), for application by Member States:

- The transitional arrangement provided by Article 14(1) only applies to aeronautical data and information that has been published before the application date of 1 July 2013;
- Any data value amended (i.e. a new value for an existing data item) after 1st July 2013 must be originated in accordance with the provisions of the ADQ Regulation;
- All aeronautical data and information published before the application date of 1st July 2013, and not subsequently amended after 1st July 2013, must be made compliant with the ADQ IR by 30th June 2017, at the latest;
- Any new data item created after 1st July 2013 must be originated in accordance with the provisions of the ADQ Regulation.

### 18.2.2.5  Implementing the Provision

There is no specific implementation of this provision as it is achieved by compliance with the remaining Articles. The reader is, however, referred to 20 Implementation Planning Guidance.

### 18.2.2.6  Means of Compliance

There is no specific means of compliance for this Article. Compliance of the relevant existing aeronautical data and information with the other Articles by 1st July 2017 will result in compliance with this provision.

### 18.2.3  Annex XI

#### 18.2.3.1  Text of Provision

*Chapter 3, Section 3.5.2 (Cyclic redundancy check) of Annex 15 to the Chicago Convention — Aeronautical Information Services. (Fourteenth edition — July 2013, incorporating Amendment No 37).*

#### 18.2.3.2  Applicability

This Article is applicable to all actors who fall under the terms of the ADQ Regulation.

#### 18.2.3.3  Rationale / Need for Provision

According to European Union regulatory drafting guidelines, a reference should be made to an external provision if it makes it possible to simplify the text of the Regulation, i.e. by not having to repeat the content of the external provisions in the Regulation. The general rationale for the use of references is explained in Chapter 10.

The specific reference contained in Annex XI of the ADQ IR is necessary to support the transitional provisions for notified ICAO 'differences' laid down in Article 14(1), and which are explained in paragraph 19.2.1 above.
18.2.3.4 Explanation of Provision
The single reference in Annex XI points to the specific ICAO Annex 15 provisions concerning the use of CRCs that must, ordinarily, be complied with by 1st July 2013, but where compliance may be deferred to 1st July 2014 by those Member States that have notified a related ‘difference’ to ICAO prior to 1st July 2013. The reference in Annex XI is invoked by Article 14(1).

18.2.3.5 Implementing the Provision
There is no specific implementation of this Annex, as it is achieved by compliance with Article 9(1) and Annex VI. The reader is, however, referred to Article 10 and Annex VII - Quality, Safety AND Security Management Requirements and 20 Implementation Planning Guidance of this guide.

18.2.3.6 Means of Compliance
There is no specific means of compliance for this Annex. For those Member States with a relevant notified ‘difference’, compliance with Article 9(1) by the 1st July 2014 will result in compliance with the reference in Annex XI.
19. **ARTICLE 15 - ENTRY INTO FORCE**

19.1 **Regulatory Basis of Article 15**

A general principle has to be maintained that those affected by Regulation must be given sufficient time to adapt. Within Regulations, a distinction is made between the date of entry into force, the date from which provisions are to have effect, and the date of application. The date of application is generally set after the entry into force date (i.e. the requirements are deferred to a specific date), unless retroactive application is justified. SES regulations generally enter into force on a date specified in them or on the twentieth day following their publication in the OJEU.

To achieve compliance with the ADQ Regulation, significant work will be required on the part of the parties affected. It is understood, therefore, that it is not reasonable to expect compliance to be achieved within the statutory notice period (twenty days) that applies to laws when they are entered into the OJEU.

Furthermore, some of the Articles will require more extensive work than others. Consequently, it has been agreed that there will be a phased application of the provisions, with some becoming applicable at later dates than others.

This Article outlines the applicability dates for the provisions within the ADQ Regulation.

19.2 **Article 15**

The following sections outline the specific provisions and requirements of Article 15 and provide guidance as to acceptable means of compliance.

19.2.1 **Article 15(1)**

19.2.1.1 **Text of Provision**

This Regulation shall enter into force on the 20th day following its publication in the Official Journal of the European Union.

It shall apply from 1 July 2013.

19.2.1.2 **Applicability**

This Article is applicable to all actors who fall under the terms of the ADQ Regulation.

19.2.1.3 **Rationale / Need for Provision**

All Regulations must contain a statement of the date by which compliance with the provisions outlined must be achieved.

19.2.1.4 **Explanation of Provision**

The OJEU is used to record and disseminate European Law and may be found at [http://eur-lex.europa.eu/](http://eur-lex.europa.eu/).

Once adopted by the European Commission, the ADQ IR was recorded under the OJEU and, twenty days following publication in the OJEU, the ADQ IR entered into force, i.e. it became law.

This provision outlines the date by which compliance with the Regulation must be achieved (i.e. the date of application), in this case 1st July 2013. This does not mean, however, that States should not, or cannot, implement the provisions in advance of this applicability date. Indeed, by 1st July 2013 compliance, except where derogations have been permitted (see Articles 14 and 15(2)), must be achieved.
19.2.1.5 Implementing the Provision

There is no specific implementation of this provision as it is achieved by compliance with the remaining Articles. The reader is, however, referred to 20 Implementation Planning Guidance.

19.2.1.6 Means of Compliance

There is no specific means of compliance for this Article. Compliance with the other Articles by the 1st July 2013 will result in compliance with this provision.

19.2.2 Article 15(2)

19.2.2.1 Text of Provision

*By way of derogation from the second subparagraph of paragraph 1, Article 4, Article 5(1), Article 5(2), Article 5(3) and Article 5(4)(c) shall apply from 1 July 2014.*

19.2.2.2 Applicability

This Article is applicable to all actors who fall under the terms of the ADQ Regulation.

19.2.2.3 Rationale / Need for Provision

It is understood that some provisions require more time to comply with than others and, as such, derogations are permitted for some Articles. This Article outlines those provisions for which derogation is permitted, allowing implementation to take place after the normal date of applicability for the Regulation.

19.2.2.4 Explanation of Provision

Derogations are foreseen as follows:

19.2.2.4.1 Article 4

Although the ADQ IR introduces the requirement for all States, to which it applies, to provide a common data set, it is understood that this is not achieved by all States today. Some States have not yet fully prepared an IAIP in accordance with ICAO Annex 15 [RD 10], for example, some sections are still published as To Be Defined (TBD).

Derogation is, therefore, established to provide States with a further year to ensure that they have complied with the requirements for a common data set. Therefore, States must have achieved compliance with this provision by 1st July 2014.

19.2.2.4.2 Article 5(1), Article 5(2), Article 5(3) and Article 5(4)(c)

These Articles relate to the provision of aeronautical data and information by electronic means. During the consultation process, it was stated by those stakeholders that commented that an extension to these provisions was necessary to allow more time to establish the necessary systems and supporting infrastructure to allow the electronic exchange of aeronautical data and information. As a consequence, a further year to comply with these provisions was granted and States must now be comply with these Articles by 1st July 2014.

19.2.2.5 Implementing the Provision

There is no specific implementation of this provision as it is achieved by compliance with the remaining Articles.
19.2.2.6 Means of Compliance

There is no specific means of compliance for this Article. Compliance with the other Articles, by the applicable date, will result in compliance with this provision.
20. Implementation Planning Guidance

20.1 Rationale/Need

At the point at which the ADQ IR becomes law, those parties identified in Article 2(2) will need to start planning and implementing their means of compliance.

This chapter provides high-level guidance, for these parties, to assist in initiating and executing implementation projects. This is provided at the State level and at an organisation level.

The provision of this guidance is divided into three sections, namely, at the general level, at the State level and at the level of an individual organisation.

20.2 ESSIP/LSSIP

It is intended that the European Single Sky Implementation (ESSIP) and Local Single Sky Implementation (LSSIP) processes will be used to assist in the implementation activities in States. Whilst these will typically impact the higher-level organisations, such as Regulators, ANSPs and aerodromes, they will also indirectly impact the lower-level organisations, such as surveyors.

EUROCONTROL created a SES-related implementation objective called 'ITY-ADQ' (ITY for Interoperability). This objective addresses the key ADQ IR provisions for implementation at the level of specific actors (regulated parties). This objective is also related to ATM Functionalities 1 and 5 of Commission Regulation (EU) No 716/2014 on the establishment of the Pilot Common Project, but it is not bound to their deployment target dates.

20.3 Guidance on the Planning of the Implementation of the ADQ Regulation

20.3.1 General

For all parties, it is recommended that the ADQ IR is studied in detail and that this guidance is read to determine the meaning and intent of the ADQ Regulation.

Whilst the State will have the ultimate decision as to which organisations are required to comply with the ADQ Regulation, most will be able to determine whether they are likely to be required to comply, or not.

This guidance identifies a number of means of compliance which, although not mandatory, would greatly assist in achieving compliance.

Many supporting documents have also been developed during the preparation of the IR and these may also provide a useful insight into the decision making and manner in which the IR was prepared. This material is available from the ADQ Implementation Support Cell (ISC) (See section 20.4.1 of this Guide).

20.3.2 State Level

In this section, the term “State” is used to refer to the body (or bodies) that will oversee implementation of the ADQ Regulation, at a national level. This may mean the Ministry, Regulator or NSA, depending upon the precise situation and allocation of responsibility within the individual State.
20.3.2.1 Identification of Parties Involved

Many of the provisions are identified as impacting all the parties identified within the scope of Article 2, whilst others identify specific parties. In both cases, there is the need to have a clear understanding of who has to comply with the ADQ Regulation. The State is therefore recommended to identify all parties that act within the data chain, from the point of requesting a data origination act, through to publication by the AISP.

This will require the State to determine a complete data chain and will necessitate the involvement of key actors, such as Aerodrome Authorities, ANSPs and the AISP. It should be noted that it is highly unlikely that every party involved will be identified at this stage. For example, the State may not be fully aware of every organisation involved, such as the survey company used by an aerodrome. As implementation progresses and, particularly, as the individual organisations analyse their processes further, any missing parties will be identified.

20.3.2.2 Allocation of Provisions

Having identified the organisations that the State considers to be affected by the ADQ Regulation, a high-level allocation of the provisions to each organisation should be made. Whilst this may sound a complex and time-consuming activity, in most cases, groups of organisations will need to comply with the same provisions. For example, it is highly likely that all Aerodrome Authorities will need to comply with the same set of provisions. A brief rationale as to why the provision applies should also be developed to justify the decision made.

20.3.2.3 Notification of Inclusion

The State should issue a formal notification to the parties affected, notifying them of the fact that they fall within the scope of the ADQ IR and must seek compliance.

Where further organisations are identified later in the process, these should be added to the list of parties involved and a formal notification issued at this point.

This formal notification should lay down the dates by which compliance is required as this may differ to that which the ADQ IR stipulates. A possible reason for this may be that the State wishes to assess compliance prior to the dates specified in the ADQ Regulation.

The State should also outline the provisions with which they believe the organisation should comply, complete with the rationale.

The State may also wish to outline a basic appeal system by which organisations who believe that they do not or should not fall under the scope of the ADQ IR may object to the notification received or challenge the applicability of particular provisions.

20.3.2.4 Awareness / Training

As the ADQ IR and its proposed means of compliance may be new to many of the parties involved, the State may consider the provision of a number of awareness / training workshops to inform and educate the parties involved.

Where there are a large number of actors associated with the parties involved, the State may also consider running workshops in a “train the trainer” mode, whereby presentation material is provided to the parties, such that they may provide their own, local workshops.
It is suggested that any workshops cover the following, as a minimum:
1) The SES;
2) Background to the ADQ Regulation;
3) ADQ IR Structure;
4) Brief coverage of each Article / Provision;
5) The identified means of compliance;
6) Timescales;
7) State-specific objectives;
8) Demonstrating compliance.

20.3.2.5 Overall Plan

It is recommended that the State develops an overall plan for gaining compliance. This should cover all the parties involved and will, in the main, be driven by each affected party’s individual implementation plan.

The plan should also identify dates for audits, including any pre-audits, if they are planned.

20.3.2.6 Monitoring

The implementation plan should be monitored to ensure that the parties involved follow their intended plans. This may help identify any problems in implementation and, where applicable, find solutions that can be shared with other relevant parties. Monitoring and communication will help ensure that compliance, at the level of the State, will not be jeopardised.

Monitoring is discussed in more detail in 21 Audit and Compliance Guidance.

20.3.2.7 Audit / Assessment

As the time at which compliance must be achieved draws closer, the State will need to start assessing the compliance of the affected parties. This may be a two or three stage process, as follows:

1) Pre-Audit:

An informal collaborative approach is taken to determine the status of implementation and to agree that the methods adopted by the party, in order to achieve compliance, are acceptable. Whilst the State may not consider the need for pre-audit essential, benefit may be gained from ensuring a common understanding and approach to compliance early in the approval process. If the State does not plan such audits as a matter of course, but a party requests a pre-audit, States are encouraged to agree to such requests.

2) Formal Audit:

An assessment is made of compliance and any remedial actions needed are identified. If only minor non-conformities are identified at this stage and actions agreed for rectification, the State may elect to approve compliance at this stage, subject to remedial action being taken within an agreed period of time. If major non-compliances are identified, this may prohibit approval of compliance and result in the need to agree corrective actions which must be taken before compliance may be approved. A State may also wish to withhold approval of compliance if a significant number of minor non-conformities are identified.

3) Follow-up audit:

Any major non-conformities are reassessed to ensure that the corrective actions identified have been taken and that compliance may now be approved.
Auditing is discussed in more detail in 21 Audit and Compliance Guidance.

20.3.2.8 Certification
States may wish to implement some form of certification against the ADQ IR for those parties who are assessed as complying with the ADQ Regulation, although there is no requirement for this in the ADQ Regulation. This may be especially beneficial for those parties that do not fall under the scope of the SES Common Requirements [RD 1].
Such certification would be an entirely local arrangement and would not fall under the auspices of the European Commission.

20.3.3 Organisation Level
Each party to whom the ADQ IR applies will have to demonstrate compliance with those provisions which apply to it. The following steps are recommended and are broadly similar to those for a State but have been adapted to be more relevant to specific organisations.
The issues of cost and financing are not addressed by this guidance.

20.3.3.1 Identification of Inclusion
Whilst the State may notify an organisation that it falls under the scope of the ADQ Regulation, an organisation is encouraged to also, independently, assess the applicability of the ADQ IR to it.

20.3.3.2 Allocation of Provisions
Firstly, the organisation should identify which provisions are applicable to the specific functions it undertakes within the data chain. The State may have provided a high-level mapping of this and this may be used as input to the assessment although it is not recommended that this is assumed to be 100% correct as the organisation in question will have a more detailed understanding of the nature of its tasks.
Should it be determined that the list of provisions which apply is different to any list provided by the State, this should be notified to the State, such that when an audit for compliance is undertaken, the full context of the provisions is understood. Where any provisions differ from the list provided, the organisation should provide rationale for the inclusion or exclusion of a provision.
Whilst some provisions may span the entire organisation, others may be limited to a small set of functions. It is, therefore, recommended that the organisation maps each of the provisions to its functional processes and allocates responsibility for gaining compliance to roles within its organisational structure. For example, all quality management provisions could be allocated to the Quality Manager who will ensure that they are correctly reflected within the Quality Plan, processes, procedures and work instructions. Allocation of responsibility should not be seen as meaning that, that role is responsible for the conduct of the work; rather that it is responsible for overseeing compliance and for demonstrating that compliance when an audit is conducted.

20.3.3.3 Initial Assessment
In order to accurately plan for implementation, it is essential that the situation at the start of the implementation process is known. This is most easily determined by performing an initial assessment of the organisation’s compliance against the relevant provisions.
In essence, this is the conduct of an audit, more details on which may be found in 21 Audit and Compliance Guidance.

20.3.3.4 Awareness / Training
Each organisation may wish to attend any workshops that the State decides to conduct and, depending upon its size, may elect to conduct its own workshops.
If an organisation does determine that there is benefit in conducting its own workshops, it may wish to take any material available from the State and enhance it to ensure that it fits the precise nature of the organisation.

20.3.3.5 Implementation Plan

It is recommended that the organisation develops a plan for implementation which covers all activities needed to achieve compliance. The precise manner of project planning will be determined by the normal practices of the organisation in question. No preferred approach is recommended.

It is, however, recommended that the plan, once agreed within the organisation, is provided to the State for information purposes. This will assist the State in planning their monitoring and auditing activities.

20.3.3.6 Monitoring

The implementation plan should be monitored to ensure that the organisation is achieving progress against the planned activities and that, where any delays are incurred, mitigating actions are undertaken.

Should the plans be revised, they should be, once again, submitted to the State, for information.

Monitoring is discussed in more detail in 21 Audit and Compliance Guidance.

20.3.3.7 Audit / Assessment

Throughout implementation, the organisation should consider assessing compliance, starting with the initial assessment conducted, as outlined in section 20.3.3.3. Regular assessments of compliance will allow progress to be monitored and lessons to be learned.

Most assessments should be conducted informally, using internal staff, such as those from the quality department. Such an approach, whilst only assuring the organisation's own interpretation of the provisions, does provide a measure of overall implementation.

In advance of formal assessment, organisations should consider obtaining an external pre-audit. This may be made by a body who will perform the formal audit or, if this is not an option, by an external assessment agency. The use of an external body brings another perspective regarding the intent of the provisions and will help to confirm if the approach taken is adequate.

Finally, the organisation will seek formal assessment when it believes that compliance has been achieved.

Auditing is discussed in more detail in 21 Audit and Compliance Guidance.

20.4 Support to Stakeholders

During the development of the ADQ IR and from the responses received from States during the consultation phase, it has become apparent that States will require a significant amount of implementation support when they implement the ADQ Regulation. It is evident that stakeholders are looking to EUROCONTROL to provide support.

As a consequence, EUROCONTROL has assessed the needs for the provision of dedicated support and identified the following keys areas:

- Establishment and provision of means of compliance;
- Support to the implementation of the provisions of the ADQ Regulation;
- Support to the NSAs;
- Support to the overall implementation and compliance monitoring process.
The ADQ implementation support will be based on the establishment of the ADQ ISC, ensuring a central EUROCONTROL Agency focal point for all stakeholder enquiries. It will provide the following functions:

- Support to implementation;
- Development and provision of awareness and training;
- Website;
- ADQ Guide maintenance;
- Development of (further) ADQ guidance material.

20.4.1 ADQ Implementation Support Cell

The approach that will be taken is to establish a single point of entry inside EUROCONTROL through the ADQ ISC which will support all regulated and supervisory parties during States’ implementation of the provisions of the ADQ Regulation. This shall also include the NSAs, as required, that have the responsibility for managing and assess compliance of the overall State implementation. It is foreseen that the ADQ ISC will act as the primary point of contact for support elements identified and developed by EUROCONTROL, related to the implementation of the ADQ provisions.

There shall be two lines of support available through the ADQ ISC, as detailed below.

20.4.2 Front-Line Support

The front-line support shall act as a help-desk facility, providing a central point of contact for all party queries. Parties may gain the support of the ADQ ISC by the following means:

- Email: adq@eurocontrol.int;
- Internet: http://www.eurocontrol.int/adq

20.4.3 Second Line Support - Subject Matter Experts

Where further expertise is required, the front-line support will identify the detailed need and contact a Subject Matter Expert (SME), available on an as-needed basis. Accordingly, a 'pool of SME' shall be available in the case that a problem cannot be sufficiently resolved by the front-line support. The pool of experts shall cover the following areas of expertise:

- AIS / Aeronautical Information Management (AIM) – operational, regulatory and technical;
- ICAO SARPS;
- SES Regulation;
- EUROCONTROL Specification for the Origination of Aeronautical Data (DO) [RD 31];
- EUROCONTROL Specification for Aeronautical Information Exchange (AIX) [RD 29];
- EUROCONTROL Specification for Data Quality Requirements (DQR) [RD 32];
- EUROCONTROL Specification for Data Assurance Levels (DAL) [RD 30];
- EUROCONTROL Specification for the Electronic Aeronautical Information Publication (eAIP) [RD 33];
- CHAIN guidance material;
• Quality standards;
• Safety management (security);
• Training and related human aspects.

20.4.4 Awareness and Training
It is necessary to proactively address all regulated parties to ensure that the actors can be properly prepared for subsequent implementation actions. This will be facilitated at two levels:
• Initial awareness through dedicated workshop(s);
• Training events and material, focusing on specific topics.

20.4.5 Website
The ADQ ISC shall provide a dedicated web space as part of the EUROCONTROL website (see http://www.eurocontrol.int/adq). The website will include, as minimum, the following information:
• ADQ events;
• Background;
• ADQ guidelines;
• Best practices;
• Timetable;
• Library;
• ARWG.

20.4.6 ADQ Guide - Maintenance
The ADQ Guide will be maintained by the ADQ ISC. It provides, for example, the rationale and background to the individual Articles and the ADQ IR provisions.

20.4.7 Further ADQ Guidance Material
Development of further guidance material, as required by stakeholders, may address the following:
• Guidance material supplementing identified means of compliance, in the form of EUROCONTROL Specifications;
• Further, customised (stand-alone) supporting material e.g. reference tables, checklists, best practices, Common Understandings released by ARWG, etc.;
• Exploitation of existing guidance e.g. CHAIN solutions.
21. **Audit and Compliance Guidance**

It is proposed that, in the light of experiences and any formal action taken by the European Commission for compliance assessment, that this section is updated, at a later date.

### 21.1 Rationale / Need

It is one thing to say that the organisation is compliant, it is another to demonstrate this. Audit is a means of determining and identifying objective evidence to support statements of compliance.

The ADQ IR requires that compliance is proven in a tangible manner, with evidence being offered. For example, Annex IV Part B (d) states:

"Arguments and evidence shall be generated to show that:

(d) all data origination, production, handling, processing, transfer or distribution processes used for each data item are defined and adequate for the assigned level of integrity of the data item;"

As may be seen, compliance must be proved. This chapter covers, at high-level, approaches to prove compliance through audit and assessments.

### 21.2 Conduct of an Audit

Any audit or assessment should be conducted in a “blame free” spirit to encourage an open and honest assessment of compliance. The auditor should be trained and understand that the objective is to gain an assessment of compliance, not to “catch out” or trick those being audited. At the same time, those being audited must understand that to deceive the auditor does not, in the long-run, bring benefit and that, if failings exist in the organisation’s processes, these must be corrected to ensure that the organisation is correctly handling aeronautical data and information.

Audits are used to determine the level of compliance, not to determine the level of non-compliance. Whilst this may sound strange, it can have a significant impact on the motivation and moral of those being audited. It is very different to hear that “congratulations, the audit found that of the assessed requirements, compliance was achieved with 87%”, rather than “you failed 13%”.

Rarely is an audit or assessment able to assess the entire set of requirements, for an entire organisation. Instead, a few areas of the organisation may be assessed against a selected set of requirements. This approach provides a cost-effective way to assess compliance. The auditor should be free to select the requirements and areas of the organisation to be assessed. Those audited and the requirements selected should vary from audit to audit.

The audit should be conducted against a defined plan which outlines who will be seen, at what time and for what duration. That said, it is not unknown for a question in one area to lead to questions for another department which is not identified on the plan and, consequently, everybody should be “on stand-by” and prepared to answer questions.

### 21.2.1 Guidance

Significant guidance exists in the conduct of assessments and audits and this Guide does not intend to replace or repeat this information as the audit process is not and should not be “ADQ-specific”. The audit of ADQ compliance should, in time, become a natural extension of the organisation’s other audit activities.

The following does, however, direct the reader as to where further information and guidance may be obtained.
21.2.1.1 Books

Thousands of books have been written on the subject of quality management, audits and assessments and some of these may be referred to for guidance.

The best source of identifying relevant books in your national language is often online booksellers where the reviews by other readers of the book are available to help assess the usefulness of the book in question.

21.2.1.2 Training Courses

Many training courses are also offered on the subject of auditing, covering subjects such as internal audit and lead auditor training.

Each organisation will have its preferred training establishments and the reader is, in the first instance, directed to investigate at the courses available through these providers.

The experiences of other, similar organisations may also be sought to identify the most suitable course to attend.

It is not, however, recommended that all staff are sent on such courses as this is not cost-effective. Rather, an approach of training some staff who then train others is recommended. It should be borne in mind that it is not essential for all staff to be trained in auditing.

21.2.1.3 Standards Institutes

Many standards institutes exist, such as ISO, who have material that may assist. ISO has the document ISO 19011:2011 “Guidelines for quality and/or environmental management systems auditing” which may be useful.

The reader is advised to consult their national standards institutes, as well as ISO, to determine the guidance which best suits their needs.

Some of these institutes will also provide training courses, attendance at which may be beneficial for some members of the organisation, particularly those responsible for developing processes and procedures, and conducting internal audits.

21.3 Assessing Compliance

It is not possible to fully understand the status of an organisation without assessing its level of compliance in some way. There is a need for different types of assessment, at differing stages of an organisation’s implementation against the ADQ IR and following its subsequent, ongoing confirmation of compliance.

What is clear, however, is that there is benefit in agreeing approaches with the relevant certification agencies that will be responsible for the formal assessment of compliance in the future. In many cases, this will be the NSA but could also be agencies, such as accredited ISO auditors.

The following sections outline the three main types of assessment and the objective of each. It should be noted that the approach, from the assessor’s perspective, to each of these assessments should be broadly similar and as discussed in 21.2.
21.3.1 Initial Assessment

In order to commence implementation of the new and revised processes, procedures and tools needed to bring compliance with the ADQ Regulation, it is recommended that organisations conduct an initial assessment. The purpose of the initial assessment is threefold:

1) To ascertain those areas where compliance is already achieved;
2) To determine areas where compliance may be achieved through minor changes to the current working practices;
3) To identify those areas where compliance is not achieved and significant effort will be needed to bring about compliance, possibly involving new working processes, procedures and tools.

The initial assessment should be carried out in full knowledge that compliance is unlikely and that it is highly possible that significant work may be required to achieve compliance. Whilst the SARPS relating to data quality have existed for many years, it has long been suggested that compliance could not be demonstrated and, in particular, for integrity, this was true. The ADQ IR has adopted a different approach for demonstrating compliance which requires a fundamentally different approach to the management and monitoring of data quality. Consequently, it is likely that significant work will be identified in the initial assessment to be able to achieve compliance with the new approach.

21.3.2 Internal Audit

The purpose of an internal audit is twofold:

1) To ascertain the level of compliance with the requirements;
2) To determine how the operations of the organisation may be improved.

As such, the spirit within which the audit should be conducted should be one of mutual co-operation, with both “sides” offering support and guidance. The auditor should provide his or her experience and any recommendations for how the undertaken processes may be improved. Similarly, those being audited should be truthful and honest about the work that they undertake and any improvements that they believe could be made.

Internal audits may be conducted at any time and it is recommended that they are held at least every six months and that a published schedule is made available to all actors so that preparation may be undertaken.

Prior to an external audit, a minimum of two internal audits are recommended. It is highly likely that the first will identify areas in which work is needed to bring about a satisfactory level of compliance. Corrective action should then be undertaken prior to the second internal audit which, it is hoped, should only identify minor issues to be resolved prior to the external audit.

21.3.3 External Audit

External audit refers to the assessment of an organisation’s compliance by an independent, usually designated, body. In the case of ADQ, it is likely to be a body that has been assigned by the NSA as responsible for assessing compliance within the State, and may well be a part of the NSA itself.

External audits are usually conducted in a very formal manner, with the auditor asking specific questions and asking for evidence to be provided. Auditors do not usually offer advice at this stage and those being audited should normally constrain themselves to only answering the question asked and not offering further information.

Two forms of external audit are common:

1) Pre-Audit;
2) Formal Audit.
21.3.3.1 Pre-Audit

In some cases, it may be advisable to ask the auditor responsible for the formal assessment of the organisation to conduct a pre-audit. The intent of the pre-audit is to have an independent assessment of compliance undertaken, but at a time that allows corrective action to be undertaken to address any non-conformities. Such an approach may assist in ensuring that the formal audit is successful and that an adequate level of compliance has been demonstrated in advance of any specified due date.

Another advantage of such an audit is that the auditor and the organisation being audited develop a level of awareness that assists in understanding how each party works and how the audits will be performed.

Pre-audits should result in a formal report which outlines the findings and highlights areas in which work is needed to gain compliance.

21.3.3.2 Formal Audit

The objective of the formal audit is to determine if the organisation being assessed has obtained a satisfactory level of compliance to be classified as operating in accordance with the relevant requirements.

The audit will be conducted in a similar style to that for pre-audits, with some areas of the organisation being assessed against a limited set of requirements.

It is entirely possible that the formal audit will find minor non-compliances which do not prohibit the report concluding that the organisation is sufficiently compliant. These minor non-compliances should then be corrected. The auditor may determine that, if a significant number of minor non-compliances exist, that the amount of minor issues is such that overall compliance is not gained. A single, major non-compliance may also preclude an organisation being accredited as compliant.

Once again, the audit should result in a report which outlines the findings of the audit, highlights where corrective action is needed and makes a clear statement as to whether a satisfactory level of compliance has been demonstrated.

This report should then be used to drive corrective action within the organisation, to improve the situation prior to any follow-up audit. Subsequent audits may well use the reports of earlier audits to determine if corrective actions have been implemented, as well as conducting a new audit.
22. **Specific Guidance Material**

22.1 **ADQ IR Other Supporting Guidance**

22.1.1 **ADQ Formal Arrangement**

An ADQ Formal Arrangement is an agreement between a service provider and its customers that defines the services provided, the indicators associated with these services, acceptable and unacceptable service levels, liabilities on the part of the service provider and the customer, and actions to be taken in specific circumstances.

To help improve the quality of aeronautical data and information, it is recommended that ADQ Formal Arrangements are established between appropriate bodies in the data chain. Such an agreement would act as a means of compliance for Article 6(3). ADQ Formal Arrangements aid communication between parties and allow each party to understand the other’s responsibilities, as well as their own, placing their role in the overall context of the aeronautical data chain.

It is recommended that the AIM establishes ADQ Formal Arrangements with the data providers that frequently provide aeronautical data and information to the AIM. There may be both internal and external data providers. It is also recommended that the Regulator plays a role in establishing ADQ Formal Arrangements. Whereas the day-to-day involvement of the Regulator in the ADQ Formal Arrangements may not be appropriate, it may be advisable to include the Regulator in conflict resolution or when there is a case of non-fulfilment of a party’s obligations. However, in some States, the Regulator may have the ultimate responsibility for the approval of aeronautical data and information and, therefore, it may be appropriate that it is fully involved in the ADQ Formal Arrangement.

The ADQ Formal Arrangement should cover the following points:

- Scope;
- Parties to the Agreement;
- Regulatory Framework;
- Entry Into Force and Termination;
- Definitions and Conventions;
- Service Description;
- Service Levels;
- Data Change Management;
- Demonstrating Compliance;
- Data Errors and/or Inconsistencies;
- Contingency;
- Rewards and Remedies;
- Escalation Procedures;
- Liaison;
- Aeronautical Data and/or Aeronautical Information to be provided;
- Data Set Specifications;
- Delivery Means;
• Data Exchange Format;
• Data Quality Attributes;
• Timeliness Requirements;
• Metadata Requirements, and
• Limitations on the Use of the Data.

As an alternative to implementing ADQ Formal Arrangements, consideration should be given to the establishment of a contract with data providers who provide aeronautical data and information on a less frequent basis. The contract should include the points listed above.

22.1.2 Cyclic Redundancy Checks

The application of CRCs is required by the ADQ IR to allow changes in blocks of data to be detected. In other words, they help detect if the integrity of the aeronautical data and information has been compromised. The use of CRCs is widespread and is the most common form of check used to ensure that the information contained within a dataset has not been changed. It forms the basis of the methodology employed within Internet communications to ensure that the information received has not been corrupted. Many international organisations have adopted the use of CRCs within their standards, such as ISO, the Institute of Electrical and Electronics Engineers (IEEE) and, most importantly, in the aviation domain, ICAO.

CRCs also forms an inherent part of many other technologies used for data security and CRCs are utilised within most digital signature and encryption technologies in use today.

The use of CRC technology for all storage and exchange of aeronautical data and information is required for a number of reasons:

• It is the ICAO mandated technology;
• It is the most widely used and accepted technology;
• It is better than check sums or parity bits for error detection as the detection rate allows the integrity levels required to be met;
• Interoperability is aided if all actors and systems involved make use of the same technology.

Through the use of supporting tools (which are widely available), its use is relatively simple.

The application of CRCs involves a mathematical process whereby a sequence of data bits is manipulated by an algorithm to produce a block of data bits which is the CRCV. When the integrity of the aeronautical data and information is verified, the same process is applied and the CRCVs compared.

Different bit algorithms can be applied to aeronautical data and information, ensuring different integrity levels. For example, a 32-bit algorithm ensures a protection level of critical. Whereas ICAO states that a 24-bit algorithm may be applied to essential data items and a 16-bit algorithm to routine data items. The ADQ Regulation, however, mandates that a 32-bit algorithm is applied to all aeronautical data and information. Not only does this allow aeronautical data and information to be protected at the highest possible level but it also allows critical, essential and routine data items to be stored together, as would be expected.

The generator polynomial of a CRC algorithm is measured in bit size, where the polynomial coefficients are binary values equal to 0 or 1. The integrity level protection provided by the polynomial is determined by the highest order term in the polynomial, for example, \(x^{32}\).

As far as a particular 32-bit algorithm is concerned, it is the CRC-32Q algorithm is mandated (See Annex VI (1)) Requirement 1) to support harmonisation. It provides the level of protection required by ICAO within Annexes 4, 14 and 15.
The CRC-32Q is defined as follows:

\[ \text{CRC-32Q} = 1 + x + x^3 + x^5 + x^7 + x^8 + x^{14} + x^{16} + x^{22} + x^{24} + x^{31} + x^{32} \]

CRCs may be applied to a whole file, whole record (Figure 5) or to selected fields within a record (Figure 6).

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Height</th>
<th>CRCV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Point A</td>
<td>532432.15N</td>
<td>0342355.49E</td>
<td>123.45</td>
<td>AB2E2768</td>
</tr>
</tbody>
</table>

*Figure 5 – CRC Applied to Whole Record*

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Height</th>
<th>CRCV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Point A</td>
<td>532432.15N</td>
<td>0342355.49E</td>
<td>123.45</td>
<td>E256B232</td>
</tr>
</tbody>
</table>

*Figure 6 – CRC Applied to Selected Fields*

The application of CRCs to only selected fields within a record does not bring significant advantages and it is recommended that all fields in a record are included in the calculation. However, there are advantages to applying CRCs to each record, rather than to a block of data or a whole file as the actual record which has been corrupted can be identified.

It is mandated (See Annex VI (1)) that CRCs are applied to aeronautical data and information whenever it is stored prior to final verification and transmission to the next intended user in the data chain. It is, however, recommended that CRCs are applied whenever aeronautical data and information is stored, even when transmission is not necessary. Consequently, CRCs should be applied from the first point that the aeronautical data and information is captured in electronic form. Where possible, a common method / tool should be applied by all actors in the data chain.

Where automated systems are used, CRCs should be implemented in the system and provide an indication to the user if any block of data fails the CRC verification.

As the size of files increases, the likelihood of generating the same CRCV for different datasets increases. Therefore, applying a single, 32-bit CRCV is no longer sufficient to comply with the ICAO requirements for the integrity of aeronautical data and information.

Whilst a larger CRCV, for example, 64-bit, may be seen as appropriate, as the maximum size of the files in unknown, there is no guarantee that even this would be sufficient. To overcome this, it is mandated (see Annex VI (2)) that where the physical size of aeronautical data and information exceeds that which may be protected at the required level of integrity by a single CRCV, multiple CRCVs shall be used.

### 22.1.3 Digital Signatures

Much transmission of information today is performed using electronic mail which makes use of the public Internet as a means of distribution. Whilst the Internet provides a convenient, cheap and fast means of distribution, it is open to unwanted and unauthorised interference of the information transmitted over it. Other means of transmission may be more secure in terms of unwarranted access, but may be open to loss or corruption of data.

The move towards electronic transmission of data brings about additional security risks, for example, someone may impersonate someone else’s email address and send incorrect data to the next intended user without the next intended user being able to detect this.
Digital signatures are a security technique that helps ensure data integrity during transmission from the data originator to the next intended user, and allow the user to authenticate that the sender of the data is legitimate. In addition, they support non-repudiation as the sender of the data cannot deny having sent it. Digital signatures are created and verified using Digital Certificates.

To create a Digital Signature, the signer creates a "hash", unique shortened version of the message, and then uses his private key to sign the hash, forming the digital signature. If the message was changed in any way, the hash result of the changed message would be different.

The Digital Signature is unique to both the message and the private key used to create it, so it cannot be forged. The Digital Signature is then appended to the message and both are sent to the message recipient.

The recipient recreates the hash from the received message, then uses the public key of the original sender to verify the hash included in the received message. If the two hash results are identical, this verifies that the digital signature was created using the signer's private key (assurance that the public key corresponds to the signer's private key) and that no one is impersonating the signer.

Thus, the authenticity of the signer has been verified, the signer cannot claim to have not signed the message and the message has not been changed. This verifies the integrity of the message.

Electronic signatures are created using strong encryption technology and, as a result, are almost impossible to forge. The level to which the integrity of the data is ensured is dependent on the algorithm that has been applied, for example, SHA-1 provides the probability $1 \times 10^{-25}$ that a signed document with the same signature exists. SHA-256 provides a probability of $1 \times 10^{-39}$.

With digital signatures, the AIM would have both a private and a public key. AIM would sign using a private "key". The AIM would then send the aeronautical data and information to the next intended user, along with a copy of the AIM's public key or certificate. The next intended user would then open the aeronautical data and information and check the electronic signature against his/her copy of the AIM's public key or certificate.

The next intended user needs to have appropriate software to be able to read the electronic signature which contains information about the owner and issuer of the document. The issuer may be a centrally managed organisation, referred to as a Certificate Authority. The Certificate Authority is a trusted source which certifies public keys for legitimate owners. The Certificate Authority would be responsible for verifying a user’s identity for certifying public keys containing that user’s name.

Digital authentication signatures should be used when exchanging aeronautical data and information between actors in the aeronautical data chain. A standard method for digital signatures should be adopted by the State and, where necessary, a certificate authority should be elected. A NSA may declare itself as a Certificate Authority, if the State deems this appropriate. Alternatively, some companies offer certificate authority services. These sell public signatures and Certificate Authority delegation when an organisation wishes to issue certificates to its employees or members. A private key is protected by a password, known only by its owner.

There is also a need for an international body to act as the Certificate Authority between all national Certificate Authorities. It could be, for instance, a commercial organisation. Obtaining this digital certificate could be part of the means of compliance referred to in Annex VII(C), as well as the certificate to act as an ANSP.

### 22.1.4 Encryption

With the increased use of electronic means for the transmission of data, there is a risk that the data may be intercepted and changed. Whilst the application of CRCs provides protection against unintentional amendments to data during transmission, an interceptor may change the data and reapply the CRC so that any changes will go undetected when it is received. Encrypting the data helps protect against malicious intervention. Therefore, it is recommended that any aeronautical data and information transferred in the aeronautical data chain is encrypted.
Encryption refers to the translation of data into a code. Encryption is generally accepted as the most effective way to achieve data security. To read an encrypted file, you must have access to a key or password that enables you to decrypt it.

There are two basic types of crypto-systems: symmetric (also known as "conventional" or "secret-key") and asymmetric ("public-key"). Symmetric ciphers require both the sender and the recipient to have the same key. This key is used by the sender to encrypt the data, and again by the recipient to decrypt the data. The problem with this method is ensuring that the sender and recipient share the same key. Asymmetric ciphers are much more flexible from a key management perspective. Each user has a pair of keys: a public key and a private key. The matching key can only decrypt messages encrypted with the original key. The public key can be published widely, while the private key is kept secret.

For example, if a data originator wishes to send the AIM some survey data, it would identify and verify the public key of the AIM, use it to encrypt the data, and transmit it to the AIM. Upon receipt, the AIM makes use of its private key to decrypt the data. Verification of public keys is an important step. Failure to verify that the public key really does belong to the AIM presents the possibility of using a key whose associated private key is in the wrong hands.

Digital encryption should be used when exchanging aeronautical data and information between actors in the data chain. Where possible, an asymmetric digital encryption method should be adopted by the State and a standard algorithm which is available in the public domain employed.
ANNEX A – ADQ REGULATORS WORKING GROUP (ARWG) COMMON UNDERSTANDINGS

All ARWG Common Understandings are also available as individual documents in the ADQ Library http://www.eurocontrol.int/articles/adq-library.

A.1 Common Understanding 01/2013 Application of the provisions of Commission Regulation (EU) 73/2010 to NOTAM

1. INTRODUCTION

This document describes the common understanding endorsed by the participants of the ADQ Regulators Working Group (ARWG) concerning the harmonised application of the provisions of Commission Regulation (EU) 73/2010 to the NOTAM system.

2. DEFINITIONS

For the purpose of this document the following definitions shall apply:

‘NOTAM’ means a notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations;

‘digital NOTAM’ means a data set that contains the information included in a NOTAM, and that will be used to create an AFTN format NOTAM, in a structured format which can be fully interpreted by an automated computer system without human interpretation;

‘Digital NOTAM Concept’ means the encoding of NOTAM based on the Aeronautical Information Exchange Model (AIXM) version 5.

3. COMMON UNDERSTANDING

(1) Both NOTAM and digital NOTAM are under the scope of the ADQ Regulation.

(2) The ADQ Regulation provisions for Data set (Article 4) and Data exchange (Article 5) only apply to digital NOTAM.

(3) The ADQ Regulation does not address the format used for distribution of NOTAM to the next intended user.

(4) Tools and software, and associated processes and procedures, involved in the origination, production, storage, handling, processing, transfer and distribution of NOTAM and/or digital NOTAM shall comply with any relevant provision of the ADQ Regulation.

(5) When transferring digital NOTAM between themselves the digital NOTAM originator and the ANSP are not required to comply with the data exchange format requirements laid down in Annex II of the Regulation.

(6) When transferring digital NOTAM between themselves the ANSP and the next intended user are not required to comply with the data exchange format requirements laid down in Annex II of the Regulation.

(7) When transferring digital NOTAM between themselves the ANSPs are required to comply with the data exchange format requirements laid down in Annex II. However, in accordance with Article 5(3) the Member State may exempt the ANSP from this obligation. If both ANSPs are exempted from this obligation, the ANSPs concerned may transfer digital NOTAM between themselves in formats not compliant with the requirements laid down in Annex II of the Regulation.
(8) The obligation to comply with the relevant provisions of the Regulation shall not inhibit the urgent distribution of aeronautical information necessary to ensure the safety of flight. It is recognised that in the cases of NOTAM or digital NOTAM that are crucial to ensure the safety of flight it is not always possible to comply with all the relevant provisions of the Regulation. However, it is also not possible to determine a priori in all cases where this consideration may apply, this shall be dependent of a case by case individual assessment made by competent staff.

(9) In the circumstance where the case by case individual assessment referred to in (8) determines that it is not possible to comply with all the relevant provisions of the Regulation, the NOTAM Office shall ensure, at the minimum, that:

i. The originator is authorised and/or from an eligible/reasonable source;

ii. The content is plausible;

iii. All data quality requirements are validated post publication, as soon as practicable

4. RECOMMENDATIONS

(1) If a Member State does not exempt the ANSP from the obligation to comply with the exchange format requirements for digital NOTAM, and the ANSP decides to put in place a new system designed to distribute NOTAM based on the Digital NOTAM concept, it is recommended that the ANSP should ensure that the new system is compatible with the means of telecommunication currently used to distribute NOTAM. This should be done in such a way that it does not compromise the interoperability of the overall system.

(2) It is recommended that an eventual exemption given to the ANSP from the obligation to comply with the data exchange format requirements shall not jeopardise any effort, already in course or planned, to move towards the Digital NOTAM Concept.

(3) It is recommended that during the case by case individual assessment referred to in 3(9), the guidance provided in Annex I of this Common Understanding is taken into consideration.

(4) It is recommended that the ANSP ensures that the staff responsible for the case by case individual assessment referred to in 3(9) is adequately trained and competent to perform the task.

(5) It is recommended that the urgency of the post publication validation referred to in 3(9) item iii takes into consideration the criticality of the data.

(6) It is recommended that the Member State acknowledge that the compliance of service providers using the EAD as one of their constituents will depend on the level of compliance achieved by the EAD.

5. JUSTIFICATION

During the 46th Session of the Single Sky Committee, held on the 14/15 June 2012, United Kingdom and France submitted a Flimsy on the difficulties encountered during the implementation of the Commission Regulation (EU) 73/2010.

Particularly in reference to NOTAM, the Flimsy requested the Commission to confirm that “Regulation (EU) No 73/2010 apply to the NOTAM, except when to do so will inhibit the distribution of aeronautical information necessary to ensure the safety of flight.”

The Flimsy was not discussed during the SSC meeting and the Commission organised on 19 July 2012 a working session of the Single Sky Committee (SSC) to discuss the content of the Flimsy and other issues related with the implementation of the Regulation.

In the report of this working session, the Commission recognised that the implementation of the obligations laid down in the Regulation shall not endanger the timely knowledge of the information communicated in the NOTAM, which may be essential to personnel concerned with flight operations. In point 2.3 of this report the Commission confirmed that “Regulation (EU) No 73/2010 applies to NOTAM, except when to do so will inhibit the distribution of aeronautical information necessary to ensure the safety of flight.”
This conclusion from the Commission was discussed during the 4th Meeting of the ARWG and the meeting confirmed that it would be important to establish a more elaborated common understanding based on and in line with the conclusions from the European Commission regarding the application of the Regulation provisions to NOTAM.

6. LEGAL TEXT

Article 3(17) defines “NOTAM” means a notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations”.

Article 3(18) defines “digital NOTAM” means a data set that contains the information included in a NOTAM in a structured format which can be fully interpreted by an automated computer system without human interpretation.

The NOTAM and PIB are specifically referred to in Article 3(7) as part of the integrated aeronautical information package which, in turn, is within the scope of the Regulation according to Article 2(1)(a).

Article 5(2) requires that “Air navigation service providers shall ensure that the aeronautical data and aeronautical information referred to in the second subparagraph of Article 2(1) are transferred between themselves in accordance with the data exchange format requirements laid down in Annex II”.

Article 5(3) defines “Member States may exclude digital NOTAM from the data exchange format referred to in paragraph 2”.

Article 5(4) only refers to AIPs, AIP amendments and AIP supplements. Hence 5(4)(c) does not apply to NOTAM or digital NOTAM.

A.2 Common Understanding 03/2013 Scope of Article 6(1) of the Commission Regulation (EU) 73/2010

1. INTRODUCTION

This document describes the subject specific common understanding endorsed by the participants of the ADQ Regulators Working Group (ARWG) concerning the harmonised application of the provisions of Commission Regulation (EU) 73/2010 related with the scope of Article 6(1).

2. COMMON UNDERSTANDING

1. The scope of Article 6(1) of the Regulation is currently limited to the scope of the data included in ICAO Annex 15, Appendix 7 and other relevant ICAO SARPs.

2. A process shall be established to address known deficiencies (and identify potential new ones) of the data quality requirements published in Appendix 7 of the ICAO Annex 15 and in other relevant ICAO SARPs, notably to support future concepts of operation.

3. The scope of the aeronautical data and aeronautical information referenced in the second sub-paragraph of Article 2(1) of the Regulation shall apply to the remaining provisions of the Regulation.

3. RECOMMENDATIONS

NIL

4. JUSTIFICATION

Article 6(1) of the Regulation requires that the “Member State shall ensure that air navigation service providers comply with the data quality requirements laid down in Annex IV, Part A.” Annex
IV. Part A complements the Article by defining the data that is within the scope of the Article, the provisions for the establishment and development of new or updated data quality requirements and the aspects that shall be covered by these requirements.

For the purpose of the development of the EUROCONTROL Specification for Data Quality Requirements (DQR) the editors of the Specification proposed an interpretation of Article 6(1) and Annex IV, Part A whereby requirements for accuracy, resolution and integrity should be defined for each data item within the scope of aeronautical data and aeronautical information referred to in the second sub-paragraph of Article 2(1) of Commission Regulation (EU) 73/2010.

This interpretation was challenged by several stakeholders based on the concerns that it would put a higher pressure on a large number of parties without any justified safety improvement. EUROCONTROL therefore initiated a review of the original intention of Article 6(1). At the same time, on 9 October 2012 the UK DGCA submitted a letter to the EC requesting clarification of the scope of the Regulation. The matter was also discussed during ARWG Meeting #04, following a presentation from the Head of the EUROCONTROL SES Unit on the dialogue between EUROCONTROL and the EC, concerning the interpretation of the Regulation provisions. During ARWG #4 discussions, the meeting agreed that once the response from the EC arrived it should be used to draft an ARWG common understanding on the scope of the Regulation and on the scope of Article 6(1).

The response from the EC (dated 14 December 2012) recognised that “certain provisions, particularly the accuracy and resolution aspects of data quality, do indeed apply to a 'sub-set' of the data in scope. This sub-set may then be subject to further development based on safety assessments to support future concepts of operations."

Based on the interpretation of Article 6(1) implicit in the letter from the EC it was recognised that quantifiable data quality requirements for accuracy, resolution and integrity apply only to a sub-set of data items, namely to the ones where they are relevant and fully justified by safety considerations. These considerations shall firstly recognise that the ICAO requirements of Annex 15, Appendix 7 are considered to provide a sufficient baseline for current data quality requirements and secondly, include mechanisms to address known deficiencies, notably to support future concepts of operations.

However, in the same letter, the European Commission also concluded “that the other interoperability and performance provisions apply to the full scope of data as referred to in Article 2(1) of the ADQ IR.”

5. LEGAL TEXT
Recital 3 of the Regulation recognises that “[…] ICAO requirements are considered to provide a sufficient baseline for current data quality requirements but there are known deficiencies that should be addressed, notably to support future applications.

The second sub-paragraph of Article 2(1) of Commission Regulation (EU) 73/2010 includes in the scope of the Regulation “[…] the following aeronautical data and aeronautical information:

(a) the integrated aeronautical information package as defined in Article 3(7) made available by Member States, with the exception of aeronautical information circulars;
(b) electronic obstacle data, or elements thereof, where made available by Member States;
(c) electronic terrain data, or elements thereof, where made available by Member States;
(d) aerodrome mapping data, where made available by Member States."

Article 6(1) of Commission Regulation (EU) 73/2010 requires that the “Member State shall ensure that air navigation service providers comply with the data quality requirements laid down in Annex IV, Part A.”
A.3 Common Understanding 04/2013 Commission Regulation (EU) 73/2010 and Exchange of Electronic Terrain Datasets

1. INTRODUCTION
This document describes the subject specific common understanding endorsed by the participants of the ADQ Regulators Working Group (ARWG) concerning the harmonised application of the provisions of Commission Regulation (EU) 73/2010 related to the exchange of electronic terrain datasets.

2. COMMON UNDERSTANDING
It is recognised that the existing formats for the exchange of electronic terrain datasets do not fully meet the requirements of the ISO 19100 series as required by the Regulation.

3. RECOMMENDATIONS
Following the discussions within the TOD WG, the users had expressed a preference for the GeoTIFF format with metadata.

4. JUSTIFICATION
The TOD Working Group revised and clarified the existing terrain formats, list of formats provided by the national geodetic agencies and the terrain formats preferred by the users.

The TOD Working Group was of the common view that there was no single outstanding terrain format which would satisfy all requirements of the ISO 19100 series as required by the Regulation.

Nevertheless, the TOD Working Group, in order to harmonise the provision of terrain datasets, will mention in the TOD Manual that the users had expressed a preference for the GeoTIFF format with metadata.

5. LEGAL TEXT
In Annex II, Part B, Point 1 it is required that “The electronic terrain data referred to in point (c) of the second subparagraph of Article 2(1) shall be provided in a common format compliant with the ISO standards referred to in points 14 to 18 of Annex III”

Points 14 to 18 of Annex III include a series of ISO standards in the field of digital geographic information.

A.4 Common Understanding 05/2013 Commission Regulation (EU) 73/2010 and Aerodrome Operators

1. INTRODUCTION
This document describes the subject specific common understanding endorsed by the participants of the ADQ Regulators Working Group (ARWG) concerning the harmonised application of the provisions of Commission Regulation (EU) 73/2010 related to the aerodrome operators.

2. COMMON UNDERSTANDING
a. Without prejudice of the provisions of its Article 6(5), the Commission Regulation (EU) 73/2010 does not apply to the operators of those aerodromes and heliports for which no IFR (or Special VFR) procedure is published in the AIP, even if those aerodromes/heliports are referenced in any part of the AIP.
b. Commission Regulation (EU) 73/2010 applies to the operators of those aerodromes and heliports for which IFR (or Special VFR) procedures have been published only if any of their systems, constituents or associated procedures are involved in the origination, production, storage, handling, processing, transfer or distribution of aeronautical data or aeronautical information that is published in the IAIP and/or as part of the electronic obstacle data set, electronic terrain data set or aerodrome mapping data set that are made available by the State\(^6\).

3. RECOMMENDATIONS
NIL

4. JUSTIFICATION
The Regulation presents its scope under Article 2 through three different levels:

- The functional level: determine which functions, their systems, constituents and associated procedures are within the scope of the Regulation
- The product level: determine which are the aeronautical data and aeronautical information products that are within the scope of the Regulation
- The party level: determine which legal or natural persons are the regulated parties bounded by the provisions of the Regulation

In order to determine if an aerodrome operator is a regulated party the three levels need to be assessed in cascading through three steps:

a. Are the systems, constituents and associated procedures of the aerodrome operator involved in any of the functions specified in the functional level?
b. Is this function performed with the objective to produce any of the products listed in the product level?
c. Is the aerodrome operator specifically mentioned at the party level?

Only if the assessment answers affirmatively all three steps, the aerodrome operator in question shall be considered as a regulated party under the scope of the Regulation and shall be bound by all relevant provisions.

It should nevertheless be noted that the Regulation also covers the cases where aeronautical data and aeronautical information that is used in one of the regulated products is provided by a non-regulated party. In these cases Article 6(5) defines that it is the responsibility of the aeronautical information service provider to determine the level of quality with which the data shall be provided. This means that even if an aerodrome operator is considered as a non-regulated party but it provides data that is used in one of the products (e.g. VFR aerodromes data published in the AIP) the aeronautical service provider may, if they wish, impose the adherence to specific data quality requirements.

Figure 1 depicts this assessment in the form of a flow chart.

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\(^6\) This means that even if the aerodrome is referenced in an IFR procedure published in the AIP but the corresponding data is not originated by the aerodrome operator (e.g. letdown procedure resp. cloud breaking procedures), the aerodrome operator is not under the scope of the Regulation.
5. **LEGAL TEXT**

In view of the first paragraph of Article 2(1), the Regulation shall apply only to the systems, their constituents and associated procedures involved in the origination, production, storage, handling, processing, transfer and/or distribution of the aeronautical data or aeronautical information.

In view of the second paragraph of Article 2(1), the Regulation shall apply only to the aeronautical data and aeronautical information that is published in the IAIP or that is included as an element in the electronic terrain data set, electronic obstacle data set or aerodrome mapping data set made available by the State.
In view of Article 2(2)(b), only the operators of aerodromes with IFR procedures, or special VFR procedures, published in the AIP are under the scope of the Regulation and shall comply with any relevant provision of the Regulation.

In view of Article 6(5), the aeronautical service provider may, if they wish so, establish specific data quality requirements for aeronautical data and aeronautical information that is provided by non-regulated parties.


1. INTRODUCTION
This document describes the specific common understanding endorsed by the participants of the ADQ Regulators Working Group (ARWG) concerning the harmonised application of the provisions of Commission Regulation (EU) 73/2010 related with Metadata.

2. COMMON UNDERSTANDING
For the IAIP7, electronic obstacle and aerodrome mapping datasets, the specific metadata items that shall be included with the transfer of each data set shall be defined in the formal arrangements established between the relevant parties.

3. RECOMMENDATIONS
   a. Because the ADQ Regulation provisions for formal arrangements do not cover the distribution of data to the next intended user, the Member State should define mechanisms to reinforce the responsibility of the aeronautical information service provider to ensure that it supplies data to the next intended user including the relevant metadata items adequate to support the intended use of the data set.
   b. For practical aspects concerning the implementation of the ADQ Regulation provisions related with metadata the parties should make use of the EUROCONTROL ADQ Metadata Profile for use in AIXM 5.1 (under development).

4. JUSTIFICATION
This Common Understanding builds on the opinion that the ADQ Regulation defines which metadata items shall be specified (as part of the data set specification) and how they shall be exchanged (through the data exchange format) between the regulated parties. However, there are neither any specific requirements that define which specific metadata items shall be exchanged during each data transfer, nor how much detail or volume of metadata should be forwarded.

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7 With the exception of aeronautical information circulars, which is outside the scope of the ADQ Regulation
Nevertheless, considering that this interpretation may well serve most of the intermediate data exchange points (e.g. Aerodrome to AIS) along the aeronautical information chain, there is some concern to protect the position of the next intended user and to ensure that those receive a data set together with those metadata items that may be deemed necessary for the intended use.

During the ADQ AIXM workshop held at EUROCONTROL on 10 December 2013, it was recognised that it serves no purpose to include all metadata items described in Annex I, Part C during each and every data transfer. It was also recognised that through the use of AIXM 5.1 most of the "important" (minimum) metadata items are already embedded in AIXM 5.1. The technical details for the encoding and transfer of metadata are described in the EUROCONTROL ADQ Metadata Profile for use in AIXM 5.1 (under development).

5. LEGAL TEXT
The requirements for Metadata provided in the ADQ Regulation may be summarised as follows:

- Description of the metadata information in the common data set specification should be based on the ISO 19115:2003 standard [Annex I, Part A, item 1(h)];
- Data set specification for the IAIP, aerodrome mapping and electronic obstacle data shall include the metadata items listed in Annex I, Part C [Annex I, Part A, item 1(i)];
- Electronic terrain data set shall include the metadata items listed in Annex I, Part C [Annex I, Part B, item (b)];
- Metadata for IAIP, aerodrome mapping and electronic obstacle data shall be provided in accordance with the features, attributes, and associations of the data set specification: the mapping rules shall be documented [Annex II, Part A, item 1(bullet 5)];
- Metadata for electronic terrain data shall be provided in a format compliant with the ISO 19139:2007 standard [Annex II, Part B, item 1];
- Specific Metadata provision requirements shall be addressed in the formal arrangements [Annex IV, Part C, item (j)].

1. INTRODUCTION
This document describes the specific common understanding endorsed by the participants of the ADQ Regulators Working Group (ARWG) concerning the harmonised application of the provisions of Commission Regulation (EU) 73/2010 related to the electronic data exchange.

2. COMMON UNDERSTANDING
   a. All regulated parties shall transfer data between themselves by direct electronic connection.
   b. Data transferred by direct electronic connection means a specific configuration where the data exchanged in a standardised format is automatically ingested into the recipient system without any manual interaction with the data itself (this shall avoid error prone copy/paste actions or the retyping of data).
   c. The data will be transferred by direct electronic network connection.
   d. In the case where no direct electronic network connection is available, it is acceptable to use email if the following conditions are met:
      i. Data shall be provided in an attached file that is in line with the requirements of point 2 above;
      ii. Reception of the data shall be confirmed to the supplier.
   e. In any of the cases referred to in points 3 and 4 above, the requirements of Article 9 and Annex VI of Commission Regulation (EU) 73/2010 shall apply.\(^8\)
   f. Data suppliers exchanging data within the confines of an ANSP is not considered as a data exchange activity between separate ANSPs. Therefore Article 5(2) is not applicable. Transmission of data to the AISP shall, nevertheless, be done without prejudice of all the other points in this Common Understanding.
   g. If either the supplier or the recipient is not an ANSP, the standardized format used to exchange data shall be agreed between both parties, without any pre-defined requirement.
   h. In any of the cases referred to in the points above, the data shall be provided in accordance with the data set specifications described in Annex I of the Commission Regulation (EU) 73/2010.

3. RECOMMENDATIONS
   a. Recognizing that electronic storage devices (e.g. USB sticks, CD-ROMs….) are not considered as "direct electronic connection" those may still, during a transitional period, serve as a means to supply electronic data that is formatted in accordance with the principles of the points in Section 2. However, the ultimate requirement is to implement a direct electronic connection as stated under item 2.2.

\(^8\) For protection against loss or alteration of data (Annex VI, item 1) see ARWG Common Understanding 02/2013 Provisions of the Commission Regulation (EU) 73/2010 for Data Protection
b. For the implementation of the data protection measures as referred to in points 2.e above, parties should follow the industry best practices, notably the recommended standards from EUROCAE ED-76\(^9\).

4. JUSTIFICATION

It is recognised that a significant amount of paper-based, manual activity still takes place within the aeronautical data chain, which leads to significant opportunities for the introduction of errors and the degradation of data quality.

Furthermore, in order to enable safe, seamless and efficient operation of the EATMN, it is recognised that it is not enough to rely only on the aeronautical information service provider systems but that also the constituents and procedures that are used by suppliers of data (including the originators) need to be interoperable with the AISP ones.

To address these issues the ADQ Regulation (Regulation 73/2010), building on the requirements from the interoperability Regulation (Regulation 552/2004), establishes that aeronautical data and aeronautical information shall be provided progressively in an electronic form, based on a commonly agreed and standardised data set.

This way the ADQ Regulation tries to achieve a twofold objective: provides requirements to ensure and protect the quality of the aeronautical data and aeronautical information and establishes the mechanisms to ensure the interoperability of the systems used all across the aeronautical data chain.

To achieve these objectives the use of direct electronic connections, a common data set specification and common exchange formats are paramount.

However, even if ideally these requirements should eventually be applicable to all parties within the scope of the ADQ Regulation, it is also recognised that the implementation of its provisions should take into account the individual capabilities and levels of involvement within the data chain of these parties. Building on this, the present Common Understanding recognises that in the case where the data originator is organisationally within the same ANSP as the AISP it should not be obliged to follow the data exchange format as required in Article 5(2) and Annex II of the Regulation (see Figure).

5. LEGAL TEXT

The ADQ provisions related with electronic data exchange may be summarised as follows (text of the referenced Annexes were omitted but were considered in the conclusions):

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\(^9\) ED-76 is currently being reviewed by EUROCAE WG 44
Article 3(15): ‘direct electronic connection’ means a digital connection between computer systems such that data may be transferred between them without manual interaction;

Article 4: The parties referred to in Article 2(2) shall provide aeronautical data and aeronautical information in accordance with the data set specifications described in Annex I.

Article 5(1): The parties referred to in Article 2(2) shall ensure that the aeronautical data and aeronautical information referred to in the second subparagraph of Article 2(1) are transferred between themselves by direct electronic connection.

Article 5(2): Air navigation service providers shall ensure that the aeronautical data and aeronautical information referred to in the second subparagraph of Article 2(1) are transferred between themselves in accordance with the data exchange format requirements laid down in Annex II.

Article 9: The parties referred to in Article 2(2) shall ensure that aeronautical data and aeronautical information are protected in accordance with the requirements laid down in Annex VI.


1. INTRODUCTION

This document describes the specific common understanding endorsed by the participants of the ADQ Regulators Working Group (ARWG) concerning the harmonised implementation of Article 6(5) of the Commission Regulation (EU) 73/2010.

2. COMMON UNDERSTANDING

1. If the aeronautical information service provider (AISP) receives aeronautical data or aeronautical information originated from data originators not referred to in Article 2(2) of Commission Regulation 73/2010, and if this data is incorporated in the IAIP, eTOD data sets or aerodrome mapping data sets, the AISP should endeavour to establish formal arrangements with the entities that are responsible for providing the data.

2. The formal arrangements referred to in point 1 above shall, as much as possible, include the items described in Annex IV, Part C of Commission Regulation 73/2010. At the minimum these formal arrangements shall include the data quality requirements:

   - the integrity, resolution and accuracy requirements for each data item supplied (Annex IV, Part C, item b);

3. The AISP shall ensure that verification and validation procedures are in place to evaluate the quality of the data that was provided by data originators not referred to in Article 2(2) of Commission Regulation 73/2010. These procedures shall confirm that the data quality requirements have been met.

3. RECOMMENDATIONS

1. The State regulator should establish national policy and/or regulation to support the discussion and establishment of the formal arrangements referred to in point 2.1 above.

4. JUSTIFICATION

It is a recognised fact that the aeronautical data and aeronautical information that is within the scope of Commission Regulation (EU) 73/2010 may impact a very wide range of parties. In order to respect the principle of proportionality, i.e to take into account the individual capabilities and levels of involvement within the data chain of all the parties, the Regulator did not include in Article
(2) of the Regulation the exhaustive list of all possible originators of aeronautical data and aeronautical information that is included in the IAIP, eTOD data sets and aerodrome mapping data.

However, in order to ensure that aeronautical data and aeronautical information is provided to the next intended user with sufficient quality to meet its intended use, it is essential that data/information originated by data originators not referred to in Article 2(2) is also originated in accordance with minimum data quality requirements.

The minimum data quality requirements are defined through the provisions of the Regulation for the data originators that are captured in Article 2(2). For those data originators which are not in the scope of Article 2(2), and which constitute a minority, the Regulator decided to put the responsibility on the AISP who shall then ensure that adequate control measures are put in place, based on a case-by-case analysis.

Because the requirements for those data originators are not defined in the Regulation, the AISP shall ensure that, nevertheless, these requirements are somehow defined and formalised. One possible way to achieve this is through the establishment of a formal arrangement between the AISP and the data originator. These formal arrangements shall include all the elements that will allow the AISP to have a degree of confidence on the data that is provided.

The Regulation defines the data originator as the entity responsible for “the creation of a new data item with its associated value, the modification of the value of an existing data item or the deletion of an existing data item”. Whilst in principle these should be the entities to figure in the formal arrangement, in some cases it may be too challenging to address them directly as they may be even further away in the aeronautical data/information chain and are sub-contracted by the entity that provides the data to the AISP. This means that, generically, we consider the signatures of the formal arrangement to be between the AISP and the entity responsible to provide the data/information.

It is recognised that in certain occasions it could be difficult to take these entities to agree to sign a formal arrangement with the AISP. This can be either due to unawareness concerning the objectives of the Regulation or to some reluctance to formalise the provision of the data. To overcome this situation, the State civil aviation authority should publish national legislation that may be used to support the endeavours of the AISP to sign the formal arrangement. National legislation is here considered in a broader sense and can range from an Aeronautical Information Circular (AIC) to a more formal legal act.

Originators of aeronautical data/information not referred to in Article 2(2) include a large variety of combinations of entities and data. It may, for example, include military entities providing search and rescue information, the civil aviation authority providing information concerning the geodetic and vertical reference systems to be used within the State, aero clubs sending data related to aerial sporting and recreational activities or environmental agencies that provide information concerning bird migration and areas with sensitive fauna.

It would have been difficult to capture all the possible situations and to define requirements for all of them without the risk of being too prescriptive in some cases or too simplistic in others. Furthermore, it is known that these combinations can greatly vary from State to State. For this reason the Regulator decided to give the AISP the obligation to clearly specify quality parameters of published data so the user can make a decision on use of such data.

Other than the formal arrangements described above, the AISP shall also ensure that adequate measures are put in place to evaluate the quality of the data received. There are several sources of guidance to support the establishment of processes to evaluate the quality of the data. The EUROCONTROL Specification for Data Assurance Levels includes in Chapter 4.3.4.3 objectives for Data Quality Evaluation on Receipt of Data and EUROCAE ED-76 has several sections dedicated to evaluation and compliance with data quality requirements. Appendix I to this Common Understanding presents a brief overview of examples of validation and verification methods.
5. LEGAL TEXT

• Commission Regulation (EU) 73/2010 Article 3(19): ‘data originator’ means an entity responsible for data origination;

• Commission Regulation (EU) 73/2010 Article 3(20): ‘data origination’ means the creation of a new data item with its associated value, the modification of the value of an existing data item or the deletion of an existing data item;

• Commission Regulation (EU) 73/2010 Article 6(5): Aeronautical information service providers shall ensure that aeronautical data and aeronautical information provided by data originators not referred to in Article 2(2) are made available to the next intended user with sufficient quality to meet the intended use.


1. INTRODUCTION

This document describes the common understanding endorsed by the participants of the ADQ Regulators Working Group (ARWG) concerning the harmonised implementation of Article 7(2) of Commission Regulation (EU) 73/2010.

2. DEFINITIONS

For the purpose of this document the following definitions shall apply:

‘formal arrangement’ means any agreement that is in accordance with the requirements laid down in Annex IV, Part C of the ADQ Regulation, signed by the parties exchanging aeronautical data and/or aeronautical information.

‘data provider’ means the legal entity responsible for the supply of aeronautical data and/or aeronautical information.

‘data quality requirements’ means the data quality requirements that are adopted by the Member State to meet the provisions laid down in Annex IV, Part A of the ADQ Regulation

3. COMMON UNDERSTANDING

(1) Aeronautical data and aeronautical information items published in the AIP shall be annotated to indicate that they do not meet the data quality requirements laid down in the ADQ Regulation if they are provided under any of the following cases:

i. There is no valid formal arrangement established between the data provider and the AISP to cover the provision of the specific data/information item.

ii. There is a valid formal arrangement established between the data provider and the AISP to cover the provision of the specific data/information item, but the conditions stated in this formal arrangement do not reflect compliance with all the data quality requirements.

iii. There is a valid formal arrangement established between the data provider and the AISP to cover the provision of the specific data/information item, but the AISP or NSA has reason to suspect that the data/information item does not fulfil data quality requirements that were agreed in the formal arrangement.

(2) Data/information items that do not meet all the data quality requirements after 30 June 2017 shall continue to be annotated until they fulfil all the data quality requirements.

(3) If a data/information item that was considered to fulfil all the data quality requirements can no longer, for any reason, continue to be considered as such, it shall be annotated as soon as
possible. This is also valid for the period beyond 30 June 2017.

4. RECOMMENDATIONS

(1) When choosing the method for the annotation of the data/information items that do not meet the data quality requirements, it is recommended that the ANSP follows the guidelines from the Guidelines for the Annotation of data not compliant with Commission Regulation (EU) No 73/2010 (ADQ) (Edition 1.0).

5. JUSTIFICATION

Article 7(2) of the ADQ Regulation requires that all aeronautical data and information items that are published in the AIP and that do not comply with the data quality requirements laid down in the regulation shall be annotated. The aim of such an annotation is to notify the users of the AIP that specific data quality requirements are not met and may, therefore, compel limitations in the use of the relevant data.

The main purpose of this Common Understanding is to establish a harmonised definition of the situations when the data/information item shall be annotated.

To reach this harmonisation it was essential to agree the definition of what is considered to be 'data quality requirements'. Whilst the ADQ Regulation defines in Article 3(3) ‘data quality’ only in terms of accuracy, resolution and integrity, Annex IV, Part A uses the term ‘data quality requirements’ extending also its scope to the ‘ability to determine the origin of the data’ and to the ‘level of assurance that the data is made available to the next intended user prior to its effective start date/time and not deleted before its effective end date/time’.

The compliance with the data quality requirements laid down in Annex IV, Part A is mandatory for the AISP and it is the responsibility of the Member State to adopt a specific set of data quality requirements that shall be used as a baseline by the AISP. These data quality requirements shall then be part of the formal arrangement that, in accordance with Article 6(3) of the Regulation, must be established between the parties exchanging the data/information.

It was the combination of these requirements that was used to establish the criteria used in this Common Understanding to define the situations when a data/information item shall be annotated. In essence this should be done when there is no formal arrangement encompassing the provision of the data/information item, or when, even though a formal arrangement exists, it cannot give enough guarantees that the data quality requirements that are portrayed within are fulfilled.

Although, in principle, after 30 July 2017 there should be no data/information item that does not comply with the ADQ Regulation data quality requirements, it is recognised that this will be difficult to achieve. This is why this Common Understanding also recognise that the annotation mechanism shall continue to be used beyond the 30 July 2017 to indicate the data/information items that still do not comply with the ADQ Regulation data quality requirements (or that, having being compliant, they are not so anymore).

Other than the criteria to define when the data/information items shall be annotated, it is obvious that it is also important to define how these data/information items shall be annotated. The document Guidelines for the Annotation of data not compliant with Commission Regulation (EU) No 73/2010 (ADQ) (Edition 1.0) is the result of the discussions in several forums (e.g. AI Operations Subgroup, ADQ Implementation Working Group) and provides a common, harmonized method that may be used to annotate the data/information items.

6. LEGAL TEXT

Article 7(2) requires that “Aeronautical information service providers shall ensure that aeronautical data and aeronautical information items published in the AIP of the Member State are annotated to indicate those that do not meet the data quality requirements laid down in this regulation”.

Article 6(3) requires that “When exchanging aeronautical data and/or aeronautical information between them, the parties referred to in Article 2(2), shall establish formal arrangements in accordance with the requirements laid down in Annex IV, Part C”.

Edition: 1.6  Released Issue  Page 201
Annex IV, Part A lay down the data quality requirements that the air navigation service providers shall comply with.
ANNEX B – DATASET, DATA EXCHANGE FORMAT AND METADATA

B.1 General guidelines are available at the ADQ Library:
http://www.eurocontrol.int/sites/default/files/article/content/documents/single-sky/guidelines/20120306-aixm-guid-v0.3.pdf

B.2 Detailed, technical supplementary material is available at:
http://www.aixm.aero/

B.3 Information on AIXM Business rules is available at:
https://ext.eurocontrol.int/aixmwiki_public/bin/view/Main/AIXM_Business_Rules
ANNEX C – FORMAL ARRANGEMENT TEMPLATE

C.1 The ADQ Formal Arrangement Template is available in MS Word format at the ADQ Library:

http://www.eurocontrol.int/sites/default/files/content/documents/single-sky/specifications/ADQi%20WG%20Formal%20Arrangement%20Template%20Edition%201.1%20.docx

C.2 Further guidelines are provided via the same webpage:

- ADQ Formal Arrangement Document Structure (pdf)
  http://www.eurocontrol.int/sites/default/files/content/documents/single-sky/mandates/FA%20document%20structure%20V1.0.pdf

- ADQ Formal Arrangement Implementation Checklist (pdf)
  http://www.eurocontrol.int/sites/default/files/content/documents/single-sky/mandates/FA%20Implementation%20Checklist%20V1.0.pdf
ANNEX D – ANNOTATION OF DATA NON COMPLIANT WITH THE ADQ IR

D.1 The Guidelines for the Annotation of data not compliant with Commission Regulation (EU) No 73/2010 (ADQ) (Ed 1.0) is available at the ADQ Library:

http://www.eurocontrol.int/sites/default/files/content/documents/single-sky/mandates/Guidelines%20for%20AIP%20Annotation%20of%20ADQ%20non%20compliances%20%28Ed%201%20%29.pdf
ANNEX E – SAFETY OBJECTIVES AND SAFETY ASSESSMENT IN AIS

E.1 The EUROCONTROL Guidance for the implementation of safety management objectives and safety assessments falling within the scope of EU Regulation 73/2010 (Edition 2.0) is available at the ADQ Library:

http://www.eurocontrol.int/sites/default/files/content/documents/single-sky/mandates/ECTR%20Guidance%20for%20AIM%20safety%20management%20%28Edition%202.0%29.pdf

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