



## ADQ Implementation Workshop #3

### Event Book Part 2

#### The set of presentations covered following main modules:

- Introduction ([page 2](#))
- Data Quality Drivers & Latest Developments ([p 5](#))
- ADQ Key Provisions – Overview ([p 20](#))
- ADQ Status based on ESSIP / LSSIP ([p 31](#))
- Status in CR ([p 39](#))
- Main Differences between ADQ and EASA Part-AIS ([p 53](#))
- Data Origination ([p 62](#))
- Data Exchange ([p 103](#))
- Datasets ([p 127](#))
- Metadata ([p 155](#))
- Terrain & Obstacle Data ([p 166](#))
- Formal Arrangements ([p 211](#))
- Event Evaluation and Summary ([p 221](#))



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# INEA Aeronautical Data Quality - Implementation Workshop



## Introduction

INEA ADQ Implementation Workshop  
ANS Czech Republic  
Prague, 4-6 Sep 2018

Manfred UNTERREINER  
EUROCONTROL  
DECMA / ACS / STAN

## Introduction



- Welcome
- Workshop objectives
- Programme



## Workshop Objectives

- Facilitate a common understanding of Regulation (EU) 73/2010 by addressing identified implementation challenges
- Outline main differences between current requirements and upcoming changes, based on draft EASA Reg. 2017/373 including consequential changes to Reg. 139/2014.



## Programme Day 1

Time	Duration	Topic	Speaker
13:00	10min	Welcome	Jan Klas, General Director, ANS CR
13:10	20	Introduction: Objectives, Program	Eurocontrol, Manfred Unterreiner (MJU)
13:30	60	Data quality drivers and latest developments <ul style="list-style-type: none"> <li>• Why is Data Quality important?</li> <li>• Global and regional aspects</li> </ul>	Eurocontrol, MJU
14:30	25	Break	
14:55	65	ADQ key provisions and means – overview	Eurocontrol, MJU
16:00	30	ADQ status based on ESSIP / LSSIP <ul style="list-style-type: none"> <li>• European view</li> <li>• LSSIP status in CR</li> </ul>	Eurocontrol, MJU CAA, Lukas Vaněk
16:30	30	Main conceptual differences between ADQ and the new EASA Part-AIS incl. consequential amendments to 139/2014 (ADR Regulation)	Eurocontrol, MJU
17:00		Closing day 1	

## Programme Day 2



Time	Duration	Topic	Speaker
09:00	5min	Introduction	Eurocontrol, MJU
09:05	145	Data Origination <ul style="list-style-type: none"> <li>• Data Scope</li> <li>• Request for Data Origination</li> <li>• Data Origination Requirements</li> <li>• Validation and Verification</li> <li>• Other data originators (survey, procedure design etc.)</li> </ul> <p><i>Note 25 min break ca. 10h30</i></p>	ITV, Rudolf Schneeberger (RS) <i>on behalf of Eurocontrol</i>
11:30	45	Q & A on Data Origination	Participants
12:15	60	Lunch	
13:15	60	Data exchange <ul style="list-style-type: none"> <li>• Differences ADQ vs. Part-AIS &amp; ADR Reg.</li> <li>• Main Requirements</li> </ul>	Solitec, Wolfgang Scheucher (WS) <i>on behalf of Eurocontrol</i>
14:15	40	Data-set: <ul style="list-style-type: none"> <li>• Part I - Aeronautical Data Catalogue</li> </ul>	Solitec, WS
14:55	25	Break	
15:20	60	Data-set: <ul style="list-style-type: none"> <li>• Part II - Digital Data Sets</li> </ul>	Solitec, WS
16:20	30	Metadata <ul style="list-style-type: none"> <li>• Differences ADQ vs. Part-AIS &amp; ADR Reg.</li> <li>• Main Requirements</li> </ul>	Solitec, WS
16:50	10	Q & A	Participants
17:00		Closing day 2	

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## Programme Day 3



Time	Duration	Topic	Speaker
09:00	5min	Introduction	Eurocontrol, MJU
09:05	115	Terrain & Obstacle Data <ul style="list-style-type: none"> <li>• Requirements</li> <li>• Status in Europe based on ESSIP</li> <li>• TOD Policy</li> <li>• Q &amp; A</li> </ul>	Eurocontrol, Alexandre Petrovsky (APE)
11:00	25	Break	
11:25	35	Formal Arrangements <ul style="list-style-type: none"> <li>• Reminder on needs, process and practices</li> </ul>	Eurocontrol, MJU
12:00	30	Event evaluation (round table) WS Summary	Eurocontrol, MJU
12:30	30	Closing remarks	ANS CR
13:00		Closing of WS	

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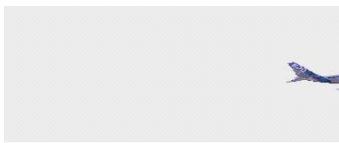


# Data Quality Drivers and Latest Developments

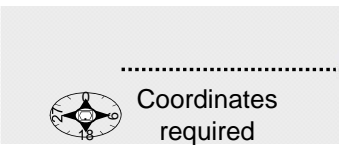
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## Changing role of Aeronautical Data?



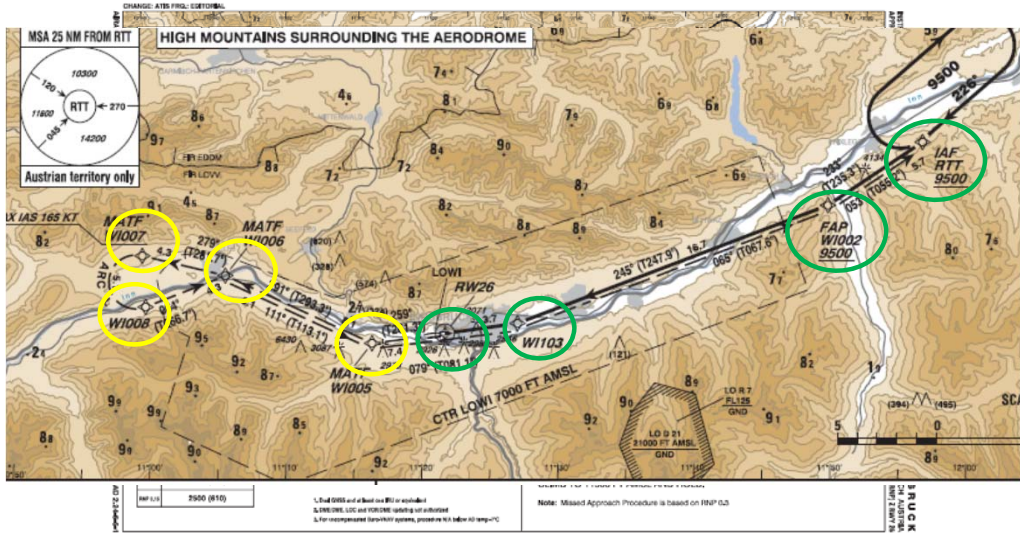
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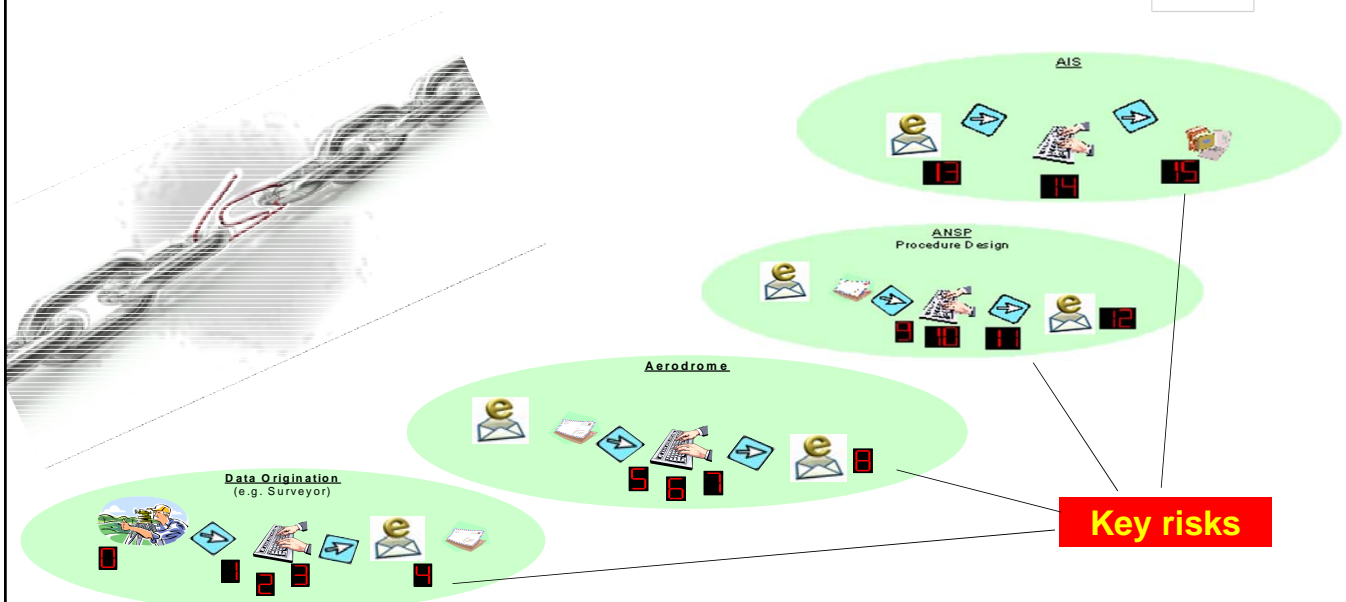
# Innsbruck IAC RNAV (RNP) 0.3 AR - RWY 26



# Innsbruck – Cockpit view VMC > IMC



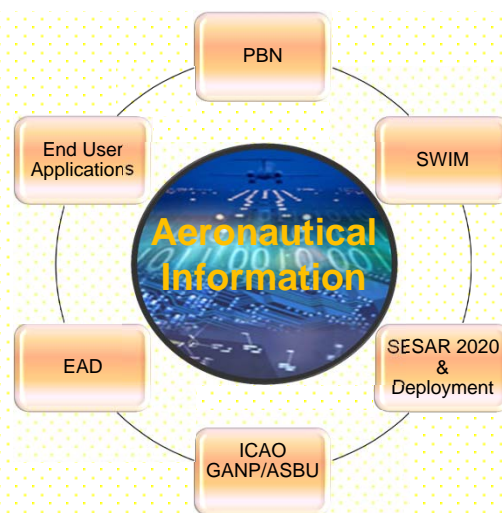
## The problem of the “weakest link in the chain”



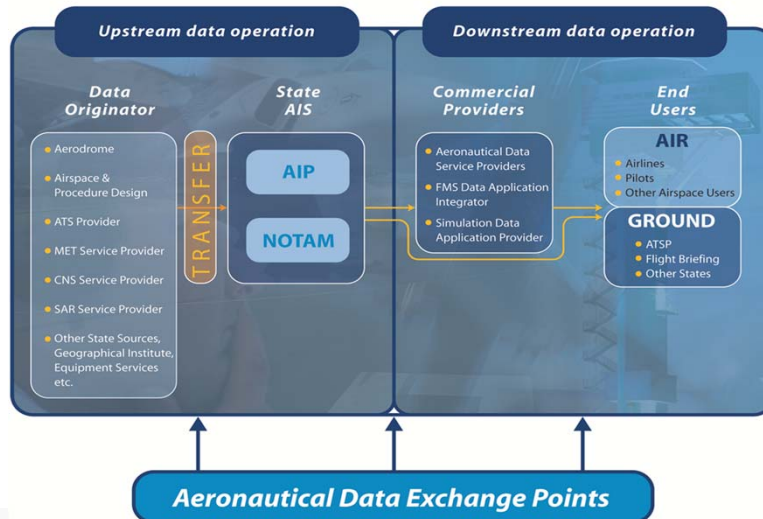
## Data / Information centric system

Present and future navigation systems are **dependent** on aeronautical data, and many of them require significantly **higher data quality** than is currently available.

Corrupt or Erroneous aeronautical information/data can potentially affect the **safety** of Air Navigation.



## Aeronautical Data Chain

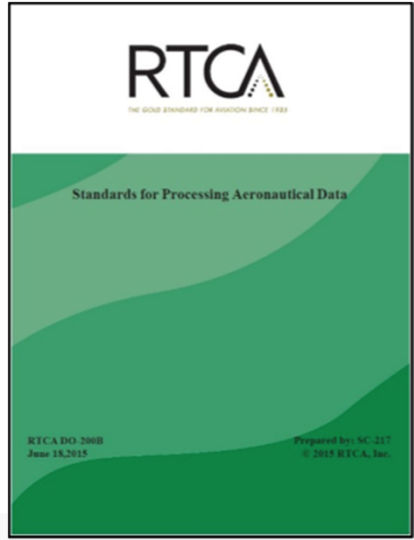


## Aeronautical Data Chain & ICAO Annex 15

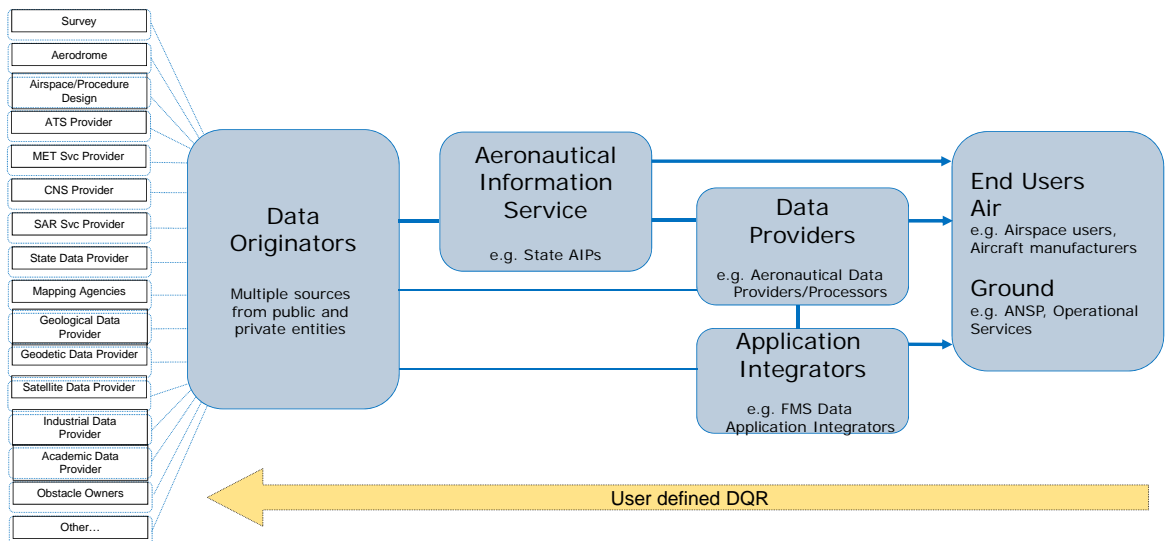
- 3.4 Metadata
  - 3.4.1 Metadata shall be collected for aeronautical data processes and exchange points. This metadata collection shall be applied **throughout the aeronautical information data chain**, from survey/origin to distribution to the next intended user.
- 3.6 Use of automation
  - 3.6.3 In order to meet the data quality requirements, automation shall:
    - a) enable **digital aeronautical data exchange** between the parties involved in the **data processing chain**; and
    - b) use aeronautical information exchange models and data exchange models designed to **be globally interoperable**.
- 3.7 Quality management system
  - 3.7.2 Recommendation.— Quality management should be applicable to the **whole aeronautical information data chain** from data origination to distribution to the next intended user, taking into consideration the intended use of data.
  - Note 2.— **Letters of agreement** concerning data quality between originator and distributor and between distributor and next intended user **may be used to manage the aeronautical information data chain**.



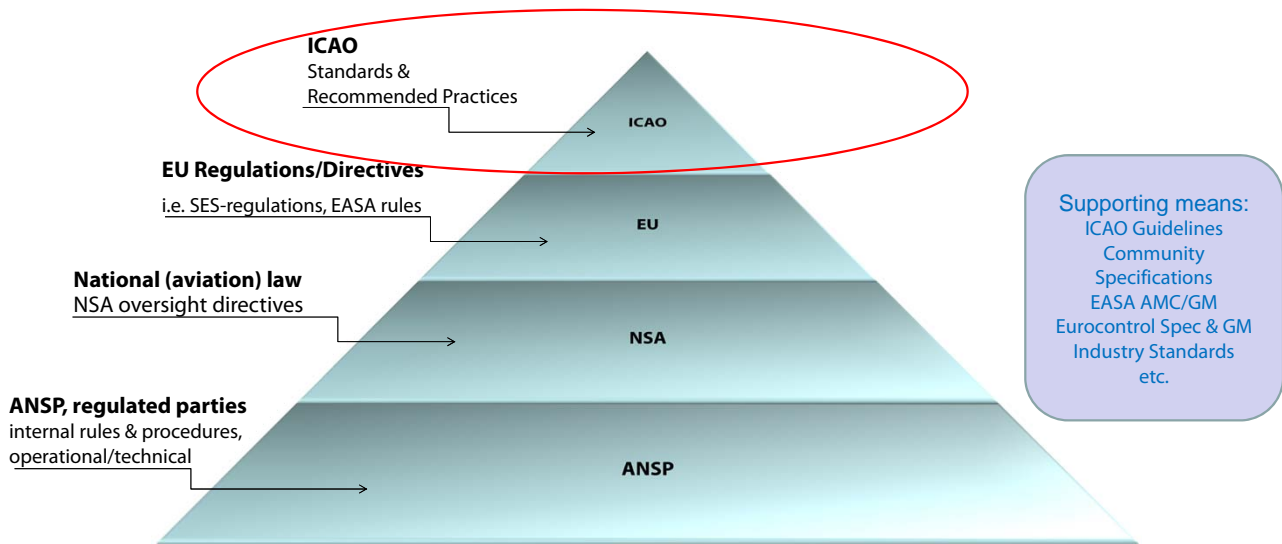
# Aeronautical Data Chain Key Concept for global Industry Standards



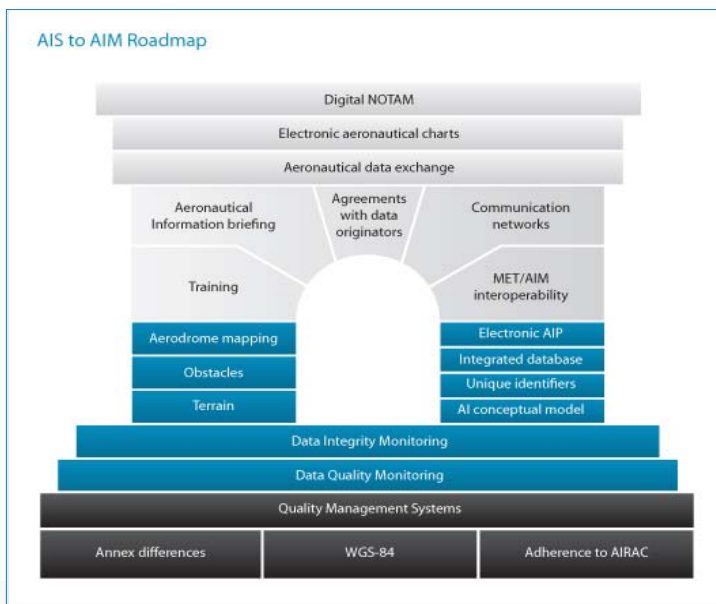
# Industry Standard Eurocae ED-76A, Fig 1-2



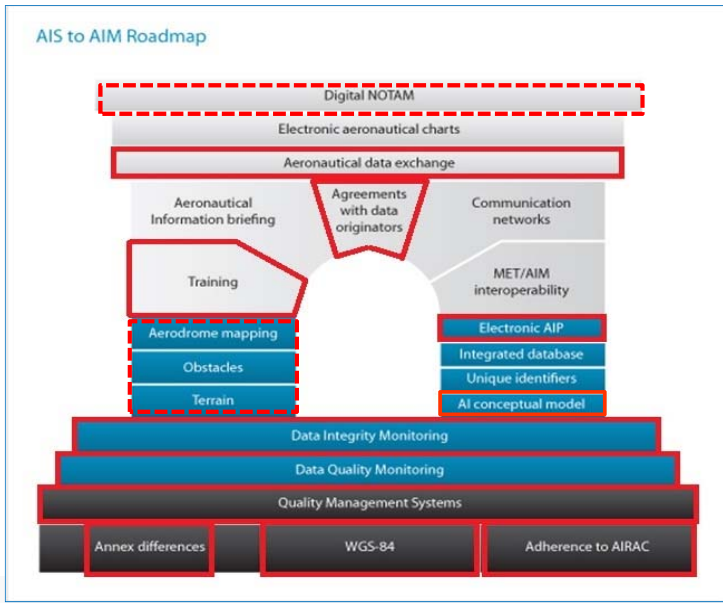
# Regulatory context



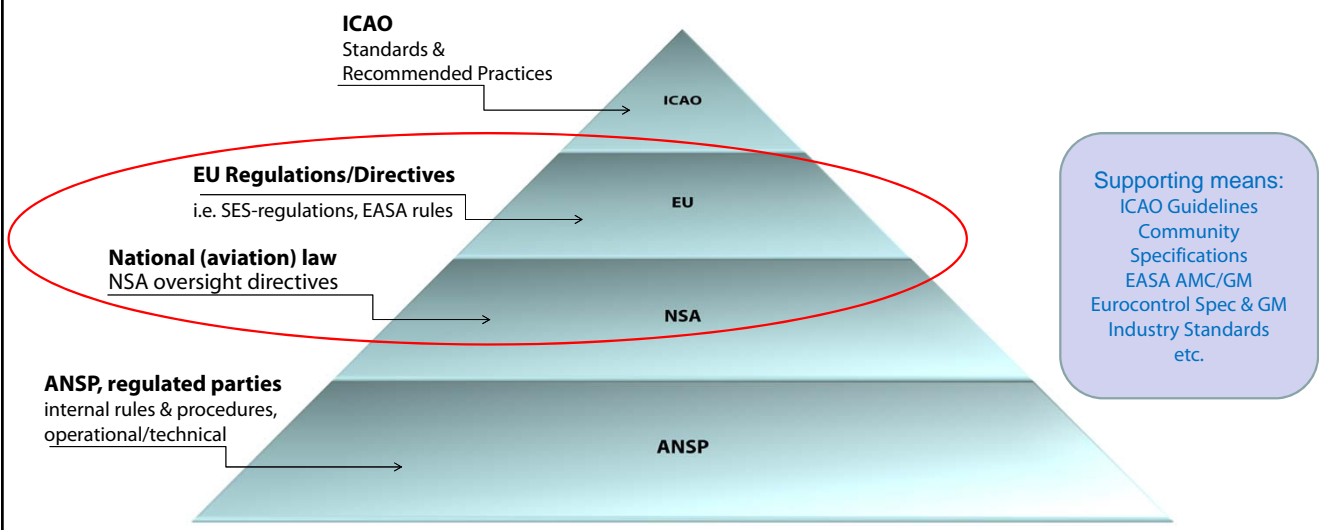
# ICAO “AIS to AIM Roadmap”



# Contribution of ADQ to "AIS to AIM Roadmap"



# Regulatory context

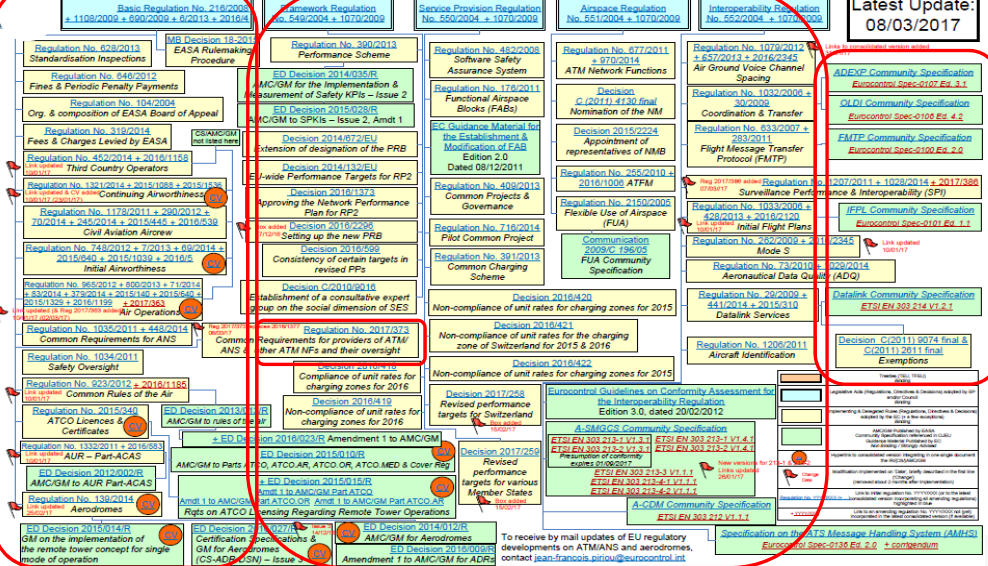


# “The big Picture of European Aviation Regulations”



## EU Legislation for ATM/ANS & Aerodromes

### Part 1: SES Legislation & ‘EASA rules’ for Aerodromes



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What does “interoperability” mean in the context of SES?

The SES Framework regulation 549/2004 specifies interoperability as...

“...a set of functional, technical and operational properties required for systems, its constituents and procedures in order to enable its safe, efficient and seamless operation”.



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## Interoperability focus...



...the **Aircraft** is at the **heart** of world-wide **interoperability**



**NOT** the same solution everywhere

**BUT** 'systems' capable of working together

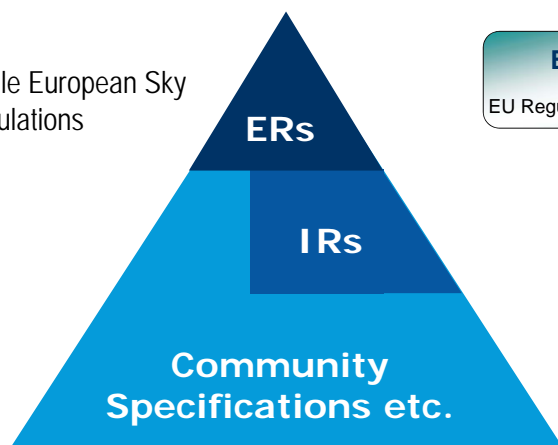
**Information exchange** at global level becoming increasingly important

'Systems' in this context at many different levels

## ADQ Regulatory Framework



Single European Sky Regulations



### Essential Requirements

EU Regulation 552/2004 (interoperability)



### Implementing Rules

EU Regulation 73/2010 (aeronautical data quality)

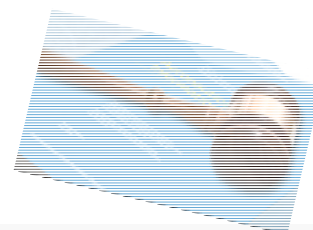
**Publication** in the 'Official Journal of European Union' **27th Jan 2010**  
Regulation entered into force on 16th February 2010



**Directly applicable law in Member States**

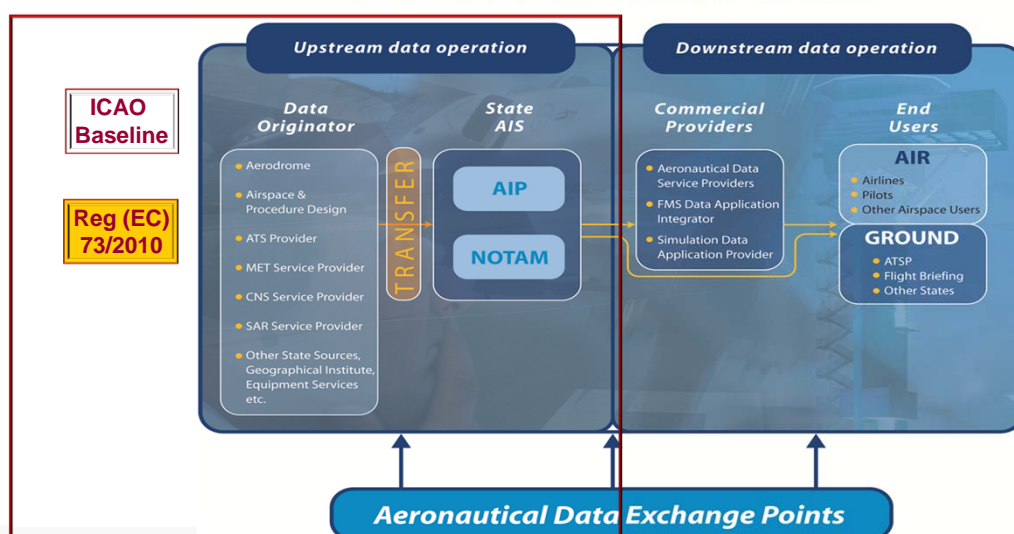
## Background and Drivers

- The ADQ **mandate** was received from the European Commission in May 2005.
  - regulation was developed in close collaboration with stakeholders including data originators, air navigation service providers and industry.
- The regulation fulfilled **2 basic functions**:
  - ensure the provision of data of **required quality to meet** the intended use
  - to support the progressive introduction of aeronautical **data in electronic format**
- The end result of the process reflected an **agreed compromise**, taking particular account of the need for proportionality.

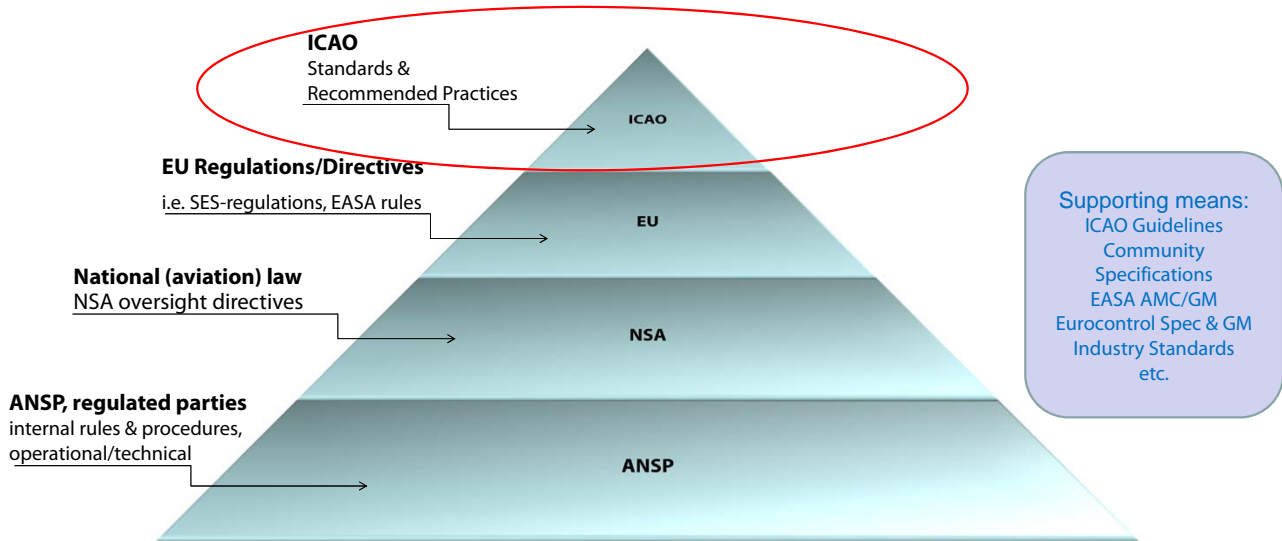


## ADQ & the Aeronautical Data Chain

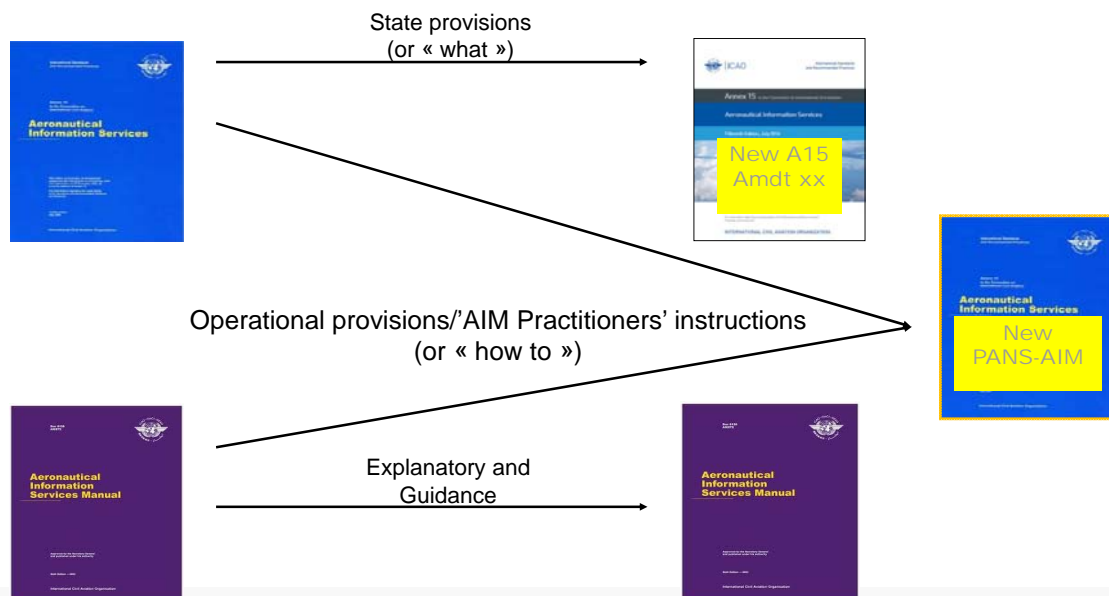
### Aeronautical Data Chain



# Latest Developments - Global



# Major change for ICAO Annex 15



# What's is coming ?

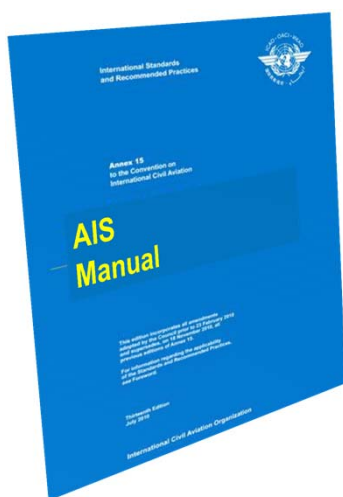
- AI Management → Split Data Collection and Data Provision
- Introduce the Data Catalogue

Subject (1)	Property (2)	Sub-Property (3)	Type (4)	Description (5)	Note (6)	Accuracy (7)	Integrity (8)	Orig Type (9)	Pub. Res. (10)	Chart Res. (11)
Runway				A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft. (Annex 14)						
	Designator		Text	The full textual designator of the runway, used to uniquely identify it at an aerodrome/airport which has more than one. E.g. 09/27, 02R/20L, RWY 1.						
	Nominal length		Distance	The declared longitudinal extent of the runway for operational (performance) calculations.		1m	critical	surveyed	1 m or 1 ft	1 m
	Nominal width		Distance	The declared transversal extent of the runway for operational (performance) calculations.		1m	essential	surveyed	1 m or 1 ft	1 m
	Geometry		Polygon	Geometries of RunwayElement.						

- Digital Data services
- I-AIP renamed to Aeronautical Information Products
- Safety Management
- NOTAM Distribution improvements
- Data protection

Restructured Annex 15 (core +/- 40p) + New PANS-AIM (+/- 160p)

# AIS Manual

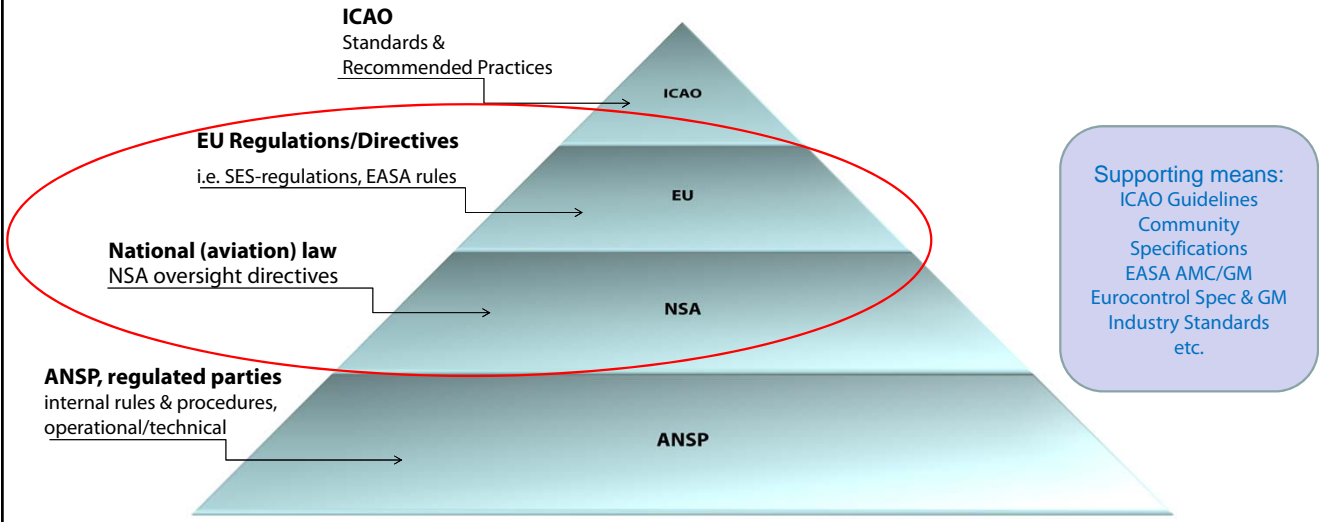


- First priority now!**
- AIS Manual (Doc 8126) is being amended in conjunction with the restructured Annex 15 and new PANS-AIM
- Delete redundant elements
- Bring in line with Annex 15 & PANS-AIM changes
- Expand guidance (AIM organizational development, Data Catalogue, Service Level Agreements, digital products and services, etc.)

- Volume I** - AIM Organizational Development
- Volume II** - Aeronautical Data Process
- Volume III** - AI products in standardized presentation
- Volume IV** - Digital Products and Services



# Latest Developments - Regional EASA Rulemaking



# "The big Picture of European Aviation Regulations"



EU Legislation for ATM/ANS & Aerodromes  
Part 1: SES Legislation & 'EASA rules' for Aerodromes

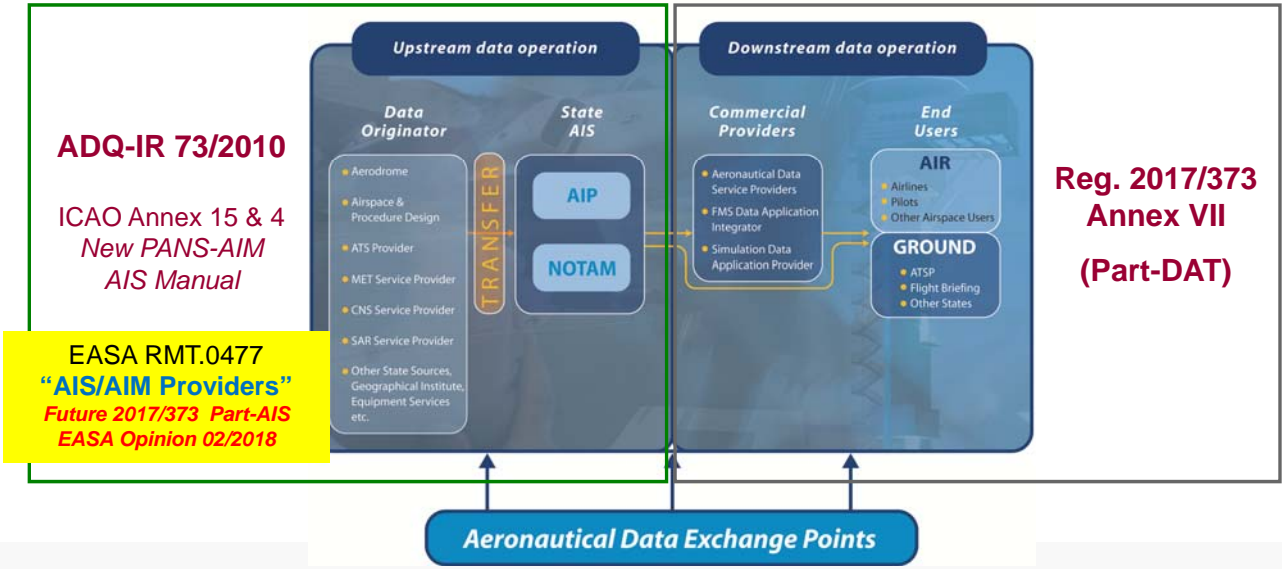
Latest Update: 08/03/2017

Legend:

- Positive link (green arrow): Indicates a link to a document that has been updated.
- Negative link (red arrow): Indicates a link to a document that has been removed.
- Link updated: Indicates a link that has been updated.
- Link added: Indicates a link that has been added.
- Change: Indicates a change in the document.
- Deleted: Indicates a document that has been deleted.

# Aeronautical Data Chain & Current Rules

## Aeronautical Data Chain



# In summary - Why does Aeronautical Data Count?





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DPS/STAN  
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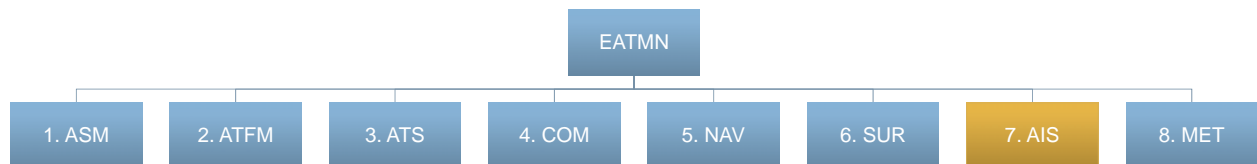


## ADQ Key Provisions

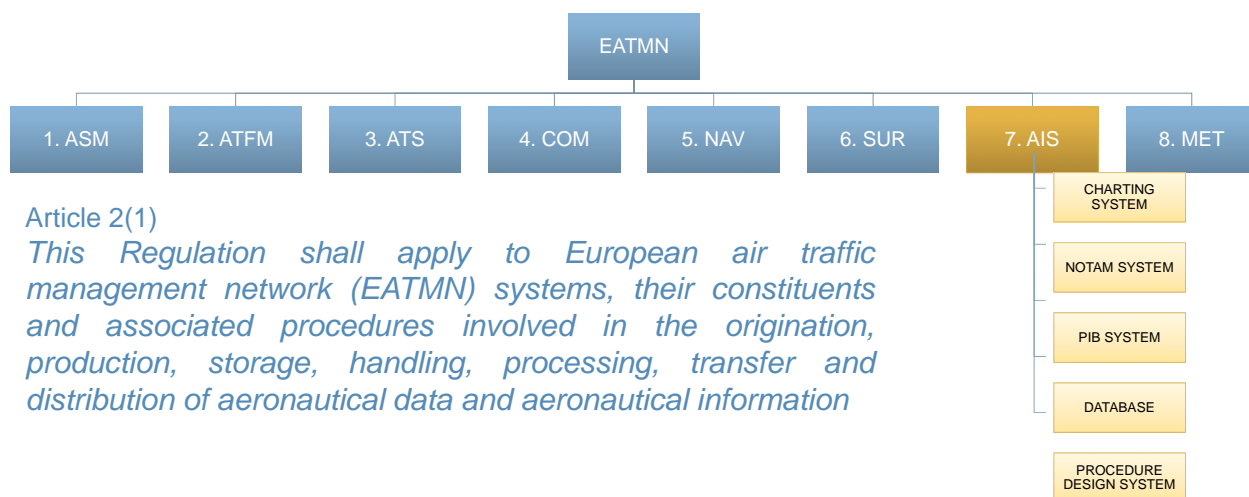
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## The interoperability Regulation (552/2004)



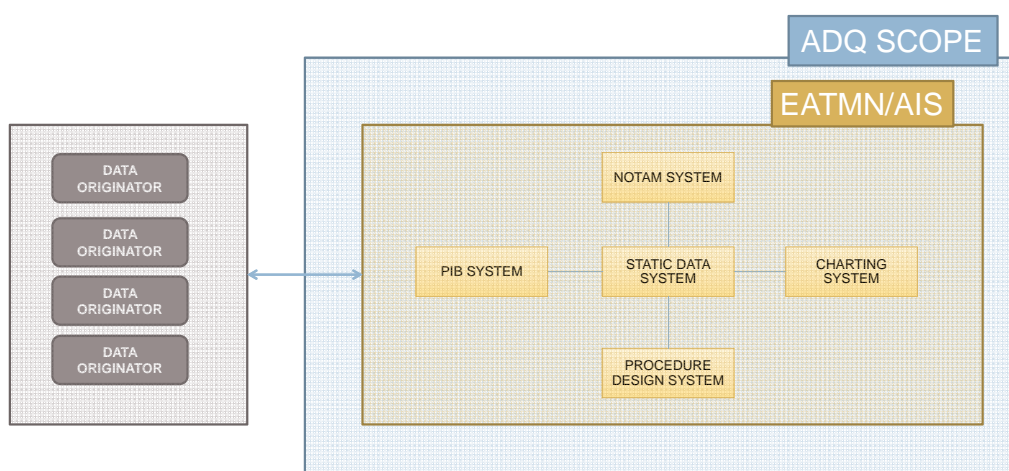
# The ADQ Regulation (73/2010)



## Article 2(1)

*This Regulation shall apply to European air traffic management network (EATMN) systems, their constituents and associated procedures involved in the origination, production, storage, handling, processing, transfer and distribution of aeronautical data and aeronautical information*

# Interfaces with the EATMN / AIS



## Subject Matter

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).

*Recital (1)*

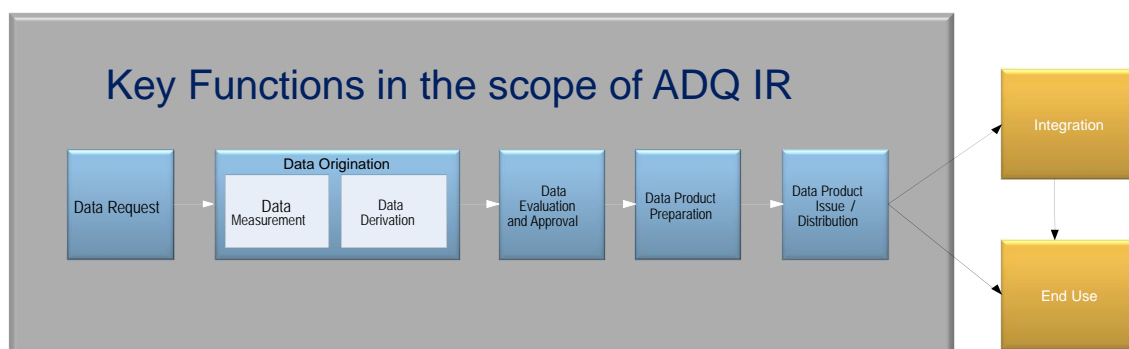


*Article 1*

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

## Scope

*Functional dimension*



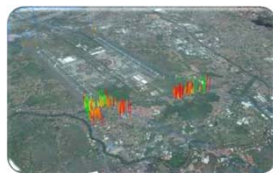
# Scope

## Data and Information



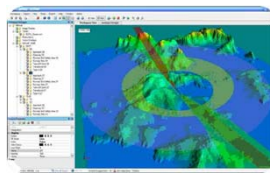
### Integrated aeronautical information package

- AIP, AMDT, SUP, NOTAM & PIB, checklists & lists of valid NOTAM
- Exception: AIC



### Electronic obstacle data

- Where made available by the Member State



### Electronic terrain data

- Where made available by the Member State

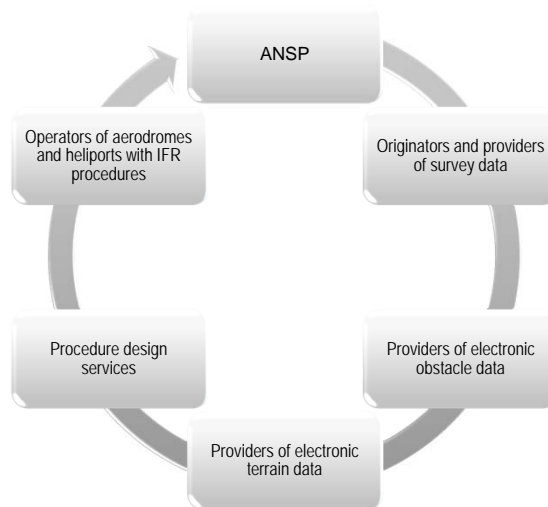


### Aerodrome mapping data

- Where made available by the Member State

# Scope

## Regulated Parties



## Key Timeline



Publication in  
OJEU

• 27/01/2010

Derogations for  
data set and data  
exchange format

• 01/07/2014



Apply From

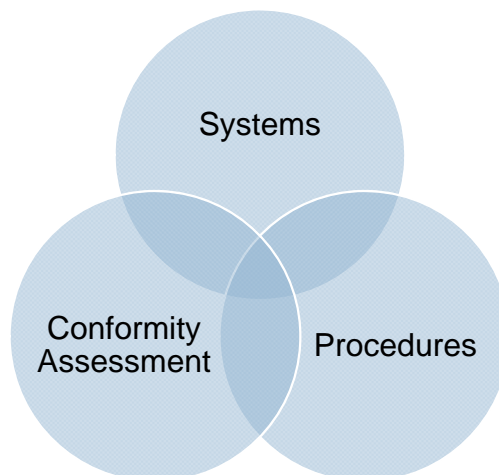
• 01/07/2013

Latest compliance  
for data published  
before 1 July 2013

• 30/06/2017

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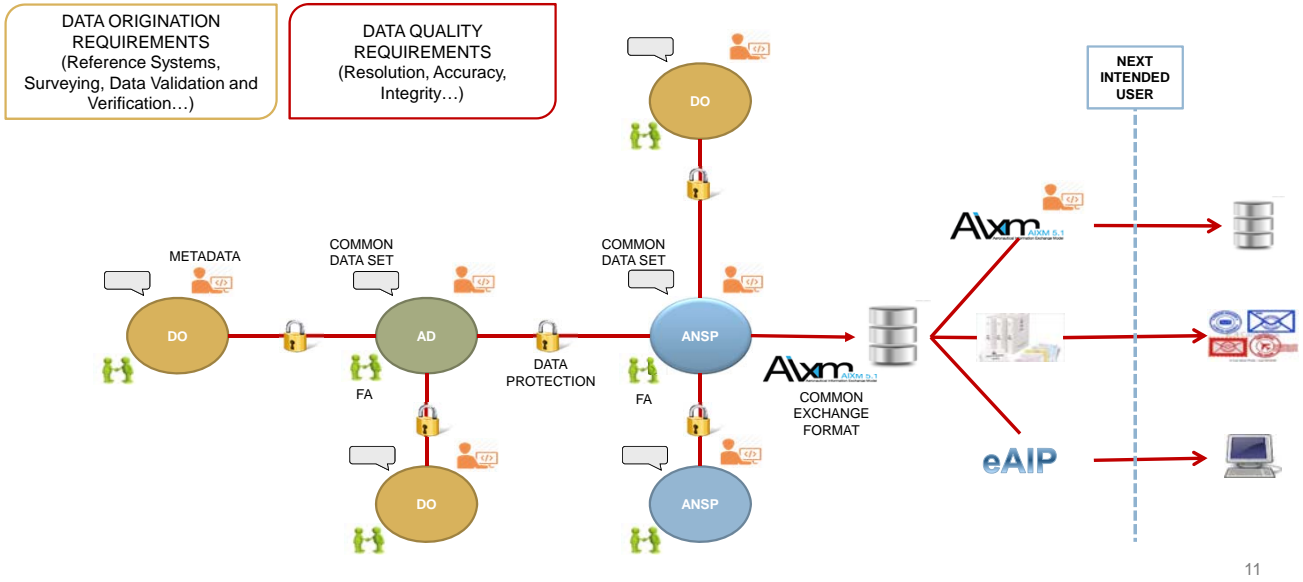
## ADQ Provisions



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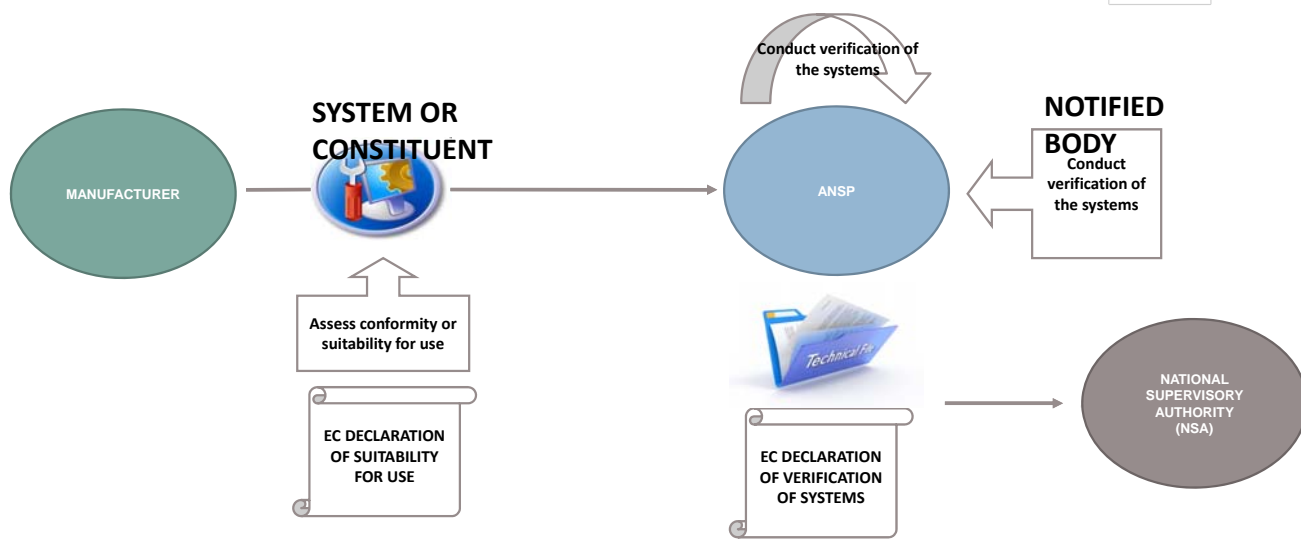
## Provisions: Systems



## Provisions: Procedures

REGULATED PARTY	
	ERROR REPORTING AND RECTIFICATION
	AUTOMATION
	CONSISTENCY
	TIMELINESS
	PERSONNEL PERFORMANCE
	TOOLS AND SOFTWARE
	QUALITY MANAGEMENT
	SAFETY MANAGEMENT
	SECURITY MANAGEMENT
	EVIDENCE REQUIREMENTS

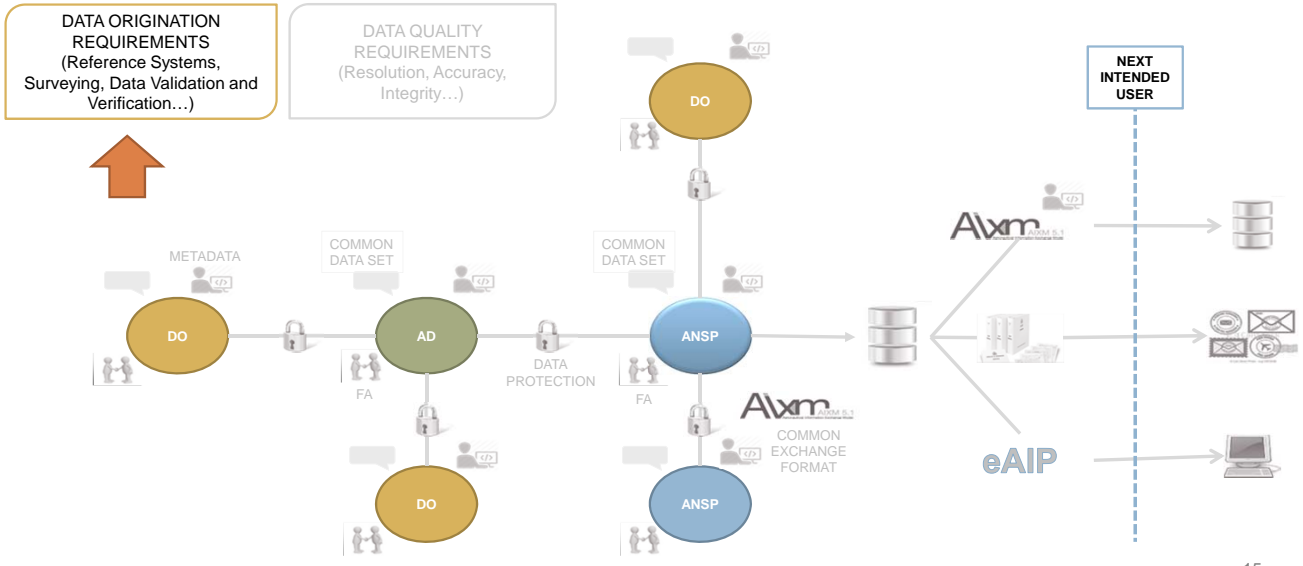
## Provisions: Conformity Assessment



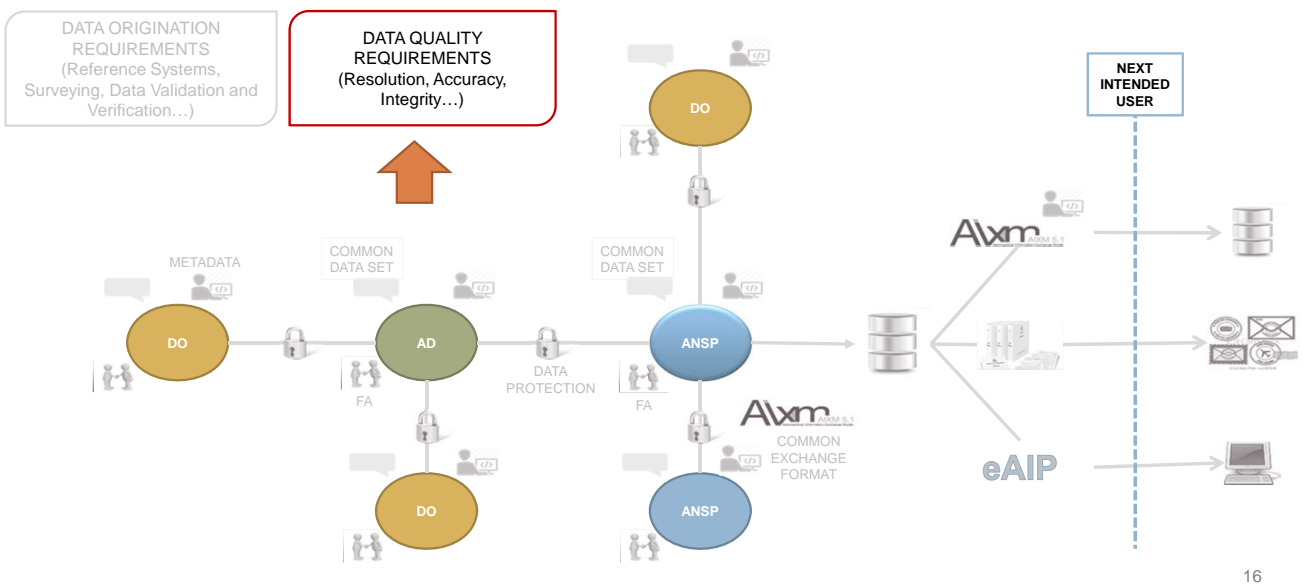
## EUROCONTROL Specifications

REF	SUBJECT	EDITION	STATUS
SPEC 146	EUROCONTROL Specification for the electronic Aeronautical Information Publication (eAIP)	2.1	Published
SPEC 148	EUROCONTROL Specification for Data Assurance Levels (DAL)	1.1	Published
SPEC 151	EUROCONTROL Specification for Aeronautical Information Exchange (AIX)	1.0	Published
SPEC 152	EUROCONTROL Specification for Data Quality Requirements	1.2	Published
SPEC 154	EUROCONTROL Specification for the Origination of Aeronautical Data Volume 1: Compliance Material for Commission Regulation (EU) 73/2010	1.0	Published
SPEC 154	EUROCONTROL Specification for the Origination of Aeronautical Data Volume 2: Guidance Material	1.0	Published

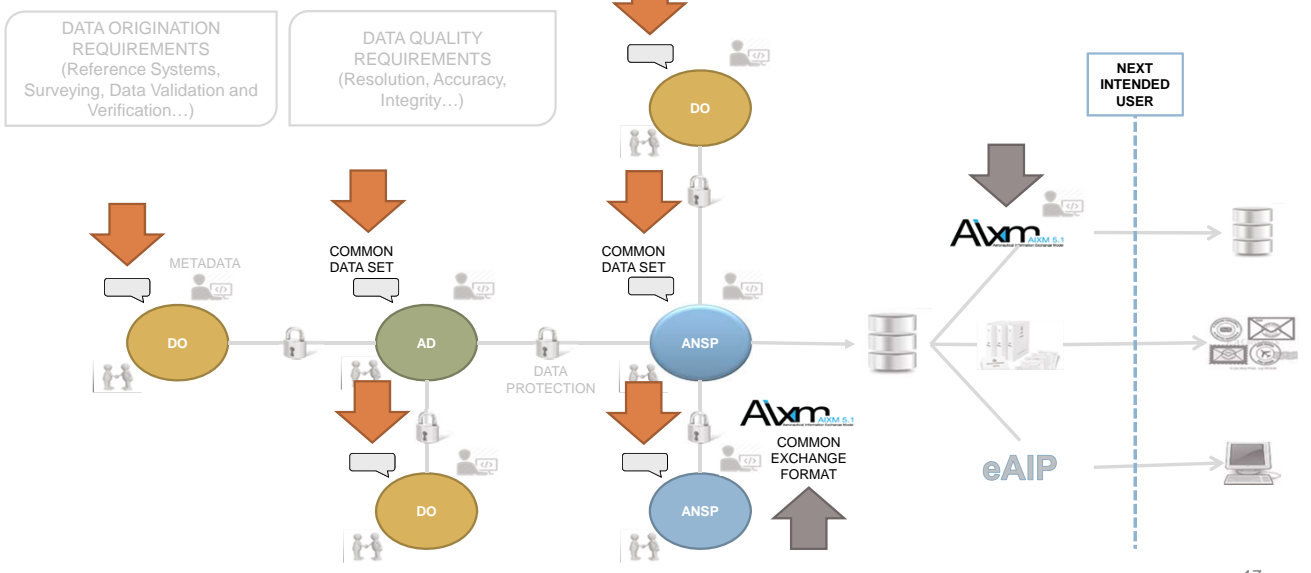
# EUROCONTROL Specification for Data Origination (DO)



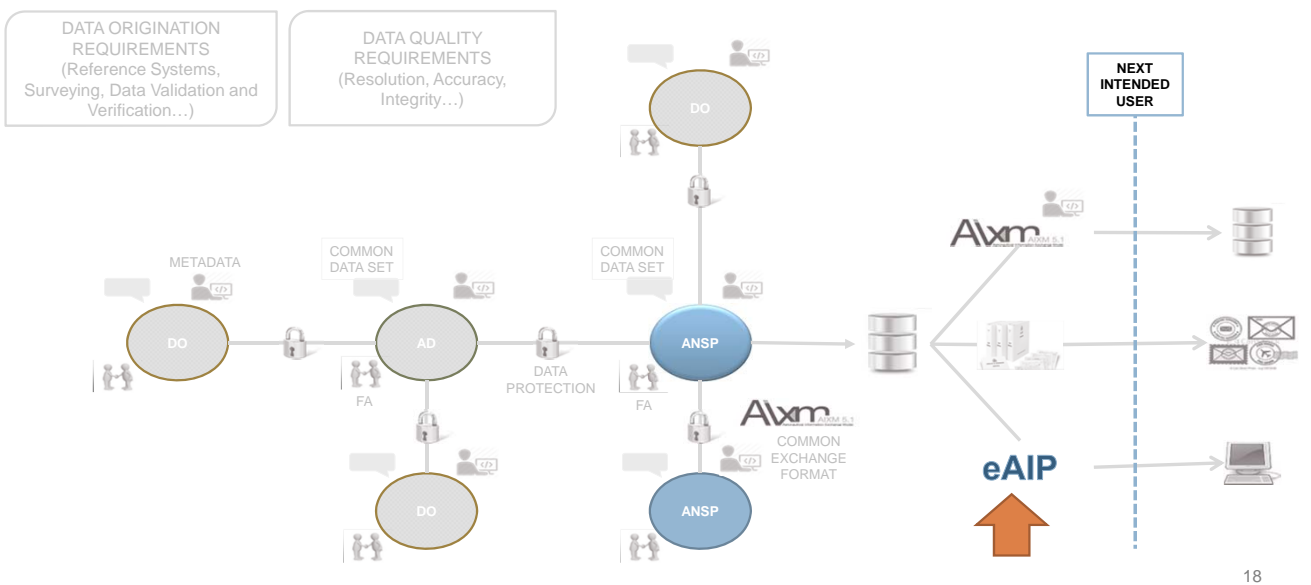
# EUROCONTROL Specification for Data Quality Requirements (DQR)



# EUROCONTROL Specification for Aeronautical Information Exchange (AIX)

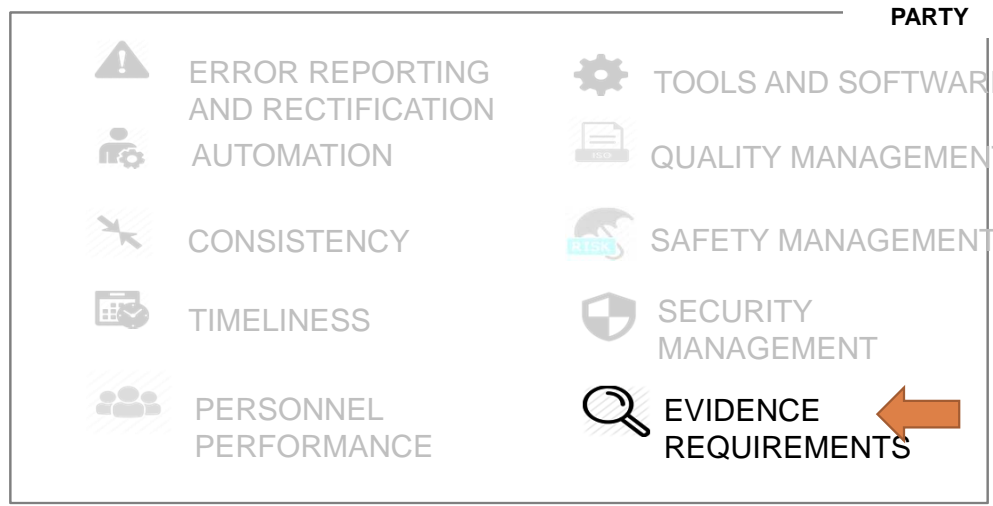


# EUROCONTROL Specification for the Electronic AIP (eAIP)



# EUROCONTROL Specification for Data Assurance Levels (DAL)

REGULATED PARTY



# EUROCONTROL Guidelines

<http://www.eurocontrol.int/articles/adq-library>

REF	SUBJECT	EDITION	STATUS
CU 01/2013	Application of the provisions of Commission Regulation (EU) 73/2010 to N27A88	1.4	Published
CU 02/2013	Provisions of the Commission Regulation (EU) 73/2010 for Data Protection	0.1	Pending
CU 03/2013	Scope of Article 8(1) of the Commission Regulation (EU) 73/2010 (Edition 1.0)	1.0	Published
CU 04/2013	Commission Regulation (EU) 73/2010 and Exchange of Electronic Terrain Datasets	1.0	Published
CU 05/2013	Commission Regulation (EU) 73/2010 and Aerodrome Operators	1.2	Published
CU 06/2014	Provisions of Commission Regulation (EU) 73/2010 for Metadata	1.0	Published
CU 07/2014	Application of the provisions of Commission Regulation (EU) 73/2010 to Military Entities	0.1	Pending
CU 08/2014	Provisions of Commission Regulation (EU) 73/2010 for Electronic Data Exchange	1.0	Published
CU 09/2014	Provisions of Commission Regulation (EU) 73/2010 for Conformity Assessment	0.1	Pending
CU 10/2014	Implementation of Article 8(5) of the Commission Regulation (EU) 73/2010	1.2	Published
CU 11/2015	Implementation of Article 7(2) of the Commission Regulation (EU) 73/2010	1.0	Published

**EUROCONTROL Specifications**

- EUROCONTROL Specification for the Electronic Aeronautical Information Publication (eAIP)
- EUROCONTROL Specification for Data Assurance Levels (DAL)
- EUROCONTROL Specification for Data Quality Requirements (DQR) including the interoperable Excel version of the Harmonized List
- EUROCONTROL Specification for the Origination of Aeronautical Data (OD)
- EUROCONTROL Specification for Aeronautical Information Exchange (AIX)

**Guidance Material**

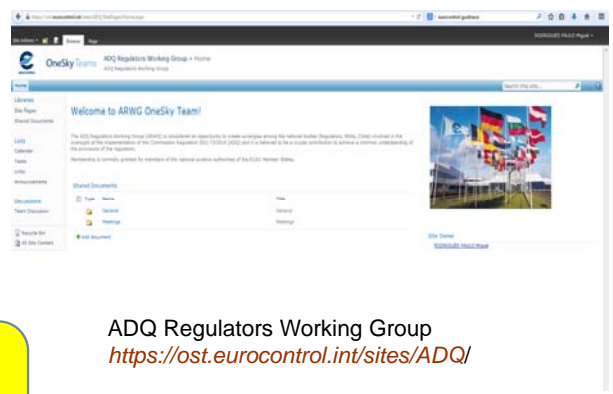
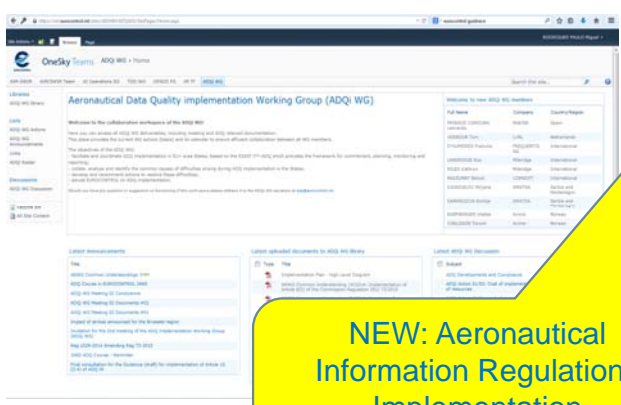
- EUROCONTROL Guidelines - Use of ADS 3.1 in relation to the AIX Specification (pdf)
- AIMM 5.1 Business Rules version 3.7
- ITV ADD (pdf) - SES related implementation objectives 2012-2018 Cycle
- ADD Suite (pdf)
- EUROCONTROL Guidelines on Conformity Assessment
- Guidelines for the AIP Annotation of ADG non-compliance (pdf)
- Guidelines for the implementation of safety management in ADSM in the ETAC region (pdf)
- AIP Originator Index (IE 1.2 pdf) incorporating ICAO Annex 15, 19th Ed., AMSD3A (supplementary info within the file - see readme) (xls)
- SLA Package (xls)
- EAD Safety Case (pdf)
- EAD Safety Case Guidance (pdf)
- Checklist Preliminary Issues (pdf)

**Formal Arrangement (FA) Guidelines**

- ADD Formal Arrangement Template (from the ADS Implementation Working Group) (Word)
- ADD Formal Arrangement Document Structure (pdf)
- ADD Formal Arrangement Implementation Checklist (pdf)

# ADQ Stakeholder Interactions Integration into one subgroup in progress

Implementation Working Group  
<https://ost.eurocontrol.int/sites/AISWIM/ADQiWG/SitePages/Home.aspx>



**NEW: Aeronautical  
Information Regulations  
Implementation  
Sub-Group (AIRI SG)**

ADQ Regulators Working Group  
<https://ost.eurocontrol.int/sites/ADQ/>





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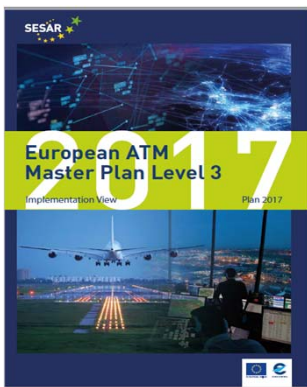


# ADQ Status based on ESSIP - European View

INEA ADQ Implementation Workshop  
ANS Czech Republic  
Prague, 4-6 Sep 2018

Manfred UNTERREINER  
EUROCONTROL  
DECMA / ACS / STAN

## The Master Plan Level 3 Implementation view



## ITY-ADQ & LSSIP

LoA	Description	by date
ITY-ADQ	Overall LSSIP implementation status	
ITY-ADQ-REG01	Verify the compliance with data quality requirements and supervise safety asse:	30/06/2013
ITY-ADQ-REG02	Verify the establishment of formal arrangements	30/06/2013
ITY-ADQ-REG04	Verify that all parties comply with all data requirements	30-06-2017
ITY-ADQ-ASP01	Implement data quality and process requirements	30/06/2013
ITY-ADQ-ASP02	Establish formal arrangements	30/06/2013
ITY-ADQ-ASP03	Establish consistency mechanisms and implement timeliness requirements	30/06/2013
ITY-ADQ-ASP04	Implement personnel and performance requirements	30/06/2013
ITY-ADQ-ASP05	Implement a quality management system and fulfil safety and security objective	30/06/2013
ITY-ADQ-ASP06	Implement the common dataset and digital exchange format	30/06/2014
ITY-ADQ-ASP07	Implement all data requirements	30/06/2017
ITY-ADQ-APO01	Implement data quality and process requirements	30/06/2013
ITY-ADQ-APO02	Implement personnel and performance requirements	30/06/2013
ITY-ADQ-APO03	Implement a quality management system and fulfil safety and security objective	30/06/2013
ITY-ADQ-APO04	Implement the common dataset and digital exchange format requirements	30/06/2014
ITY-ADQ-APO05	Implement all data quality requirements	30/06/2017

## ITY-ADQ Status Report 2017

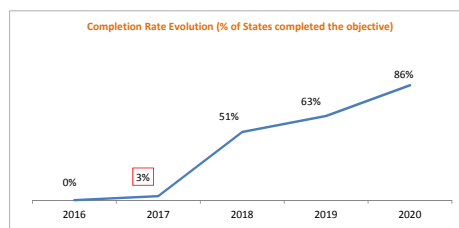
### Stakeholders:

- ANSPs
- Airport Operators
- Regulators
- Industry

**FOC:** 06/2017

**Late**

**Estimated achievement:** 12/2020



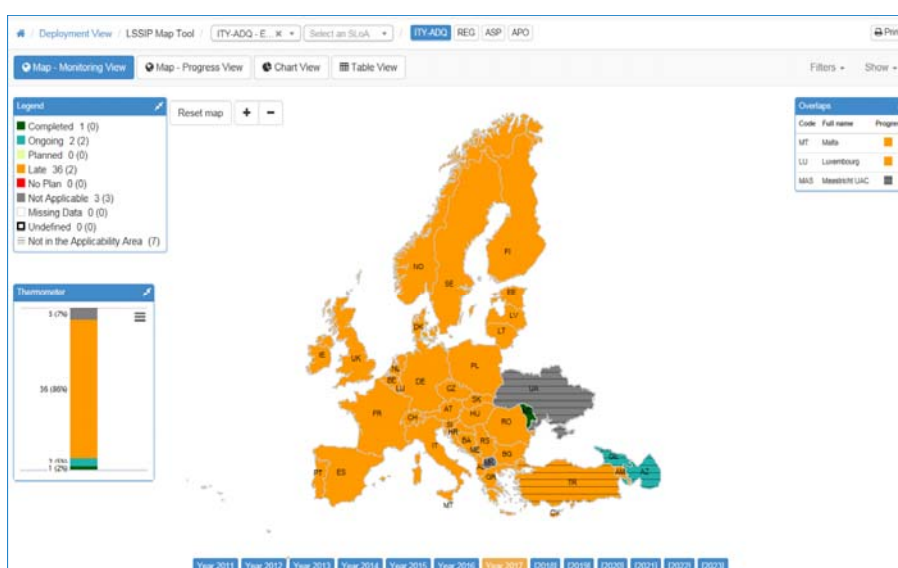


## European ATM Master Plan Level 3 - Implementation Plan (ESSIP Plan)

- Implementation Objectives
- Edition 2017
- [https://www.eatmportal.eu/working/depl/essip\\_objectives/monitoring](https://www.eatmportal.eu/working/depl/essip_objectives/monitoring)
- ITY-ADQ overall status achieved according **Monitoring reports for 2017**

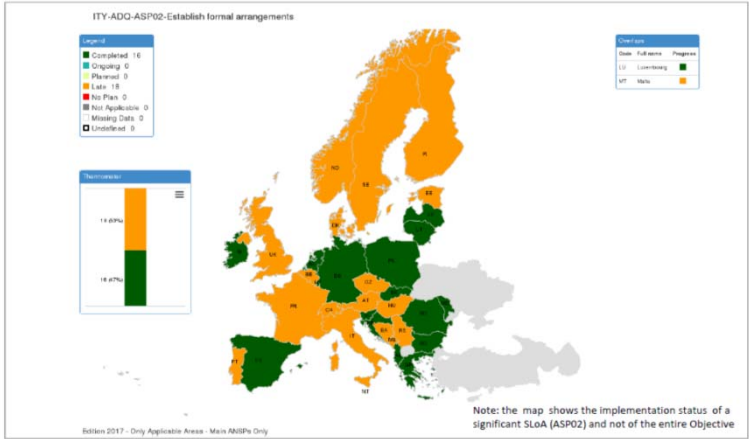
# 51%

## ITY-ADQ Global view ref. LSSIP Map Tool

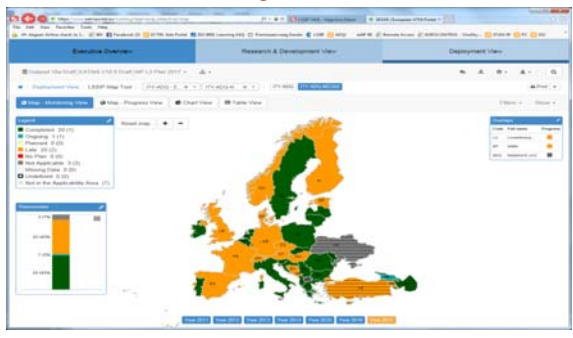


# Masterplan L3 Implementation Report 2018 (for 2017)

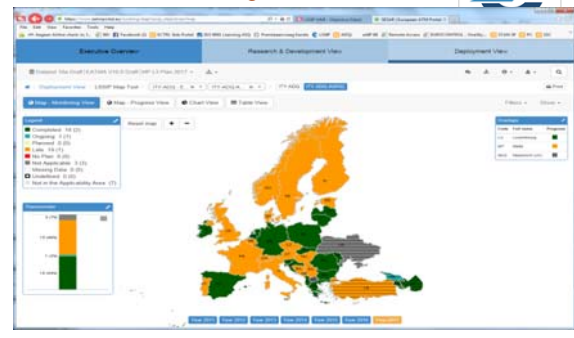
**Main 2017 developments:**  
 The FOC(06/2017) date was reached and at State level there is only one declared completion – Moldova. This poor progress was expected taking into account the high number of States that declared being Late in the last cycle. Some SLOAs that are on the critical path for ADQ implementation, such as Formal Arrangements (ASP02), did show some good progress with 16 ANSP declaring “Completed” (see map). It needs to be recognised that a lot of individual progress has been made by many stakeholders, mostly ANSP, nevertheless overall compliance is disappointing. This is notably due to strong dependencies on a wide range of data originators, challenging requirements, tool adaptations or procurement or a lack of resources. States are strongly urged to recover existing delays since ADQ compliance will provide an optimum baseline for later certification in accordance with the upcoming EASA rule Part-AIS. Note: EASA Opinion 02/2018 has been published on 8/3/2018 and the OJEU publication of Part-AIS is envisaged for the first half of 2019.



## REG02 Formal Arrangements



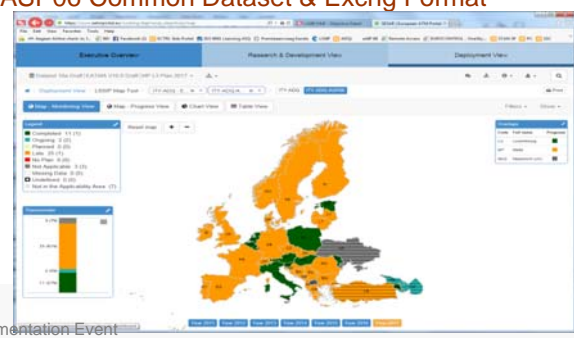
## ASP02 Formal Arrangements



## ASP05 QMS incl Safety objectives

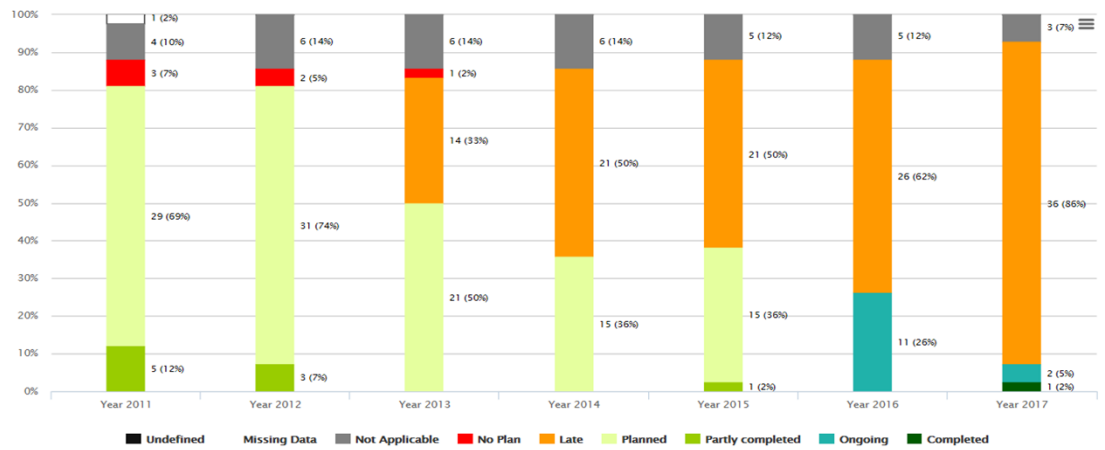


## ASP06 Common Dataset & Exchg Format



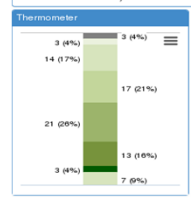
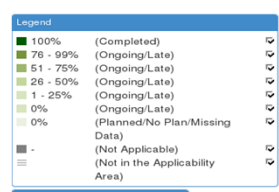
# ITY-ADQ Evolution view

## Evolution

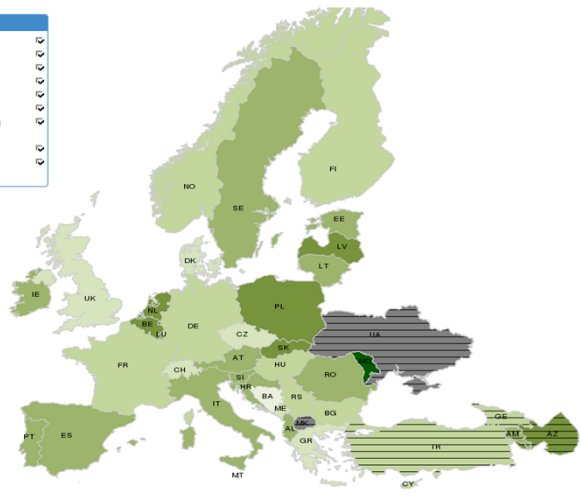


# ITY-ADQ Progress view

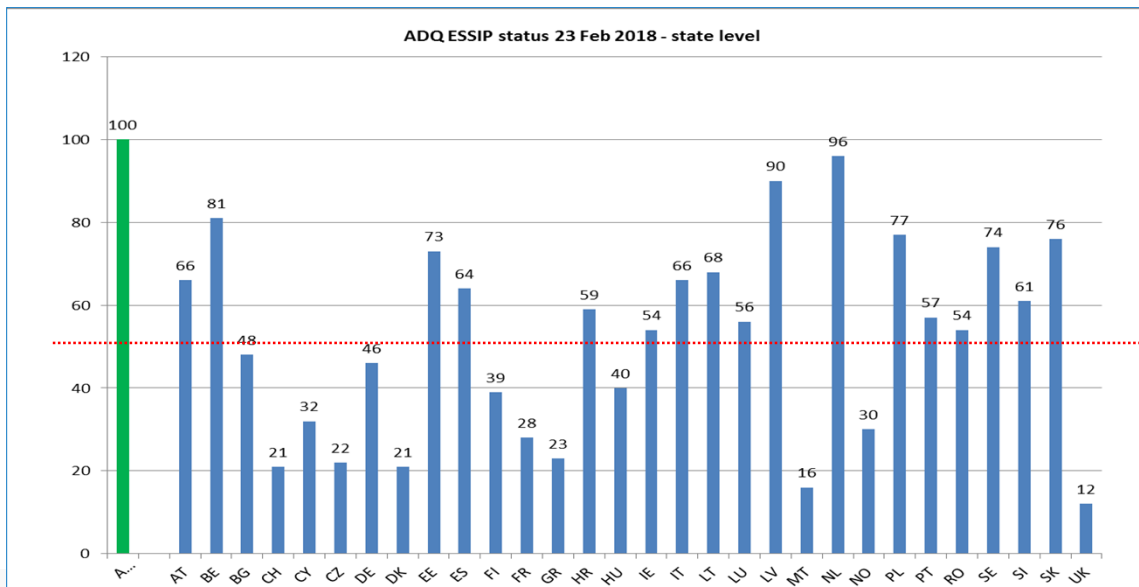
## ITY-ADQ - Ensure Quality of Aeronautical Data and Aeronautical Information



Code	Full name	Progress
MT	Malta	0%
LU	Luxembourg	100%
MAS	Maastricht UAC	0%



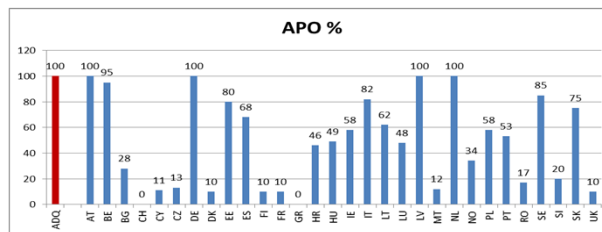
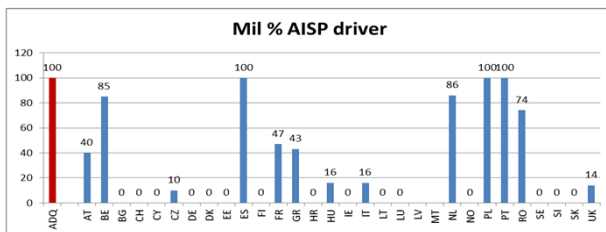
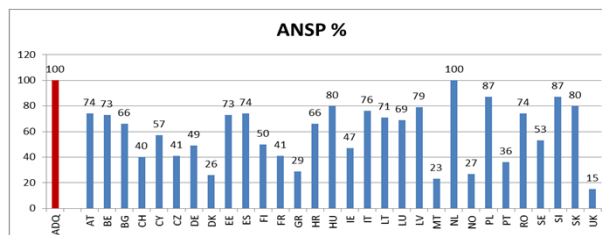
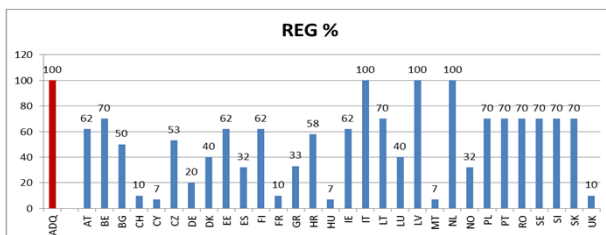
## ADQ Implementation status Overall % achieved at State level



INEA ADQ Implementation Event

11

## ADQ Implementation status % achieved by stakeholder groups



INEA ADQ Implementation Event

12

## Masterplan L3 *Implementation Report 2018 (draft for 2017)*

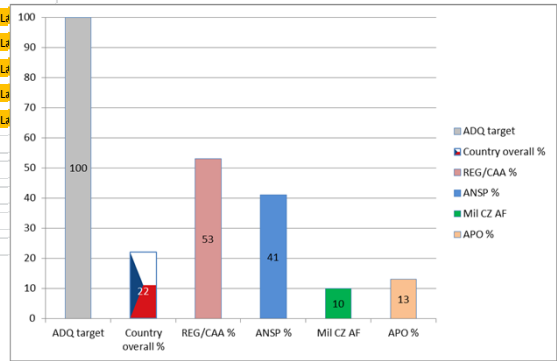
### Table 2: Implementation of PRE-SWIM elements in ECAC region

State <sup>1</sup>	FMTF	AIXM 5.1	ADQ	State	FMTF	AIXM 5.1	ADQ
AL	☑	2018	2018	IT	☑	2018	2018
AM	2018	n.a.	2018	LT	☑	2018	2018
AT	☑	2018	2019	LU	☑	n.a.	2020
AZ	☑	2018	2018	LV	☑	☑	2018
BA	☑	2018	2019	MAS	☑	☑	n.a.
BE	☑	☑	2019	MD	☑	n.a.	☑
BG	☑	☑	2018	ME	☑	2018	2020
CH	☑	☑	2023	MK	2019	n.a.	n.a.
CY	☑	☑	2018	MT	2018	n.a.	2018
CZ	☑	2021	2018	NL	☑	2023	2018
DE	☑	☑	2020	NO	☑	2018	2018
DK	☑	☑	2020	PL	☑	☑	2018
EE	2018	☑	2018	PT	2019	2018	2020
ES	☑	2018	2023	RO	☑	☑	2020
FI	2018	2018	2020	RS	☑	2019	2020
FR	2018	☑	2022	SE	2018	☑	2021
GE	☑	n.a.	2019	SI	☑	2018	2018
GR	2018	2018	2018	SK	☑	2018	2018
HR	☑	☑	2018	TR	☑	n.p.	2022
HU	☑	☑	2019	UA	2019	☑	n.a.
IE	☑	2018	2018	UK	2020	2018	2022

☑ completed; n.p. no plan yet; n.a. not applicable

## Masterplan L3 *Implementation Report 2018 (for 2017)*

LoA	Description	by date	Status	MIL
ITY-ADQ	Overall LSSIP implementation status		Late 31/12/2018	
ITY-ADQ-REG01	Verify the compliance with data quality requirements and supervise safety asse	30/06/2013	Late	
ITY-ADQ-REG02	Verify the establishment of formal arrangements	30/06/2013	Late	Late
ITY-ADQ-REG04	Verify that all parties comply with all data requirements	30-06-2017	Late	
ITY-ADQ-ASP01	Implement data quality and process requirements	30/06/2013	Late	Late
ITY-ADQ-ASP02	Establish formal arrangements	30/06/2013	Late	Late
ITY-ADQ-ASP03	Establish consistency mechanisms and implement timeliness requirements	30/06/2013	Late	Late
ITY-ADQ-ASP04	Implement personnel and performance requirements	30/06/2013	Completed	Late
ITY-ADQ-ASP05	Implement a quality management system and fulfil safety and security objective	30/06/2013	Completed	Late
ITY-ADQ-ASP06	Implement the common dataset and digital exchange format	30/06/2014	Late	Late
ITY-ADQ-ASP07	Implement all data requirements	30/06/2017	Late	Late
ITY-ADQ-APO01	Implement data quality and process requirements	30/06/2013	Late	
ITY-ADQ-APO02	Implement personnel and performance requirements	30/06/2013	Late	
ITY-ADQ-APO03	Implement a quality management system and fulfil safety and security objective	30/06/2013	Late	
ITY-ADQ-APO04	Implement the common dataset and digital exchange format requirements	30/06/2014	Late	
ITY-ADQ-APO05	Implement all data quality requirements	30/06/2017	Late	





**Aeronautical Data Quality - Implementation Workshop  
Czech Republic**

# **ADQ status based on ESSIP/LSSIP in the Czech Republic**

**Lukas Vanek**  
CAA Czech Republic  
04.09.2018, IATCC Jenec  
vanek@caa.cz


Úřad pro civilní letectví  
K letišti 1149/23, 160 08 Praha 6

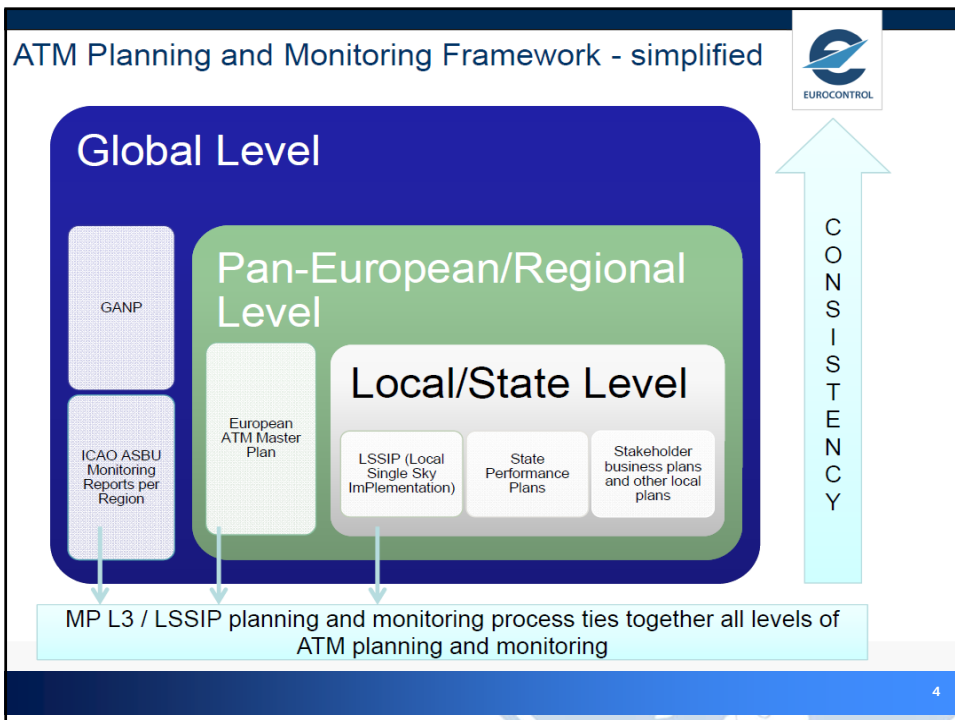
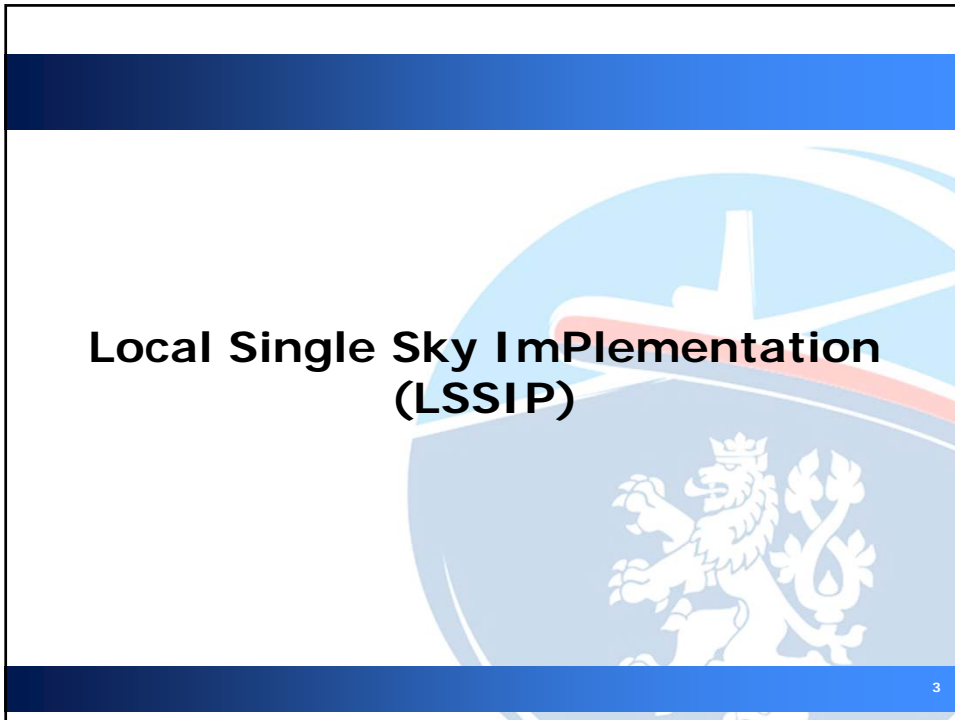


## **Outline**

- **Local Single Sky ImPlementation (LSSIP)**
- **ADQ in the Czech Republic** (overall status)
- **ITY-ADQ** – Ensure Quality of Aeronautical Data and Aeronautical Information

2








## LSSIP – brief introduction

- LSSIP is a document (planning and monitoring tool) showing implementation status and progress of ECAC States in ATM/ANS environment
- LSSIP serves to all ATM stakeholders (accessible on ECTRL website)
- LSSIP Expert Group, governed by the authorities of each MS
- The output of national LSSIPs goes as an input for European Masterplan, Level 3 report (former ESSIP)
- These documents are produced reviewed and updated annually
- LSSIP is aligned with SJU, ICAO (GANP), EASA, SESAR Deployment, EDA, etc...




Local Single Sky ImPlementation  
LSSIP 2017 - CZECH REPUBLIC  
Level 1 - Implementation Overview

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## LSSIP Documents - Overview

- **Planning and Reporting Tool**
  - Implementation Objectives
  - Stakeholder Lines of Action (SLoAs)
- For all National Stakeholders
- Annual documents
- 42 Documents (one per ECTL state + MUAC)
- Azerbaijan is not a ECTL member State but participates in the LSSIP monitoring (ECAC)




Level 1 – *High Level View on the National ATM situation (Public part)*  
 Level 2 – *Details on progress and plans of all Implementation Objectives (Restricted part)*

<http://www.eurocontrol.int/articles/lssip>

Click here to access LSSIP Documents 

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**Enabling Aviation Infrastructure**

Major ATM Changes	Pre-SESAR	(P)CP	New Essential Operational Changes / Operational Changes
Pre-SWIM & SWIM	<p><b>IP network</b></p> <ul style="list-style-type: none"> <li>• ITY-FMTP-FMTP over IPv6</li> </ul> <p><b>B2B services</b></p> <p><b>Information reference and exchange models</b></p> <ul style="list-style-type: none"> <li>• INFO7-eTOD</li> <li>• ITY-ADQ-Aeronautical Data Quality</li> </ul>	<p><b>Common Infrastructure</b></p> <p>Components: SWIM registry, PKI</p> <ul style="list-style-type: none"> <li>• INFO8.1-ISWIM Yellow TI Profile</li> </ul> <p><b>SWIM technical infrastructure and profiles</b></p> <ul style="list-style-type: none"> <li>• INFO8.1-ISWIM Yellow TI Profile</li> </ul> <p><b>Aeronautical information exchange</b></p> <ul style="list-style-type: none"> <li>• INFO8.1-ISWIM Yellow TI Profile</li> </ul> <p><b>Meteorological information exchange</b></p> <ul style="list-style-type: none"> <li>• INFO8.1-ISWIM Yellow TI Profile</li> </ul> <p><b>Cooperative network information exchange</b></p> <ul style="list-style-type: none"> <li>• INFO8.1-ISWIM Yellow TI Profile</li> </ul> <p><b>Flight information exchange</b></p> <ul style="list-style-type: none"> <li>• INFO8.1-ISWIM Yellow TI Profile</li> <li>• INFO8.2-ISWIM Blue TI Profile</li> <li>• FCM08-Extended Flight Plan</li> </ul> <p><b>Communications Infrastructure</b></p> <ul style="list-style-type: none"> <li>• COM12-NewPENS</li> </ul>	<p><b>Digital Integrated Briefing</b></p>
Data Link	<p><b>A/G datalink</b></p> <ul style="list-style-type: none"> <li>• ITY-AGDL-A/G Data-link</li> </ul>	<p><b>Initial trajectory information sharing (I4D)</b></p>	<p><b>Information sharing and business trajectory</b></p> <p><b>Mission trajectory</b></p>
CNS Rationalisation	<p><b>ADS-B, WAM</b></p> <ul style="list-style-type: none"> <li>• ITY-ACID-Aircraft Identification</li> <li>• ITY-SPI-Surveillance performance and interoperability</li> </ul> <p><b>GNSS, GBAS, SBAS</b></p> <p><b>Communications infrastructure</b></p> <ul style="list-style-type: none"> <li>• COM10-Basic and enhanced AMHS</li> <li>• ITY-AGVCS2-8.33KHz below FL195</li> </ul>	<p><b>Communications Infrastructure</b></p> <ul style="list-style-type: none"> <li>• COM11-Voice over IP (*)</li> <li>• COM12-NewPENS</li> </ul>	<p><b>CNS rationalisation</b></p>

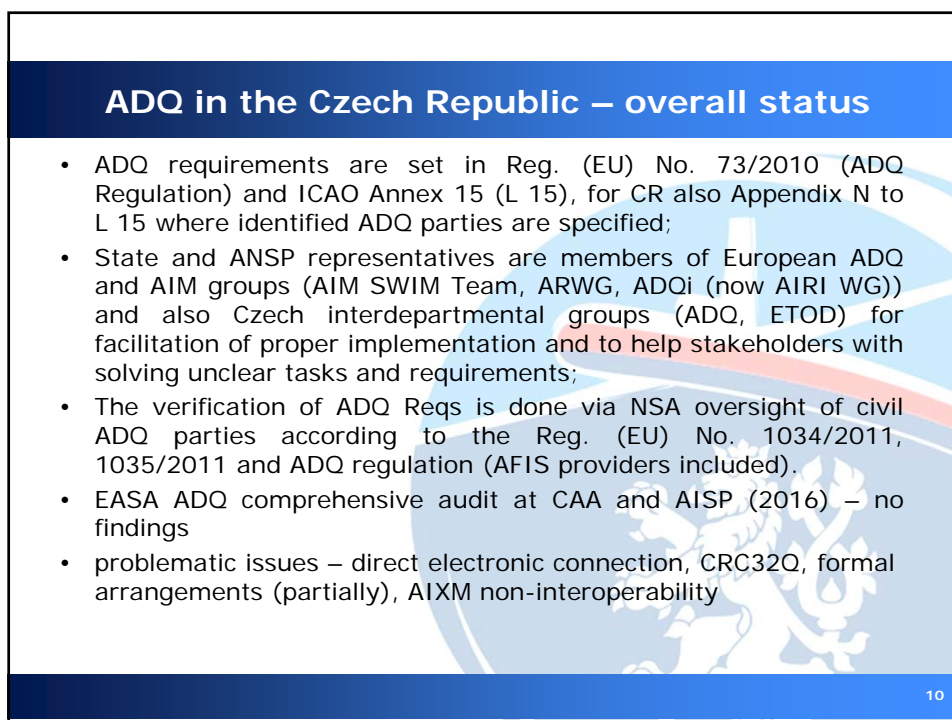
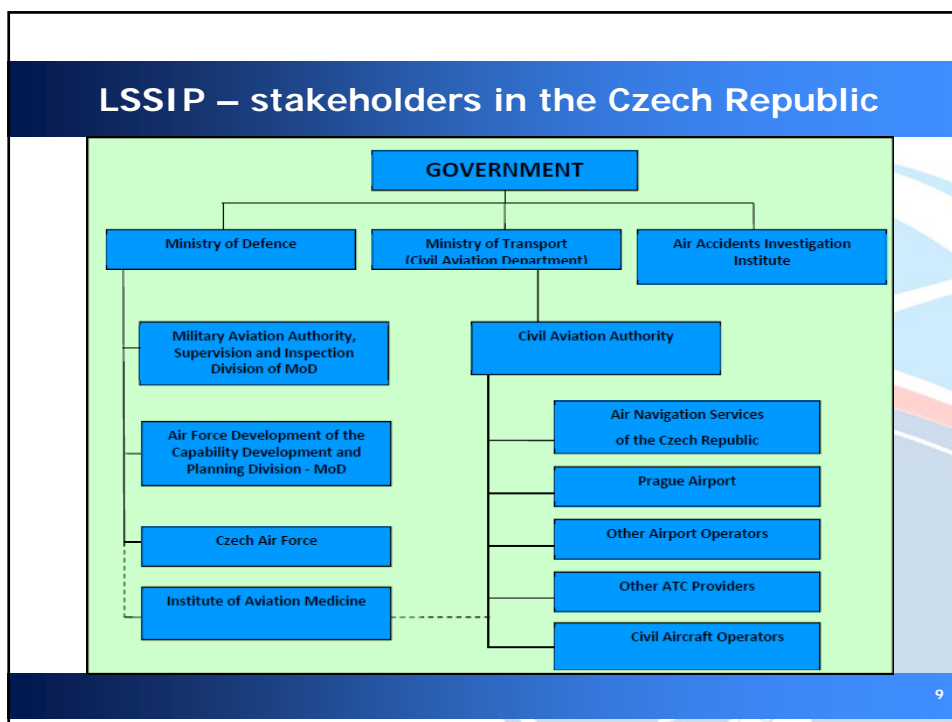
(\*) Not mandated by the PCP Regulation but enabling some SESAR 1 operational changes

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**ADQ in the Czech Republic**  
(overall status)

8



## ITY-ADQ – LSSIP implementation status in the Czech Republic

11

## LSSIP - ITY-ADQ - OVERVIEW

- Based on Reg. (EU) No. 73/2010 – all data requirements implemented by 30.6.2017;
- Requirements on quality in terms of accuracy, integrity and resolution, and it applies up to the moment when the AD are made available by the AISP to the next intended user;
- ITY-ADQ objective stakeholders:
  - AISP (ANS CR)
  - CAA
  - MAA, CDPD
  - APO (LKPR)
  - Industry manufacturers

**ITY-ADQ - Ensure Quality of Aeronautical Data and Aeronautical Information**

This objective is derived from Regulation (EU) No 73/2010 on the quality of aeronautical data and aeronautical information in terms of accuracy, resolution and integrity. It applies to systems, their constituents and procedures involved in the origination, production, storage, handling, processing, transfer and distribution of aeronautical data and aeronautical information. It applies to the integrated aeronautical information package (IAP) [with the exception of aeronautical information circulars], electronic obstacle and electronic terrain data or elements thereof, and aerodrome mapping data.

<b>SESAR Key Feature:</b>	Enabling Aviation Infrastructure	<b>When</b>	30/06/2017
<b>Essential Operational Change / PCP:</b>	Prerequisite for: - 2-AIS 2 - Enhanced Terminal Airspace using RNP-based Operations - AFS - Initial DTM	<b>FOC:</b>	See intermediate milestones in the SlaAs list in the second page.
<b>DP Families:</b>	1.3.2 Geographical database for procedure design	<b>Who</b>	Stakeholders: - Regulators - AISP - Airport Operators - Industry
<b>OT Steps &amp; Enablers:</b>	IS-0302, IS-0204	<b>Where</b>	Applicability Area All EU+ States except FRONL, Georgia and Mauritius LAC
<b>Dependencies:</b>	No dependencies	<b>Status</b>	<span style="background-color: red; color: white; padding: 2px;">Late</span>
<b>ICAO ASBU:</b>	80-DATM	<b>Completion rate - end 2017:</b>	3%
<b>Network Strategy Plan:</b>	SO2/2	<b>Estimated achievement:</b>	12/2020
<b>Operating Environment:</b>	Airport, Terminal, Mixed, En-Route, Network		
<b>EATMN Systems:</b>	AIS		

**Applicable regulations & standards**

- Regulation (EU) 73/2010 on the quality of aeronautical data and aeronautical information (the ADQ Regulation)
- Regulation (EU) 2019/2024 amending Regulation (EU) 73/2010
- ICAO Annex 15

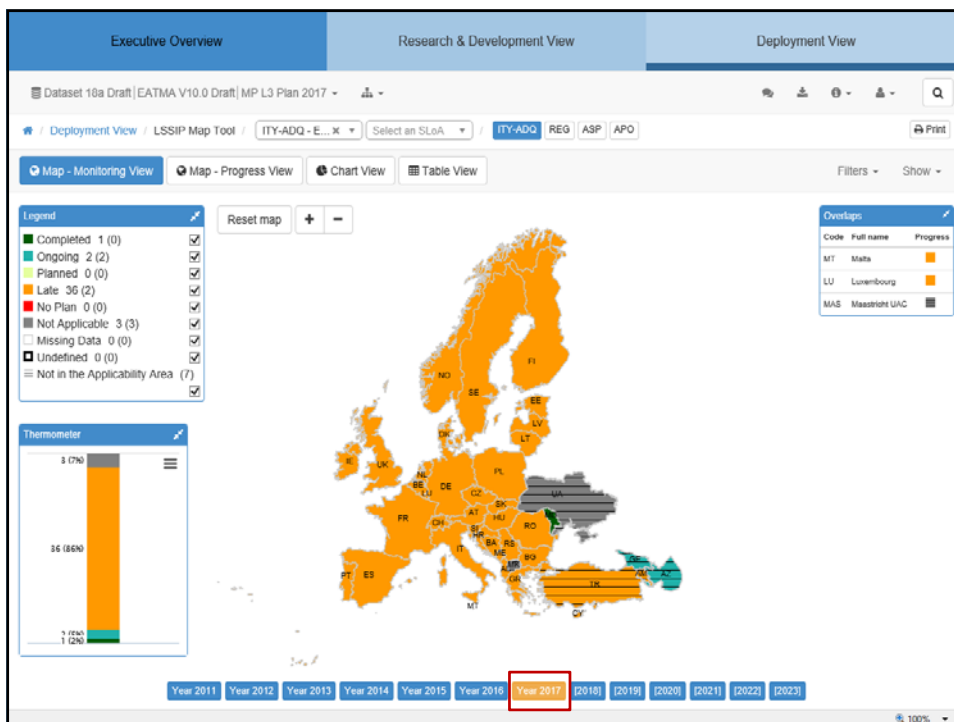
**Benefits**

- Safety**  
Improved consistency, reliability and integrity of aeronautical data and aeronautical information.
- Security**  
Enhanced security due to the implementation of security requirements.

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Progress determination in implementation		
Completed	Function in operational use.	100%
On going	<b>Planned date ≤ Deadline</b>	1-99%
	Implementation has kicked off, but is not yet fully completed and the planned implementation date is within the SLoA finish date.	
Planned	A planned schedule and proper (approved and committed budgeted) actions are specified within the SLoA finish date for completion	0%
Late	<b>Planned date &gt; Deadline</b>	0-99%
	An SLoA shall be reported "Late" in the case when there is a firm commitment to implement the SLoA (e.g. budget and schedule approved) but foreseen to be achieved after the SLoA finish date	
No Plan	No plan yet -> Feasibility phase, no budget allocated, risk identification, etc.	xx%
Not Applicable	Objective is not relevant for the State	-

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Regulatory Lines of Action:		
REG01	Verify the compliance with data quality requirements and supervise safety assessments	30-06-2013
REG02	Verify the establishment of formal arrangements	30-06-2013
REG04	Verify that all parties comply with all data requirements	30-06-2017
ANSPs Lines of Action:		
ASP01	Implement data quality and process requirements	30-06-2013
ASP02	Establish formal arrangements	30-06-2013
ASP03	Establish consistency mechanisms and implement timeliness requirements	30-06-2013
ASP04	Implement personnel and performance requirements	30-06-2013
ASP05	Implement a quality management system and fulfil safety and security objectives	30-06-2013
ASP06	Implement the common dataset and digital exchange format	30-06-2014
ASP07	Implement all data requirements	30-06-2017
Airport Operators Lines of Action:		
APO01	Implement data quality and process requirements	30-06-2013
APO02	Implement personnel and performance requirements	30-06-2013
APO03	Implement a quality management system and fulfil safety and security objectives	30-06-2013
APO04	Implement the common dataset and digital exchange format requirements	30-06-2014
APO05	Implement all data quality requirements	30-06-2017
Industry Lines of Action:		
IND01	Implement data quality and process requirements	30-06-2013
IND02	Implement personnel and performance requirements	30-06-2013
IND03	Implement a quality management system and fulfil safety and security objectives	30-06-2013
IND04	Implement the common dataset and digital exchange format requirements	30-06-2014
IND05	Implement all data quality requirements	30-06-2017

ITY-ADQ lines of action			
ITY-ADQ	<b>Ensure Quality of Aeronautical Data and Aeronautical Information</b> <u>Timescales:</u> Entry into force of the regulation: 16/02/2010 Article 5(4)(a), Article 5(4)(b) and Article 6 to 13 to be implemented by: 30/06/2013 Article 4, Article 5(1) and Article 5(2), Article 5(3) and Article 5(4)(c) to be implemented by: 30/06/2014 All data requirements implemented by: 30/06/2017	22%	Late
	The working group at national level was established and all required actions including time schedule are in preparation. Part of the requirements are fulfilled as a part of the standard NSA oversight process with regard to ICAO and SES legislation requirements. The objective will be completed when ANS CR provides new AIM system planned for 2018. MIL has its own system. The upgrade of MIL systems to be fully compliant with Regulation (EC) 73/2010 is planned for 2018, however their implementation fully depends on the MIL budget limitations.		31/12/2018
REG (By:06/2017)			
CAA CR		53%	Late
The working group at national level was established and all required actions including time schedule are in preparation.		-	31/12/2018

ITY-ADQ lines of action (CAA) (1/3)			
ITY-ADQ-REG01	Verify the compliance with data quality requirements and supervise safety assessments	From: -	By: 30/06/2013
Action by:	State Authorities		
Description & purpose:	Verify that data quality and process requirements are fulfilled in accordance with Article 6 (with the exception of Article 6 (3), see ITY-ADQ-REG02) and Annex IV Parts A, B, D, E and F of Regulation (EU) No 73/2010.  Supervise that a safety assessment is conducted in accordance with Article 10 of Regulation (EU) No 73/2010 and review the safety assessment report. If applicable review the safety arguments. Notify the acceptance of the change to the ANSP/ANS.		
CAA CR	-	75%	Late
	1 Activity started (e.g. Project kicked-off)	10%	Y
			-
	2 Verification that data quality and process requirements were met	30%	Y
			-
	3 Supervision of safety assessment conducted	35%	Y
			-
	4 Notification that changes were accepted	25%	N
			31/12/2018
Comment:	Most of the ANS organisations (including ANS CR) have submitted EN ISO 9001 certificate to the NSA.		
17			

ITY-ADQ lines of action (CAA) (2/3)			
ITY-ADQ-REG02	Verify the establishment of formal arrangements	From: -	By: 30/06/2013
Action by:	State Authorities		
Description & purpose:	Verify that appropriate formal arrangements, respecting at least the minimum content, are established between the relevant parties in accordance with Article 6(3) and Annex IV Part C of Regulation (EU) No 73/2010.		
CAA CR	-	75%	Late
	1 Activity started (e.g. Project kicked-off)	10%	Y
			-
	2 Formal arrangements have been received	65%	Y
			-
Comment:	Formal arrangements were established between ANS CR and LKPR and signed at the end of 2016,		
	3 Formal arrangements have been verified and accepted	25%	N
			31/12/2018
Comment:	Formal arrangements were established between ANS CR and LKPR and signed at the end of 2016, formal arrangements between ANS and other stakeholders will follow in 2018. Formal arrangement between CAA CZ and ANS CR (AIS provider) were signed in 2017 (Stemms from Reg. EU No. 73/2010).		
18			

## ITY-ADQ lines of action (CAA) (3/3)

ITY-ADQ-REG04	Verify that all parties comply with all data requirements	From: -	By: 30/06/2017
Action by:	State Authorities		
Description & purpose:	Verify that those aeronautical data and aeronautical information items published before 1 July 2013 and not amended since are brought in line by 30 June 2017, at the latest, and that all parties fulfil the requirements in accordance with Article 14 of Regulation (EU) No 73/2010.		
CAA CR	-	10%	Late
	1 Activity started (e.g. Project kicked-off)	10%	Y
			-
	2 All parties publishing aeronautical data and/or aeronautical information comply with all the requirements	65%	N
			-
	3 An according statement of compliance has been received	25%	N
			31/12/2018
Comment:	This objective will be completed when ANS CR provides new AIM system planned for 2018. The final preparations are on the way. The NSA will exercise established procedures.		

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## ITY-ADQ lines of action (ANSP)

ITY-ADQ-ASP01	Implement data quality and process requirements	From: -	By: 30/06/2013
Action by:	ANS Providers		
Description & purpose:	<p>Implement the data quality, evidence, origination, process, error reporting and rectification requirements in accordance with Article 6 (with the exception of Article 6(3), see: ITY-ADQ-ASP02) and Annex IV Parts A, B, D, E and F of Regulation (EU) No 73/2010 and provide written evidence that the requirements are met.</p> <p>Validate and verify all tools used to support or automate processes in the origination, production, storage, handling, processing and transfer of aeronautical data and/or aeronautical information in accordance with Article 8 and Annex V of Regulation (EU) No 73/2010. Protect data against loss or alteration in accordance with Article 9 and Annex VI of Regulation (EU) No 73/2010.</p> <p>Conduct a safety assessment including hazard identification, risk assessment and mitigation in accordance with Article 10 of Regulation (EU) No 73/2010 and provide a safety assessment report to the NSA. If applicable provide safety arguments to the NSA.</p> <p>Conduct a verification of the systems demonstrating the conformity with the interoperability, performance and safety requirements in accordance with Article 12 and Annex IX and X of Regulation (EU) No 73/2010 and draw up an EC declaration of verification of systems together with a technical file.</p>		
ASP ANS CR	-	41%	Late
	The working group at national level was established. Part of required actions are implemented; see details below. The objective will be completed when ANS CR provides new AIM system planned for 2018.		31/12/2018
ITY-ADQ-ASP01	Implement data quality and process requirements		by:30/06/2013
ASP ANS CR	-	10%	Late
	1 Activity started (e.g. Project kicked-off)	10%	Y
			-
	2 Implement data quality, evidence, origination, process, error reporting and rectification requirements. Validate and verify all tools used to support or automate processes	30%	N
			-
	3 Conduct a safety assessment, provide a safety assessment report to the NSA and if applicable provide safety arguments to the NSA	35%	N
			-
	4 Introduction of the change into service was accepted by the NSA and a notification of acceptance has been received. An EC declaration of verification of systems and a technical file has been submitted to the NSA	25%	N
			31/12/2018
Comment:	The requirements are related to 3 following systems, NOTAM/OPMET which fulfilled requirements, AISVIEW upgrade was completed and AIM System where the upgrade is planned for 12/2018. The requirements are fulfilled for NOTAM/OPMET and AISVIEW, Safety assessment report for AIM System will be provided in 2018. NOTAM/OPMET, PL US and AISVIEW systems have DOV accepted by NSA.		

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## ITY-ADQ lines of action – ANSP (1/2)

### ANSP

- Part of interdepartmental ADQ WG, the overall objective will be completed with new AIM System
- ITY-ADQ-ASP01 Implement DO and process requirements – the requirements related to 3 systems – NOTAM/OPMET, AISVIEW and PLIS (all have NSA accepted DoV), waiting for AIM System (planned for 12/2018)
- ITY-ADQ-ASP02 Establish formal arrangements – formal arrangements signed with – all IFR airports (except LKVO), CAA as a ASM data originator, negotiations with MoT and MoD (waiting for MoT statement), LKPD (CIV-MIL, ongoing)
- ITY-ADQ-ASP03 Establish consistency mechanisms and implement timeliness reqs – Art. 7(1), 7(3), 7 (4) and 7 (5) of ADQ reg. fulfilled, Art. 7 (2) partially fulfilled (non-ADQ compliant data are listed in AIP GEN 1.7, but they are not marked as such in database, waiting form AIM System

Late

31/12/2018

by:30/06/2013

Late

by:30/06/2013

Late

by:30/06/2013

Late

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## ITY-ADQ lines of action – ANSP (2/2)

### ANSP

- ITY-ADQ-ASP04 Implement personnel and performance requirements – AIS personnel adequately trained, competent and authorised according to the provisions of ADQ Reg – verified by NSA regulatory audits (2013, 2015, 2017)
- ITY-ADQ-ASP05 Implement QMS and fulfil safety and security objectives – QMS in place, documented and maintained, it has been provided to NSA
- ITY-ADQ-ASP06 Implement the common dataset and digital exchange format – activity started in 2018
- ITY-ADQ-ASP07 Implement all data requirements – activity is ingoing

by:30/06/2013

Completed

by:30/06/2013

Completed

by:30/06/2014

Late

by:30/06/2017

Late

22

## ITY-ADQ lines of action - APO

### APO (LKPR)

- Part of interdepartmental ADQ WG, APO is in process of software procurement to meet the ADQ requirements
- ITY-ADQ-APO01 Implement DO and process requirements – activity started in 2018
- ITY-ADQ-APO03 Implement a QMS and fulfil safety and security objectives – activity started
- ITY-ADQ-APO04 – Implement the common dataset and digital exchange format requirements – activity has already started
- ITY-ADQ-APO05 – Implement all data quality reqs – activity started, AIXM 5.1,

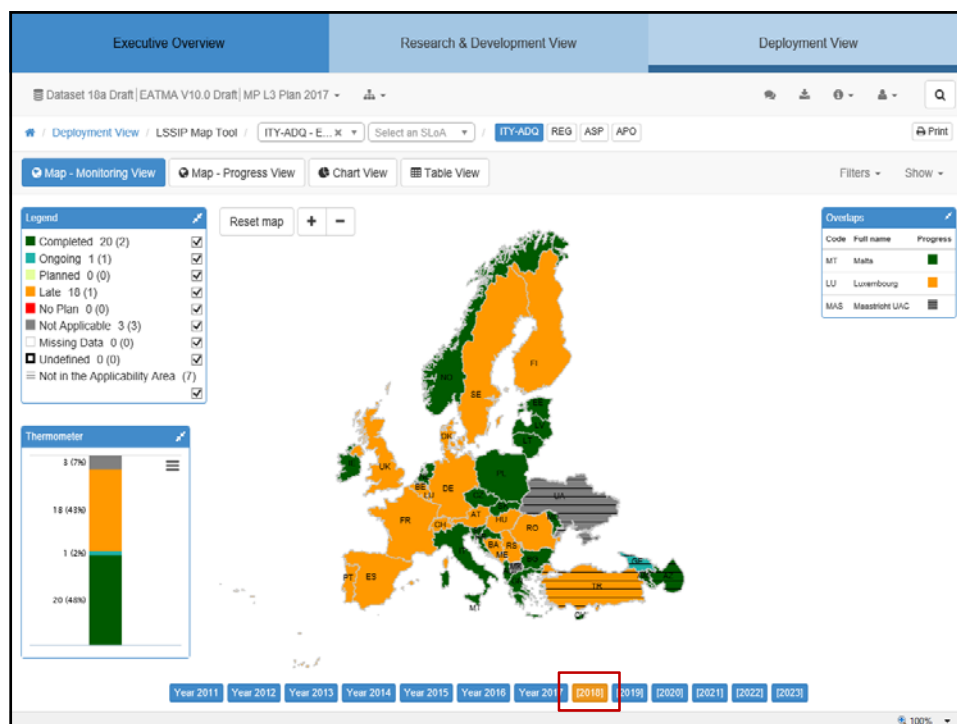
Late
31/12/2018
by:30/06/2013
Late
by:30/06/2013
Late
by:30/06/2014
Late
by:30/06/2017
Late

23

## ITY-ADQ lines of action – MAA, CDPD, Czech Force (summary)

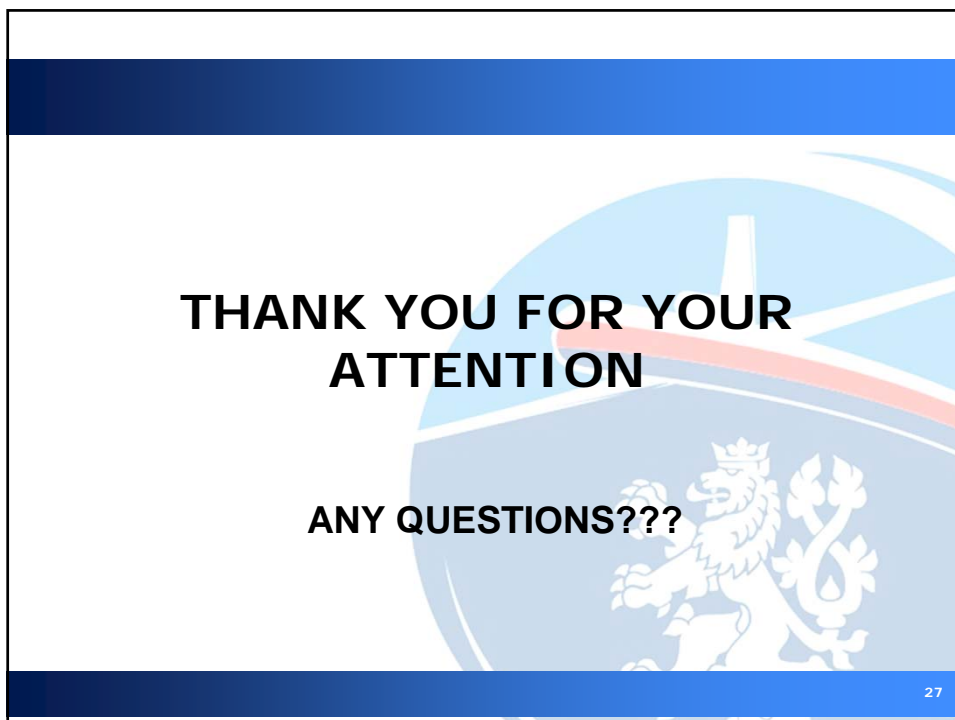
- The tender for the Mil ADQ compliant System has been signed by MIL authorities.
- Currently waiting for the system supplier (problem with location of the system)
- The system should meet the most of ADQ requirements, discussions ongoing with AIS
- Formal arrangements – the FA with civil AIS has been distributed over MIL authorities, waiting for signature

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## ADQ – hopes, wishes and challenges

- AIM system introduction at ANSP
- 2017/373 – fluent transition without any „unexpected constraints“
- interoperability
- proper guidance material and sharing best practises amongst WGs
- outcome from this workshop may help



**THANK YOU FOR YOUR  
ATTENTION**

**ANY QUESTIONS???**

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# Main Differences ADQ vs Future EASA Part- AIS & consequential Amendments to 139/2014

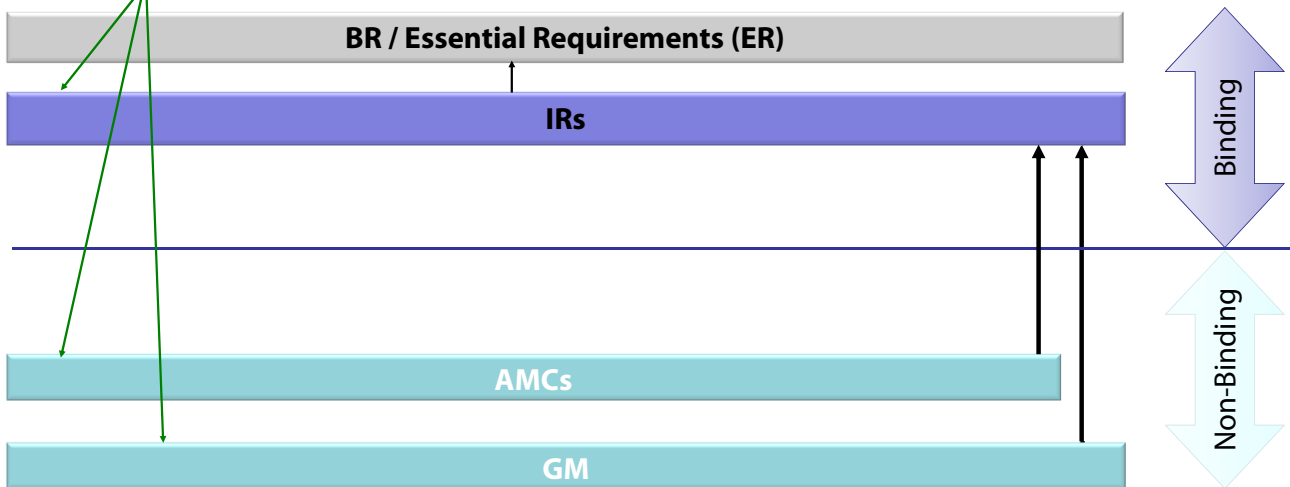
INEA ADQ Implementation Workshop  
ANS Czech Republic  
Prague, 4-6 Sep 2018

Manfred UNTERREINER  
EUROCONTROL  
DECMA / ACS / STAN

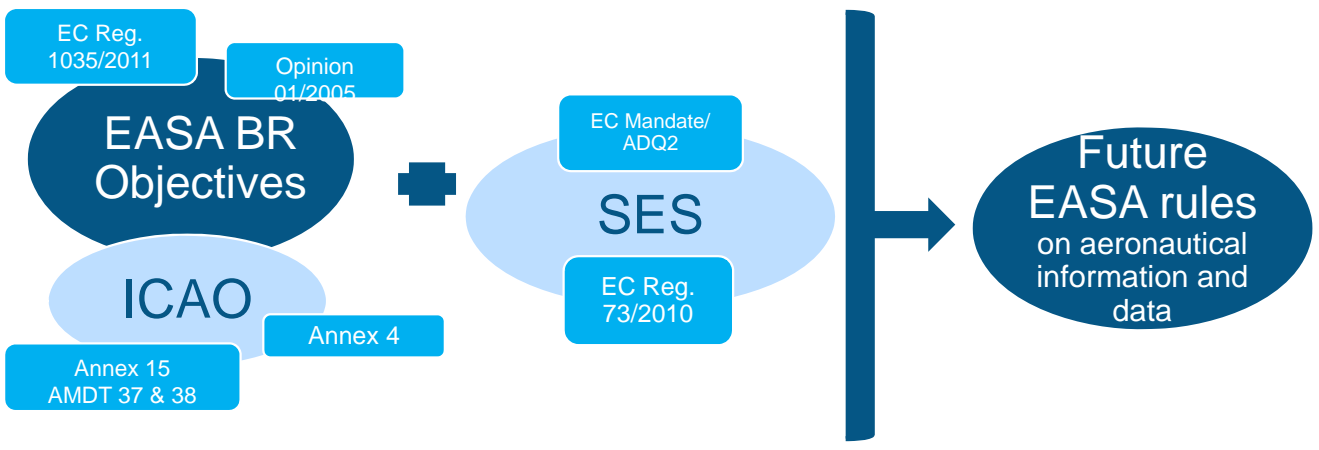
## EASA Rulemaking



Implementing Measures



# EASA's overall approach in reference to AIS/AIM



# Objectives of RMT on AIS/AIM

- Transpose various baseline material from different sources into consistent set in EU legislation

- ADQ-IR 73/2010
- ICAO Annex 15
- PANS-AIM
- ICAO AIS Manual
- ICAO Annex 4
- ECTL Specs & GM
- EUROCAE ED 76A
- ...

Amendments to

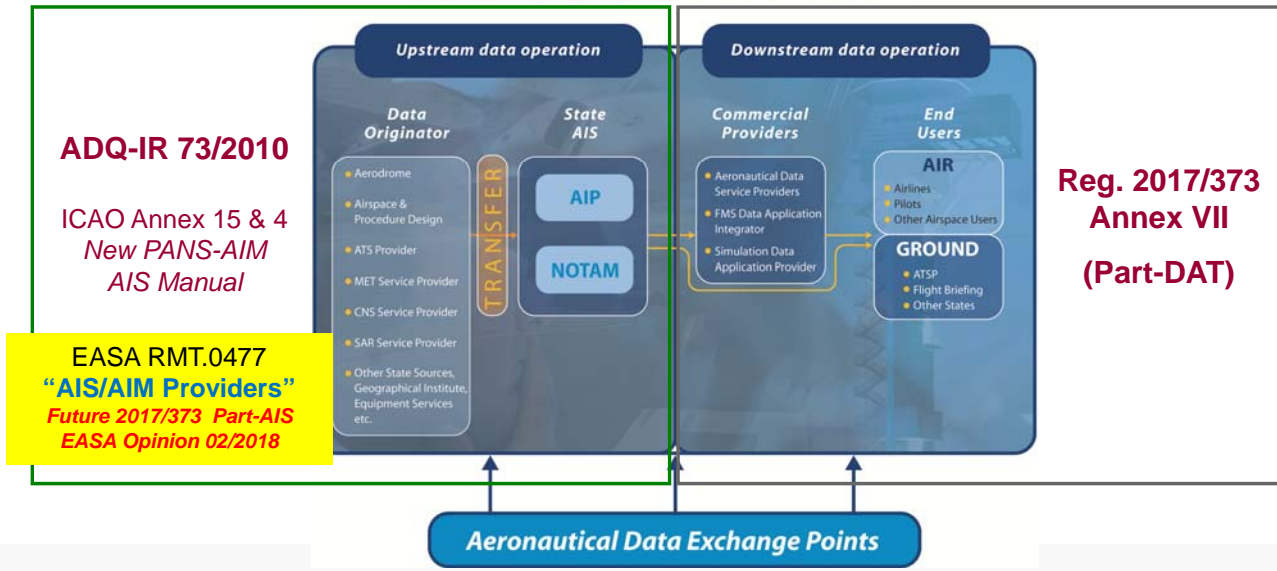
Reg. 2017/373

+

ADR-IR 139/2014

+ new extensive set of AMC/GM

### Aeronautical Data Chain



### General differences of the future EASA Part-AIS versus ADQ

- AIS/AIM Provider rule will be at **higher level**
  - Performance based approach
  - Details addressed in AMC/GM
  
- Presentation & construction of the **rule package**
  - Multiple Annexes that apply per party
  - AMC/GM published as separate EASA Decision



## Key differences of the future EASA AIS rule versus ADQ



## Other Data Originators Member State duty within Cover Regulation



### DQRs introduced by reference in Article 3(5)

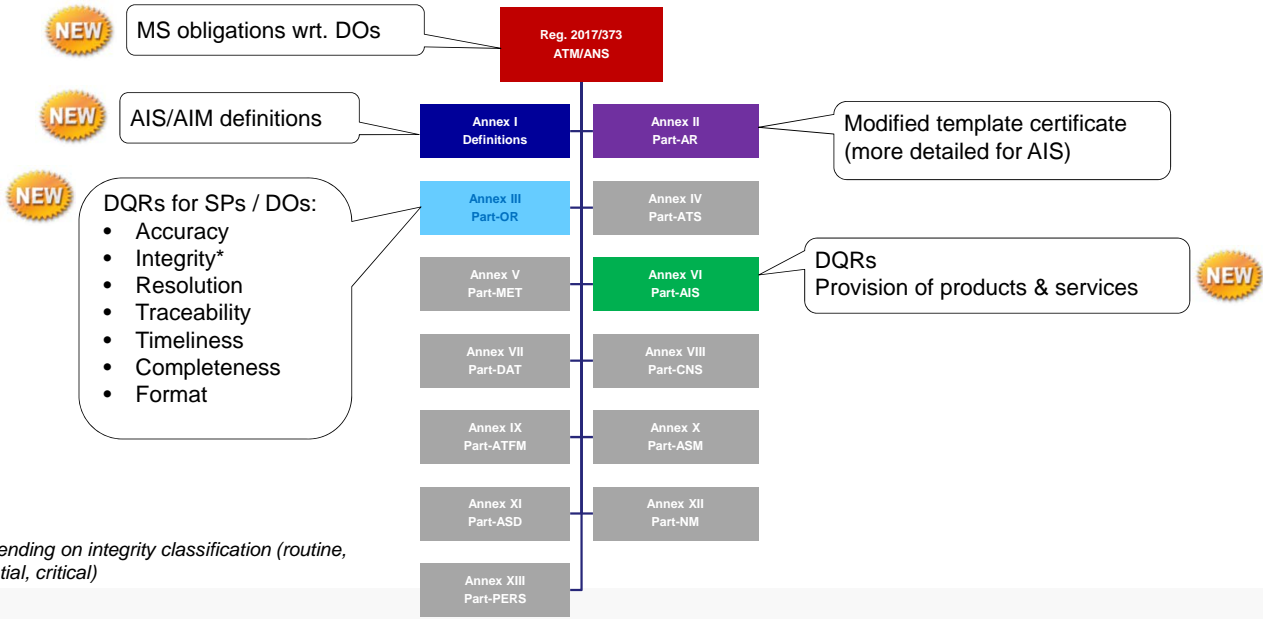
New paragraphs 5, 6,7 and 8 are added:

- (5) When aeronautical data and aeronautical information is originated by parties other than service providers regulated by this Regulation or other than aerodrome operators regulated by Regulation (EU) No 139/2014, Member States shall ensure that:
- (i) those aeronautical data and aeronautical information meet the requirements laid down in:
    - (A) ATM/ANS.OR.A.085, except those in points (e), (g) and (h); and
    - (B) ATM/ANS.OR.A.090; and
  - (ii) personnel of those parties meet the requirements of ATM/ANS.OR.B.005(a)(6).

Draft – subject to review at SSC level

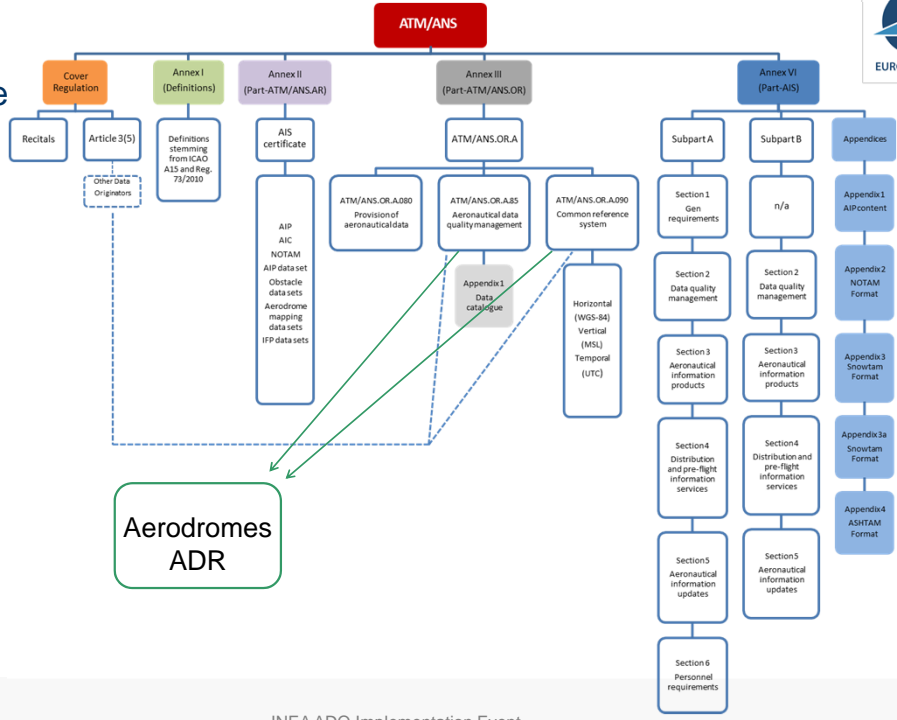


# ATM/ANS Rule Structure incl. Future Provisions for AIS/AIM Providers

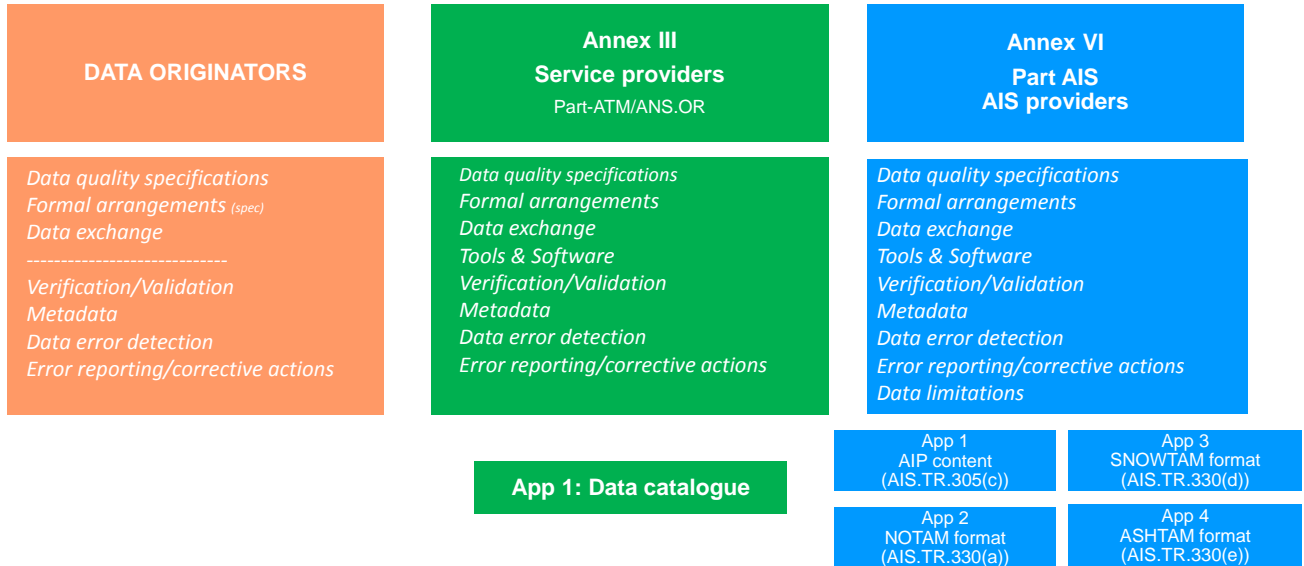


\* Depending on integrity classification (routine, essential, critical)

## Part AIS/AIM Rule structure



## Data quality requirements



## Part-AIS and its wider Regulatory Consequences



- Will **repeal** ADQ-IR 73/2010
- **Proposes** changes to Reg. 2017/373
  - Article 3 (5)
  - Annex I, II
  - Annex III ATM/ANS.OR.A.080/085/090 and *OR.B.005(a)(6)*
  - Annex VI Part-AIS new set of rules for AISPs
- **Proposes** consequential amendments to ADR Reg. 139/2014 incl. relevant AMC/GM to:
  - **replace** ADR.OR.D.007 with **revised** provisions for Management of aeronautical data/information
  - **amend** ADR.OR.D.015 with rel. data competence aspects
  - **add** a series of Data quality requirements in ADR.OPS.A.010 - .055 by basically replicating data origination requirements if ADR originate data (align with 373/Anx III).



# Next estimated Steps at EC/SSC Level... if all goes well...

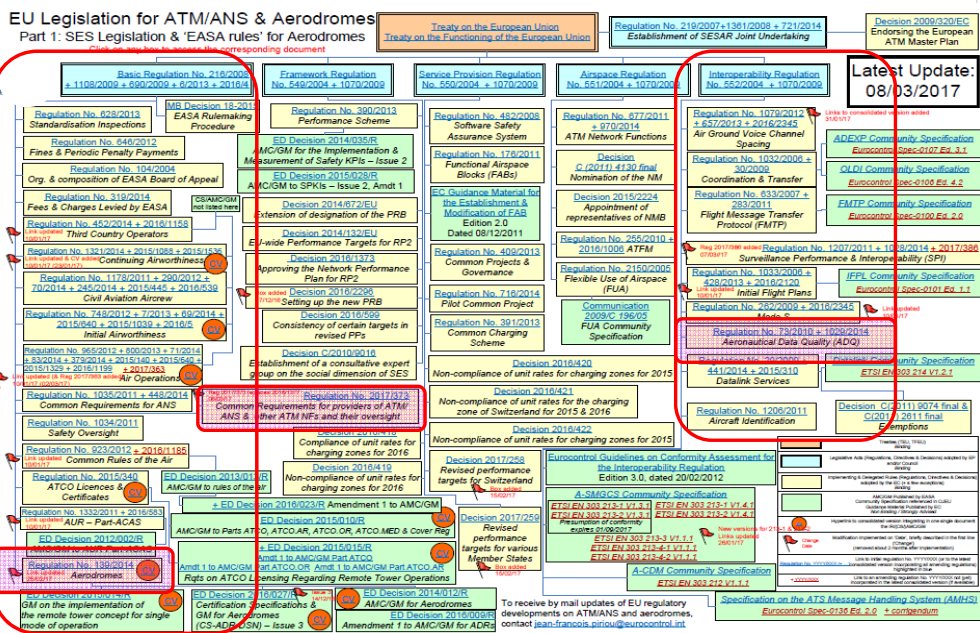


- EASA Opinion published **8/3/2018**: Explanatory Note, Draft regulation (amending Reg. 2017/373), draft AMC/GM plus CRD
- Current:
  - EC to perform inter-service & legal consultations => **Q2/3 2018**
  - EC to **discuss at level of SSC** content of proposals => **est. Q3/4 2018**
  - **SSC to adopt** the rule (transition arrangements) => **est. Nov 2018**
  - Translation and **Publication of Rules in OJEU** => **est. Q2/2019**
  - EASA Decision to **publish AMC/GM** => **est. Q2/2019**
  - Envisaged **Applicability date: 2/1/2020**, except SNOWTAM (5/11/2020).



INEA ADQ Implementation Event

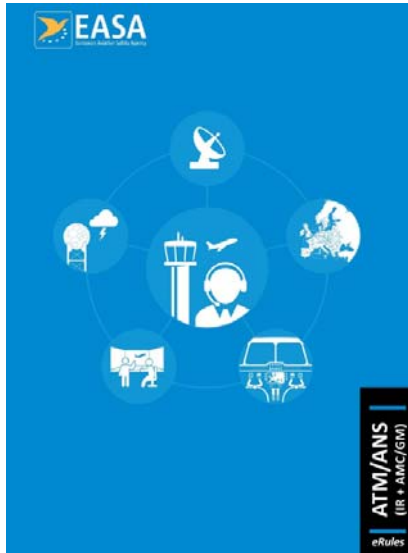
# “The big Picture of European Aviation Regulations”



INEA ADQ Implementation Event

# EASA Easy Access Rules for ATM/ANS

<https://www.easa.europa.eu/document-library/general-publications/easy-access-rules-air-traffic-managementair-navigation>



Implementing rule	Commission regulation
Acceptable means of compliance	ED Decision
Guidance material	ED Decision

### ATM/ANS.OR.B.030 Record-keeping

- Agreement (EU) 2017/177
- (a) A service provider shall establish a system of record-keeping that allows adequate storage of the records and reliable traceability of all its activities, covering in particular all the elements indicated in point ATM/ANS.OR.B.030.
  - (b) The format and the retention period of the records referred to in point (a) shall be specified in the service provider's management system procedures.
  - (c) Records shall be stored in a manner that ensures protection against damage, alteration and theft.

### AMC1 ATM/ANS.OR.B.030 Record-keeping

- ED Decision 2017/041/R
- GENERAL
- (a) The record-keeping system should ensure that all the records required in ATM/ANS.OR.B.030(a) are accessible whenever needed. These records should be organised in a way that ensures traceability and retrieval throughout the retention period.
  - (b) Records should be kept in paper form or in electronic format or a combination of both. Records stored on microfilm or optical disc format are also acceptable. The records should remain legible throughout the required retention period. The retention period starts when a record has been created or last amended.
  - (c) Paper systems should use robust material which can withstand normal handling and filing.
  - (d) Computer systems should have at least one backup system which should be updated within 24 hours of any new entry. Computer systems should include safeguards against the probability of unauthorised personnel altering the data.
  - (e) All computer hardware used to ensure data backup should be stored in a different location from that containing the working data and in an environment that ensures they remain in good condition. When hardware or software changes take place, special care should be taken that all necessary data continues to be accessible at least through the full retention period.

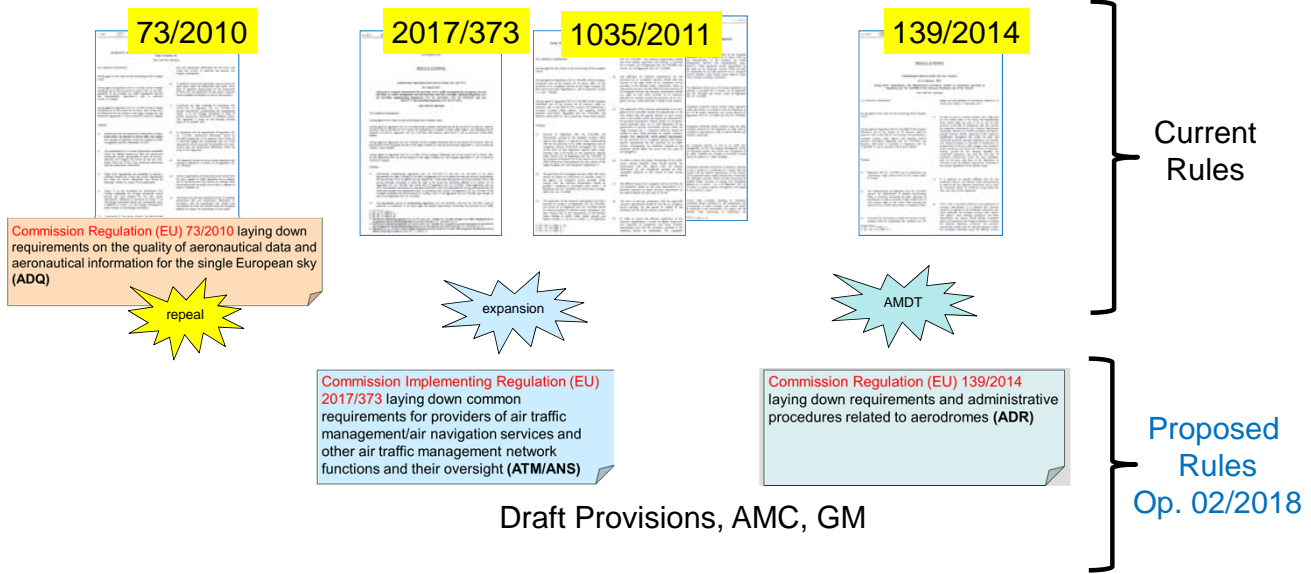
### GM1 ATM/ANS.OR.B.030 Record-keeping

ED Decision 2017/041/R

GENERAL

The record-keeping provision is intended to address the management system records rather than operational data which is covered by other record-keeping applicable requirements.

## Challenge for this WS: Evolution of Regulatory package





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Co-financed by the Connecting Europe  
Facility of the European Union



# Data Origination

INEA ADQ Implementation Workshop  
ANS Czech Republic  
Prague, 4-6 Sep 2018

Rudolf Schneeberger  
ITV Consult AG

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Data Scope

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Request for Data Origination

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Data Origination Requirements

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Validation and Verification

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Other Data Originators

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Introduction

Data Scope

Request for Data Origination

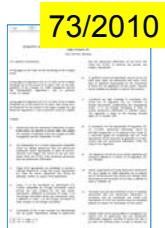
Data Origination Requirements

DO Specification

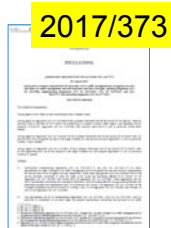
Validation and Verification

Other Data Originators

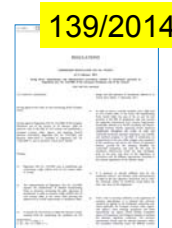
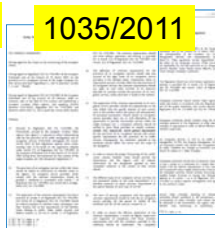
Relevant Regulations and their Evolution



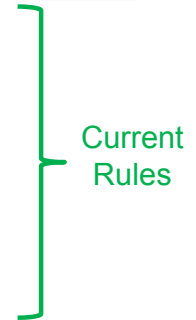
Commission Regulation (EU) 73/2010 laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky (ADQ)



Commission Implementing Regulation (EU) 2017/373 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight (ATM/ANS)



Commission Regulation (EU) 139/2014 laying down requirements and administrative procedures related to aerodromes (ADR)



Draft Provisions, AMC/GM

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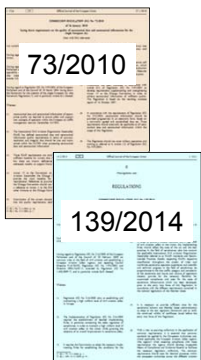
Other Data Originators



# Data Scope



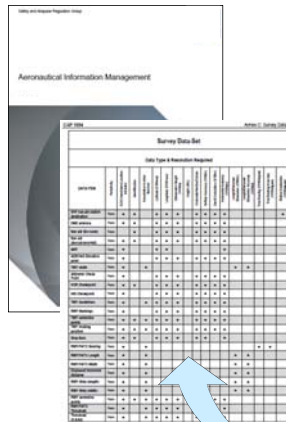
## Regulation



## DO Spec AMC / GM



## National Policy



## Data



## Products



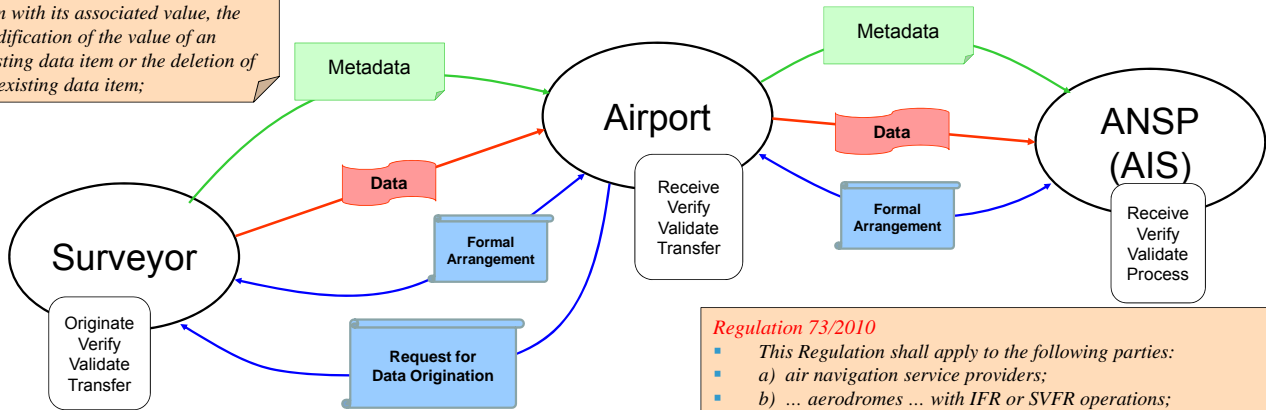




## Involved Parties, Activities and Interactions



**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;



### Regulation 73/2010

- This Regulation shall apply to the following parties:
- a) air navigation service providers;
- b) ... aerodromes ... with IFR or SVFR operations;
- c) public or private entities providing ... :
  - (i) services for the origination and provision of survey data;
  - (ii) procedure design services;
  - (iii) electronic terrain data;
  - (iv) electronic obstacle data.

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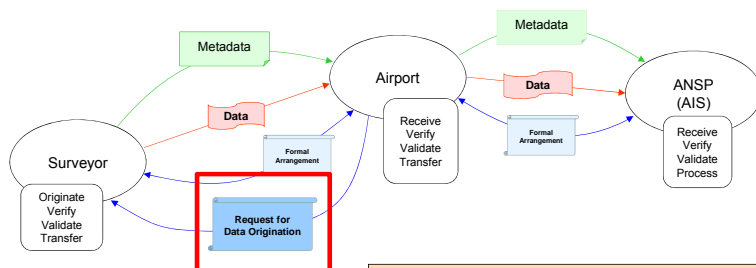
Data Origination Requirements

DO Specification

Validation and Verification

Other Data Originators

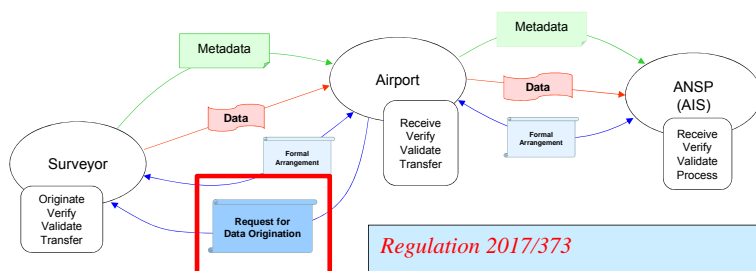
## Art. 6(6) Request for data origination



### Regulation 73/2010

- 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;
- Minimal content of instructions (in addition to formal arrangements as of Annex IV Part C):
  - (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

## Art. 6(6) Request for data origination



### Regulation 2017/373

#### Annex III (ATM/ANS.OR.A.085):

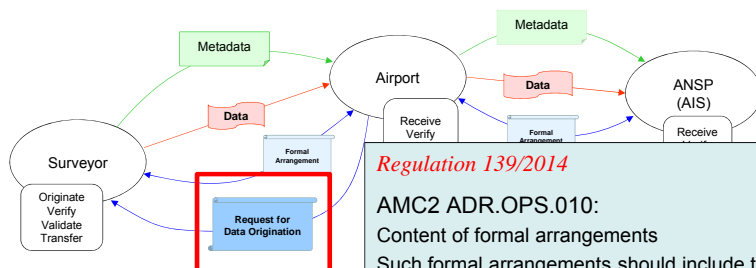
When originating, processing or transmitting data to the AIS provider, the service provider shall:

...

(h) with regard to data origination activity, establish specific formal arrangements that contain instructions for data creation, modification or deletion, which include as a minimum:

- (1) an unambiguous description of the aeronautical data that is to be created, modified or deleted;
- (2) the entity to which the aeronautical data is to be provided;
- (3) the date and time by which the aeronautical data is to be provided;
- (4) the format of the data origination report to be used;
- (5) the **format** of the aeronautical data to be transmitted; and
- (6) the requirement to identify any **limitation on the use** of the data.

## Art. 6(6) Request for data origination



### Regulation 139/2014

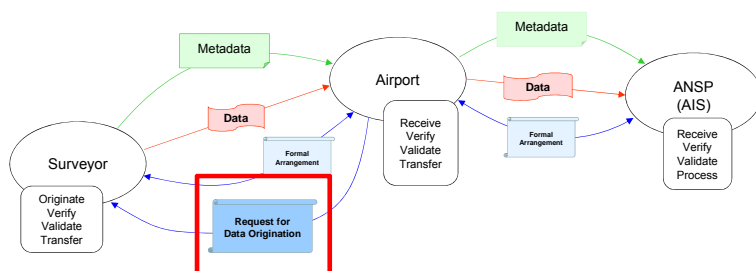
#### AMC2 ADR.OPS.010:

##### Content of formal arrangements

Such formal arrangements should include the following minimum content:

- (1) the aeronautical data to be provided;
- (2) the **quality requirements** for each data item supplied according to the aeronautical data catalogue;
- (3) the method for **demonstrating that the data** provided **conforms** with the specified requirements;
- (4) the nature of action to be taken in the event of **discovery of a data error** ...;
- (5) minimum criteria for **notification of data changes**: (timeliness, prior notice, means of notification)
- (6) the party **responsible for documenting data changes**;
- (7) **data exchange details** such as format or format change processes;
- (8) any **limitations on the use** of data;
- (9) requirements for the production of **data origination quality reports**;
- (10) **metadata** to be provided; and
- (11) **contingency** requirements concerning the continuity of data provision.

## Art. 6(6) Request for data origination



### Regulation 139/2014

#### AMC3 ADR.OPS.010:

##### CONTRACTED ACTIVITIES

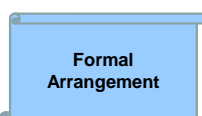
In case of **contracted activities** to external organisations for the origination of aeronautical data and aeronautical information, data origination requirements for such organisations are to be found in **ATM/ANS.OR.085** of Annex III of Commission Implementing Regulation (EU) 2017/373.

## Practical Example

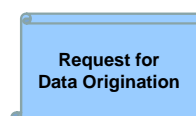
- An airport has extended a runway and needs to provide the data of the changes to the AIS provider.
- A surveyor is contracted to survey the changes.
- **What is the content of a request for data origination?**



## Content of formal arrangements and request for data origination



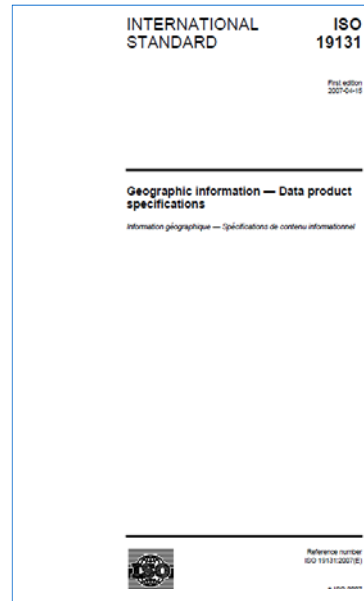
- scope
- the accuracy, resolution and integrity requirements
- methods for demonstrating that the data provided conforms with the specified requirements
- requirements for the production of quality reports
- metadata requirements



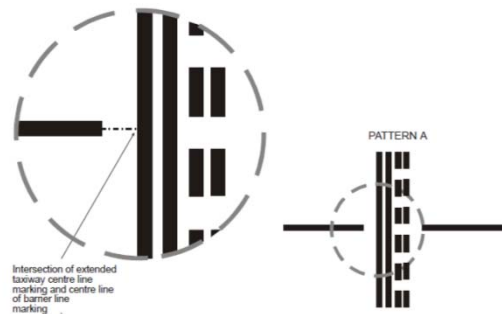
- unambiguous description of the data to be originated
- entity to which the data are to be provided
- date and time by which the data are to be provided
- data origination report

## Description of the Data to be originated

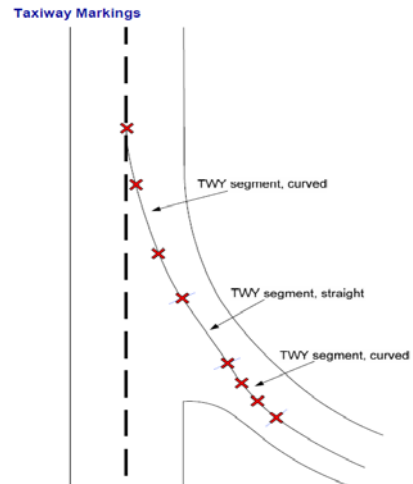
- Data Product Specifications (ISO 19131)
  - Overview
  - Specification scopes
  - Data product identification
  - Data content and structure
  - Reference systems
  - Data quality
  - Data product delivery
  - Metadata



## Description of the features to be collected



## Survey Requirements for Facilities

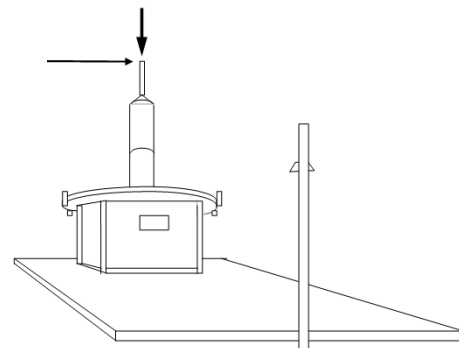
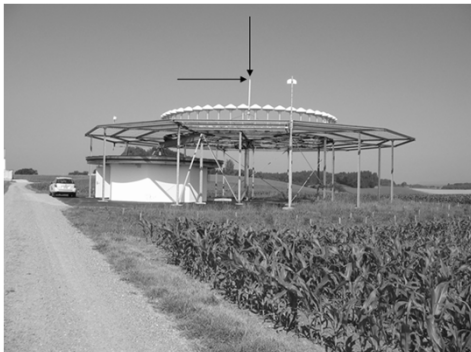


Note: Illustration of normative requirements DO-SVY-960 ff.

## Radio Navigation Aids



The survey reference point shall be located as close as possible to the antenna of the radio navigation facilities.



## Source of data quality requirements

- Regulation 73/2010
  - EUROCONTROL Specification for Data Quality Requirements

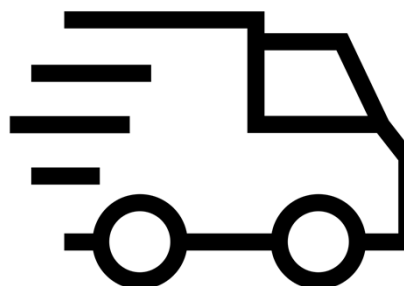
REF ID	TEXT ID	RESOLUTION	SOURCE	ACCURACY	SOURCE	DATA POINT	RELEVANCE
<b>Latitude and Longitude</b>							
LL001	Flight information region boundary points	1 km	Annex 10	2 km	Annex 11	declared	medium
LL002	P, R, Q area boundary points (outside STRACR)	1 km	Annex 10	2 km	Annex 11	declared	medium
LL003	P, R, Q area boundary points (inside STRACR)	1 km	Annex 10	100 m	Annex 11	calculated	essential
LL004	STRACR boundary points	1 km	Annex 10	100 m	Annex 11	calculated	essential
LL005	Exclude MIFADS, intersections and airports, and holding and STRACR points	1 km	Annex 10	100 m	Annex 11	unapproved/declared	essential
LL006	(Obstacles in area) (in the area (data territory))	1 km	Annex 10	100 m	Annex 11	unapproved	medium
LL007	Airborne reference point	1 km	Annex 10	30 m	Annex 11	unapproved/declared	medium
LL008	Height reference point	1 km	Annex 10	30 m	Annex 11	unapproved/declared	medium

- Draft Regulation 2017/373
  - Data catalogue in Appendix 1 to Annex III (PART-ATM/ANS.OR)

Subject	Property	Sub-Property	Type	Description	ICAO	Note	Accuracy	Integrity	Orig. Type	Pub. Res.	Chart Res.	
Runway	Designator		Text	A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft. (Annex 14)								
	Nominal length		Distance	The full-length designator of the runway, used to uniquely identify it at an aerodrome/airport which has more than one. E.g. 06/21.			1m	critical	surveyed	1 m or 1 ft	1 m	
	Nominal width		Distance	The declared longitudinal extent of the runway for operational performance calculations.			1m	essential	surveyed	1 m or 1 ft	1 m	
	Geometry		Polygon	The declared transversal extent of the runway for operational performance calculations.								
	Centre line points		Point	The geographical location of runway centre line at each end of the runway, at the stopway and at the origin of each side-of-terrain path area, and at each significant change in slope of runway and taxiway.			1m	critical	surveyed			
		Position	Point	The geographical location of runway centre line at each end of the runway, at the stopway and at the origin of each side-of-terrain path area, and at each significant change in slope of runway and taxiway.								
		Elevation	Elevation	The elevation of the corresponding centre line points.			0.25m	critical	surveyed			
		Local elevation	Height	The local elevation at the corresponding centre line point.								
	RWY exit line		Line	The geographical location of the runway exit line.			0.5m	essential	surveyed	1/100 sec	1 sec	
		Exit guidance line	Line	The geographical location of the runway exit line.								
		Colour	Text	Colour of runway exit line.								
		Style	Text	Style of runway exit line.								
		Directionality	Code List	Directionality of RWY exit line (one-way or two-way).								
		Surface type	Text	The surface type of the runway defined as specified in Annex 14 Volume I.								
	Strength		FCN	Pavement classification number.								
	Pavement type	Text	Pavement type for ACN/PCN determination.									
	Subgrade category	Text	Subgrade strength category.									
	Allowable pressure	Text	Maximum allowable tire pressure category or maximum allowable tire pressure value.									
	Evaluation method	Text	The evaluation method used.									

## Data delivery

- Requirements regarding the delivery of data:
  - Data **provided to** the surveyor;
  - Data **originated by** the surveyor.
- Typical requirements
  - Language
  - Character coding
  - Data protection
  - Data exchange





Introduction

Data Scope

Request for Data Origination

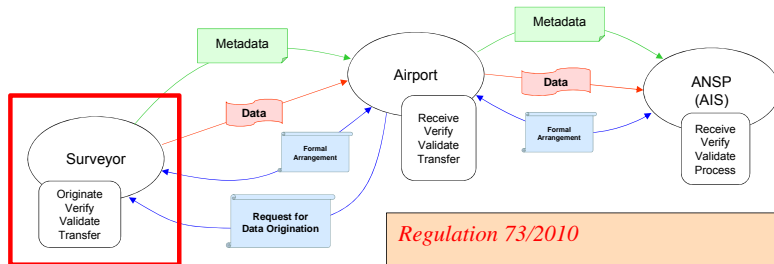
Data Origination Requirements

DO Specification

Validation and Verification

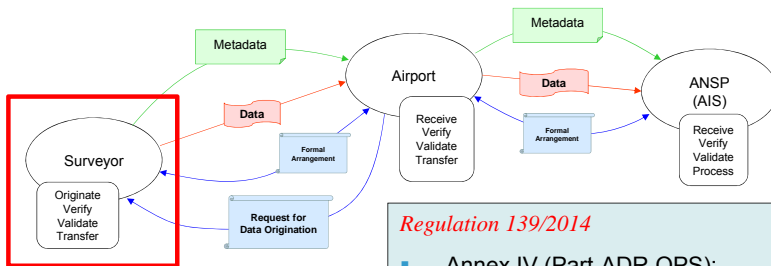
Other Data Originators

### Art 6(4) and Annex IV Part D: Data origination requirements



- Regulation 73/2010**
- When acting as data originators, the parties referred to in Article 2(2), shall comply with the data origination requirements laid down in Annex IV, Part D
  - Annex IV Part D:
    - Origination according to appropriate standards and ICAO Doc 9674 (WGS-84 Manual)
    - Horizontal reference : WGS-84
    - Vertical reference: EGM 96
    - Maintain data throughout lifetime of data item
    - Initial survey and yearly monitoring of critical and essential data
    - Specific electronic survey data capture and storage requirements
    - Sufficient additional measurement for critical data
    - Validate and verify aeronautical data prior to use in deriving or calculating other data

## Art 6(4) and Annex IV Part D: Data origination requirements



- Regulation 139/2014**
- Annex IV (Part-ADR.OPS):
    - Formal Arrangements
    - Horizontal reference: WGS-84
    - Vertical reference: Mean Sea Level (AMC: EGM 96)
    - Data error detection
    - Authentication
    - Origination according to specification in the Data Catalogue
    - Validation / verification
    - Error handling
    - Metadata
    - Transmission by electronic means
    - Tools and Software without adversely impacting the quality



## DO Specification Purpose and Scope

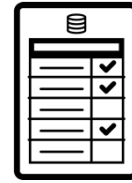


- Support of IR Article 6(4), 6(6) and Appendix IV Part D
- Volume 1:
  - Compliance material to relevant articles
- Volume 2:
  - Guidance material and comprehensive requirements (including Vol. 1)
  - Not a guidance how to survey but explanations how to apply survey knowledge in the aviation domain
  - Bridge between aviation community and surveyors
  - Builds on, updates and enhances ICAO Doc 9674 – The WGS-84 Manual



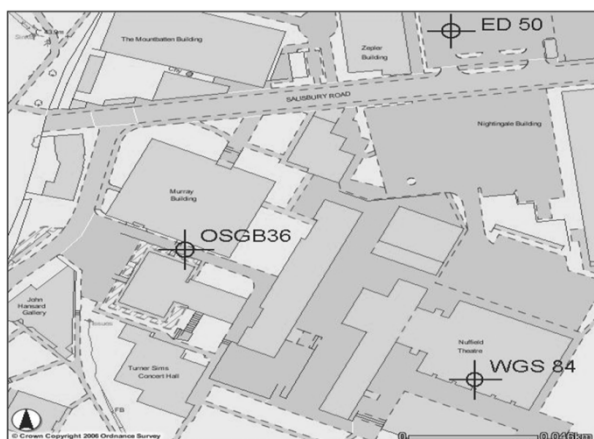
## DO Specification Functional Areas

- RDQ: Requirements for Data Quality;
- REF: Reference System Specification;
- UOM: Units of Measurement;
- DPS: Data Product Specification;
- CAT: Categories of Data;
- PRO: Data Processing
- EXC: Data Exchange;
- VAL: Validation and Verification;
- SVY: Survey;
- FPD: Instrument Flight Procedure Design;
- ASD: Airspace Design.



## Same coordinates – different location!

Northing: 50.935834  
Easting: -1.397226



Why do the locations in real world differ?

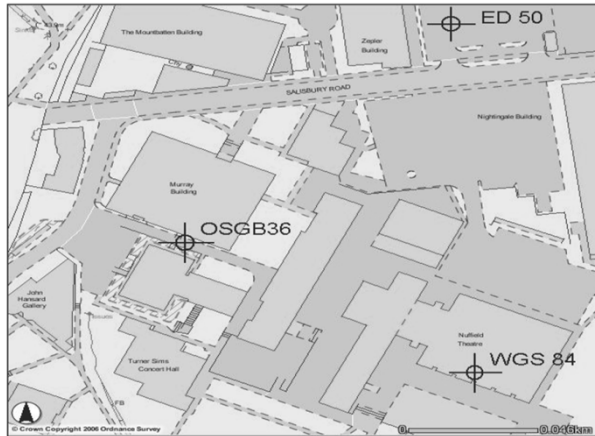
- A. Inaccurate definition of models
- B. Different ellipsoid
- C. Different horizontal reference frame
- D. Different vertical reference frame

Source <http://www.ordnancesurvey.co.uk>



## Same coordinates – different location!

Northing: 50.935834  
 Easting: -1.397226



Go to [www.menti.com](http://www.menti.com) and use the code 44 65 96

### Why do the locations in real world differ?

Inaccurate definition of models  
 Different ellipsoid  
 Different horizontal reference frame  
 Different vertical reference frame

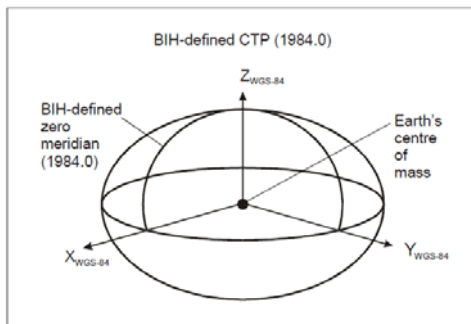
Show correct answer

Results are hidden       Slide is not active      0

Source <http://www.ordnancesurvey.co.uk>

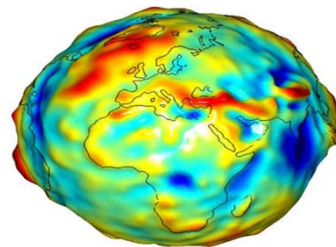
## Geodetic Reference System

Horizontal Reference System  
 WGS-84



Source: ICAO Doc 9674

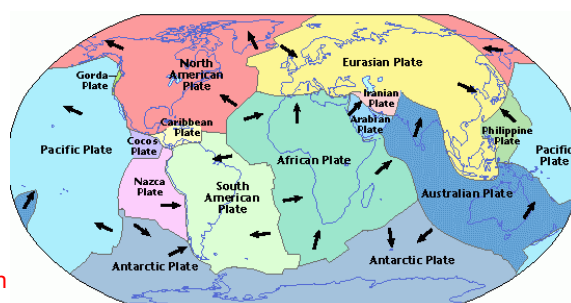
Vertical Reference System  
 Mean Sea Level (EGM-96)



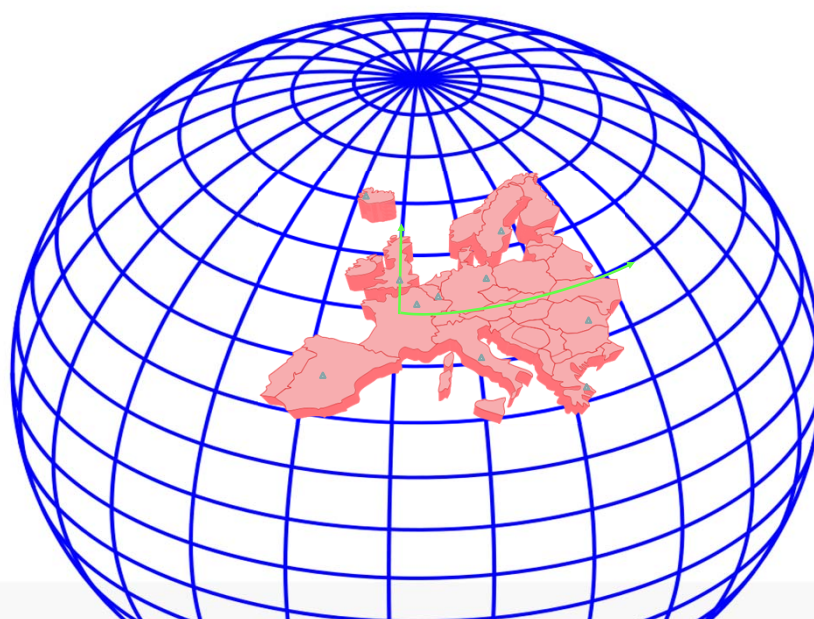
Source <http://en.wikipedia.org>

## Horizontal Reference System

- WGS-84
  - Maintained by National Spatial-Intelligence Agency (NSA) for the GPS Satellite System
  - Details in DO Specification or ICAO WGS-84 Manual (Doc 9674)
- ITRF
  - International Terrestrial Reference Frame established by a globally distributed network of survey stations
  - Can be considered identical to WGS-84
- ETRF
  - European Terrestrial Reference Frame established by a number of European survey stations
  - Required by INSPIRE
  - Moves with the Eurasian tectonic plate (2-3 cm / year)
  - Was identical to ITRF in 1989
  - Today: 50-60 cm difference to ITRF
  - **Do not use for publishing aeronautical data and information**



## ITRF vs. ETRF



- Earth fixed Coordinates:  
**ITRF / WGS-84**
- Coordinates fixed to European tectonic plate:  
**ETRF**
- **ETRF** is moving relative to **ITRF / WGS-84**

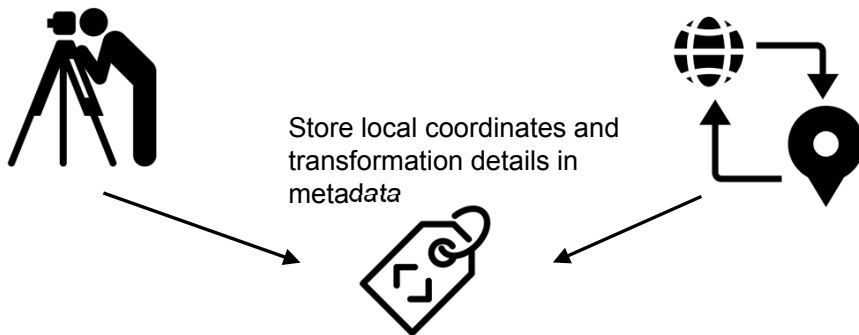
## Survey and WGS-84



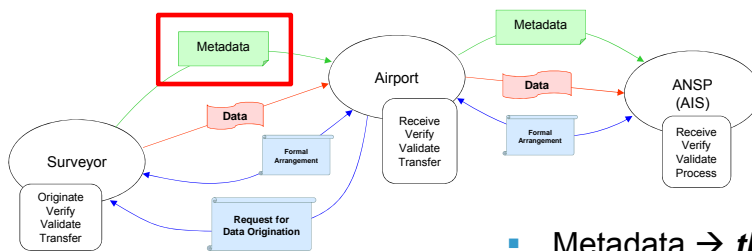
Direct survey in WGS-84/ITRF is not always feasible

1. Survey in local coordinate reference system

2. Transformation to WGS-84/ITRF



## Metadata



- Metadata → **the** means for providing traceability and data validation!
- Topics covered by the DO Specifications:
  - Reference Systems, units;
  - Data processing;
  - Lineage information;
  - Data quality evaluation;
  - Survey report.

## Metadata: Data processing, lineage and data quality evaluation



- **Recording of actions** carried out in order to originate, modify or withdraw the data
- The **statistical accuracy** of the measurement or calculation technique used
- Data **processing parameters** which impact the results
- Appropriate **information regarding data from a third party supplier** if used in the data origination process (e.g. permanent GNSS network, geoid model)
- **Lineage information** in accordance with ISO 19115 for each processing step:
  - Name and role of the person that has interacted with the data
  - Method and sensor (equipment) used for data origination
  - Data validation tasks and quantitative quality results



## Data Origination Report



### *DO Specification*

[DO-SVY-1490] All survey work undertaken to determine the coordinates of aeronautical data/information shall be reported as metadata in compliance with ISO 19115:2003

[DO-SVY-1550] Lineage information shall be reported in the metadata, in accordance with ISO 19115:2003

- **Practical implementation:** Survey report produced by the surveyor describing:
  - Purpose of the survey
  - Organisation responsible for the survey
  - All metadata recorded with a level of detail allowing
    - **Traceability** of aeronautical data/information
    - **Data validation** (= assessment of its suitability for use)

## NOTAM origination



- Data origination requirements also apply to NOTAM data
- Timely delivery of information necessary to ensure safety of flight takes priority

ADQ Regulators Working Group

Common Understanding 01/2013  
Application of the provisions of Commission Regulation (EU) 753/2010 to NOTAM

### *Common Understanding 01/2013*

...

(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**.

...

(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.

...

(9) In the circumstance ...

## NOTAM origination



- Data origination requirements also apply to NOTAM data
- Timely delivery of information necessary to ensure safety of flight takes priority

### *Regulation 2017/373*

#### GM1 AIS.OR.330(b) NOTAM EXCEPTIONAL SITUATIONS

...

(b) If it is determined that it is not possible to comply with all the relevant provisions of the Regulation, the NOTAM Office ensures, at the minimum, that:

- (1) the party originating the aeronautical data is **authorised and/or an eligible/reasonable source**;
- (2) the **content is plausible**;
- (3) the **data quality requirements are validated post publication**, as soon as practicable



Introduction

Data Scope

Request for Data Origination

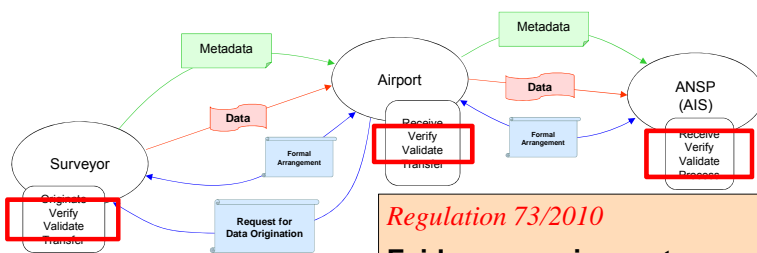
Data Origination Requirements

DO Specification

Validation and Verification

Other Data Originators

### Validation and verification in the data chain

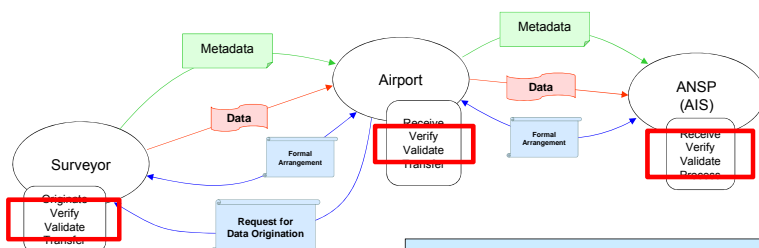


**Regulation 73/2010**

**Evidence requirements:**  
 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;

**Formal Arrangements:**  
 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;

## Validation and verification in the data chain



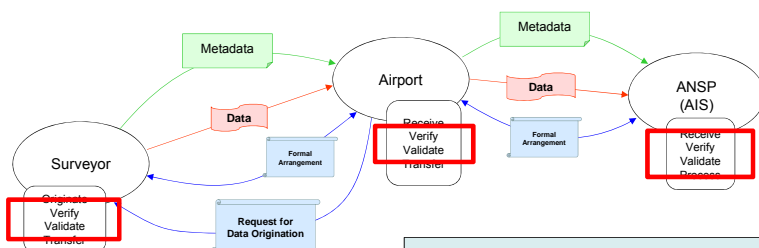
### *Regulation 2017/373*

#### **ATM/ANS.OR.A.085 Aeronautical data quality management**

When originating, processing or transmitting data to the AIS provider, the service provider shall: (...)

- (i) ensure that **data validation and verification techniques** are employed to ensure that the aeronautical data meets the associated data quality requirements

## Validation and verification in the data chain



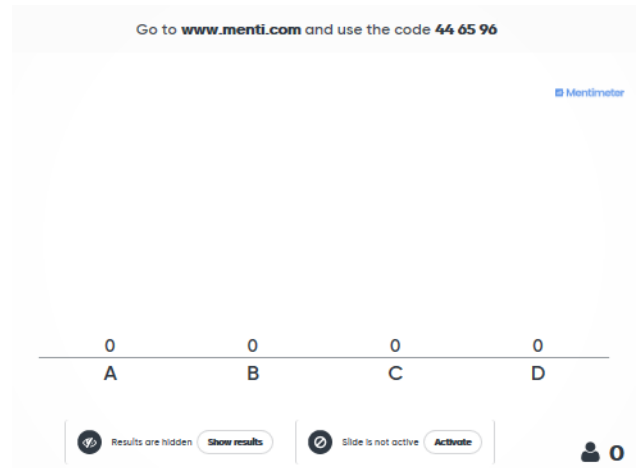
### *Regulation 139/2014*

#### **ADR.OPS.A.035 Data validation and verification**

When originating, processing or transmitting data to the AIS provider, the aerodrome operator shall ensure that **validation and verification techniques** are employed so that the aeronautical data meets the associated DQRs. [...]

What are the main sources for incorrect coordinates from surveying aeronautical items?

- A. Mistakes and misunderstandings in the data chain (like formal arrangements, knowledge in aviation domain, diligence...)
- B. Typos when transferring measurements from sensor to the database
- C. Wrong reference frames used in data origination and/or mistakes in transformation
- D. Inaccuracies and weaknesses from sensors



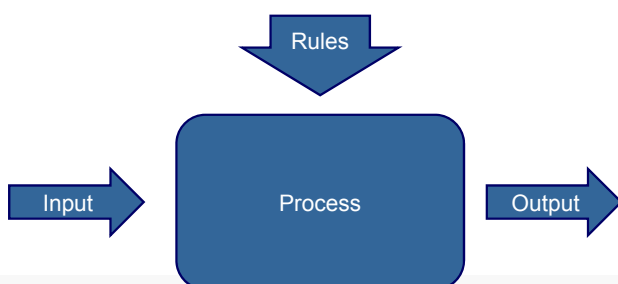
## Verification and validation (Art. 3 Definitions)

### data verification

*means 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;*

### data validation

*means the process of ensuring that data meets the requirements for the specified application or intended use;*



**Ensuring data meets the quality requirements**

## Practical Example

- Runway extension, same case as before.
- You are aerodrome operator and have received the data from the surveyor.
- You are surveyor and have to provide the surveyed data to the aerodrome operator.
- You are AIS and have received the data from the aerodrome.
- **How do you verify and validate the data?**



## Verification of “black box” data processing applications

- Major parts of data origination by means of surveying is «black boxed» and even surveyors do not know all calculations performed.



- The sensors and software are also used in highly complex engineering projects
- Sensor calibration
- Redundant and truly independent measurements
- Check with national mapping agency
- Verify by manual calculations
- Use more than one software package

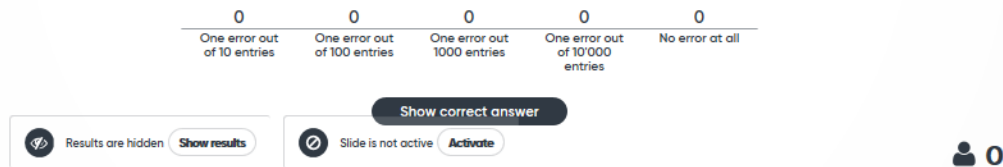
## Manual data entry



Go to [www.menti.com](http://www.menti.com) and use the code **44 65 96**

### How good are you in manually entering data?

Mentimeter



## Manual data entry



- EUROCAE ED-76A / RTCA DO-200A:  
“If a data supplier is not able to perform a human factors analysis, a range of  $1 \times 10^{-2}$  to  $1 \times 10^{-3}$  is reasonable depending on the task.”
- How many checks are required to reach  $10^{-3}$ ,  $10^{-5}$ ,  $10^{-8}$ ?

## Verification of data entered manually

- Routine data
    - One person entry
  - Essential data
    - One person entry
    - Independent check by second person
  - Critical data
    - One person entry
    - Two independent checks by different persons
- **Avoid manual data entry if possible**

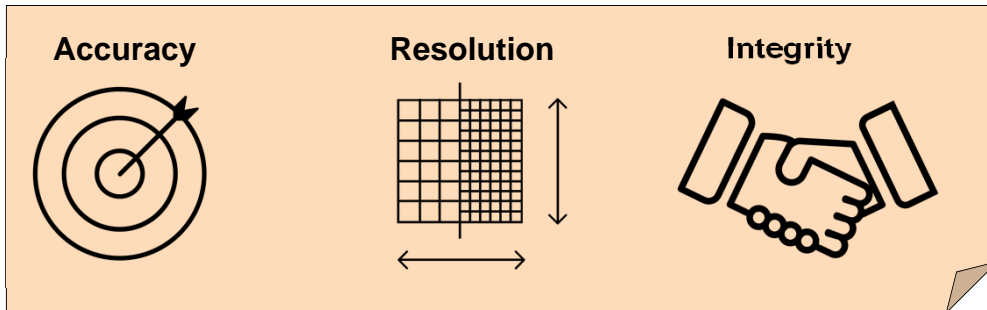


## Verification of data entered manually (with supporting tool)

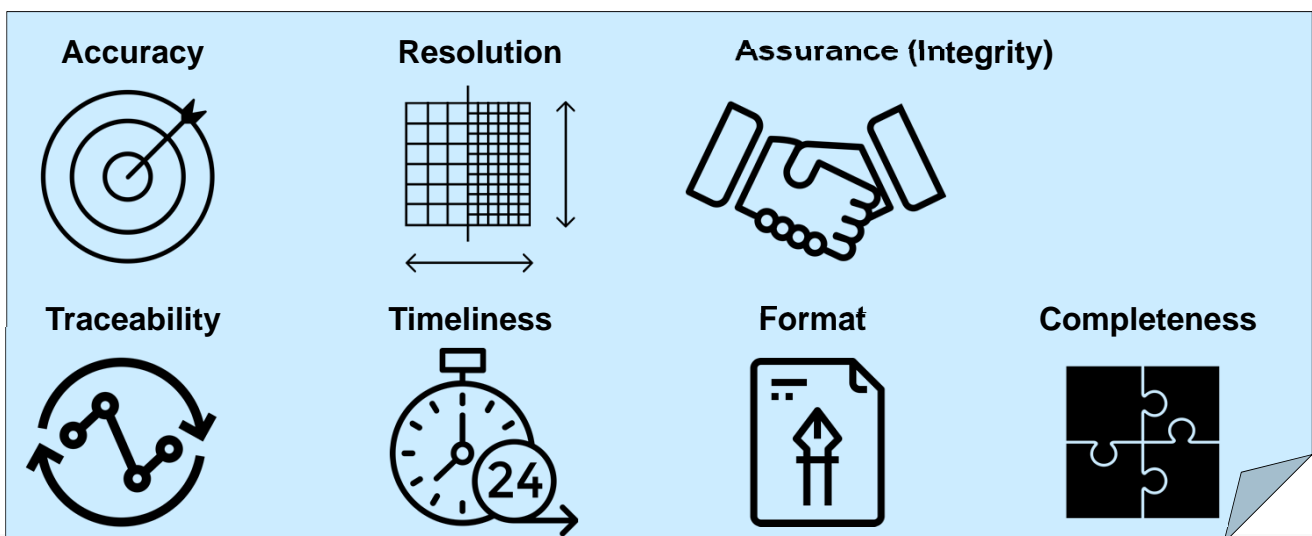
- Routine data
    - One person entry
  - Essential data
    - Entered by two persons
    - Check by a qualified tool
  - Critical data
    - Entered by three persons
    - Check by a qualified tool
- **Avoid manual data entry if possible**



## Data Quality as defined in ADQ

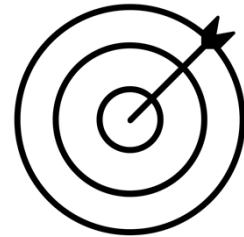


## Data Quality as defined in 2017/373



## Validation of Accuracy

- **Methods:**
  - Estimates based on sensors, survey configuration and experience;
  - Redundant independent measurements;
- **Measure:**
  - Standard deviation:  $1\sigma$ , 90 %, 95 %;
- **Conformance levels:**
  - Given by DQR HL / Data Catalogue;
  - Tolerance values proposed in DO Specs, Vol 2, DO-SVY-010.

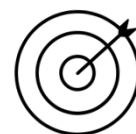


Confidence	Routine	Essential	Critical
90%	3.5	3	(no such data)
95%	3	2	(always redundant measurements)

**Table 1: Tolerance Values (Multipliers) for Aeronautical Data**

## Spatial accuracy and assurance in surveying

- Today's sensors exceed the accuracy requirement of aviation
- "One measurement is no measurement"
- **Additional measurements:**
  - Not necessarily improve the result of the measured item, but
  - Improve the reliability of the result
  - Must be performed as independent measurements and feasible to eliminate systematic errors and gross (human) errors
  - Do not protect against measuring the wrong item or the wrong location





### Accident of Turkish Airlines TC-JOC, on 24. March 2015 in Katmandu



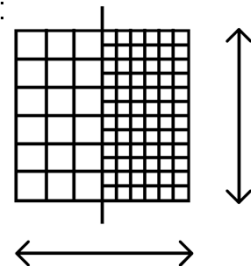
#### FMS database for RNP AR Approach

....  
threshold coordinates for runway 02 .... were given with a lower resolution compared to the runway coordinates published to 1/1000<sup>th</sup> of an arc second, whereas the coordinates in the supplement were degrees, minutes and seconds. ...

.... CAA ... were given with a lower resolution compared to the runway coordinates published to 1/1000<sup>th</sup> of an arc second, whereas the coordinates in the supplement were degrees, minutes and seconds. Bearing/Distance calculations showed that these published coordinates were not exactly lined up, but the published RW02 coordinates were slightly off to the left.

The airline and flight crew were unaware of these facts. Had the airline and flight crews been aware of this fact, the airline would have taken remedial measures in order to release the aircraft.

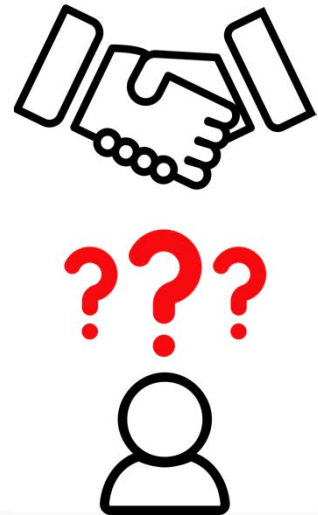
- Harmonized List (Appendix E) of the DQR Specification or the aeronautical data catalogue (Appendix 1 to Annex III of 2017/373) specifies the **publication** resolution.
- The resolution of the data features contained in the database should be **commensurate with the data accuracy** requirements. (Source Annex 15)
- Resolution of data in the database or in a digital data exchange :
  - is the same or finer as the publication resolution
  - is sufficient to maintain the accuracy



## Data Quality Requirement: Integrity



- Validation and verification procedures shall:
  - for routine data: **avoid corruption** throughout the processing of the data
  - for essential data: **assure corruption does not occur** ... and **may include additional processes as needed** to address potential risks
  - for critical data: **assure that corruption does not occur** ... and **include additional integrity assurance processes to fully mitigate** the effects of faults ....



source: ICAO Annex 15

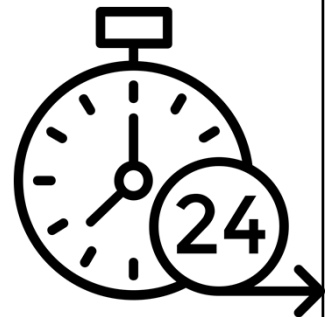
## The Process is Assuring the Integrity



- Critical data:
  - Independent verification** that origination / modification is done according to specification
  - Sufficient **additional measurements** to identify survey errors
  - Yearly monitoring** of survey data
- Essential data
  - Yearly monitoring of survey data
- Routine data
  - Survey data monitored every five years

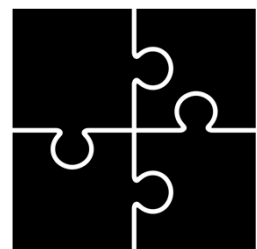
## Data Timeliness

- Definition (Annex 15)
  - The degree of confidence that the data is applicable to the period of its intended use.
- Validation
  - Ensure that limits on the effective period of the data element are defined
- Documentation
  - Property of a feature (AIXM: TimeSlice)
  - Metadata of a data set if all data elements have the same effective period



## Data Completeness

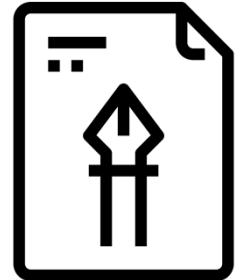
- Definition (Annex 15)
  - The degree of confidence that all of the data needed to support the intended use is provided.
- Validation
  - Visual inspection
  - Comparison with other data sources – or in the field against data request
  - Full inspection or sample based inspection (terrain and obstacle data)
- Measure:
  - Number of excess or missing items.
  - Missing items: Zero tolerance



## Data Format



- Definition (Annex 15)
  - A structure of data elements, records and files arranged to meet standards, specifications or data quality requirements.
- Verification
  - Verify that format is according to the **specification in the formal arrangements**
- Validation
  - The format specification in the formal arrangements must be adequate to ensure that the data is interpreted in a manner that is **consistent with its intended use**.



## Is this format consistent with its intended use?



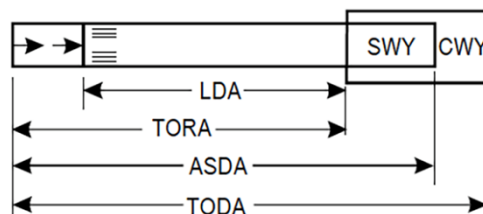
*ADR 139/2014 (current version)*

GM1 ADR.OPS.A.005 Aerodrome data

- (k) The geographical coordinates of:
- (1) each threshold;
  - (2) appropriate taxiway centre line points; and
  - (3) each aircraft stand;
- are measured and reported to the aeronautical information services in degrees, minutes, seconds and hundredths of seconds.

## Validation of Numerical Data

- Independent calculation
  - Declared distances from runway coordinates
  - Obstacle elevation from DTM and obstacle height
- GIS
  - Overlay aeronautical data on orthophotos or topographic maps



## Validation of Data from “Non-ADQ” Originators

*Regulation 2010/73*

### Art 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.

### Annex 15

3.3.1 Material to be issued as part of an aeronautical information product shall be **thoroughly checked before it is submitted to the AIS** ....

3.3.2 An AIS shall establish **verification and validation procedures** which ensure that upon receipt of aeronautical data and aeronautical information, quality requirements are met.

## Validation of Data from “Non-ADQ” Originators



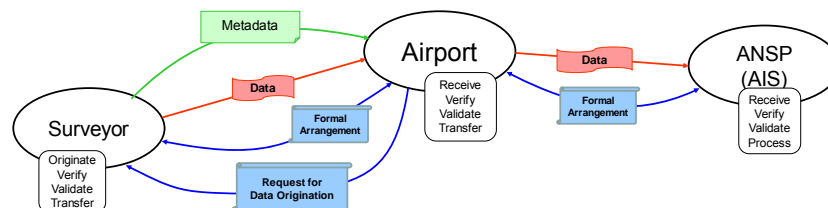
### Annex 15

- 3.3.1 Material to be issued as part of an aeronautical information product shall be **thoroughly checked before it is submitted to the AIS** ....
- 3.3.2 An AIS shall establish **verification and validation procedures** which ensure that upon receipt of aeronautical data and aeronautical information, quality requirements are met.

## Summary



- Formal arrangements need to be established
- Request for data origination requires a description of the data to be collected (use the data catalogue)
- Data origination specification provides a means of compliance and best practice guidance
- Metadata is an essential requirement to ensure traceability and data validation
- Verification and validation ensures data meets the data quality requirements and is fit for use





Introduction

Data Scope

Request for Data Origination

Data Origination Requirements

DO Specification

Validation and Verification

Other Data Originators

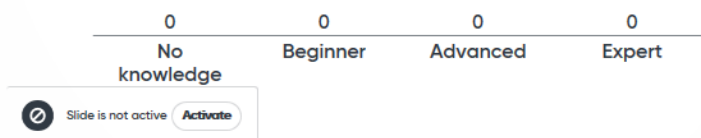


## SURVEY AS DATA ORIGINATION

Go to [www.menti.com](http://www.menti.com) and use the code **44 65 96**

## What is your competence level in surveying?

Mentimeter



## Calibration of Survey Equipment

- The survey **equipment shall be calibrated** and able to perform to the accuracy required for the task.
- Instructions on **sensor calibration** shall be **based on the requirements** of the survey method and of the sensor manufacturer.
- Equipment **calibration shall be valid**.
- The **survey report** shall include details on the calibration process and results.





## Digital handling of Data

Very detailed specifications which are a matter of course for a surveyor:



- Coordinates of reference points shall be **transferred digitally** into the survey equipment.
- Field measurements shall be **digitally captured** and **stored**.
- Raw data shall be **digitally transferred** and loaded into the processing software.
- The use of a data model for aviation features should be considered for the sensor software.
- Surveyors shall **digitally capture** and store **observations, parameters** and intermediate data

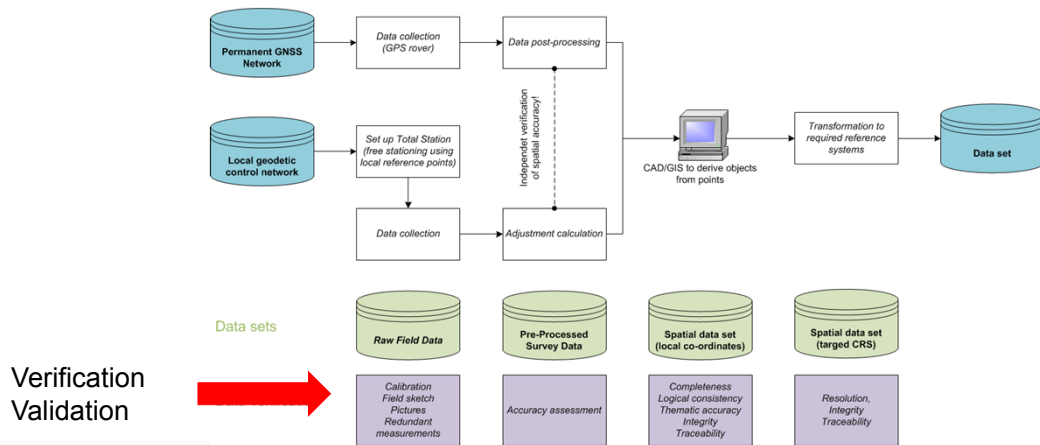
## Geodetic Control Network



▲ Local geodetic Survey control stations

⊠ National geodetic reference point

# Quality Assurance Terrestrial Survey



# PROCEDURE DESIGN AS DATA ORIGINATION



Go to [www.menti.com](https://www.menti.com) and use the code **44 65 96**

### What is your competence level in procedure design?

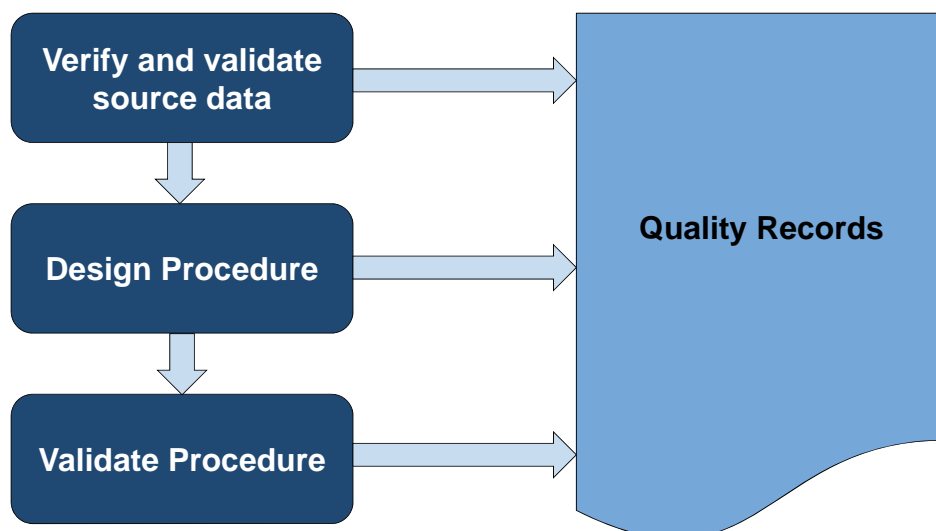
Mentimeter

0                      0                      0                      0  
No competence    Beginner            Advanced            Expert

Slide is not active **Activate**

0

## Requirements for Flight Procedure Design



## Validation and verification source data

### Regulation 2017/373

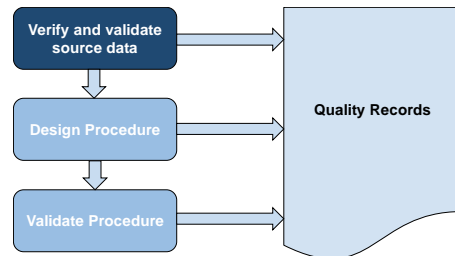
#### FPD.OR.100 Flight procedure design (FPD) services

(a) A flight procedure design services provider shall perform any or all of the following activities:

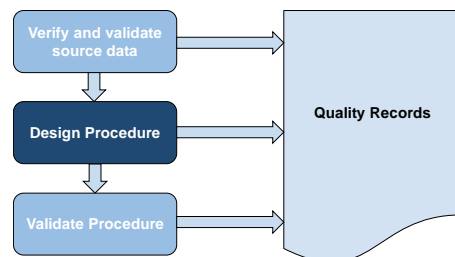
- (1) design and documentation of flight procedures;
- (2) validation of flight procedures

In this context, the FPD provider shall use aeronautical data and aeronautical information that meet the requirements of accuracy, resolution, and integrity as specified in the aeronautical data catalogue in accordance with Appendix 1 to Annex III (Part-ATM/ANS.OR) to this Regulation

(b) If aeronautical data is not provided by an authoritative source or does not meet the applicable data quality requirements (DQRs), such aeronautical data may be originated by the FPD provider. In this context, such aeronautical data shall be validated by the FPD provider originating it.



## Qualification of the Designers

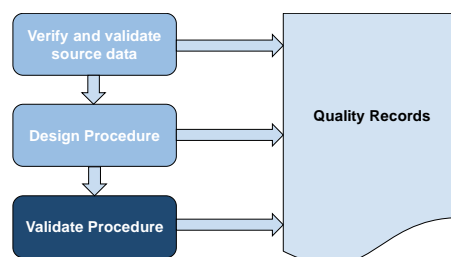


### Regulation 2017/373

- FPD.OR.115 Technical and operational competence and capability
- (a) In addition to ATM/ANS.OR.B.005(a)(6), the FPD provider shall ensure that its flight procedure designers:
  - (1) have successfully completed a training course that provides competency in flight procedure design;
  - (2) are suitably experienced to successfully apply the theoretical knowledge; and
  - (3) complete successfully continuation training.

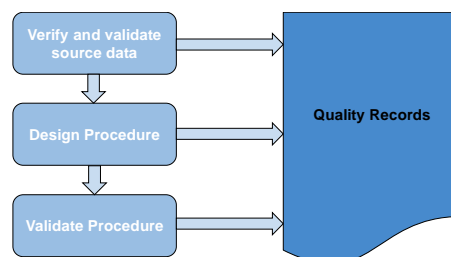
## Validation and verification

- The instrument flight procedure shall be **validated** to ensure
  - the design is correct
  - the procedure is flyable and
  - the description is complete and coherent
- An instrument flight procedure design shall be **checked independently** by a qualified instrument procedure designer.
- The results of the validation and verification, together with conclusions, shall be **recorded in the metadata**.
- All **PBN procedures** should be validated and **checked for fly-ability**.



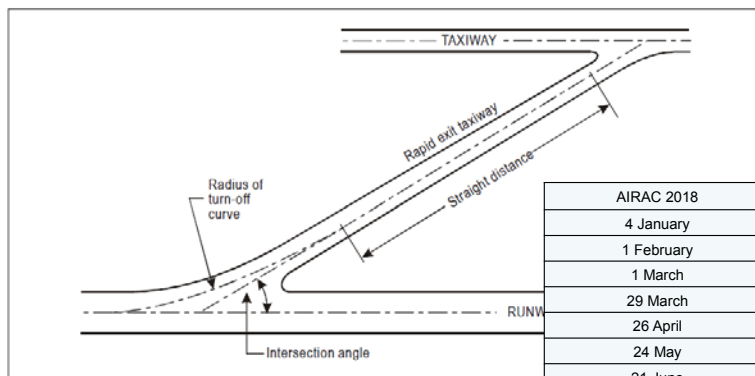
## Quality records

- Quality records of instrument flight procedures must be kept ensuring traceability through metadata.



## Homework

- An airport plans a new rapid exit taxiway.
- Draft a plan of the data related activities** (from design to start of operation), including, surveyor, data exchange etc.
- Consider ADQ, AIRAC, Timeliness** (AIS requires to receive data 3 weeks before publication date)



AIRAC 2018
4 January
1 February
1 March
29 March
26 April
24 May
21 June
19 July
16 August
13 September
11 October
8 November
6 December

LL023	Taxiway intersection marking line	1/100 sec	Annex 15	0.5 m	Annex 14 V1,V2	surveyed	essential
LL025	Exit guidance line	1/100 sec	Annex 15	0.5 m	Annex 14 V1,V2	surveyed	essential

## Thank you





Co-financed by the Connecting Europe  
Facility of the European Union



# IR 73/2010 (ADQ) & Opinion 02/2018 Data Exchange

INEA ADQ Implementation Workshop  
ANS Czech Republic  
Prague, 4-6 Sep 2018

Wolfgang Scheucher  
SOLITEC Software Solutions GesmbH

## Table of Content



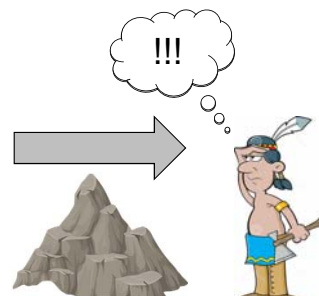
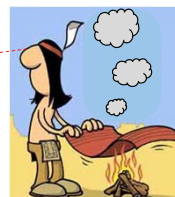
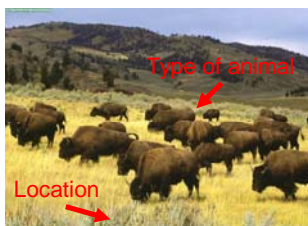
- Introduction
- Differences IR 73/2010 (ADQ) vs. Opinion 02/2018
- Main Requirements
- Specific parties in the Data-Chain

Data Exchange

# INTRODUCTION

## What do we need to exchange data...

- Based on
- **Data Specification**
    - Description of the data used within a particular domain
      - Conceptual/Logical Data Model,
      - Data/Feature Catalogue,
      - etc.
  - **Data Exchange**
    - Defines how data are
      - communicated (Means)
      - encoded (Format)



**Shared understanding** of the content and meaning of the data for **suppliers and user** of the data (→ fit for purpose)





Data Exchange

# MAIN DIFFERENCES IR 73/2010 (ADQ) & OPINION 02/2018

## Regulated Parties

### 73/2010 (ADQ)

Article 2 §2

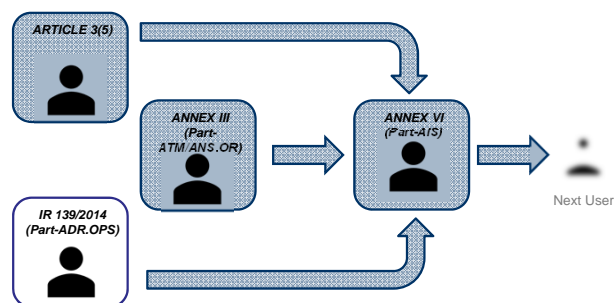
- ANSPs,
- IFR Airport operators,
- entities providing:
  - (i) services for survey data;
  - (ii) procedure design services;
  - (iii) electronic terrain data;
  - (iv) electronic obstacle data.



### Opinion 02/2018

Article 3(5); Annex III, Annex VI; IR139/2014

- AISP (Part-AIS)
- Service Provider (Part-ATM/ANS)
- Aerodromes (via IR 139/2014, Part-ADR)
- Article 3 (5) "Other" data originator



## Data Specification, Data Exchange & Metadata Requirements

### 73/2010 (ADQ)

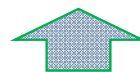
- ARTICLE 4 (“Data set”)
  - ANNEX I (Data set specification)
- ARTICLE 5 (“Data Exchange”)
  - ANNEX II (Aeronautical data exchange format requirements)
- References
  - ANNEX III (Referred Provisions)



EUROCONTROL Supporting Documents (AIX Specification & AIXM 5.1)

### Opinion 02/2018 (EASA)

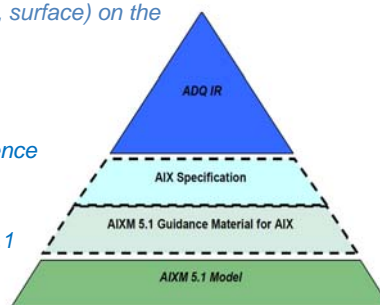
- ANNEX VI (PART – AIS)
  - Organisation Requirements (OR)
  - Technical Requirements (TR)
- ANNEX III (Part - ATM.ANS.OR)
  - Appendix 1 (Aeronautical Data Catalogue)
- Regulation 139/2014, (PART-ADR.OR/OPS)
- Main Article 3(5), („other“ data originator)



Acceptable Means of Compliance (AMC) & Guidance Material (GM)

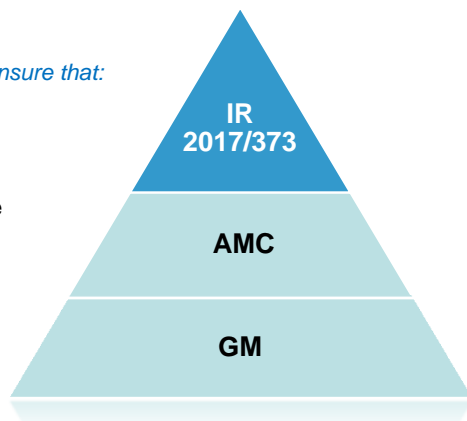
## ADQ IR & EC Supporting Documents

- Commission Regulation (EU) No 73/2010
  - laying down requirements on the quality of aeronautical data for the single European sky  
*Example: “base the description of geometrical elements (point, curve, surface) on the*  
**ISO 19107:2003 — Geographic information — Spatial schema**
- Specification on Aeronautical Information Exchange (AIX)
  - Provides means of compliance with Articles 4 and 5 of the ADQ IR  
*Example: [AIX-GM-01] The regulated party shall provide formal evidence that the common data set ... reuses the GM\_Point (documented in ISO 19107:2003) for the definition of the location of aeronautical features that have point type geometry; MOC = AIXM 5.1*
- AIXM 5.1 Guidance Material for AIX
  - provides evidences of compliance of AIXM 5.1 with the requirements  
*The AIXM classes Point or ElevatedPoint as appropriate are used for modelling the location of aeronautical features that have point type geometry, ...the GM\_Point is used for the definition of AIXM locations...*



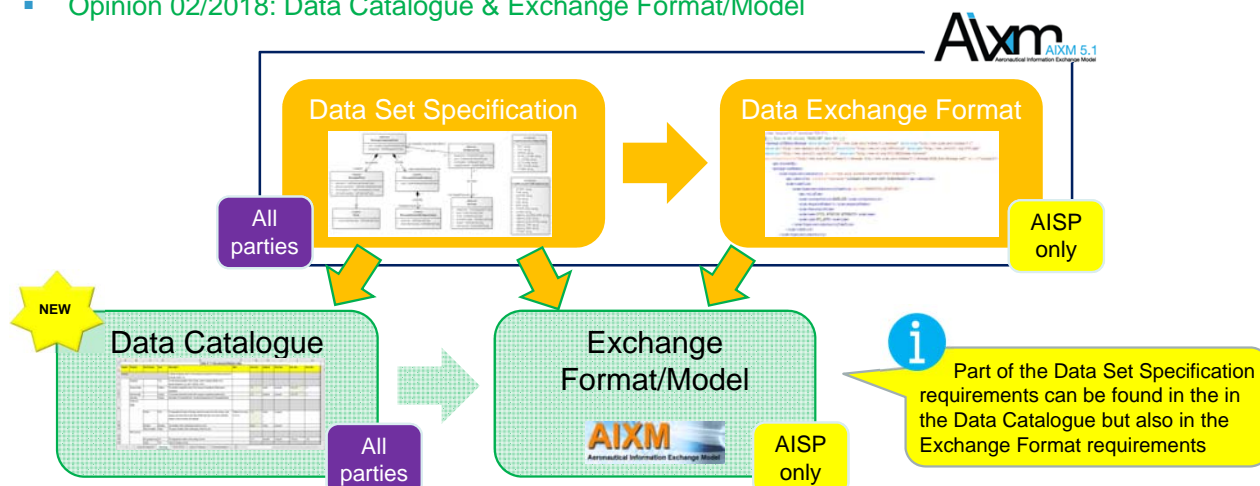
## Regulation 2017/373 & EASA AMC & GM

- Commission Regulation (EU) No 2017/373
  - “laying down common requirements...”
    - Example: An aeronautical information services provider shall ensure that:*
      - (a) *the format of aeronautical data is based on an aeronautical information exchange model...*
- Acceptable Means of Compliance (AMC)
  - AMCs are non-binding standards adopted by EASA to illustrate means to establish compliance with the Regulation
    - Example: An AIS provider should use the aeronautical information exchange model (AIXM) ...*
- Guidance Material (GM)
  - GMs may be provided by the Agency to assist the user in complying with an Implementing Rule, where this material does not form part of the IR or associated AMC
    - Example: ...AIXM 5.1 is considered as being the minimum baseline for the exchange of aeronautical data...*



## Baseline for the Data Exchange Requirements

- 73/2010 (ADQ): Data Set Specification & Data Exchange Format
- Opinion 02/2018: Data Catalogue & Exchange Format/Model



## Opinion 02/2018 Digital Data Sets



AISP  
only

- ANNEX VI (Part-AIS) defines **5 Digital Data Sets**:
- If available, an AIS provider shall ensure that digital data is in the form of the following data sets:
  - (1) AIP data set;
  - (2) terrain data set;
  - (3) obstacle data sets;
  - (4) aerodrome mapping data sets; and
  - (5) instrument flight procedure data sets.



Based on the data sets defined by ICAO Annex 15 & PANS-AIM



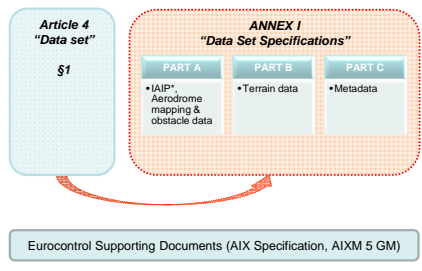
Data Exchange

## DATA SPECIFICATION REQUIREMENTS

# Data Specification Overview

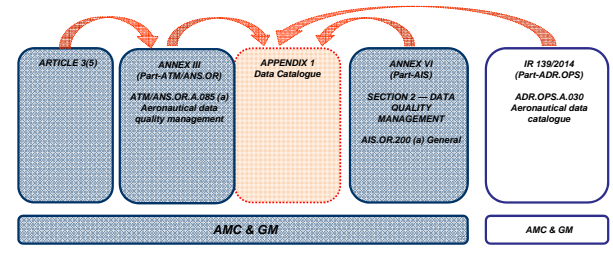
73/2010 (ADQ)  
Article 4, §1

- All regulated parties shall provide aeronautical data and aeronautical information in accordance with the data set specification (described in Annex I)



Opinion 02/2018  
AIS.OR.200 (a); ATM/ANS.OR.A.085 (a); ADR.OPS.A.030

- All regulated parties shall ensure that aeronautical data conform to the data catalogue specifications.

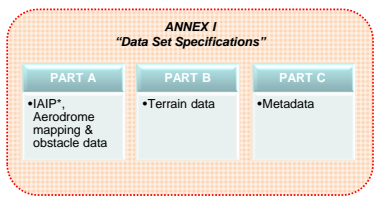


# Data Set Specification Requirements - Scope

73/2010 (ADQ), Annex I

- Data Set Specification for:
  - ANNEX I (PART A)
    - IAIP,
    - aerodrome mapping and
    - electronic obstacle data
  - ANNEX I (PART B)
    - Electronic terrain data

**i** Scope still the same



Opinion 02/2018, GM

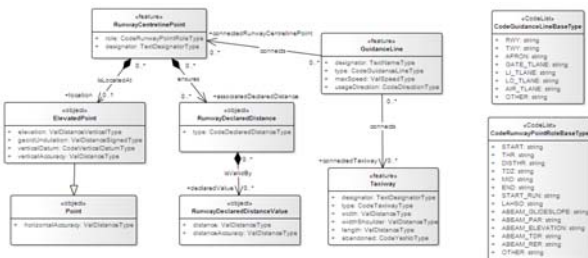
- The aeronautical data catalogue presents the scope of data that can be collected and maintained by the AIS providers and provides a common terminology that can be used by data originators and service providers.
- Plus OR/TR for terrain data

Subject	Priority	Sub-Phases	Type	Description	Doc	Frequency	Integrity	Orig. Type	Pub. Req.	Obst. Req.
Category				A defined rectangular area or a line demarcated pursuant to the entry and data of the aerodrome chart.						
33	Category		Text	The full textual description of the runway, used to uniquely identify it at an aerodrome/airport. E.g. 08/26 (07/25), Runway 1.						
41	Normal height	Obstacle	Number	The highest published value of the runway for operations performance calculations.		1.0	initial	revised	0.0/0.15	1.0
5	Normal width	Obstacle	Number	The maximum published width of the runway for operations performance calculations.		1.0	initial	revised	0.0/0.15	1.0
7	Demarcation	Program	Demarcation of Runway/Obstacle, Runway/Obstacle and Runway/Obstacle							
8	Category									
9	Position	Text	Text	The geographical location of runway centre line at each end of the runway, at the obstacle end and at the origin of each class of flight path area, and at each significant change in slope of runway and obstacle.	Definition for Annex I §13.1.2	1.0	initial	revised		
10	Position	Obstacle	Obstacle	The elevation of the corresponding centre line point.		1.0	initial	revised		
11	Position	Obstacle	Height	The point elevation at the corresponding centre line point.		1.0	initial	revised		
12	Position	Text	Text	The geographical location of the runway end line.		1.0	initial	revised	1.0/0.15	1.0
13	Position	Text	Text	Colour of runway end line.		1.0	initial	revised	1.0/0.15	1.0
14	Position	Text	Text	Colour of runway end line.		1.0	initial	revised	1.0/0.15	1.0

## Data Set Specification Requirements - Documentation

### 73/2010 (ADQ), Annex I

- Data Set Specification shall be documented
- Choice to use either UML or Feature cataloguing methodology



### Opinion 02/2018, AMC to AIS.TR.210

- The *exchange model* used should:
  - use the unified modelling language (UML) to describe the aeronautical information features and their properties, *associations* and data types
  - The content and structure of aerodrome mapping data sets shall be defined in terms of an application schema and a *feature catalogue*.

- UML recommended
- Feature cataloguing TR for AMD only

AIXM 5 (UML)

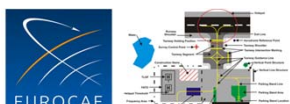
## Data Set Specification Requirements – Definitions of Aeronautical Features

### 73/2010 (ADQ), Annex I

- Data set specification shall define the atomic components of the AIP data based on ICAO ANNEX 15
- EUROCAE ED-99 airport mapping requirements contains additional data elements and requirements

### Opinion 02/2018

- The *aeronautical data catalogue* is transposed from the ICAO one (→ ICAO Annex 15/PANS-AIM)
  - defines the aeronautical features
- OR/TR & AMC/GM for Digital data sets, incl. Aerodrome Mapping data (GM reference to ED-99D)



ED-99 User Requirements for Aerodrome Mapping Information

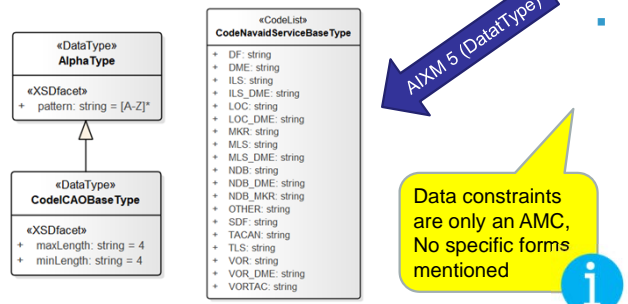


Baseline for the definition of aeronautical features still the same

# Data Set Specification Requirements - Allowable Values for Feature Attributes

## 73/2010 (ADQ), Annex I

- 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**
- constraints on data → "Simple Rules"



## Opinion 02/2018

- The **data catalogue** defines some basic **data types** for each property (e.g. Text, Date, Point, Distance, Elevation, Code list, etc) but does not provide any further details, such as range of values or enumerated lists.
- AMC to AIS.TR.210: Exchange Model** should "include data value constraints ..."

Table A 1-1 Aerodrome/Heliport data

Subject	Property	Sub-Property	Type	Description	Note
Runway				defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft. (Annex 14)	
	Designator		Text	The full textual designator of the runway, used to uniquely identify it at an aerodrome/heliport. E.g. 09L/09R, RWY 1	
	Nominal length		Distance	The declared longitudinal extent of the runway for operational (performance) calculations.	
	Nominal width		Distance	The declared transverse extent of the runway for operational (performance) calculations.	
	Geometry		Polygon	Geometries of RunwayElement, RunwayDisplacement and RunwayIntersection	
	Centre line points				
	Position	Point		The geographical location of runway centre line at each end of the runway, at the apex and at the angle of each take-off/flight path area, and at each significant change in slope of runways and stopways	Definition from Annex 4.3.3.4.2
	Elevation	Elevation		The elevation of the corresponding centre line point	
	Ground elevation	Height		The ground elevation at the corresponding centre line point	

# Data Set Specification Requirements - Temporal Model

## 73/2010 (ADQ), Annex I

- UTC based **temporal model**, 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;

```

<axm:RunwayTimeSlice gml:id="RWY_EADD_09L_2TR">
  <gml:validTime>
    <gml:TimePeriod gml:id="v1ILURU94">
      <gml:beginPosition>2017-07-01T00:00:00Z</gml:beginPosition>
      <gml:endPosition indeterminatePosition="unknown"/>
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  </gml:validTime>
  <axm:interpretation>BASELINE</axm:interpretation>
  <axm:sequenceNumber>2</axm:sequenceNumber>
  <axm:featureLifetime>
    <gml:TimePeriod gml:id="t1ILURU94">
      <gml:beginPosition>2009-01-01T00:00:00Z</gml:beginPosition>
      <gml:endPosition indeterminatePosition="unknown"/>
    </gml:TimePeriod>
  </axm:featureLifetime>
</axm:RunwayTimeSlice>
  
```



## Opinion 02/2018, AMC to AIS.TR.210

- Exchange model should: "include a **temporality model** to enable capturing the evolution of the properties of an aeronautical information feature during its life cycle"





## Data Set Specification Requirements - Business Rules

### 73/2010 (ADQ), Annex I

- 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;
- “Complex Rules” in addition to allowable values and data ranges

### Opinion 02/2018, AMC to AIS.TR.210

- “include data value constraints and data verification rules”
- no minimum of the data verification rules is defined

Verification rules are only an AMC, but also some req on TR level

← AIMX 5 (Business Rules)

UID	Profile:EAD	Source	Rule textual description	Comments	AIMX Class	AIMX Attribute
ADM-5_1_RULE-16B54	Warning	ICAO Annex 15	It is prohibited that a <b>NavaidEquipment</b> specification <b>NDB</b> has location <b>ElevatedPoint</b> coordinates expressed with less than 4 decimals	Latitude and Longitude of NDB shall be published with 1 sec resolution (aerodrome navaid equipment)	NDB	location
ADM-5_1_RULE-16B57	Warning	ICAO Annex 15	It is prohibited that a <b>NavaidEquipment</b> specification <b>TACAN</b> has location <b>ElevatedPoint</b> coordinates expressed with less than 4 decimals	Latitude and Longitude of TACAN shall be published with 1 sec resolution (aerodrome navaid equipment)	TACAN	location
ADM-5_1_RULE-16B56	Warning	ICAO Annex 15	It is prohibited that a <b>NavaidEquipment</b> specification <b>Glidepath</b> has location <b>ElevatedPoint</b> coordinates expressed with less than 5 decimals	Latitude and Longitude of Glidepath shall be published with 1/10 sec resolution (aerodrome navaid equipment)	Glidepath	location

## Data Set Specification Requirements - Naming Convention

### 73/2010 (ADQ), Annex I

- apply a **naming convention** for features, attributes and associations, which avoids the use of abbreviations
- Feature cataloguing & UML have good naming practices
  - No special characters
  - Name of entity expressed in “UpperCamelcase”, etc.

### Opinion 02/2018

- The aeronautical data catalogue implicitly uses some naming convention
- But no commonly used standard is applied

Different terms used, e.g. subject and properties compared to features and attributes

Table A 1-1 Aerodrome/Heliport data

Subject	Property	Sub-Property	Type	Description
Entity				A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft (Annex 14)
	Designator		Text	The full textual designator of the runway, used to uniquely identify it at an aerodrome/heliport. E.g. 06/27, 02R/20L, RWY 1
	Nominal length		Distance	The declared longitudinal extent of the runway for operational (performance) calculations
	Nominal width		Distance	The declared transversal extent of the runway for operational (performance) calculations
	Geometry		Polygon	Geometries of RunwayElement, RunwayDisplacementline and RunwayIntersection
	Centre line points			
		Position	Point	The geographical location of runway centre line at each end of the runway, at the stopways and at the origin of each take-off flight path area, and at each significant change in slope of runway and stopway
	Elevation		Elevation	The elevation of the corresponding centre line point
	Geoid undulation		Height	The geoid undulation at the corresponding centre line point

# Data Set Specification Requirements - Geographic Information



All parties

## 73/2010 (ADQ), Annex I

- Description of geometrical elements (point, curve, surface) based on ISO 19107:2003 - Geographic information - Spatial schema

## Opinion 02/2018

ISO 19107 not required



- The data catalogue defines 3 basic geometrical elements i.e. Point, Line, Polygon.

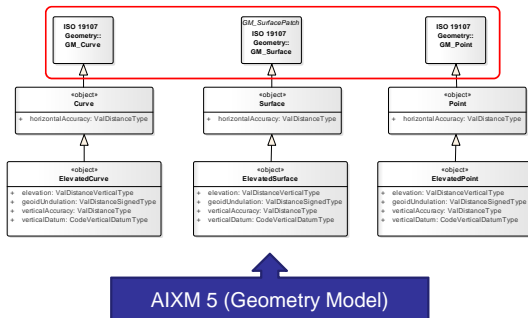


Table A1-9. Data types

Type (1)	Description (2)	Data elements (3)
Point	A pair of coordinates (latitude and longitude) referenced to the mathematical reference ellipsoid which define the position of the point on the surface of the Earth.	Latitude Longitude Horizontal reference system Units of measurement Horizontal accuracy achieved
Line	Sequence of Points defining a linear object	Sequence of Points
Polygon	Sequence of Points forming the boundary of the polygon. The first and last Point are identical.	Closed sequence of Points



# Data Set Specification Requirements - Terrain Data



AISP only

## 73/2010 (ADQ), Annex I

- be provided digitally in accordance with the ICAO Annex 15, Chapter 10, Section 10.2
  - Terrain data set - content, numerical specification and structure
- ICAO Annex 15 Appendix 8
  - Terrain and Obstacle Data Requirements
    - Feature attributes & Numerical requirements

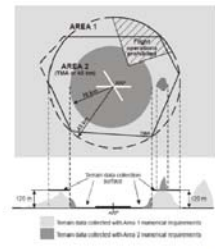
## Opinion 02/2018, Part - AIS

- When made available, terrain data shall be provided in the form of terrain data sets
- ICAO requirements are copied into OR & TR
  - Definition of coverage areas (Area 1-4),
  - Terrain feature attributes
  - Etc.
- Numerical requirements covered within the data catalogue.

Table A8-1. Terrain data numerical requirements

	Area 1	Area 2	Area 3	Area 4
Post spacing	3 arc seconds (approx. 90 m)	1 arc second (approx. 30 m)	0.6 arc seconds (approx. 20 m)	0.3 arc seconds (approx. 9 m)
Vertical accuracy	30 m	3 m	0.5 m	1 m
Vertical resolution	1 m	0.1 m	0.01 m	0.1 m
Horizontal accuracy	50 m	5 m	0.5 m	2.5 m
Confidence level	90%	90%	90%	90%
Data classification	routine	essential	essential	essential
Integrity level	$1 \times 10^{-4}$	$1 \times 10^{-7}$	$1 \times 10^{-7}$	$1 \times 10^{-7}$
Maintenance period	as required	as required	as required	as required

NOSIG, still ICAO Annex 15 req. are relevant



Terrain data collection surfaces — Area 1 and Area 2



## Summary - Data Set Specification vs. Data Catalogue

- **(ALL) Data set specification vs. Aeronautical data catalogue**
  - The opinion text introduces the aeronautical data catalogue, which partially covers the data set specifications foreseen in Article 4 of Regulation 73/2010.
- **(AISP) Documentation**
  - UML or Feature Cataloguing is not required anymore to describe the aeronautical information features. But UML is still recommended as AMC in PART-AIS.
  - Feature Catalogue and application schema is required for Aerodrome Mapping Data (Part-AIS).
- **(ALL) Description of geometrical elements**
  - ISO 19107 is no requirement anymore.  
The data catalogue defines 3 basic geometrical elements i.e. Point, Line, Polygon.



Data Exchange

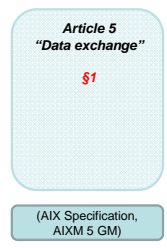
## DATA EXCHANGE FORMAT REQUIREMENTS

# Data Exchange Overview – All Regulated Parties

## 73/2010 (ADQ)

Article 5, §1

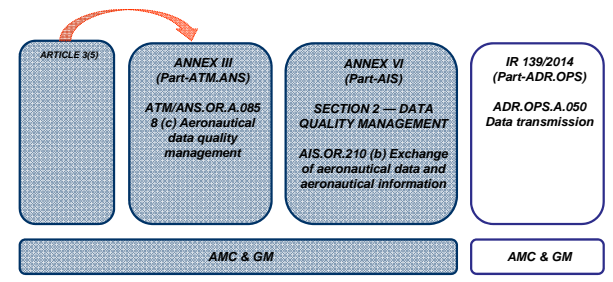
- All regulated parties shall ensure that the aeronautical data and aeronautical information are transferred between themselves by **direct electronic connection**



## Opinion 02/2018

AIS.OR.210 (b); ATM/ANS.OR.A.085 (c); ADR.OPS.A.050

- All regulated parties shall ensure that aeronautical data is exchanged/transmitted through/by **electronic means**



# Direct Electronic Connection vs. Electronic Means

## 73/2010 (ADQ)

Article 3, 15.

direct electronic connection  
*“means a digital connection between computer systems such that data may be transferred between them without manual interaction”*




## Opinion 02/2018

GM1 AIS.OR.210(b); GM1 ATM/ANS.OR.A.085(c); GM1 ADR.OPS.A.050

- GM1 AIS.OR.210(b)
  - The exchange of aeronautical data and aeronautical information may be done by a number of electronic exchanges avoiding the need of manual interaction with the data itself.
- GM1 ATM/ANS.OR.A.085(c)
  - The transmission of aeronautical data and aeronautical information may be done by different electronic means avoiding the need of manual interaction with the data itself.
- GM1 ADR.OPS.A.050
  - The aerodrome operator shall ensure that aeronautical data is transmitted by electronic means.



## Common Understanding 08/2014 Electronic data exchange

- Direct electronic connection: ... data exchanged ... is **automatically ingested** into the recipient system **without any manual interaction with the data itself**
- Data transferred by direct electronic network connection (system-to-system) 



### Exception to use email

- data shall be provided in an attached file that is in line with the requirements
- reception of the data shall be confirmed
- data protection Article 9 applies (follow the industry best practices → EUROCAE ED-76)



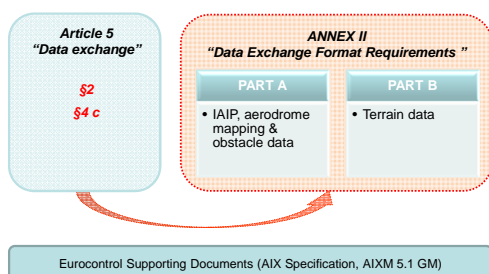
electronic storage devices (e.g. USB sticks, CDROMs...) are not considered as “direct electronic connection” those may still, during a transitional period serve as a means to supply electronic data

## Data Exchange Format Overview – AISP specific

### 73/2010 (ADQ)

Annex II, §2 & § 4c


- AISP shall ensure that the aeronautical data and aeronautical information are in accordance with the **data exchange format** requirements laid down in **Annex II** when
  - transferred **between themselves** (§2)
  - made available to the **next intended user** (§4c)

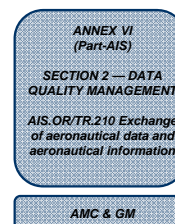


### Opinion 02/2018, PART-AIS

AIS.OR.210

- AISP shall ensure that the format of aeronautical data is based on **an aeronautical information exchange model** designed to be globally interoperable.
  - AMC: AISP should use the aeronautical information exchange model (**AIXM**)
  - GM: Currently, **AIXM 5.1** is considered as being the minimum baseline for the exchange of aeronautical data and aeronautical information.
- AIS.TR.210 (for details)

AIXM relevant for AISP: at different levels 



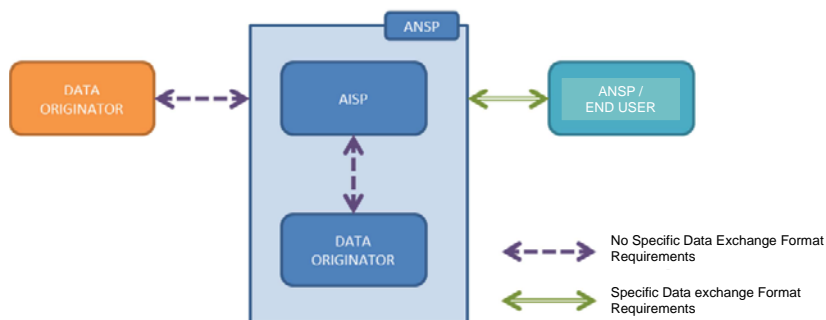
## Data Exchange Format Overview – Other Regulated Parties

### 73/2010 (ADQ)

- no specific format requirements
- (Common Understanding 08/2014) to be agreed between parties in accordance with the **data set specifications**

### Opinion 02/2018

- no specific format requirements
- to be defined in formal arrangements



## Data Exchange Format Requirements - Data Encoding

### 73/2010 (ADQ), Annex II

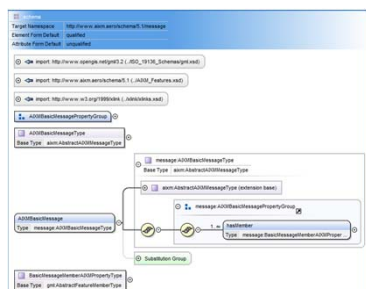
- The aeronautical data and aeronautical information shall be formatted in accordance with a **common specification** which shall
  - use the extensible mark-up language (XML) for data encoding &
  - be expressed in the form of an **XML schema**

### Opinion 02/2018, Part-AIS

XML & XML schema not required



- AMC: The exchange model used should apply a **commonly used data encoding format**
  - GM: Examples of commonly used data encoding formats include extensible markup language (XML), geography markup language (GML), and JavaScript object notation (JSON).
  - GM: The intent of using a commonly used data encoding format is to **ensure interoperability** of aeronautical data exchange between the organisations involved in the data processing chain



```

{
  "results": [
    {
      "id": "1",
      "name": "Bemagde Internet",
      "parent": "Bemagde",
      "status": "true",
      "type": "Bemagde",
      "parent": ""
    },
    {
      "id": "2",
      "name": "Bemagde Internet",
      "parent": "Bemagde",
      "status": "true",
      "type": "Bemagde",
      "parent": ""
    }
  ]
}

```

**JSON**  
JavaScript Object Notation

## Data Exchange Format Requirements - Individual features and feature collections

### 73/2010 (ADQ), Annex II

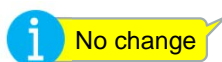
common specification which shall

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

### Opinion 02/2018, Part-AIS.TR.210 (a)

the exchange format of aeronautical data shall:

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



- Ensure that not only whole and complete data set can be exchanged but also a particular feature
- Data provider/originator may only provide a limited sub-set of whole the defined data set or even just the value of one property (e.g. position, elevation, frequency, identifier etc.)

## Data Exchange Format Requirements - Baseline & Permanent Changes

### 73/2010 (ADQ), Annex II

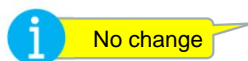
common specification which shall

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

### Opinion 02/2018, Part-AIS

AIS.TR.210(a) the exchange format of aeronautical data shall:

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

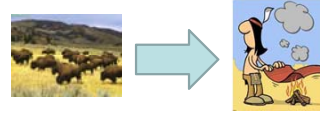


Feature: gmt:identifier: 123	
Timeslice (gmt.id)	1021
validTime/timePeriod/beginPosition:	2015-06-25 00:00
validTime/timePeriod/endPosition:	"unknown"
Interpretation:	BASELINE
sequenceNumber:	2
featureLiftime/timePeriod/beginPosition:	2015-01-08 00:00
featureLiftime/timePeriod/endPosition:	"unknown"
property 1:	ABC
property 2:	BRAVO
property 3:	DVOR
property 4:	115.3
property n:	2.1E

- communicating just a complete new data set might be insufficient
  - recipient has to identify what has changed, while this information is already known by the data provider
- communicating just a property change might also be insufficient
  - recipient has to re-compose the feature data, merging the existing data with the changed values.
- data encoding format needs to support both individual property changes and the complete feature data, as result of that change

Feature gmt:identifier: 123	
Timeslice (gmt.id)	1020
validTime/timeInstant/timePosition:	2015-06-25 00:00
interpretation:	PERMDelta
sequenceNumber:	2
property 2:	BRAVO
property 4:	115.3

# Data Exchange Format Requirements - Structuring of the Exchange Format



AISP only

## 73/2010 (ADQ), Annex II

common specification which shall

- be structured in accordance with the features, attributes and associations of the data set definition described in Annex I
- mapping rules shall be documented

**i** NOSIG: Still the exchange format shall be in accordance with the data specification

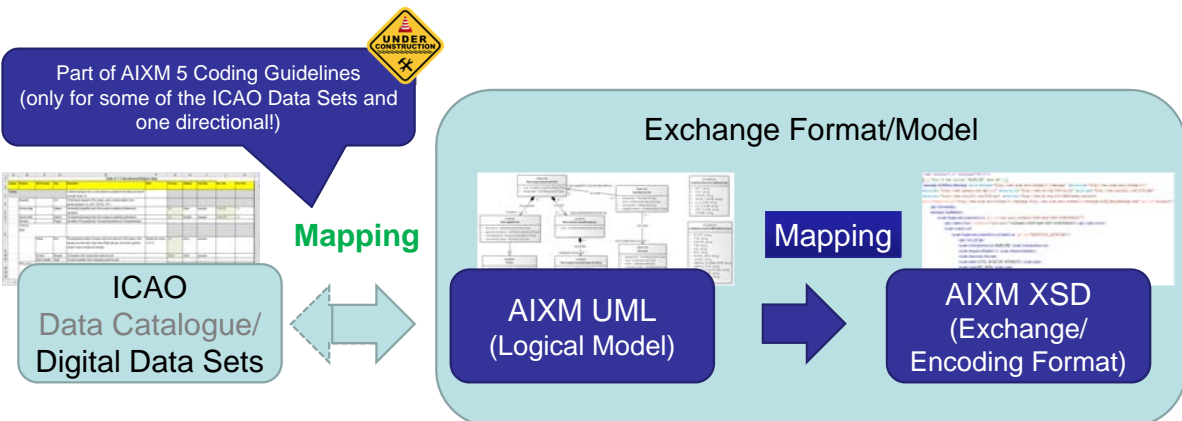
## Opinion 02/2018, Part-AIS.TR.210(c)

the exchange format of aeronautical data shall

- be structured in accordance with the subjects, properties of the aeronautical data catalogue and
- be documented through a mapping between the exchange format and the aeronautical data catalogue



# Reality Check: AIXM 5





## Data Exchange Format Requirements - Enumerated list & range of values

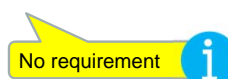
### 73/2010 (ADQ), Annex II

common specification which shall

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

### Opinion 02/2018

Does not contain any format requirements regarding enumerated lists of values or range of values



## Data Exchange Format Requirements - GML

### 73/2010 (ADQ), Annex II

common specification which shall

- comply with the **geography mark-up language (GML)** specification for the encoding of geographical information

```

    <aixm:ElevatedPoint srsName="urn:ogc:def:crs:EPSG::4326" gml:id="ID55">
      <gml:pos>52.2889 -32.0350</gml:pos>
    </aixm:ElevatedPoint>
  
```

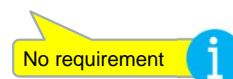


### Opinion 02/2018

Does not contain any requirements regarding GML or the encoding of geographical information.

GML is only mentioned in the **GM to AIS.TR**

*"Examples of commonly used data encoding formats include extensible markup language (XML), geography markup language (GML), and JavaScript object notation (JSON)."*



## Data Exchange Format Requirements - Extensibility

73/2010 (ADQ)

Does not contain any requirements regarding extensibility

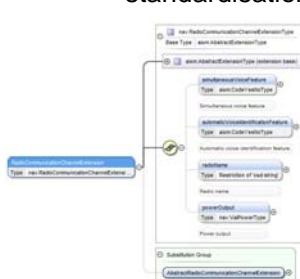
Opinion 02/2018, AMC to AIS.TR.210

The exchange model used should:

- provide an **extension mechanism** by which groups of users can extend the properties of existing features and add new features which do not adversely affect global standardisation

```

<!--Member-->
<ais:RadioCommunicationChannel gml:id="RCC_000001">
  <ais:timeSlice>
    <ais:RadioCommunicationChannelTimeSlice gml:id="RADIO_COMM_CHAN_TR_000001">
      <gml:validTime>
        <gml:TimePeriod gml:id="RCC_TIME_PERIOD_000001">
          <gml:beginPosition>2012-12-12T00:00:00.000-05:00</gml:beginPosition>
          <gml:endPosition indeterminate="indeterminate"></gml:endPosition>
        </gml:TimePeriod>
      </gml:validTime>
      <ais:interpretation>BASELINE</ais:interpretation>
      <ais:channel>OTTK</ais:channel>
      <ais:extension>
        <nav:RadioCommunicationChannelExtension gml:id="RCC_EXTENSION_000001">
          <nav:simultaneousVoiceFeature<nav:simultaneousVoiceFeature>
            <nav:automaticVoiceIdentificationFeature<nav:automaticVoiceIdentificationFeature>
              <nav:radioName>NONE</nav:radioName>
            </nav:RadioCommunicationChannelExtension>
          </ais:extension>
        </nav:RadioCommunicationChannelExtension>
      </ais:timeSlice>
    </ais:RadioCommunicationChannel>
  </!--Member-->
  
```



AIXM 5 extension

## Data Exchange Format Requirements - Terrain Data

73/2010 (ADQ), Annex II

- The electronic terrain data shall be provided in a common format compliant with the **ISO standards**:
  - ISO 19107:2003 - Geographic information - Spatial schema
  - ISO 19115:2003 - Geographic information - Metadata
  - ISO 19139:2007 - Geographic information - Metadata — XML schema implementation
  - ISO 19118:2005 - Geographic information - Encoding
  - ISO 19136:2007 - Geographic information - Geography Mark-up Language (GML)

Opinion 02/2018, Part-AIS, GM

- The existing formats for the exchange of electronic terrain datasets do not fully meet the requirements of the ISO 19100 series on geographic information, therefore the **GeoTIFF** format with metadata is preferred. Further formats may include **Shape file**.

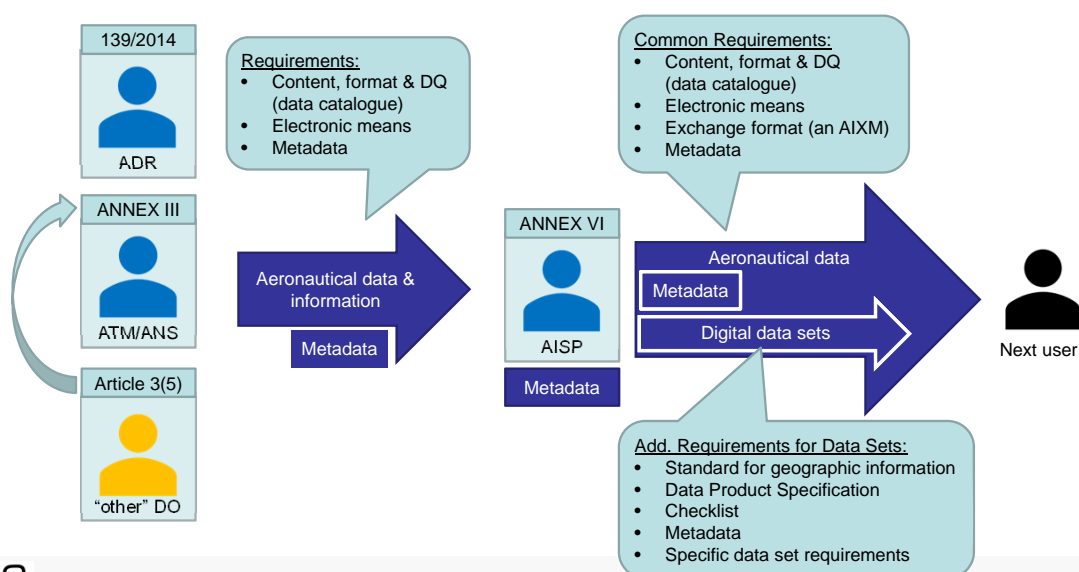
Common Understanding 04/2013  
*"It is recognised that the existing formats for the exchange of electronic terrain datasets do not fully meet the requirements of the ISO 19100 series as required by the Regulation."*

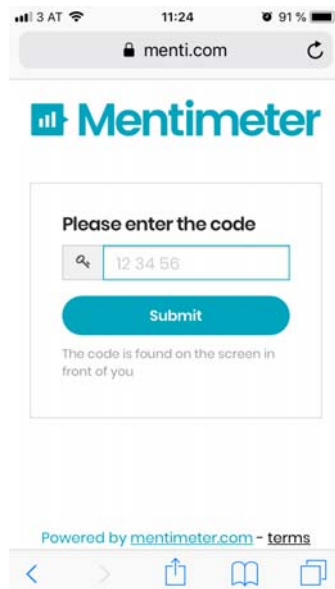
Less stringent requirements. Recommendation from TOD WG which said that users had expressed this preference.

## Summary - Data Exchange Format Requirements

- (ALL) Electronic means
  - “avoiding the need of manual interaction with the data” but not required “digital connection between computer systems”
- (AISP) Exchange format - General
  - ‘the format of aeronautical data is based on an aeronautical information exchange model designed to be globally interoperable’ AMC ‘the AIXM’ as exchange format, without mentioning a version.  
GM ‘AIXM 5.1 is considered as being the minimum baseline for the exchange of aeronautical data...’
- (AISP) Terrain data
  - For terrain data a GM states that the GeoTIFF format with metadata is preferred
- (ASIP) Extension mechanism
  - The opinion recommends as AMC an extension mechanism
- (AISP) Data Encoding
  - To use XML & XML Schema for data encoding is not required anymore.  
In a GM XML is just mentioned as one of many example of a data encoding format (amongst GML and JSON)
- (ASIP) Mapping to the Data Catalogue
  - Analog to the mapping between the data set specification and the data exchange format mentioned in IR 73/2010, Opinion 02/2018 requires a mapping between the data catalogue and the exchange format
- (AISP) Encoding of geographical information
  - The Geography mark-up language (GML) is not a requirement anymore  
In a GM GML is just mentioned as one of many example of a data encoding format (amongst XML and JSON)

## EASA Opinion 02/2018 Data Flow & Requirements Summary







UML (Unified Modelling Language) is used ...

- A. to define data quality requirements
- B. to describe aeronautical information features and their properties
- C. as data encoding format
- D. to define business rules



What is considered as “electronic means”...

- A. System to system connection
- B. Fax
- C. Smoke signals
- D. All of the above



## XML (Extensible Markup Language) is...

- A. used for creating web pages
- B. the same as an excel spreadsheet
- C. required to exchange terrain data
- D. a data encoding format



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# Opinion 02/2018

## Aeronautical Data Catalogue & Digital Data Sets

INEA ADQ Implementation Workshop  
ANS Czech Republic  
Prague, 4-6 Sep 2018

Wolfgang Scheucher  
SOLITEC Software Solutions GesmbH

### Table of Content



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- Concept and Use
- Content and Structure
- Data Quality Requirements



#### **PART II – Digital Data Sets**

- Introduction
- General Requirements
- AIP Data Set
- Terrain & Obstacle Data Set
- Aerodrome Mapping Data Set
- Instrument Flight Procedure Data Set
- Data Set Updates
- AIXM Coding Guidelines



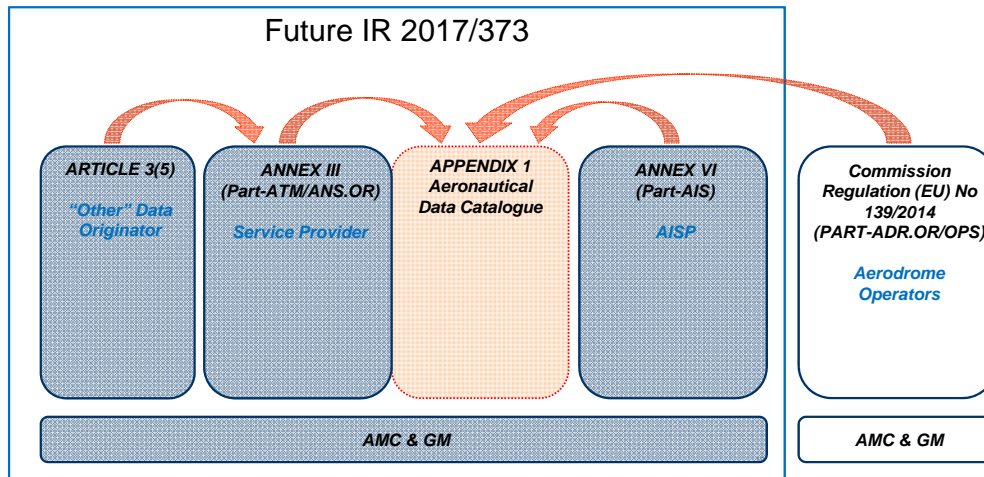
# PART I – AERONAUTICAL DATA CATALOGUE



Aeronautical Data Catalogue

# CONCEPT AND USE





## Basic Requirements

### AIS.OR.200 "General"

An AIS provider shall ensure that:

- (a) aeronautical data ...are provided in accordance with the specifications laid down in the aeronautical data catalogue

### ATM/ANS.OR.A.085 "Aeronautical data quality management" & Article 3(5)

When originating, processing or transmitting data to the AIS provider, the service provider shall:

- (a) ensure that aeronautical data ...conform to the specifications of the aeronautical data catalogue

### ADR.OPS.A.030 "Aeronautical data catalogue"


- When originating, processing or transmitting data to the AIS provider, the aerodrome operator shall ensure that the aeronautical data ... conform to the data catalogue specifications



## Data Catalogue – Content

- The origin of the data catalogue is the **ICAO data catalogue** (PANS-AIM),
  - a set of **excel spreadsheets**,
  - each containing a particular **information sub-domain**,
  - which was **copied into** Appendix 1 of Annex III of IR 2017/373.
- These domains are:
  - (1) Aerodrome data;
  - (2) Airspace data;
  - (3) ATS and other routes data;
  - (4) Instrument flight procedure data;
  - (5) Radio navigation aids/systems data;
  - (6) Obstacle data;
  - (7) Geographic data.  
(e.g. Buildings, roads, etc.) → cultural data;
- & Data types.

ICAO Data Catalogue	
Table A1-1	Aerodrome data;
Table A1-2	Airspace data;
Table A1-3	ATS and other routes data;
Table A1-4	Instrument flight procedure data;
Table A1-5	Radio navigation aids/systems data;
Table A1-6	Obstacle data;
Table A1-7	Geographic data;
Table A1-8	Terrain data;
Table A1-9	Data types; and
Table A1-10	Information about national and local regulations, services and procedures.



## Data Catalogue – Structure

- provides a common list of terms
- aeronautical data subjects, properties and sub-properties
- identification of the organizations and authorities responsible for data origination*

subject for which data can be collected

an identifiable characteristic of a subject which may be further defined into sub-properties

the data is classified into different types

a description of the data element

containing additional information or conditions for the provision of the data

Subject	Property	Sub-Property	Type	Description	Note	Accuracy	Integrity	Orig. Type	Pub. Res.	Chart Res.
Runway				A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft. (Annex 14)						
	Designator		Text	The full textual designator of the runway, used to uniquely identify it at an aerodrome/heliport. E.g. 09/27, 02R/20L, RWY 1.						
	Nominal length		Distance	The declared longitudinal extent of the runway for operational (performance) calculations.		1 m	critical	surveyed	1 m or 1 ft	1 m
	Nominal width		Distance	The declared transversal extent of the runway for operational (performance) calculations.		1 m	essential	surveyed	1 m or 1 ft	1 m
	Geometry		Polygon	Geometries of RunwayElement, RunwayDisplacement and RunwayIntersection						
	Centre line points									
		Position	Point	The geographical location of runway centre line at each end of the runway, at the stopway and at the origin of each take-off flight path area, and at each significant change in slope of runway and stopway	Definition from Annex 4 3.8.4.2	1 m	critical	surveyed		
		Elevation	Elevation	The elevation of the corresponding centre line point		0.25 m	critical	surveyed		
		Ground undulation	Height	The ground undulation at the corresponding centre line point						
	RWY exit line									

Aeronautical Data Catalogue

# DATA QUALITY REQUIREMENTS

## Data Quality Requirements

**AIS.TR.200 “General“**

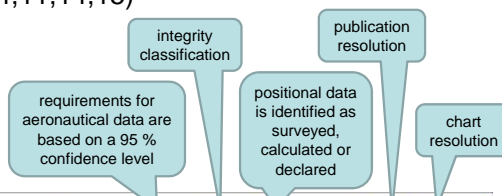
**ATM/ANS.OR.A.085 “Aeronautical data quality management” & Article 3(5)**

**ADR.OPS.A.010 “Data quality requirements”**

- The **accuracy** of aeronautical data shall be as specified in the aeronautical data catalogue...
- the **resolution** of the aeronautical data is commensurate with the actual data accuracy
- The integrity of aeronautical data shall be maintained. Based on the **integrity classification** specified in the data catalogue...

## Data Catalogue – Data Quality Elements

- **Single source** of all data quality requirements (Annex 4,11,14,15)
- Could be considered as Metadata (e.g. IR ADQ)
- Opinion 02/2018 does not mention it as Metadata



**Table A 1-1 Aerodrome/Heliport data**

Subject	Property	Sub-Property	Type	Description	Note	Accuracy	Integrity	Orig Type	Pub. Res.	Chart Res.
Runway				A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft. (Annex 14)						
	Designator		Text	The full textual designator of the runway, used to uniquely identify it at an aerodrome/heliport. E.g. 09/27, 02R/20L, RWY 1.						
	Nominal length		Distance	The declared longitudinal extent of the runway for operational (performance) calculations.		1 m	critical	surveyed	1 m or 1 ft	1 m
	Nominal width		Distance	The declared transversal extent of the runway for operational (performance) calculations.		1 m	essential	surveyed	1 m or 1 ft	1 m
	Geometry		Polygon	Geometries of RunwayElement, RunwayDisplacedArea and RunwayIntersection						
	Centre line points									
		Position	Point	The geographical location of runway centre line at each end of the runway, at the stopway and at the origin of each take-off flight path area, and at each significant change in slope of runway and stopway	Deletion from Annex 4 3.8.4.2	1 m	critical	surveyed		
		Elevation	Elevation	The elevation of the corresponding centre line point.		0.25 m	critical	surveyed		
		Ground undulation	Height	The ground undulation at the corresponding centre line point.						
	RWY exit line									

## Formal arrangements

- **AMC1 AIS.OR.205 “Formal arrangements” & AMC1 ATM/ANS.OR.A.085(d) “Aeronautical data quality management” & AMC2 ADR.OPS.010 “Data quality requirements”**

**Formal arrangements** should include the following minimum content:

...the **data quality requirements** for each data item supplied **according to the aeronautical data catalogue**;

...

## Summary - Aeronautical Data Catalogue

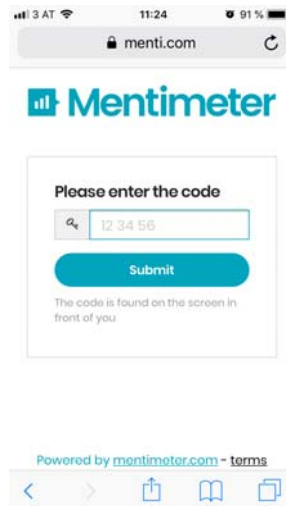


- provides a **common list of terms**
- defines **data quality requirements**
- facilitates the **formal arrangements** between data originators and the AIS

## Q & A



Time for Quiz...



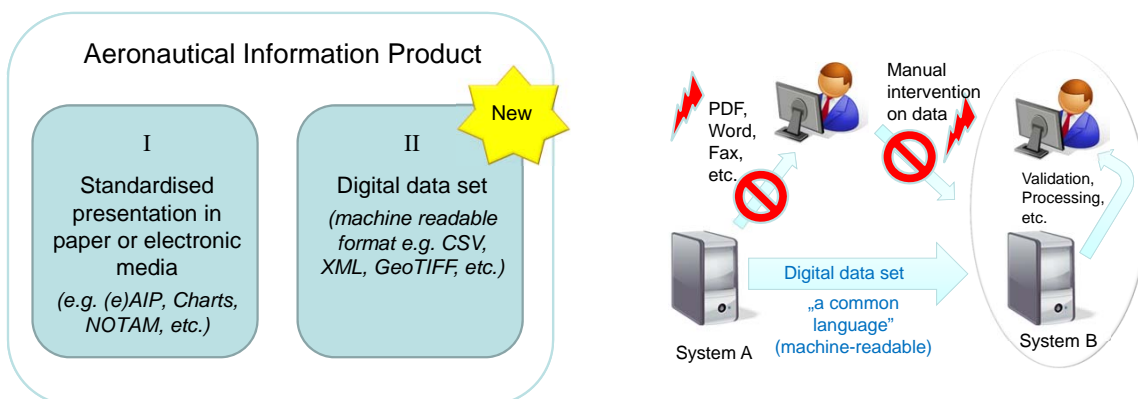
## PART II – DIGITAL DATA SETS

Digital Data Sets

# INTRODUCTION

## Opinion 02/2018 Aeronautical Information Product

- aeronautical data and aeronautical information may be provided as





## Some definitions ...

- data set**  
*"means an identifiable collection of data"*
- data item**  
*"means a single attribute of a complete data set, which is allocated a value that defines its current status"*

Defined by the Data Catalogue

```

<?xml version="1.0" encoding="UTF-8">
<!-- Disclaimer: This sample data set is created by SIA (the French Aeronautical Information Service) and is only provided for evaluation purpose.
This data set shall not be used for operational purpose. -->
<message:AIMDataMessage xmlns:sia="http://www.w3.org/2001/XMLSchema-instance" xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:igs="http://www.
xmlns:resd="http://www.w3.org/2001/XMLSchema" xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:geo="http://www.isotc211.org/2005/geo" xmlns:igs="http://www.
xmlns:slink="http://www.w3.org/1999/xlink" xmlns:event="http://www.aixm.aero/schema/5.1/event" xmlns:aixm="http://www.aixm.aero/schema/5.1" xmlns:m
xmlns:schemaLocation="http://www.aixm.aero/schema/5.1/message http://www.aixm.aero/schema/5.1/message/AIXM_BasicMessage.xsd" gml:id="MS000001">
<message:hasMember>
<aixm:AirportHeliport gml:id="uid.729920d4-5360-49e3-b4b2-1a28313261ba">
<gml:identifier codeSpace="urn:uuid:">729920d4-5360-49e3-b4b2-1a28313261ba</gml:identifier>
<aixm:timeSlice>
<aixm:AirportHeliportTimeSlice gml:id="MID_1522556_729920d4-5360-49e3-b4b2-1a28313261ba">
<gml:validTime>
<aixm:interpretation:BASELINE</aixm:interpretation>
<aixm:sequenceNumber:1</aixm:sequenceNumber>
<aixm:correctionNumber:0</aixm:correctionNumber>
<aixm:designator:LPH358</aixm:designator>
<aixm:name:SAINT ETIENNE MLLACUSSY</aixm:name>
<aixm:type:HP</aixm:type>
<aixm:certif:ICAO nilReason="unknown" xsi:nil="true"/>
<aixm:controlType nilReason="inapplicable" xsi:nil="true"/>
<aixm:fieldElevation uom="FT">2148</aixm:fieldElevation>
<aixm:fieldElevationAccuracy uom="FT">1</aixm:fieldElevationAccuracy>
<aixm:magneticVariationAccuracy nilReason="unknown" xsi:nil="true"/>
<aixm:magneticVariationDate nilReason="unknown" xsi:nil="true"/>
<aixm:certificationDate nilReason="unknown" xsi:nil="true"/>
<aixm:certificationExpirationDate nilReason="unknown" xsi:nil="true"/>
<aixm:responsibleOrganisation>
<aixm:ARP>
<aixm:annotation>
</aixm:AirportHeliportTimeSlice>
</aixm:timeSlice>
</aixm:AirportHeliport>
</message:hasMember>
</message:hasMember>

```

Data set

Data item

Data value

Digital Data Sets

# GENERAL REQUIREMENTS

# Opinion 02/2018 Digital Data Sets

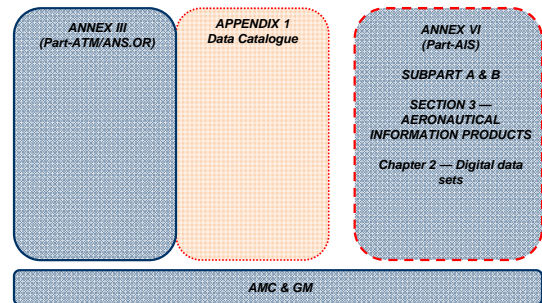


## AIS.OR.335 General — Digital data sets

(a) If available, an AIS provider shall ensure that digital data is in the form of the following data sets:

- (1) AIP data set;
- (2) terrain data set;
- (3) obstacle data sets;
- (4) aerodrome mapping data sets; and
- (5) instrument flight procedure data sets.

Only relevant for AISP

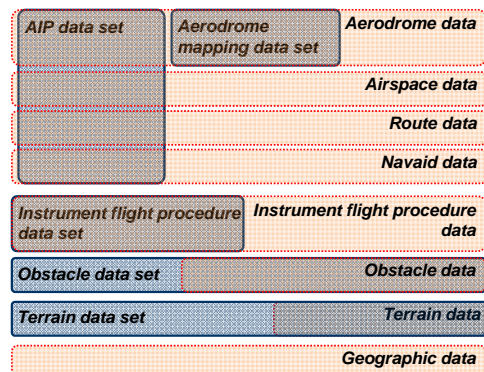
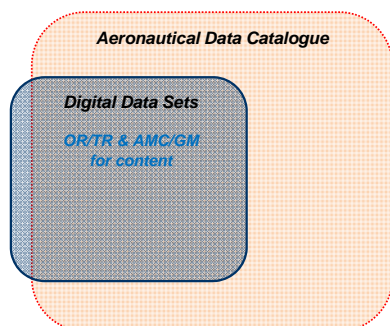


Based on the data sets defined by ICAO Annex 15 & PANS-AIM

# Opinion 02/2018 Data Catalogue & Data Sets



- Different data scope of data catalogue & digital data sets



## General Requirements Data Sets

### GM1 AIS.OR.335(a)

- Digital data sets are **not compulsory** to be provided. If digital data is made available, the corresponding requirements apply

### GM1 AIS.OR.335(a)

- Data **items may appear in multiple data sets**

### AMC1 AIS.OR.210(a)

- An AIS provider should use “the” **AIXM** to enable the distribution of AIS data in digital format

## General Requirements Geographic Information

### AIS.TR.335 General — Digital data sets

- (a) A standard for geographic information shall be used as a **reference framework**.

### GM1 AIS.TR.335(a) General

- The **ISO 19100 series** of standards for geographic information **may be used** as a reference framework.

ISO 19107:2003 Geographic information -- Spatial schema

ISO 19136:2007 Geographic information -- Geography Markup Language (GML)

ISO 19115-1:2014 Geographic information -- Metadata

ISO/TS 19139:2007 Geographic information -- Metadata -- XML schema implementation

ISO 19108:2002 Geographic information -- Temporal schema

**Aixm**  
Aeronautical Information Exchange Model  
AIXM 5.1

## General Requirements Data Product Specification

### AIS.TR.335 General — Digital data sets

- (b) A **description** of each available **data set** shall be provided **in the form of a data product specification**.



### GM1 AIS.TR.335(b) General

- (a) **ISO Standard 19131** requirements of data product specifications for geographic information
- (b) The data product specification enables air navigation users to **evaluate the products** and determine whether they **fulfil the requirements for their intended use** (application).
- (c) This **may include** an overview, scope, data product identification, data content and structure, reference system, data quality, data capture, data maintenance, data portrayal, data product delivery, and metadata.

## General Requirements Checklist

### AIS.OR.335 General — Digital data sets

- (c) A **checklist of valid data sets** shall be regularly provided.

NOTAM checklist

### AIS.TR.335 General— Digital data sets

- (c) A checklist of the available data sets, including their **effective and publication dates**, shall be made available to users to **ensure that current data is being used**.
- (d) The checklist of data sets shall be made available through the **same distribution mechanism** as the one used for the data sets.



E.g. Website, Web Service, etc.

Digital Data Sets

# AIP DATA SET

## AIP Data Set

### AIS.OR.345 AIP data set

- An AIS provider shall ensure that the AIP data set, if available, contains the digital representation of aeronautical information of lasting character, including **permanent information** and **long-duration temporary changes**.

### AIS.TR.345 AIP data set

- (a) The AIP data set shall include data about the following **subjects**, including the **properties** indicated, applicable:

Data subjects	Associated properties as a minimum
ATS airspace	Type, name, lateral limits, vertical limits, class of airspace
Special activity airspace	Type, name, lateral limits, vertical limits, restriction activation

Subset of the data catalogue subjects

### GM1 AIS.TR.345(a)

- The AIP data set **includes** the relevant **AIP amendment and SUP information**.

# AIP Data Set – Data subjects

Opinion 02/2018

Data subjects	Associated properties as a minimum
ATS airspace	Type, name, lateral limits, vertical limits, class of airspace
Special activity airspace	Type, name, lateral limits, vertical limits, restriction, activation
Route	Identifier prefix, flight rules, designator
Route segment	Navigation specification, start point, end point, track, distance, upper limit, lower limit, minimum en-route altitude (MEA), minimum obstacle clearance altitude (MOCA), direction of cruising level, reverse direction of cruising level, required navigation performance
Waypoint — en-route	Reporting requirement, identification, location, formation
Aerodrome heliport	Location indicator, name, International Air Transport Association (IATA) designator, served city, certification date, certification expiration date, if applicable, control type, field elevation, reference temperature, magnetic variation, airport reference point
Runway	Designator, nominal length, nominal width, surface type, strength
Runway direction	Designator, true bearing, threshold, take-off run available (TORA), take-off distance available (TODA), accelerate-stop distance available (ASDA), landing distance available (LDA), rejected TODA (for helicopters)
Final approach and take-off area (FATO)	Designation, length, width, threshold point
Touchdown and lift-off area (TLOF)	Designator, centre point, length, width, surface type
Radio navigation aid	Type identification, name, aerodrome served, hours of operation, magnetic variation, frequency/channel, position, elevation, magnetic bearing, true bearing, zero bearing direction



ICAO PANS-AIM: "When the AIP Data Set is provided, the following sections of the AIP may be left blank and a reference to the data set availability shall be provided:"

1. ENR 2.1 FIR, UIR, TMA
2. ENR 3.1 Lower ATS Routes
3. ENR 3.2 Upper ATS Routes
4. ENR 3.3 Area Navigation (RNAV) Routes
5. ENR 3.4 Helicopter Routes
6. ENR 3.5 Other Routes
7. ENR 3.6 En-route Holding
8. ENR 4.1 Radio navigation aids — en-route
9. ENR 4.4 Name-code designators for significant points
10. ENR 4.5 Aeronautical Ground Lights — En-route
11. ENR 5.1 Prohibited, Restricted and Danger Areas
12. ENR 5.2 Military exercise and training areas and air defence identification zone
13. ENR 5.3.1 Other activities of a dangerous nature
14. ENR 5.5 Aerial sporting and recreational activities
15. \*\*\*\* AD 2.19 Radio navigation and landing aids
16. \*\*\*\* AD 3.18 Radio navigation and landing aids

# AIP Data Set not applicable

## AIS.TR.345 AIP data set

- (b) When a property is not defined for a particular occurrence of the subjects listed in (a), the AIP data subset shall include an **explicit indication: 'not applicable'**.

## GM1 AIS.TR.345(b)

- There may also be other reasons why a property is not provided, e.g. **missing, unknown, withheld**, etc.

AIXM 5 example!



Digital Data Sets

## TERRAIN & OBSTACLE DATA SET

### Terrain & obstacle data Definition of the Coverage Areas

#### **AIS.OR.350 Terrain and obstacle data — General requirements**

- An AIS provider shall ensure that terrain and obstacle data, if available, are provided in accordance with [AIS.TR.350](#)



## Terrain & obstacle data

### GM1 to AIS.OR.350

- (a) EUROCONTROL '[Terrain and Obstacle Data Manual](#)'
- (b) EUROCAE Document [ED-98C](#) 'User Requirements For Terrain And Obstacle Data'

Additional  
Guidance Documentation

### GM2 AIS.OR.350

- (a) Terrain and obstacle data are intended to be used in the following [air navigation applications](#):
  - ground proximity warning system;
  - instrument procedure design;
  - advanced surface movement guidance and control system (A-SMGCS);
  - aeronautical chart production and on-board databases.
  - Etc.
- (b) The data may also be used in [other applications](#) such as flight simulator and synthetic vision systems...

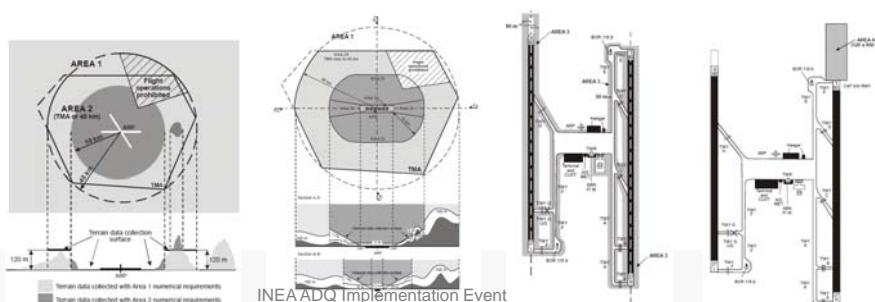
Applications  
(copied from PANS-AIM)

## Terrain & obstacle data Definition of the Coverage Areas

### AIS.TR.350 Terrain and obstacle data — General requirements

- The coverage [areas](#) for sets of terrain and obstacle data shall be specified as:
  - (a) Area 1: territory of the State;
  - (b) Area 2 vicinity of aerodrome:
    - (Area 2a, Area 2b, Area 2c, Area 2d):...;
  - (c) Area 3: aerodrome movement area...;
  - (d) Area 4: prior to the runway threshold...

Definitions of Areas  
(copied from ICAO Annex 15)





## Terrain data sets Technical Requirements

### AIS.TR.355 Terrain data sets

- Basic Requirements
  - e.g. **only one feature** type, i.e. terrain, shall be provided
- Mandatory attributes

Basically copied from Annex 15 & PANS-AIM

Numerical Requirements in Data Catalogue.

Table A3-6. Terrain data numerical requirements				
	Area 1	Area 2	Area 3	Area 4
Post spacing	3 sec seconds (approx. 90 m)	1 sec second (approx. 30 m)	0.6 sec seconds (approx. 20 m)	0.3 sec seconds (approx. 9 m)
Vertical accuracy	30 m	3 m	0.5 m	1 m
Vertical resolution	1 m	0.1 m	0.01 m	0.1 m
Horizontal accuracy	50 m	5 m	0.5 m	2.5 m
Confidence level	90%	90%	90%	90%
Integrity classification	essential	essential	essential	essential
Maintenance period	as required	as required	as required	as required

Terrain attribute	Mandatory/Optional
Area of coverage	Mandatory
Data originator identifier	Mandatory
Data source identifier	Mandatory
Acquisition method	Mandatory
Post spacing	Mandatory
Horizontal reference system	Mandatory
Horizontal resolution	Mandatory
Horizontal accuracy	Mandatory
Horizontal confidence level	Mandatory
Horizontal position	Mandatory
Elevation	Mandatory
Elevation reference	Mandatory
Vertical reference system	Mandatory
Vertical resolution	Mandatory
Vertical accuracy	Mandatory
Vertical confidence level	Mandatory
Surface type	Optional
Recorded surface	Mandatory
Penetration level	Optional
Known variations	Optional
Integrity	Mandatory
Date and time stamp	Mandatory
Unit of measurement used	Mandatory

## Obstacle data sets Technical Requirements

### AIS.TR.360 Obstacle data sets

- Basic Requirements
  - e.g. obstacle data elements are features that shall be represented in the data sets by **points, lines or polygons**;
- Mandatory attributes

Basically copied from Annex 15 & PANS-AIM

Numerical Requirements in Data Catalogue.

Subject	Property	Sub-Property	Type	Description	Note	Accuracy	Integrity	Cong Type	Pub. Res.	Chart Res.
Obstacle				All land-pollution (temporary or permanent) and mobile obstacles in path						
	Horizontal position	Point	Point	Horizontal position of obstacle					See Note 1)	
		Line	Line	Horizontal position of obstacle						
		Polygon	Polygon	Horizontal position of obstacle						
	Elevation			Elevation of the highest point of the obstacle					See Note 2)	
	Dimension									
	Height			Height of the obstacle above ground						
				Note 1)						
				Obstacles in Area 1		10 m	essential	horizontal	1 sec	as published
				Obstacles in Area 2 (including Ob. 2b, 2c, 2d take-off flight path area and obstacle limitation surfaces)		10 m	essential	horizontal	110 sec	110 sec
				Obstacles in Area 3		15 m	essential	horizontal	110 sec	110 sec
				Obstacles in Area 4		2.5 m	essential	horizontal		
				Note 2)						
				Obstacles in Area 1		10 m	essential	horizontal	1 sec or 1.8	1 sec or 1.8
				Obstacles in Area 2 (including Ob. 2b, 2c, 2d take-off flight path area and obstacle limitation surfaces)		10 m	essential	horizontal	1 sec or 1.8	1 sec or 1.8
				Obstacles in Area 3		15 m	essential	horizontal	1.1 sec or 1.8	1.1 sec or 1.8
				Obstacles in Area 4		1 m	essential	horizontal	0.1 m	

Obstacle attribute	Mandatory/Optional
Area of coverage	Mandatory
Data originator identifier	Mandatory
Data source identifier	Mandatory
Obstacle identifier	Mandatory
Horizontal accuracy	Mandatory
Horizontal confidence level	Mandatory
Horizontal position	Mandatory
Horizontal resolution	Mandatory
Horizontal extent	Mandatory
Horizontal reference system	Mandatory
Elevation	Mandatory
Height	Optional
Vertical accuracy	Mandatory
Vertical confidence level	Mandatory
Vertical resolution	Mandatory
Vertical reference system	Mandatory
Obstacle type	Mandatory
Geometry type	Mandatory
Integrity	Mandatory
Date and time stamp	Mandatory
Unit of measurement used	Mandatory
Operations	Optional
Effectivity	Optional
Lighting	Mandatory
Marking	Mandatory

## Obstacle Data Set (AIP sections)



ICAO PANS-AIM: "When the Obstacle Data Set is provided, the following sections of the AIP may be left blank and a reference to the data set availability shall be provided:"

- 17. ENR 5.4 Air navigation obstacles
- 18. \*\*\*AD 2.10 Aerodrome obstacles
- 19. \*\*\*AD 3.10 Heliport obstacles

Digital Data Sets

## AERODROME MAPPING DATA SET

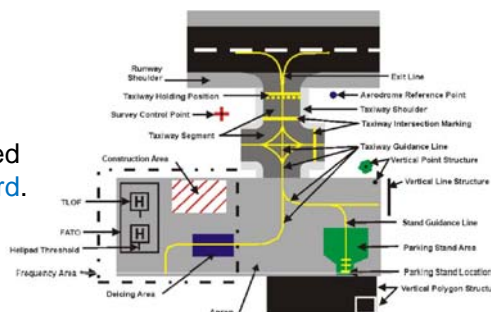
## Aerodrome mapping data sets

### AIS.OR.365 Aerodrome mapping data sets

- An AIS provider shall ensure that aerodrome mapping data sets, if available, are provided in accordance with [AIS.TR.365](#).

### AIS.TR.365 Aerodrome mapping data sets

- (a) Aerodrome mapping data sets shall contain the [digital representation](#) of aerodrome features.
- (b) [ISO standards for geographic information](#) shall be used as a reference framework.
- (c) Aerodrome mapping data products shall be described following the relevant [data product specification standard](#).
- (d) The content and structure of aerodrome mapping data sets shall be defined in terms of an [application schema](#) and a [feature catalogue](#).



## Aerodrome mapping data sets Guidance Material/Reference Documents

### GM1 AIS.TR.365

[EUROCAE ED-99D](#) 'User requirement for aerodrome mapping information' and [EUROCAE ED-119C](#) 'Interchange standards for terrain, obstacle and aerodrome mapping data',

### GM1 AIS.TR.365(a)

Aerodrome features consist of attributes and geometries, which are characterised as [points](#), [lines](#) or [polygons](#). Examples include runway thresholds, taxiway guidance lines and parking stand areas.

...

### GM1 AIS.TR.365(b)

[ISO Standard 19100 series](#) on geographic information can be used as a reference framework.

### GM1 AIS.TR.365(c)

[ISO Standard 19131](#) contains standards for data product specification.

### GM1 AIS.TR.365(d)

[ISO Standard 19109](#) contains standards for application schemas, [ISO Standard 19110](#) describes the feature cataloguing methodology for geographic information.

Digital Data Sets

# INSTRUMENT FLIGHT PROCEDURE DATA SET

## Instrument flight procedure data sets

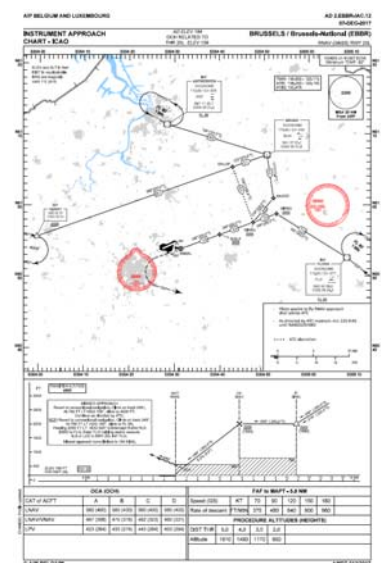
### AIS.OR.370 Instrument flight procedure data sets

- An AIS provider shall ensure that instrument flight procedure data sets, if available, are provided in accordance with [AIS.TR.370](#).

### AIS.TR.370 Instrument flight procedure data sets

- (a) Instrument flight procedure data sets shall contain the [digital representation](#) of instrument flight procedures.
- (b) The instrument flight procedure data sets shall include data about the following [subjects](#), including all of their properties:
  - (1) procedure;
  - (2) procedure segment
  - (3) final approach segment;
  - (4) procedure fix;
  - (5) procedure holding; and
  - (6) helicopter procedure specifics.

Basically copied from Annex 15 & PANS-AIM



# Instrument flight procedure data sets Reference Document



## GM1 AIS.TR.370

- **PANS-OPS**, ICAO Doc 8168, Volume II, 6th edition of 2014 – Part III, Section 2, Chapter 5 “Navigation database coding”.

Path Terminator concept (ARINC 424)

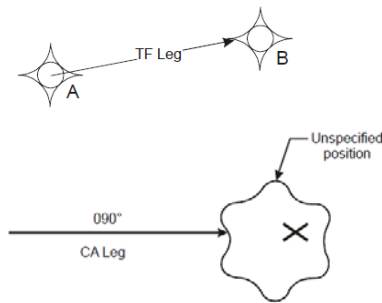


Table III-2-5-App-3. Path terminators (Required data)

Path terminator	Waypoint identifier	Flyover	Turn direction	Recommended Novald	Distance from Novald	Bearing from Novald	Magnetic course	Path length	Altitude restriction 1	Altitude restriction 2	Speed limit	Vertical angle	Arc centre
CA		O					✓		6		O		
CF	✓	1	O	✓	✓	✓	✓		O	O	O	O	
DF	✓	1	O	O	O	O			O	O	O		
FA	✓		O	✓	✓	✓			6				
FM	✓		O	✓	✓	✓	✓		O		O		
HM	✓		O	O	O	O	✓	✓	O		O		
IF	✓			O	O	O			O	O	O		
RF	✓	O	✓	O		2	3	5	O	O	O	O	✓
TF	✓	O	O	O	O	O	O	O	O	O	O	O	
VA			O				4		6		O		
VI			O	O			4		O	O	O		
VM	O		O				4		O	O	O		

✓ — Required  
 O — Optional  
 1 — Required for CF/DF and DF/DF combinations only.  
 2 — Inbound tangential track  
 3 — Outbound tangential track  
 4 — Heading not course  
 5 — Along track distance  
 6 — Altitude at or above



Digital Data Sets

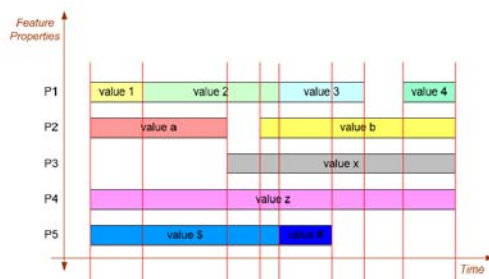
# DATA SET UPDATES

## Data set updates (1)

### AIS.OR.515 Data set updates

An AIS provider shall:

- (a) amend or reissue data sets at such **regular intervals** as may be necessary to **keep them up to date**;
- (b) issue permanent changes and temporary changes of long duration - three months or longer - made available as digital data in the form of a **complete data set and/or a subset** that includes only the differences from the previously issued complete data set.



## Data set updates (2)

### AIS.TR.515 Data set updates

- (a) The **update interval** for the AIP data set and the instrument flight procedure data sets shall be specified in the **data product specification**.

### GM1 AIS.OR.515

- (a) When made available as a completely re-issued data set, the **differences** from the previously issued complete data set **should be indicated**.

## Summary – Digital Data Sets

- For provision of aeronautical data 5 categories of digital **data sets** are defined: AIP, IFP, Obstacle, Terrain & Aerodrome Mapping
- For each available data set a **data product specification** shall be provided
- Permanent and temporary changes (long duration) as **full dataset or sub-set of data**
- A **checklist of valid data sets** shall be regularly provided
- A standard for geographic information shall be used as a **reference framework**
- An AIS provider should use “the” **AIXM** to enable the distribution of AIS data in digital format

Digital Data Sets

# AIXM CODING GUIDELINES



## AIXM 5 Guidelines for Data Sets AIXM.AERO

- "Technical" coding guidelines
  - AIXM specification (UML/XSD)
  - Temporality Concept (Released, Version 1.0, 15/09/2010)
  - Guidance on Aviation Metadata (OGC 10-196r1)
  - etc.
- Mappings
  - AIP <-> AIXM (Draft, Version 0.9, 20/01/2012)
  - ED-99 (Airport Mapping Requirements) <-> AIXM (Proposed Issue, Version 0.6, 09/04/2013)
  - AIXM 4.5 <-> AIXM 5.1 (Released, Version 1.1, 11/07/2013)

<http://aixm.aero/page/data-coding-guidelines>



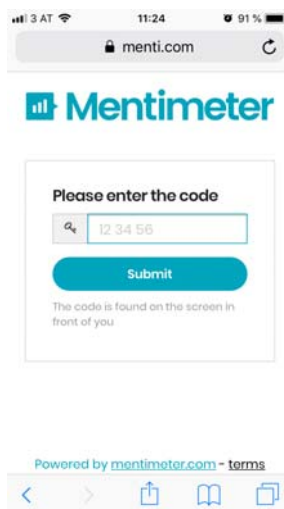
## AIXM 5 Guidelines for Data Sets AIXM 5 Confluence

- The AIXM Confluence is to enable the AIXM community to collaboratively **develop guidance material** in support to the AIXM implementations and to provide information about such implementations.

Data Set	AIXM 5 Confluence Coding Guidelines		
	Status		Release Date
AIP	Proposed	Waiting for final publication by ICAO of the 16 <sup>th</sup> Edition of the Annex 15 and of the new PANS-AIM (DOC 10066)	Q4 2018
Obstacle	Under development	Developed by EC & AIXM AIXM 5 Coding guidelines FG	End 2018
IFP	Under development	CfT Mid of 2018 for external support	Q2 2019
Aerodrome mapping	Not started	No planned date yet	?
Terrain	N/A	Terrain data is not covered by AIXM	N/A

<http://aixm.aero/confluence>





Time for a little video...?



## The AIXM 5 Story





Co-financed by the Connecting Europe  
Facility of the European Union



# Regulation 73/2010 vs. Opinion 02/2018 Metadata Requirements

INEA ADQ Implementation Workshop  
ANS Czech Republic  
Prague, 4-6 Sep 2018

Wolfgang Scheucher  
SOLITEC Software Solutions GesmbH

## Table of Content



- Introduction
- Differences between IR 73/2010 & Opinion 02/2018
- Main Requirements
- Common Understanding

Metadata

# INTRODUCTION

## Metadata

- Metadata is data about data
  - Descriptive information about quality of data, the origin of the data, point of contact, etc.
- Metadata allows...
  - Data to be found
    - Starts interoperability
  - Decision making based on
    - Quality
    - Relevance
    - Time
    - Geography



I DON'T REMEMBER THE TITLE, BUT IT WAS ON A LITTLE PIECE OF WHITE PAPER.

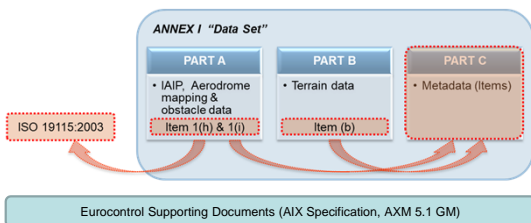
Metadata

# MAIN DIFFERENCES IR 73/2010 (ADQ) VS. OPINION 02/2018

## Metadata Requirements

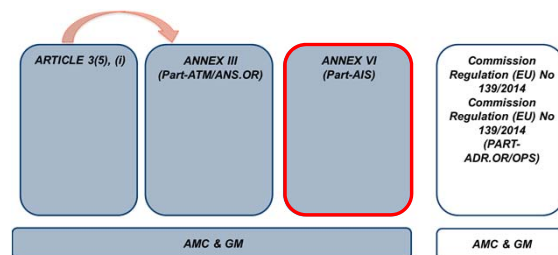
### 73/2010 (ADQ)

- Various Metadata Requirements („73/2010 specific“)



### Opinion 02/2018

- Various Metadata Requirements (main source: ICAO Annex 15/PANS-AIM)
- General metadata requirements (for all parties)
- Specific metadata requirements for data sets (for AISP)



## Metadata Requirements - Standards



### 73/2010 (ADQ), Annex I, PART C

- ISO 19115:2003 - Geographic information – Metadata required for the data set specification

ISO 19115 requires a basic minimum number of metadata, e.g. dataset title, abstract, language, etc.



### Opinion 02/2018, GM on AIS.TR

- Further explanation on the schema required for describing geographic information and services by means of metadata may be found in the International Organisation for Standardisation, ISO 19115 — Geographic information — Metadata, Part I

ISO 19115 is only GM, & only for AIS



## IR 73/2019, ANNEX I, PART C



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

- the *data originator* of the data;
- amendments* made to the data;
- the persons or *organisations* that have *interacted* with the data and *when*;
- details of any *validation and verification* of the data that has been performed;
- effective* start date and time of the data;
- for geospatial data: [...*earth reference model*, *coordinate system* used...];
- for numerical data: [...*accuracy*, *resolution*, *confidence level*...];
- details of any functions applied if data has been subject to *conversion/transformation*;
- details of any *limitations* on the use of the data.

## Metadata Requirements Interaction Who and When

### 73/2010 (ADQ), Annex I, PART C

- the **data originator** of the data;
- the **persons** or **organisations** that have interacted with the data and **when**

**In AXIM 5**

**i** NOSIG: Identification of organization/entity interacting with the data & when is required

```
<message:AIXMBasicMessage xmlns:message="http://www.aixm.ero/schema/5.1.1/message" xmlns:qt="http://www.aixm.ero/schema/5.1.1/extension" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.aixm.ero/schema/5.1.1/message http://www.aixm.ero/schema/5.1.1/message.xsd">
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  </message>
```



### Opinion 02/2018

- AIS.TR
  - the **identification of the organisations** or entities **performing any action** of originating, transmitting or manipulating the data
  - the **date and time** the action was performed
- ATM.ANS.OR & ADR.OPS
  - the **identification of the organisations** or entities **performing any action** of originating, transmitting or manipulating the data
  - the **date and time** the action was performed
- „Other“ data originator
  - Reference to ATM.ANS.OR

#### GM AIS.OR

When collecting metadata, the protection of individuals with regard to the processing of personal data ..., in accordance with Directive 95/46/EC on Data protection.

## Metadata Requirements Effective date / Validity

### 73/2010 (ADQ), Annex I, PART C

- effective **start date** and time of the **data**

### Opinion 02/2018, AIS-Part, Digital data sets

- validity** of the **data set**

**i** Metadata Requirement for data sets

## Metadata Requirements Accuracy, Resolution & Reference System



No specific requirements to cover this information as metadata



### 73/2010 (ADQ), Annex I, PART C

- for numerical data:
  - the statistical accuracy of the measurement or calculation technique used,
  - the resolution,
  - the confidence level
 as required by the ICAO standards Annex 15
- for geospatial data:
  - the earth reference model used,
  - the coordinate system used;

In AIXM 5 part of data

```
<aixm:RunwayCentrelinePointsTimeSlice gml:id="RCP_FAD_091">
  <gml:validTime> (5 lines)
  <aixm:interpretation>BASELINE</aixm:interpretation>
  <aixm:sequenceNumber>2</aixm:sequenceNumber>
  <aixm:featureLifetime> (5 lines)
  <aixm:role>THR</aixm:role>
  <aixm:location>
    <aixm:ElevatedPoint urnName="urn:ogci:def:crs:EPSG::4326" gml:id="RCPFP">
      <gml:pos>52.37559722222225 -31.964263888888887</gml:pos>
      <aixm:horizontalAccuracy uom="m">1</aixm:horizontalAccuracy>
      <aixm:elevation uom="m">30.0</aixm:elevation>
      <aixm:geoidUndulation uom="m">11.5</aixm:geoidUndulation>
      <aixm:verticalDatum>EGM_96</aixm:verticalDatum>
      <aixm:verticalAccuracy uom="m">0.25</aixm:verticalAccuracy>
    </aixm:ElevatedPoint>
  </aixm:location>
</aixm:RunwayCentrelinePointsTimeSlice>
```

### Opinion 02/2018, Part-AIS, ATM/ANS, ADR

- Not explicitly considered as metadata, but required by OR/TR & AMC/GM and in the data catalogue
- AIS.TR for Terrain data sets & Obstacle data sets the following feature attributes shall be recorded:
  - horizontal accuracy; horizontal confidence level; horizontal resolution; vertical accuracy; ...;
  - horizontal/ vertical reference system; etc.

## Metadata Requirements Limitations of use



### 73/2010 (ADQ), Annex I, PART C

- details of any limitations on the use of the data.

### Opinion 02/2018, Part-AIS, Digital Data Set

- any limitations with regard to the use of the data set.



Metadata requirement for digital data set

ATM/ANS.OR085 (h) (6) &  
AMC2 ADR.OPS.010  
Formal arrangement shall/should include any limitations on the use of data



Metadata

# MAIN REQUIREMENTS OPINION 02/2018

## Metadata requirements in Opinion 02/2018 PART-AIS

### General Metadata requirements

#### AIS.OR.225 Metadata

- An AIS provider shall **collect and preserve** metadata.

#### AIS.TR.225 Metadata

- (a) the **identification of the organisations** or entities performing any action of originating, transmitting or manipulating the aeronautical data;
- (b) the **action performed**; and
- (c) the **date and time** the action was performed.

Metadata to be collected

AMC: **exchange model** used should include provisions for metadata



### Data Set specific Metadata requirements

#### AIS.OR.340 Metadata requirements

- Each data set shall include a minimum set of metadata **to be provided to the next user**.

#### AIS.TR.340 Metadata requirements

The minimum metadata for each data set shall include:

- (a) the **name of the organisations** or entities providing the data set;
- (b) the **date and time** when the data set was provided;
- (c) the **validity** of the data set; and
- (d) **any limitations** on the use of the data set.

Metadata to be exchanged in scope of a data set

## Metadata requirements in Opinion 02/2018 PART-ATM/ANS & Article 3 (5) Data Originator

When originating, processing or transmitting data to the AIS provider, the service provider shall:

(f) collect and transmit **metadata** which shall include as a minimum:

- (1) the **identification of the organisations** or entities **performing any action** of originating, transmitting or manipulating the aeronautical data;
- (2) the **action performed**; and
- (3) the **date and time** the action was performed;



Who

b) (5) the **traceability** of the aeronautical data shall be ensured

### GM1 ATM/ANS.OR.A.085(b)(5)

Traceability is supported by maintaining the metadata.



What

### AMC1 ATM/ANS.OR.A.085(d)

**Formal arrangements** should include...metadata to be provided



When

## ADR.OPS.A.045 Metadata

The aerodrome operator shall ensure that **metadata** include, as a minimum:

- (a) the **identification of the organisations** or entities **performing any action** of originating, transmitting or manipulating the aeronautical data;
- (b) the **action performed**; and
- (c) the **date and time** the action was performed.



Who

### ADR.OPS.A.010

The aerodrome operator shall ensure the following:

(5) the **traceability of the aeronautical data**



What

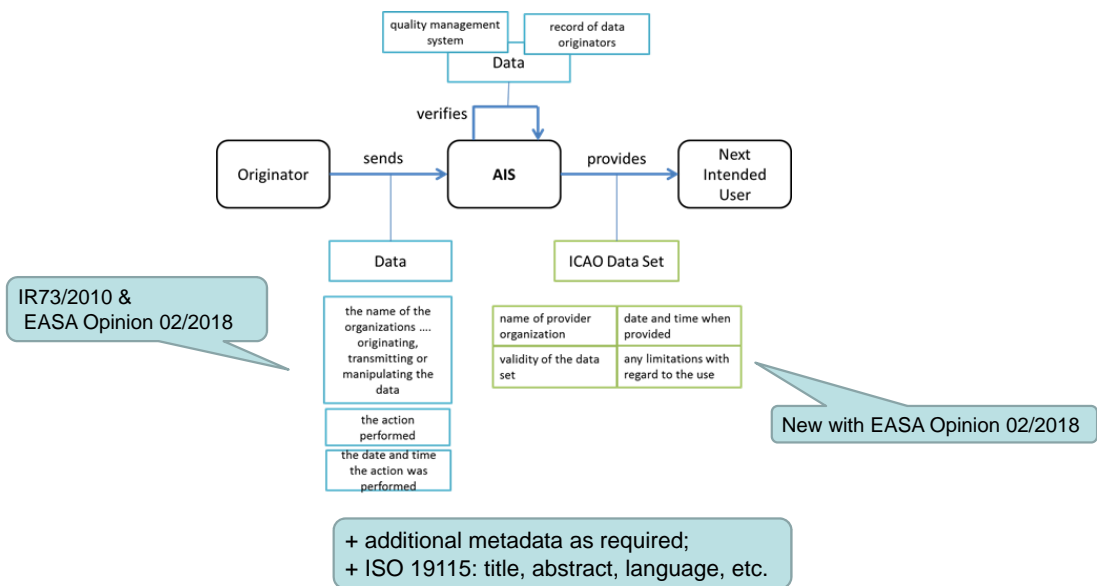
### AMC2 ADR.OPS.010

(b) Content of **formal arrangements**:  
metadata to be provided



When

# Metadata - Data Chain



Metadata

# COMMON UNDERSTANDING

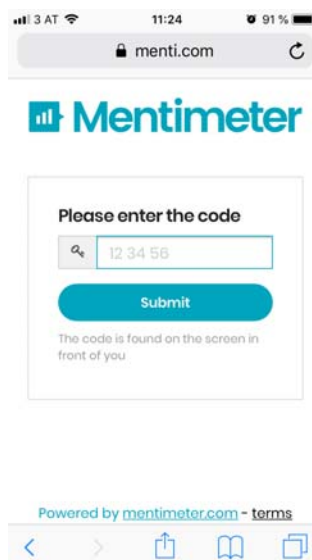
## Metadata

### Common Understanding 06/2014

- **Provisions of Commission Regulation (EU) 73/2010 for Metadata:**  
*“For the IAIP, 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.”*
- No specific requirements that define **which specific metadata items shall be exchanged**, nor about detail or volume of metadata
  - ANSPs should including the relevant metadata items adequate to support the intended use of the data set
  - **no purpose to include all metadata** items described in Annex I, Part C during each and every data transfer
  - Should make us of the EUROCONTROL **AI Metadata Profile** for use in AIXM 5.1 (under development)

## Summary – Metadata Requirements

- **ISO 19115 is not required for metadata anymore**
  - GM “Further may be found in the International Organisation for Standardisation, ISO 19115”
- **Traceability**
  - The traceability of aeronautical data shall be ensured
  - GM “Traceability is supported by maintaining the metadata”
- **Minimum set of Metadata**
  - Opinion defines a new minimum of metadata (overlapping but not 1:1 with 73/2010), also slightly different depending on the regulated party (i.e. AIS, ATM/ANS & other data originator, aerodromes)  
→ **Who did When What** with the data
- **Metadata for digital data sets**
  - If provided, specific metadata requirements for data sets
- **Protection of individuals**





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Facility of the European Union



## Terrain & Obstacle Data

INEA ADQ Implementation Workshop  
ANS Czech Republic  
Prague, 4-6 Sep 2018

Alexandre PETROVSKY  
EUROCONTROL  
DECMA / RTD / DAI

## Table of content



- TOD requirements
  - TOD history
  - Applications using TOD
  - Importance of TOD
  - TOD Requirements
- TOD Policy
- Status in Europe
- Q & A



Co-financed by the Connecting Europe  
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# (e)TOD history 2003-2018

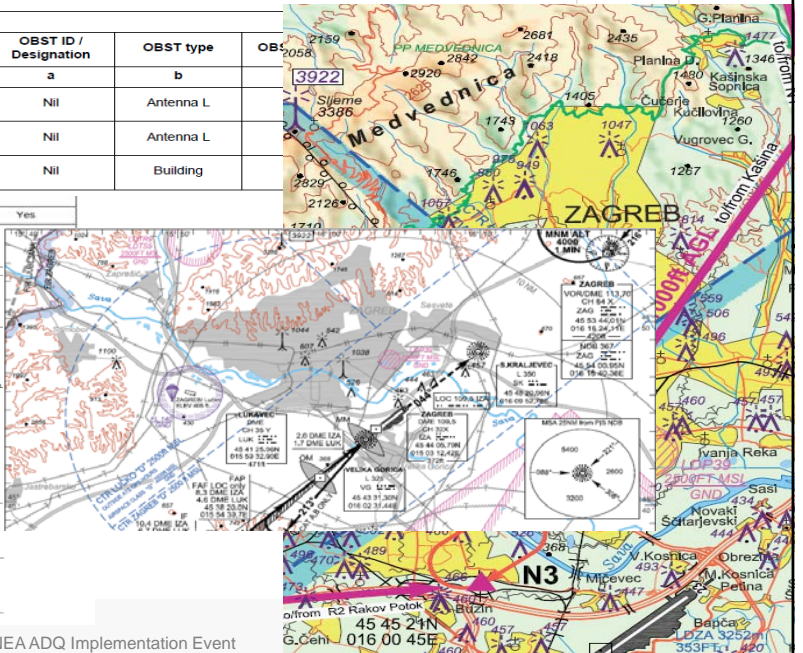
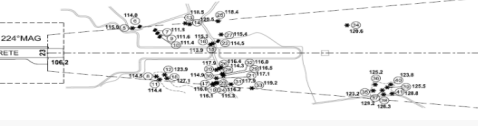
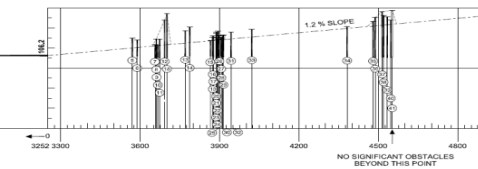
## Terrain and obstacles in aviation



ENR 5.4 AIR NAVIGATION OBSTACLES

Designation	Type of obstacle	Coordinates	ELEV/HGT GND
1	2	3	4
BELJE	Antenna mast	454746N 0184128E	1513FT / 722FT
BORINCI	Antenna mast	451814N 0184426E	898FT / 562FT
JOSIPOVAC	Antenna mast	453332N 0183515E	656FT / 362FT
PSUNJ	Antenna mast	452308N 0171956E	3645FT / 417FT
TOPLANA FOLNEGОВICEVO	Chimney	454652N 0160100E	1038FT / N8
TOPLANA OSJEK	Chimney	453232N 0184444E	689FT / 393FT
TOPLANA TRESNJEVKA	Chimney	454822N 0155659E	1044FT / N8

OBST ID / Designation	OBST type	OBST
a	b	
Nil	Antenna L	
Nil	Antenna L	
Nil	Building	



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# Evolution of cockpit vs AIS



1970



2010



1990



2030

eAIP Issues  
eAIP izdanja

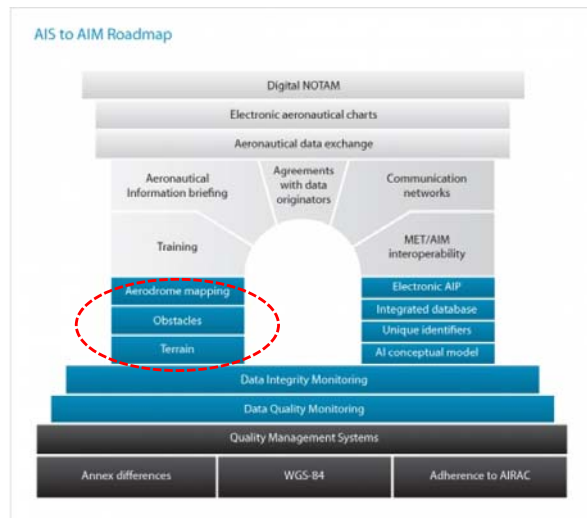
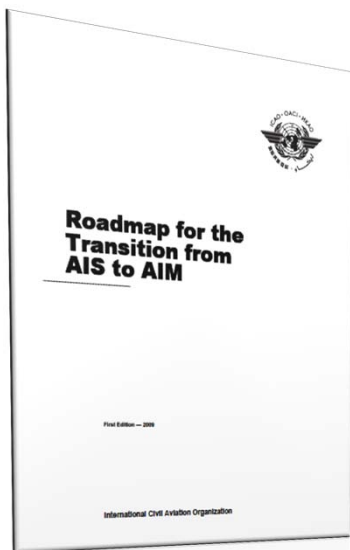
Consult NOTAM for latest information  
REPUBLICA HRVATSKA  
REPUBLIC OF CROATIA

Currently Effective Issue / Trenutno važeće izdanje

Effective date	Publication date	Short Description
Datum stupanja na snagu	Datum izdavanja	Kratki opis
01 FEB 2018	07 DEC 2017	AIRAC AIP AMBT (12/2017) AIP HRV (08/2017) (08/12 FEB 2017)

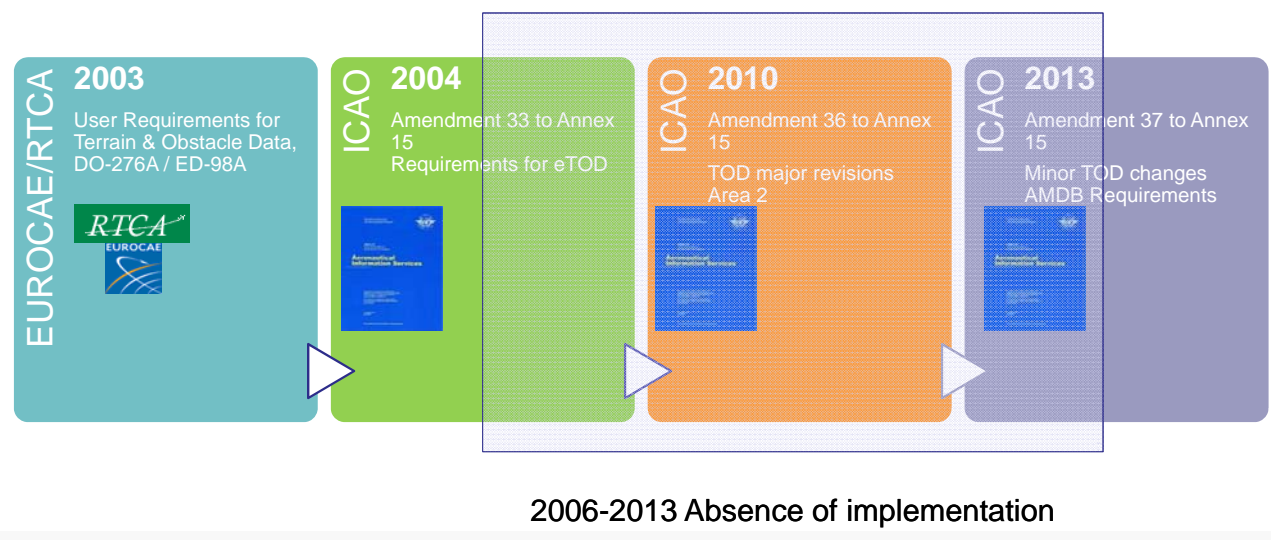


# AIM – Aeronautical Information Management

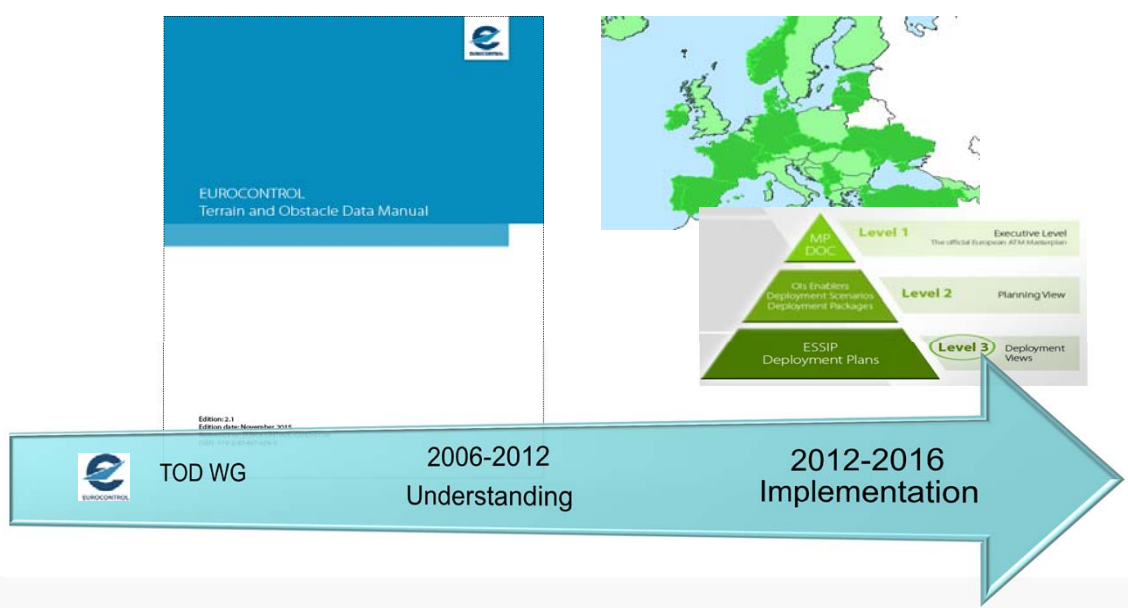




# The history of terrain and obstacle data



# European activities





## Use of terrain and obstacle data

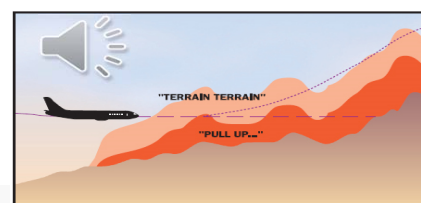
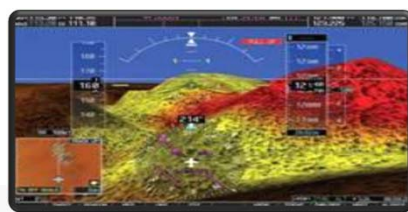
### Applications using terrain and obstacles data



- Terrain Awareness and Warning System (TAWS)
- Off-airway “drift-down” protection
- Engine-out / contingency take-off procedures
- Emergency landing site location selection
- Radio Altimeter operations in CAT II/III
- Synthetic/Enhanced vision system
  - Minimum Safe Altitude Warning (MSAW)
  - Instrument procedure design
  - Simulation / flight crew familiarisation in terminal airspace
  - Advanced Surface Movement Guidance and Control systems (A-SMGCS)

## Terrain Awareness and Warning System (TAWS)

- Applications to help avoid Controlled Flight Into Terrain (CFIT)
  - CFIT is when a plane is accidentally flown, under full pilot control, into the ground
- This application predominantly makes use of terrain data
  - Some use obstacle data also
- Act as a secondary safety system for pilots
  - Results in famous "Terrain Terrain Pull Up Pull Up" messages



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## Engine-out / contingency take-off procedures

- The loss of an engine on a multi-engine aircraft during take-off is a major failure
- In order to minimise risks associated with failure, the pilot will have a contingency "engine inoperative" departure procedure Engine-Out SID (EOSID)
- These procedures are designed by, or on behalf of, the airline:
  - Do not have to follow any State published procedure
  - Intended to ensure that the aircraft does not hit anything and reaches a safe altitude
- Area 2 data (AOC) and then Area 1 are used

A320X32 - JAA		IAE V2527-A1 engines		Marseille-Marianas-UMC		13L		DRY		
Q28744		1013.23.11FA		Elevation: 10 FT (3.05m) ASL		12 obstacles		14000 ft (4267m) MSL		
Airfield: 04m		Asphalt-concrete		Runway: 31 C: 2000 x 30m						
Minimum fuel: 20000 kg		All instruments operating		Engine Out Contingency Procedure						
Dry runway		Dry runway		At 1400' RT MTG - ED ACC 2500'						
OAT	CONF 1+F			CONF 2			CONF 3			
	HEADWIND	WIND	TAILWIND	HEADWIND	WIND	TAILWIND	HEADWIND	WIND	TAILWIND	
C	ft/kts	ft/kts	ft/kts	ft/kts	ft/kts	ft/kts	ft/kts	ft/kts	ft/kts	
6	12.3	8.4	71.8	8.4	89.7	8.4	71.8	8.4	89.7	8.4
16	12.3	8.4	71.8	8.4	89.7	8.4	71.8	8.4	89.7	8.4
26	12.3	8.4	71.8	8.4	89.7	8.4	71.8	8.4	89.7	8.4
36	12.3	8.4	71.8	8.4	89.7	8.4	71.8	8.4	89.7	8.4
46	12.3	8.4	71.8	8.4	89.7	8.4	71.8	8.4	89.7	8.4
48	12.3	8.4	71.8	8.4	89.7	8.4	71.8	8.4	89.7	8.4
50	12.3	8.4	71.8	8.4	89.7	8.4	71.8	8.4	89.7	8.4
52	12.3	8.4	71.8	8.4	89.7	8.4	71.8	8.4	89.7	8.4
54	12.3	8.4	71.8	8.4	89.7	8.4	71.8	8.4	89.7	8.4

*!Sometimes impacts commercial load!*

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## Synthetic/ Enhanced Vision Systems



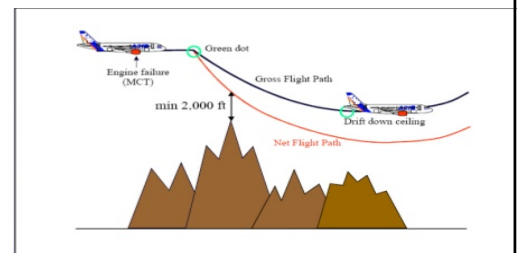
- require obstacle and terrain information to provide a computer visualisation of “reality”
- High level of accuracy is needed



## En-route “Drift-down” Procedure and Emergency Landing Location



- Drift-down procedure: is a maximum thrust/minimum rate descent necessitated by an engine failure in a multi-engine aircraft in the latter stages of climb or during cruise when an aircraft cannot maintain its current altitude and terrain clearance or other factors are critical
- At all stages, the pilot must be able to maintain adequate clearance above terrain and obstacles despite having lost an engine
- The pilot must also then, in-flight, be able to determine the best route to take to reach an aerodrome at which to land
- Calculation of amount of oxygen on-board
  - Chemical Oxygen Generators last 12-20'
- Area 1 terrain and obstacle data are used for these calculations



## Radio Altimeter operations in CAT II/III

- Used to determine decision height when using Radio Altimeter



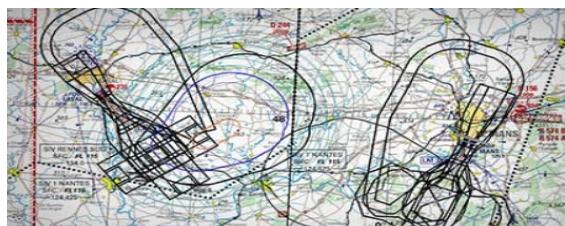
## A-SMGCS Advanced-Surface Movement Guidance and Control Systems

- The main functions of A-SMGCS are:
  - Surveillance, providing controllers with situational awareness on the movement area;
  - Control, providing conflict detection & alerting on runways;
  - Routing, through which the most efficient route is designated for each aircraft or vehicle;
  - Guidance, giving pilots and drivers indications enabling them to follow an assigned route.
- TOD could enable representation of the airport buildings providing enhanced pilot and ATC situational awareness in low visibility operations



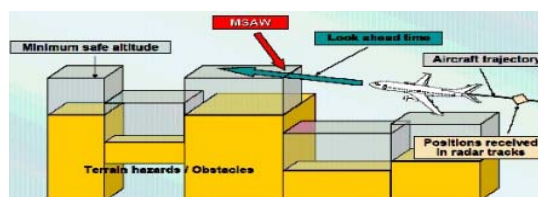
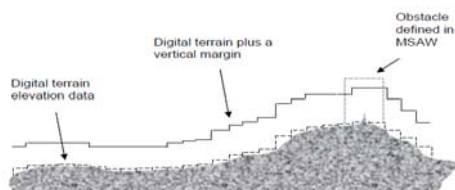
## Instrument Procedure Design

- Instrument Procedure Design generically refers to the development of a route together with minimum altitudes by which an aircraft may take-off or land at an airport safely.
- These routes are designed to ensure sufficient clearance (vertically and horizontally) from ground and obstacles.
- Normally only the features that have most significance are used
  - shading
- Procedure design mainly uses Area 2 data
  - a small percentage of it



## Minimum Safe Altitude Warning (MSAW) Approach Path Monitor (APM)

- The MSAW function compares the levels/altitude reported by **aircraft transponders** against **defined minimum safe altitudes**.
- When the level/altitude of an aircraft is detected or predicted to be lower than the applicable minimum safe altitude, a visual and, in some implementations, audible warning is generated to the ATCO within whose area of responsibility the aircraft is operating.
- Digital terrain and obstacle data for Area 1 and Area 2





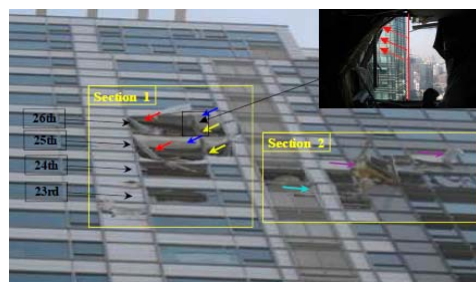
## The importance of terrain and obstacle data

Safety promotion

### Obstacle and terrain related incidents and accidents (safety promotion) <sub>1</sub>



- 2013 Gangnam-gu, Seoul, Korea
  - The information on the Korean Peninsula's terrain and power lines was entered into the EGPWS, but obstacles like buildings were excluded.
- 2013 Georgia, USA
  - Business Jet Collides With Obstacle During Go-Around
  - Georgia Power did not notify FAA before constructing utility poles in 1989; therefore, FAA had no knowledge of the poles as potential obstacles. No depictions or mention of possible obstructions on associated aeronautical charts.



## Obstacle and terrain related incidents and accidents (safety promotion) <sub>2</sub>

- 2013 London, UK
  - Helicopter crashes into crane: two dead in Vauxhall rush hour accident
- 2016 Minnesota, US
  - plane struck a guy line cable that helped to support a radio tower



## Obstacle and terrain related incidents and accidents (safety promotion) <sub>3</sub>

- 2013 Sweden
  - A military aircraft of the type JAS 39 Gripen passed a mast at very close range when flying low (30 metres). The lateral clearance was assessed to be approximately 10–20 metres. The mast was not recorded in the chart documentation used

 **Statens haverikommission**  
Swedish Accident Investigation Authority

RM 2015:02

### Safety recommendations

#### Recommendation to the Government:

- to clarify responsibility for the obstacle database and responsibility for the Aeronautical Information Service and ensure that measures are taken as soon as possible with the purpose of ensuring that both existing and future information on obstacles for the needs of both civil and military aviation fulfil the quality requirements and other requirements laid down in the ADQ regulation. (RM 2015:02 R1)

#### Recommendations to the Swedish Transport Agency:

- to take measures as soon as possible – e.g., in the form of information or regulatory initiatives – in order to address aviation safety with regard to the existing quality of obstacle data and the marking out of obstacles. (RM 2015:02 R2)
- to use its authority to issue regulations for reporting obstacles and to take measures to ensure that the information on all new obstacles fulfils the quality requirements imposed in the ADQ regulation. (RM 2015:02 R3)





## Obstacle and terrain related incidents and accidents (safety promotion) <sup>4</sup>

- 2014 South Dacota, US
  - Collision with Turbine Blade
  - Lawsuits Filed Against Wind Turbine Operator and FAA
    - lighting system was not functioning
    - Aviation community was not informed
    - FAA did not include the wind farm on their aeronautical charts



## Obstacle and terrain related incidents and accidents (safety promotion) <sup>5</sup>

- 2017
  - Ireland
    - Irish Coast Guard rescue helicopter crashed off the west coast of Ireland struck terrain that wasn't in its enhanced ground proximity warning system (EGPWS) database (preliminary investigation report)
    - The EGPWS manufacturer informed investigators that terrain of the island was not in the terrain database for the EGPWS, and that the lighthouse at was not in the obstacle database



## Obstacle and terrain related incidents and accidents (safety promotion) <sub>6</sub>

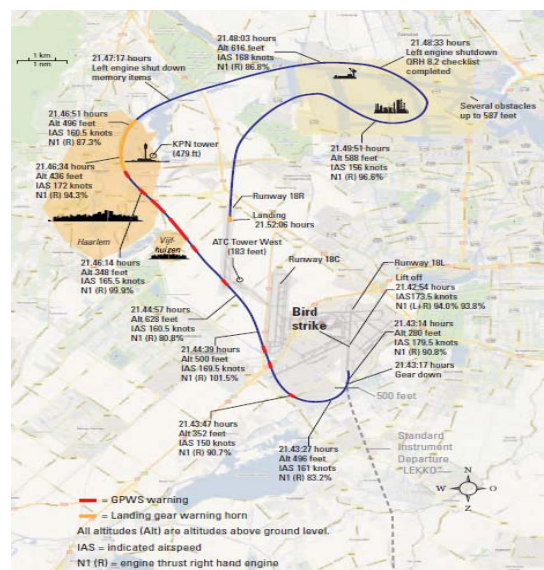
- 2017
  - Germany
    - Propeller plane crashes into wind turbine
  - Turkey, Helicopter crash Istanbul
    - Eyewitness said helicopter hit a former TV tower



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## Obstacle and terrain related incidents and accidents (safety promotion) <sub>7</sub>

- 2010 Amsterdam Schiphol Airport, NL
  - Emergency landing after bird strike
  - Not all high obstacles were presented on radar screen
  - Flight below vectoring altitude which provides ATC obstacle clearance
  - Route at an altitude 380-480ft within 1km from 479ft antenna and other up to 587ft obstacles
  - VMC 7km at sunset
  - ATC assisted with headings for landing but no information about obstacles

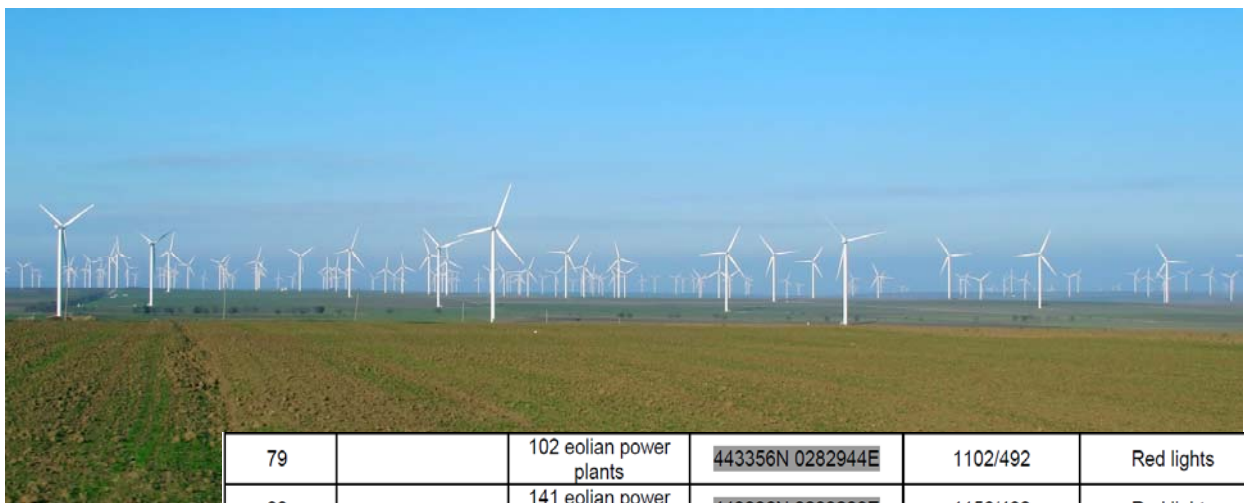


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## Importance of accuracy and completeness of obstacles data 1



## Importance of accuracy and completeness of obstacles data 2



79		102 eolian power plants	443356N 0282944E	1102/492	Red lights
80		141 eolian power plants	443836N 0283209E	1156/492	Red lights

## Importance of accuracy and completeness of obstacles data <sup>3</sup>



## The terrain and obstacle data requirements

## ICAO Terrain and Obstacles Data requirements

- **Annex 15**
  - Chapter 10 –TOD SARPS
  - Appendix 8 –TOD numerical requirements
- **From November 2018**
  - **Annex 15 - Chapter 5. aeronautical information products and services**
    - 5.3 Digital data sets
  - **PANS-AIM**
- **Doc 9881** –Guidelines for Electronic Terrain, Obstacle and Aerodrome Mapping Information – *requires updates since Amdt 33*
- **Annex 14** - 2.5 Aerodrome dimensions and related information



## EU (EASA) electronic Terrain and Obstacles Data related requirements

- Aerodrome safety regulation (Commission Regulation (EU) No 139/2014)
  - Article 8: Safeguarding of aerodrome surroundings
  - Article 9: Monitoring of aerodrome surroundings
  - AMC1 ADR.OPS.A.005 Aerodrome data
- EASA Opinion 02/2018, Part AIS
  - Transposition of ICAO Annex 15 and ADQ IR
  - Expected entry into force Jan 2020



## More details from EU regulation 139/2014 AMC1 ADR.OPS.A.005 Aerodrome data

AMC/GM TO ANNEX IV – PART-ADR-OPS  
SUBPART A – AERODROME DATA

ANNEX IV  
ACCEPTABLE MEANS OF COMPLIANCE AND GUIDANCE MATERIAL TO PART-ADR-OPS  
OPERATIONS REQUIREMENTS

SUBPART A – AERODROME DATA (ADR-OPS)

**AMC1 ADR.OPS.A.005 Aerodrome data**

<p>(a) Data relevant to the aerodrome and available services should be limited to, items in the following list:</p> <ol style="list-style-type: none"> <li>(1) aerodrome reference point;</li> <li>(2) aerodrome and runway elevations;</li> <li>(3) aerodrome reference temperature;</li> <li>(4) aerodrome dimensions and related information;</li> <li>(5) strength of pavements;</li> <li>(6) pre-flight altimeter check location;</li> <li>(7) declared distances;</li> <li>(8) condition of the movement area and related facilities;</li> <li>(9) disabled aircraft removal;</li> <li>(10) rescue and firefighting; and</li> <li>(11) visual approach slope indicator systems.</li> </ol> <p>(b) The aerodrome operator should measure and report to the services obstacles and terrain data in Area 3, and in Area 2 (the part within the aerodrome boundary) in degrees, minutes, seconds and tenths of the top elevation, type, marking and lighting (if any) of obstacle the aeronautical information services.</p> <p>(c) Electronic obstacle data for all obstacles in Area 2 (the part boundary) that are assessed as being a hazard to air navigation is</p> <p>(d) Electronic terrain and obstacle data should be provided for:</p> <ol style="list-style-type: none"> <li>(1) Area 2a, for those that penetrate the relevant obstacle data collection surface;</li> <li>(2) penetrations of the take-off flight path area obstacle identification surfaces;</li> <li>(3) penetrations of the aerodrome obstacle limitation surfaces.</li> </ol> <p>(e) Electronic terrain and obstacle data should be provided for i obstacles that penetrate the relevant obstacle data collection s where precision approach Category II or III operations have been established and where detailed terrain information is required by operators to enable them to assess the effect</p>	<p>(b) The aerodrome operator should measure and report to the aeronautical information services obstacles and terrain data in Area 3, and in Area 2 (the part within the aerodrome boundary) in degrees, minutes, seconds and tenths of seconds. In addition, the top elevation, type, marking and lighting (if any) of obstacles should be reported to the aeronautical information services.</p> <p>(c) Electronic obstacle data for all obstacles in Area 2 (the part within the aerodrome boundary) that are assessed as being a hazard to air navigation should be provided.</p> <p>(d) Electronic terrain and obstacle data should be provided for:</p> <ol style="list-style-type: none"> <li>(1) Area 2a, for those that penetrate the relevant obstacle data collection surface;</li> <li>(2) penetrations of the take-off flight path area obstacle identification surfaces; and</li> <li>(3) penetrations of the aerodrome obstacle limitation surfaces.</li> </ol> <p>(e) Electronic terrain and obstacle data should be provided for Area 4 for terrain and obstacles that penetrate the relevant obstacle data collection surface, for all runways where precision approach Category II or III operations have been established and where detailed terrain information is required by operators to enable them to assess the effect of terrain on decision height determination by use of radio altimeters.</p> <p>(f) The aerodrome operator should establish arrangements with the Air Traffic Services providers and the Competent Authority for the provision of obstacles and terrain data outside of the aerodrome boundary.</p>
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## Users (industry) electronic Terrain and Obstacles Data requirements



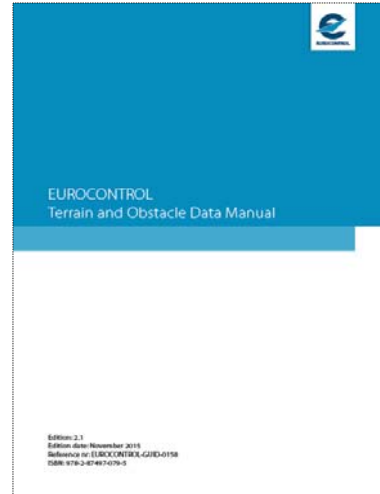
- ED-98C (October 2015) - User requirements for terrain and obstacle data
- ED-119C (October 2015) - Interchange standards for terrain, obstacle and aerodrome mapping data



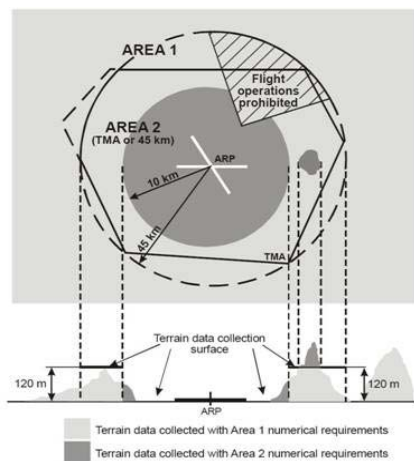
## Eurocontrol TOD Manual



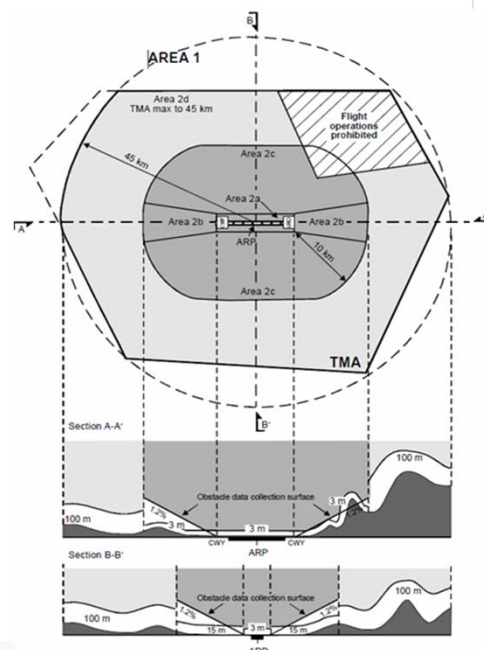
- Provides assistance for implementing eTOD
- Explains requirements
- Implementation process
- Institutional and financial matters
- Technical matters
- Use of existing data
  
- Version 2.1 May 2015



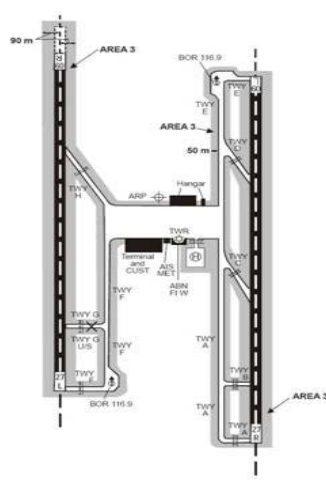
## The four areas



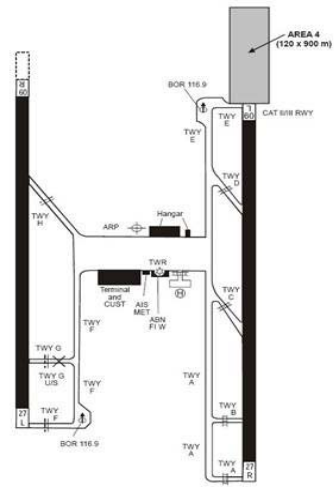
**Area 1 = State (2008)**  
**Area 2 = TMA (2015)**



# The four areas



**Area 3 =  
Aerodrome/Heliport  
(Recommendation)**



**Area 4 =  
CATII/III RWY (2008)**

# TOD numerical requirements

*extract from Annex 15*

**Table A8-1. Terrain data numerical requirements**

	Area 1	Area 2	Area 3	Area 4
Post spacing	3 arc seconds (approx. 90 m)	1 arc second (approx. 30 m)	0.6 arc seconds (approx. 20 m)	0.3 arc seconds (approx. 9 m)
Vertical accuracy	30 m	3 m	0.5 m	1 m
Vertical resolution	1 m	0.1 m	0.01 m	0.1 m
Horizontal accuracy	50 m	5 m	0.5 m	2.5 m
Confidence level	90%	90%	90%	90%
Integrity classification	routine	essential	essential	essential
Maintenance period	as required	as required	as required	as required

**Table A8-2. Obstacle data numerical requirements**

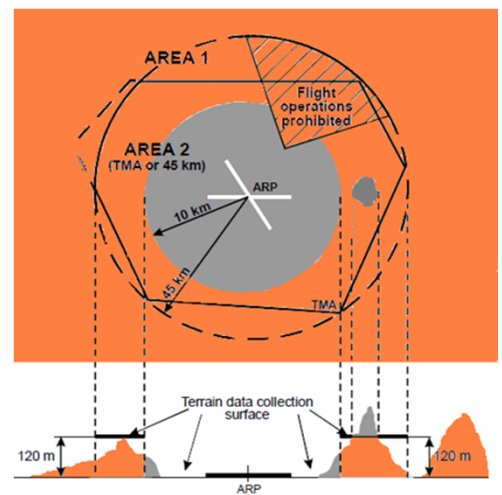
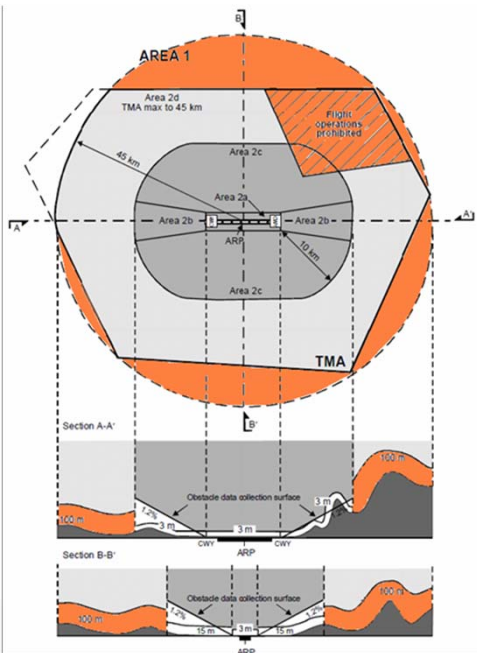
	Area 1	Area 2	Area 3	Area 4
Vertical accuracy	30 m	3 m	0.5 m	1 m
Vertical resolution	1 m	0.1 m	0.01 m	0.1 m
Horizontal accuracy	50 m	5 m	0.5 m	2.5 m
Confidence level	90%	90%	90%	90%
Integrity classification	routine	essential	essential	essential
Maintenance period	as required	as required	as required	as required

**Table A8-4. Obstacle attributes**

Obstacle attribute	Mandatory/Optional
Area of coverage	Mandatory
Data originator identifier	Mandatory
Data source identifier	Mandatory
Obstacle identifier	Mandatory
Horizontal accuracy	Mandatory
Horizontal confidence level	Mandatory
Horizontal position	Mandatory
Horizontal resolution	Mandatory
Horizontal extent	Mandatory
Horizontal reference system	Mandatory
Elevation	Mandatory
Height	Optional
Vertical accuracy	Mandatory
Vertical confidence level	Mandatory
Vertical resolution	Mandatory
Vertical reference system	Mandatory
Obstacle type	Mandatory
Geometry type	Mandatory
Integrity	Mandatory
Date and time stamp	Mandatory
Unit of measurement used	Mandatory
Operations	Optional
Effectivity	Optional
Lighting	Mandatory
Marking	Mandatory



# Area 1 Graphical Portrayal



Obstacles

Terrain

# Area 1 terrain

- Area 1: The entire territory of a State – applicable from Nov 2008
- Terrain dataset for whole State
  - Mostly available from civ/mil national geodetic agencies
  - No format defined by ICAO
  - User preferred format:
    - GeoTIFF or shape
    - + metadata



**EuroDEM**  
EuroDEM is a 1:100 000 scale digital elevation model providing height data for 40 European countries.

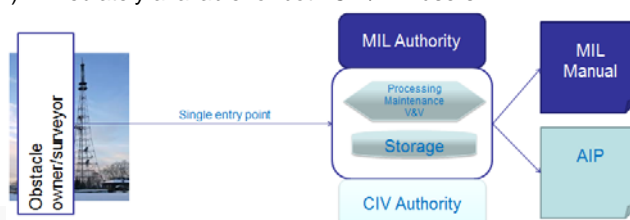
## Area 1 obstacles

- Obstacle dataset for >100m above ground
  - **Obstacle collection policy** should exist for AIP ENR 5.4 'Air Navigation Obstacles'
  - Dataset requires additional attributes (meta data) to ENR 5.4
  - Dataset to be provided with caveat if some attributes are missing
  - Synergies possible between CIV and MIL



## Why coordination with MIL is beneficial

- MIL (NATO) requirements: all obstacles >60m AGL for whole territory of State
- ICAO requirements: all obstacles >100m AGL for whole territory of State
- Synergies - saving costs for data collection/storage/maintenance/ verification and validation
- Advantages:
  - single entry point for obstacle owners
    - no duplication for submission of same type of information to different authorities
    - notification on any changes (e.g. light out of order) immediately available for both CIV/MIL users
  - Single repository/storage/etc
- Similar approach adopted in other States



# Paper or Dataset? Trend in obstacle provision

	2014	2018
AT	83	109
FR	69	100
DE	135	237
IT	214	258
PL	30	60
ES	38	1
SE	40	55
GB	130	1

Number of pages with Area 1 Obstacles in ENR 5.4 (2014-2018)

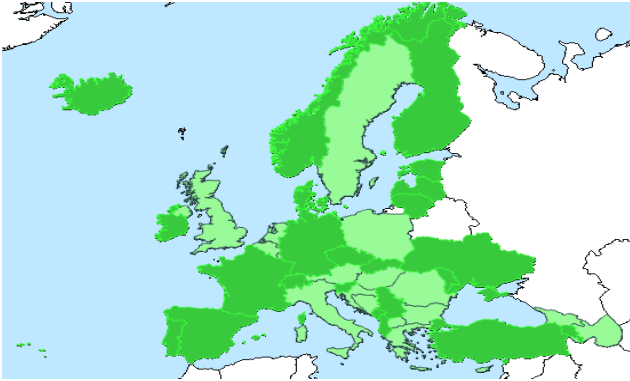


NO	Profil-NO	Type	Altitude	Alt. sur l'origine	Remarque	Classification
0101	480010104001001	Pyloon	1	1000 0100	non balise	non balise
0102	480010104001002	Obstacle fixe	1	1010 0100	non balise	Obstacle fixe - pylone
0103	480010104001003	tour	1	1020 0100	non balise	non balise
0104	480010104001004	Cheminée	1	1030 0100	non balise	non balise
0105	480010104001005	Obstacle temporaire	1	1040 0100	non balise	non balise
0106	480010104001006	Pyloon	1	1050 0100	non balise	non balise
0107	480010104001007	Obstacle fixe	1	1060 0100	non balise	non balise
0108	480010104001008	Pyloon	1	1070 0100	non balise	non balise
0109	480010104001009	Pyloon	1	1080 0100	non balise	non balise
0110	480010104001010	tour	1	1090 0100	non balise	non balise
0111	480010104001011	Pyloon	1	1100 0100	non balise	non balise
0112	480010104001012	Pyloon	1	1110 0100	non balise	non balise
0113	480010104001013	Pyloon	1	1120 0100	non balise	non balise
0114	480010104001014	Pyloon	1	1130 0100	non balise	non balise
0115	480010104001015	Pyloon	1	1140 0100	non balise	non balise
0116	480010104001016	Pyloon	1	1150 0100	non balise	non balise
0117	480010104001017	Pyloon	1	1160 0100	non balise	non balise
0118	480010104001018	Obstacle fixe	1	1170 0100	non balise	Obstacle fixe - pylone
0119	480010104001019	Obstacle fixe	1	1180 0100	non balise	Obstacle fixe - pylone
0120	480010104001020	Pyloon	1	1190 0100	non balise	non balise

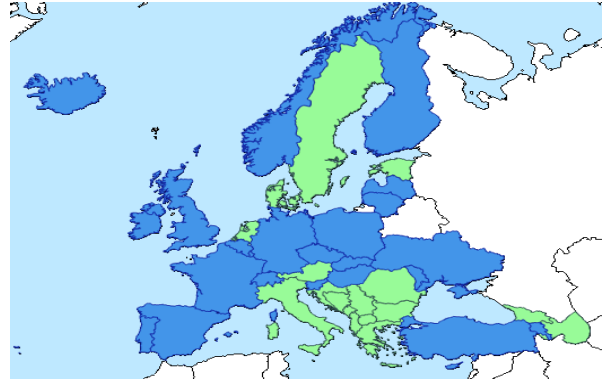
# Examples of Area 1

## Area 1 TOD implementation in ECAC

information from AIP GEN 3.1.6



Available Area 1 Terrain datasets



Available Area 1 Obstacles datasets

## New requirements: helicopters operations



- Area 1 obstacle –
  - 60m collection surface
  - accuracy V 7m H 16m
- Area 1 terrain with area 2 numerical requirements



## New requirements: Drones

- Drone aeronautical information management
- Identification of drone users requirements for data incl. Terrain and Obstacles



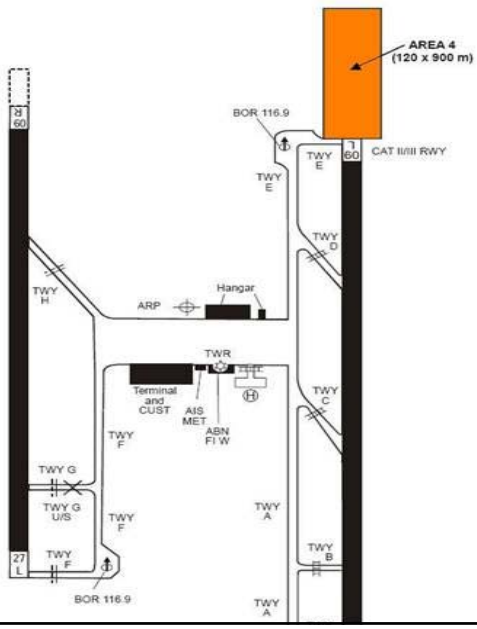
Drone information management : DREAMS

## Area 4 TOD

- Applicable from Nov 2008
- Digital representation of area covered today by Precision Approach Terrain Chart (PATC)
- Mostly available with AD authorities and used for PATC production

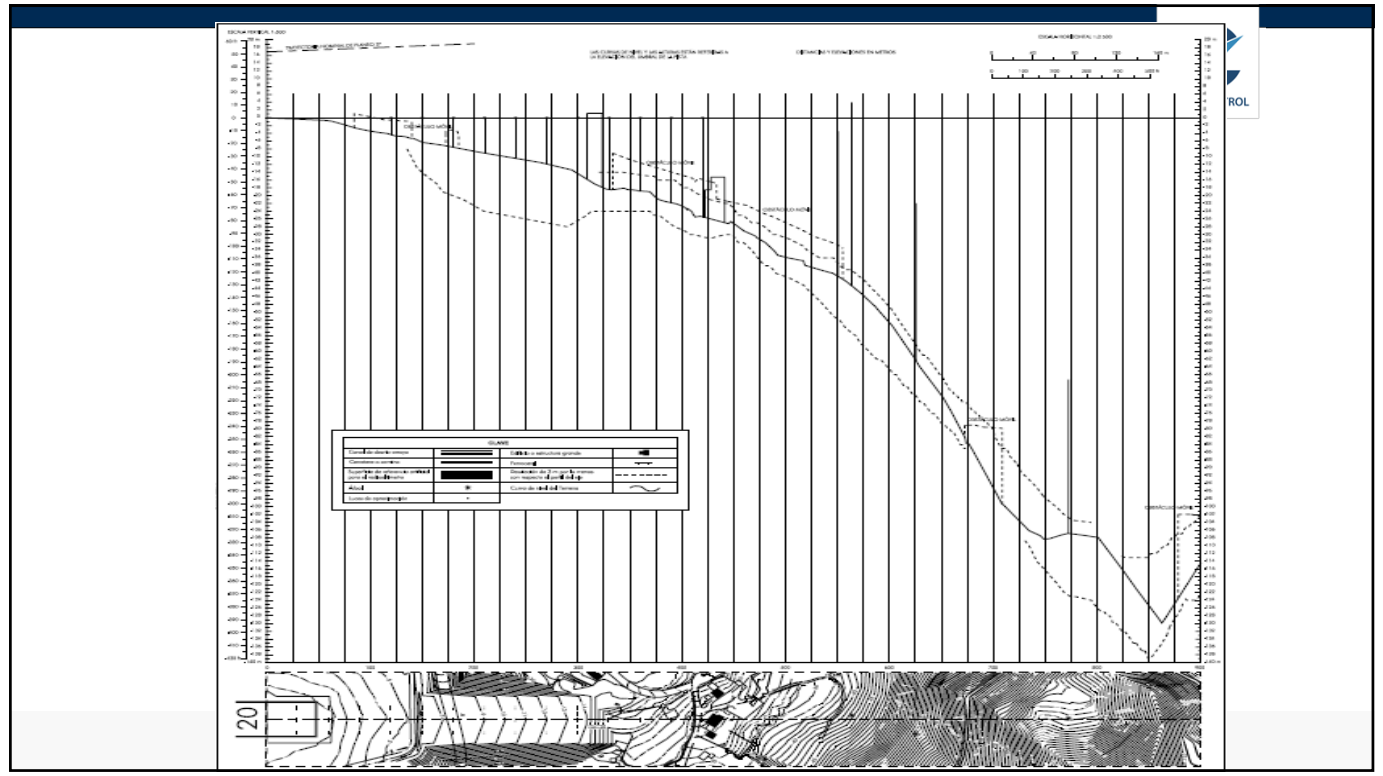


# Area 4 Numerical requirements



Area 4 Obstacles		
	accuracy	resolution
Vertical	1m	0.1m
Horizontal	2.5m	

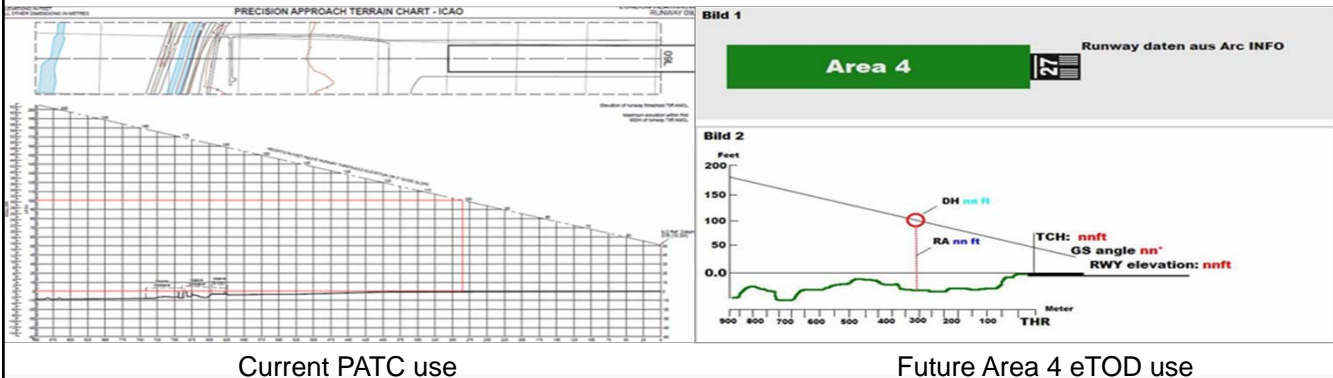
Area 4 Terrain		
Post spacing		0.3 arc " (~9 m)
	accuracy	resolution
Vertical	1m	0.1m
Horizontal	2.5m	



## Area 4 TOD use



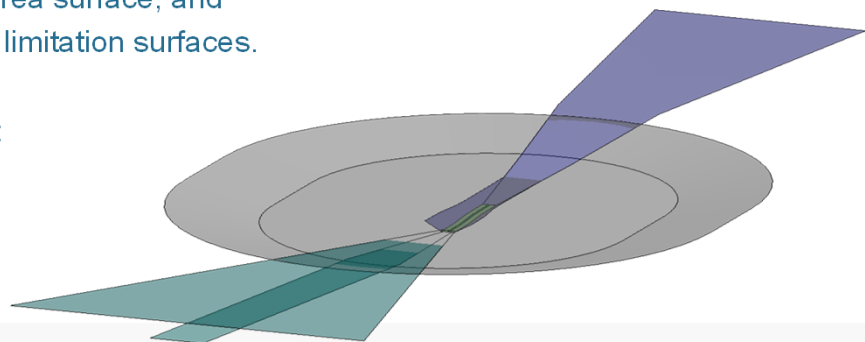
- Used to determine decision height when using Radio Altimeter
- Today manual process using trigonometry on PATC
- To become automatic (data quality and integrity) with availability of Area 4 TOD



## Area 2 TOD

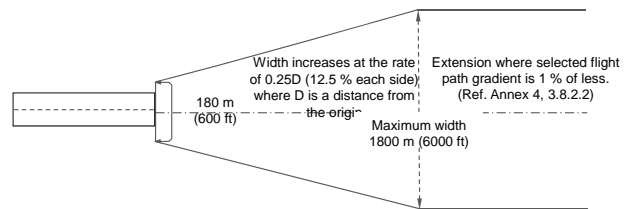
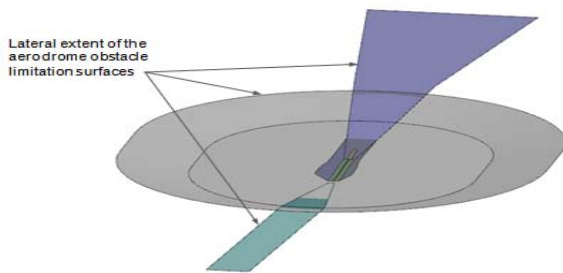
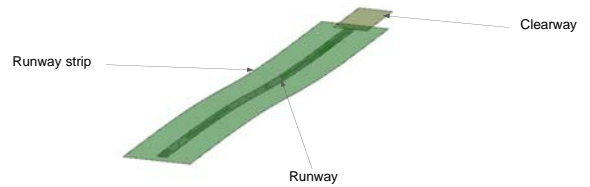


- **Applicable from 12<sup>th</sup> November 2015**
- Provision of Area 2 split into two parts:
- Standard:
  - Area 2a;
  - Take-off flight path area surface; and
  - Aerodrome obstacle limitation surfaces.
- Recommended Practice:
  - Area 2b, 2c and 2d.



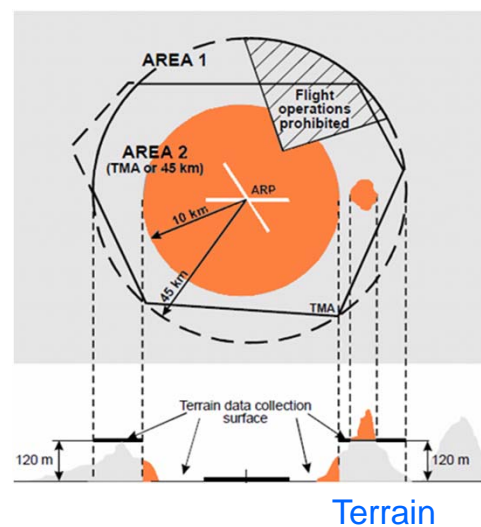
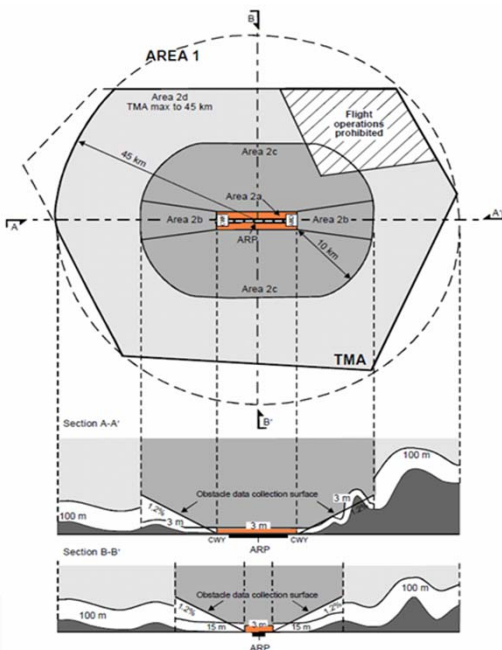
## Area 2 TOD standard

- Area 2a;
- Take-off flight path area surface; and
- Aerodrome obstacle limitation surfaces



## Area 2 Graphical Portrayal

Obstacles 2abcd





## Area 2 Numerical requirements

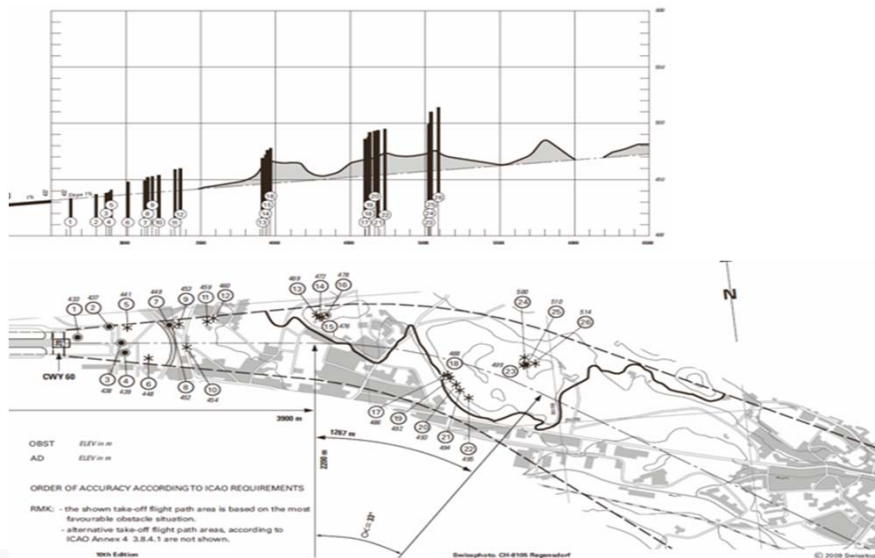
Area 2 Obstacles		
	accuracy	resolution
Vertical	3m	0.1m
Horizontal	5m	



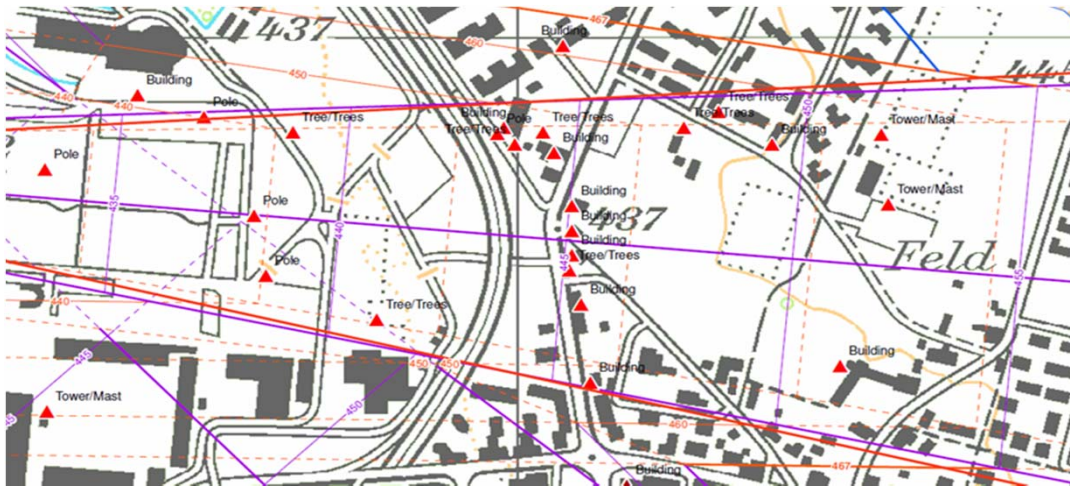
Area 2 Terrain		
Post spacing		1 arc " (~30 m)
	accuracy	resolution
Vertical	3m	0.1m
Horizontal	5m	



## AOC: Publication initial AOC Type A RWY10 - LSZH AD 2.24.4 - 1



## AOC publication initial in database



## AOC: Result Pilot-survey Zürich



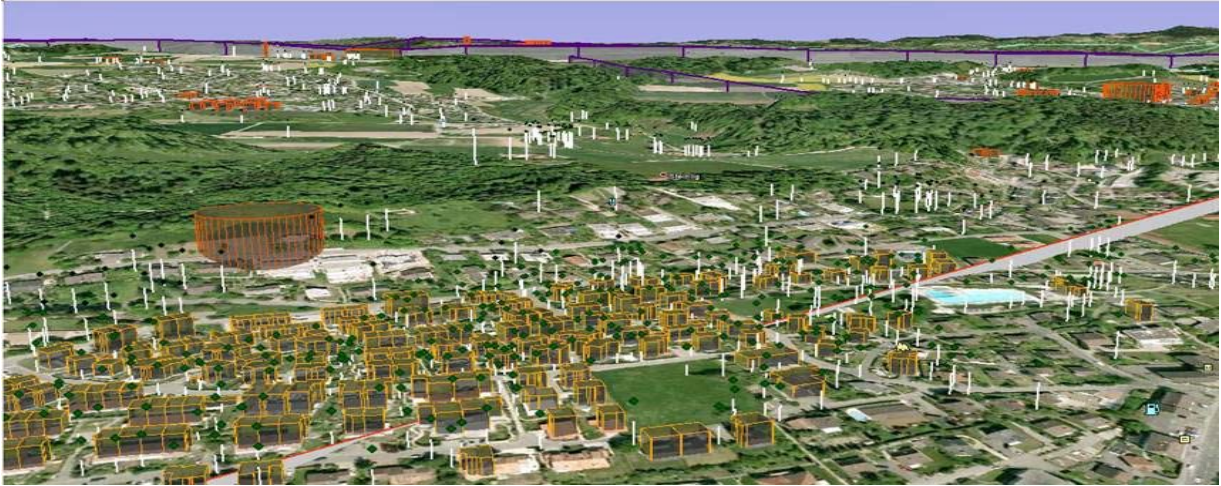
Same Area 3D: LSZH RWY 10 Area 2b and (2c)



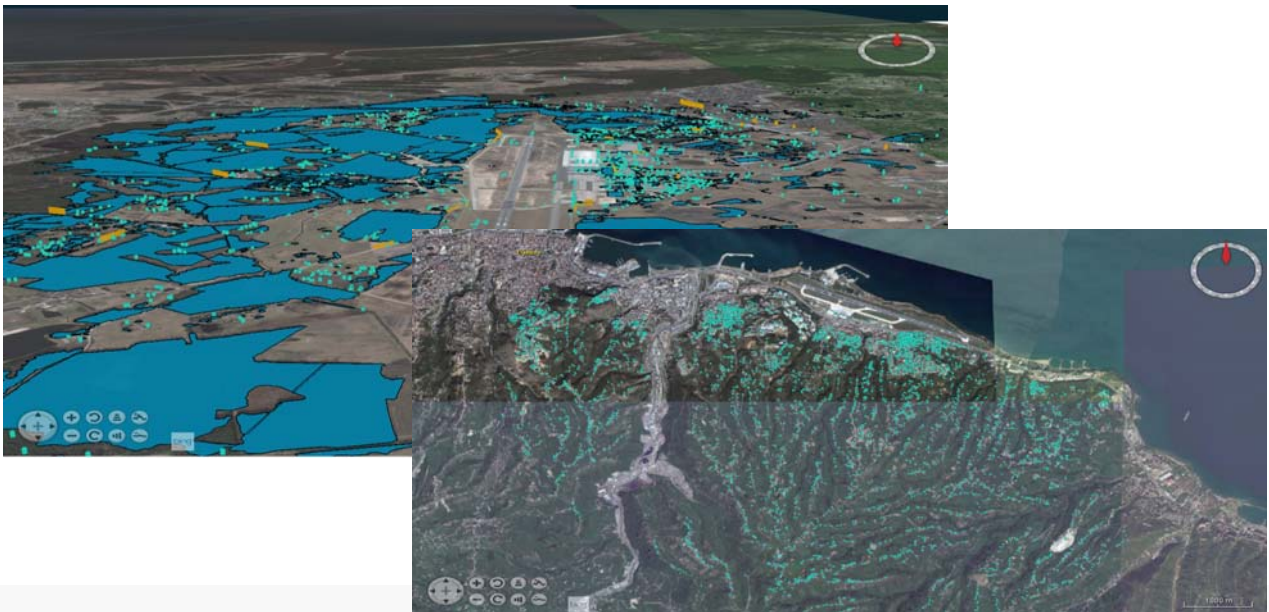
Same Area Obstacles 3D: LSZH RWY 10 Area 2b



## Same Area Obstacles 3D: LSZH RWY 10 Area 2b and (2c)



## Examples of Area 2



## Area 3 TOD

- Recommendation in Annex 15
- To be provided only together with the digital aerodrome mapping information (e.g. AMDB)

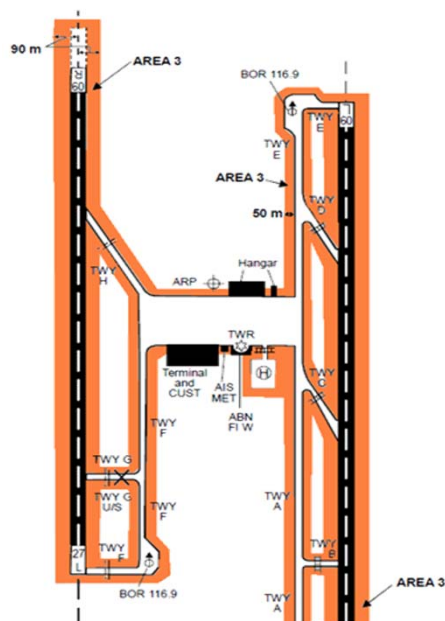


INEA ADQ Implementation Event

## Area 3 Numerical requirements

Area 3 Obstacles		
	accuracy	resolution
Vertical	0.5m	0.01m
Horizontal	0.5m	

Area 3 Terrain		
Post spacing	0.6 arc " (~20 m)	
	accuracy	resolution
Vertical	0.5m	0.01m
Horizontal	0.5m	



INEA ADQ Implementation Event



DATE: 13.04.2013 LOCAL TIME: 14:59 LOCATION: Brasilia-Intl AP (SBBR) COUNTRY: Brazil  
AIRLINE: TAP Portugal TYPE: Airbus A330-200 REGISTRATION: CS-TOF **PHOTO** C/N: 308 AGE: 13 y + 5 m  
OPERATION: ISP FLIGHT No.: - FROM: Brasilia TO: Lisbon VIA: -  
OCCUPANTS: FATALITIES: INJURIES: DAMAGE TO AIRCRAFT: **substantial** 2  
PAX: 259 CREW: 0 PAX: 0 CREW: 0 OTHER: 0 PAX: 0 CREW: 0 OTHER: 0

During taxi out for departure from the main apron via taxiway "Lima", the left outer wing hit a tall lightpost erected to light up a nearby construction site at night. The mast was situated very close to the edge of the tarmac. No person inside the aircraft was harmed in the event. The return flight to Lisbon had to be cancelled.




[Photo: E. Figueira via EBC](#)

SOURCE(S): [ASN](#) - [TrikunaDaBahia](#) - [LatinaPress](#) - [EBC-PHOTO SERIES](#)



INEA ADQ Implementation Event

 Co-financed by the Connecting Europe Facility of the European Union



# ESSIP INF07 – REG01

## Development of National TOD policy

## Why late/no TOD implementation?

### Main identified issues:

- The root cause of delay with TOD implementation: **absence of national regulations defining the roles and responsibilities of all parties**
- Other:
  - Additional complexity for TOD: non-ATM data origination
  - Aerodromes eligible for provision of Area 2
  - Cross-border Harmonisation
    - Area 2 in one State is Area 1 for another
  - Cost-allocation

## ESSIP INF07 – TOD

### European ATM Master Plan – Level 3

- Solution: ESSIP INF07 REG01 – Establish National TOD Policy
- Define responsibilities within the State - WHO, WHAT, HOW, by WHOM, who OWNS, who PAYS and LIABILITY
- National TOD Policy: not a regulation, but a course, plan or principle of action adopted and agreed by all affected parties (e.g. REG, ASP, APO & Geodetic agencies).
- !Important!: ASP and APO participate in the definition of the National TOD policy



## Stakeholder Lines of Action (SLoA)

SESAR	Active						ECAC
INF07	Electronic Terrain and Obstacle Data (TOD)						
REG	ASP	MIL	APO	USE	INT	IND	NM

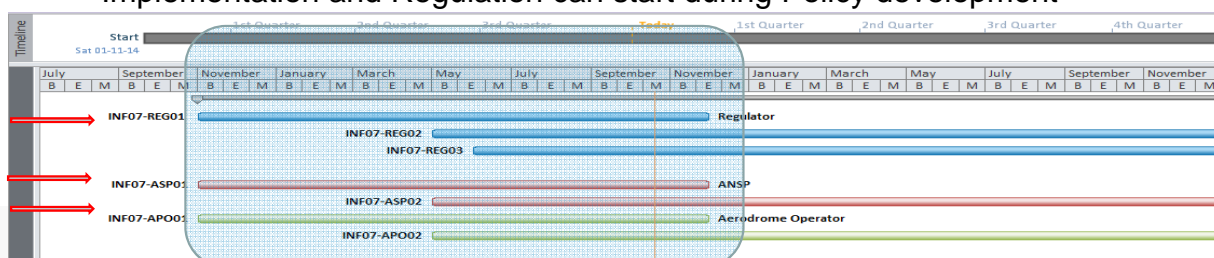
### Stakeholder Lines of Action (SLoA)

SLoA ref.	Title	From	By
INF07-REG01	Establish National TOD policy	01/11/2014	30/11/2015
INF07-REG02	Establish TOD regulatory framework	01/05/2015	31/12/2017
INF07-REG03	Establish oversight of TOD implementation	01/06/2015	31/12/2017
INF07-REG04	Verify the regulatory compliance of TOD implementation	01/12/2017	31/05/2018
INF07-ASP01	Plan the required activities for the collection, management and provision of TOD in accordance with national TOD policy	01/11/2014	30/11/2015
INF07-ASP02	Implement the collection, management and provision of TOD in accordance with the national TOD policy and regulatory framework	01/05/2015	31/05/2018
INF07-APO01	Plan the required activities for the collection, management and provision of TOD in accordance with national TOD policy	01/11/2014	30/11/2015
INF07-APO02	Implement the collection, management and provision of TOD in accordance with the national TOD policy and regulatory framework	01/05/2015	31/05/2018

Description of finalised SLoAs is available on the PEPR website at <http://www.eurocontrol.int/articles/essip-plan/>

## Considerations for INF07 timeline

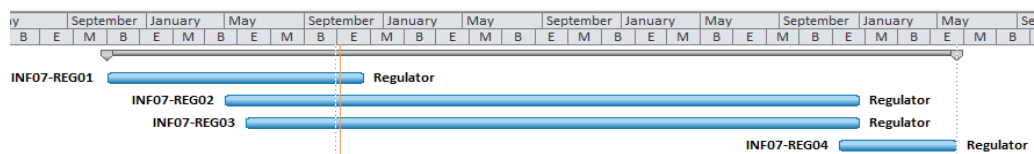
- ICAO SAPRS TOD requirements overdue deadline of 2008/2015
- Timeline: scenario of a State -
  - without any TOD regulation
    - Best known estimates required to set up such regulations ~ 3 years
  - some regulations in place
    - No need to comply with INF07 timeline, earlier implementations are possible
- ASP01 and APO01 (planning activities) same timeline with REG01
- Implementation and Regulation can start during Policy development





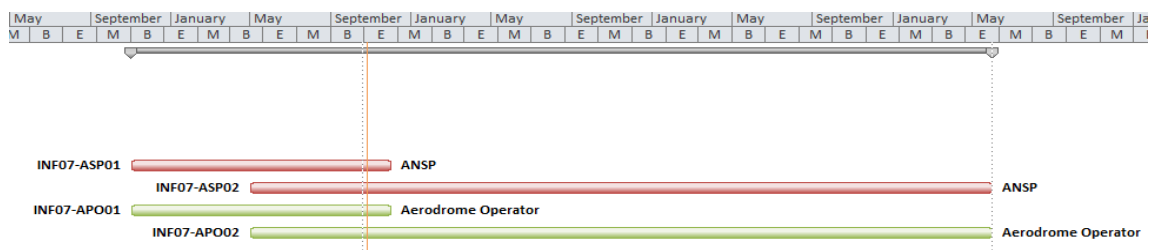
## REG (Regulators) actions

SloA.ref.	Title	From	By
INF07-REG01	Establish National TOD policy	01/11/2014	30/11/2015
INF07-REG02	Establish TOD regulatory framework	01/05/2015	31/12/2017
INF07-REG03	Establish oversight of TOD implementation	01/06/2015	31/12/2017
INF07-REG04	Verify the regulatory compliance of TOD implementation	01/12/2017	31/05/2018



## ASP (ANS Provider) and APO (Aerodrome Operator) actions

INF07-ASP01	Plan the required activities for the collection, management and provision of TOD in accordance with national TOD policy	01/11/2014	30/11/2015
INF07-ASP02	Implement the collection, management and provision of TOD in accordance with the national TOD policy and regulatory framework	01/05/2015	31/05/2018
INF07-APO01	Plan the required activities for the collection, management and provision of TOD in accordance with national TOD policy	01/11/2014	30/11/2015
INF07-APO02	Implement the collection, management and provision of TOD in accordance with the national TOD policy and regulatory framework	01/05/2015	31/05/2018



## Draft National TOD Policy template



- Developed to assist the regulators with the outline structure of the National TOD policy
  - Based on TOD manual - TOD Implementation Plan Template
  - Additions based on implementation experience from the TOD WG
  - Reviewed by the ADQ regulators working group of Eurocontrol




Appendix A National TOD Policy template	
Introduction	
A.1	Objectives
A.1.1	Objectives of the policy
A.1.2	Objectives of the implementation plan
A.1.3	Objectives of the implementation plan
A.1.4	Objectives of the implementation plan
A.1.5	Objectives of the implementation plan
A.1.6	Objectives of the implementation plan
A.1.7	Objectives of the implementation plan
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A.1.99	Objectives of the implementation plan
A.1.100	Objectives of the implementation plan

## National TOD Policy template: Content



Part I: Scope 

Part II:  
Responsibilities 

Part III: Costs 

## National TOD Policy template Part I: Scope definition <sup>1</sup>

### Part I: Scope



- Objective: to determine
  - a) required quality/numerical requirements and collection surfaces
  - b) Involved Stakeholders
- Applicable regulations affecting T&O
  - International (determine applicability)
    - ICAO SARPS
    - EU Regulations
    - ISO 19100 series
    - User requirements (e.g. EUROCAE ED-98)
  - National (exist or should be updated to reflect TOD?)
    - Policy for aerodrome safeguarding
    - Obstacle authorisation process
    - Policy for assignment of obstacle identification

## National TOD Policy template Part I: Scope definition <sup>2</sup>



### Part I: Scope



- Based on applicable regulations, determine:
  - Collection surfaces in State (vertical and horizontal)
    - Area 1 (100m or 60m?)
    - Area 2 (TOFP area & OLS or 2b,c,d?)
    - Area 3 (recommended practice, only when AMD?)
    - Area 4 (vertical collection surface?)
  - List aerodromes required to provide T & O
    - Area 2: as minimum all AD with AOC Type A/B
    - Area 3: AD with planned AMD
    - Area 4: ILS CAT II/III operations RWY

## National TOD Policy template Part I: Scope definition <sup>2</sup>

### Part I: Scope



- Based on applicable regulations, determine:
  - Collection surfaces in State (vertical and horizontal)
    - Area 1 (100m or 60m?)
    - Area 2 (TOFP area & OLS or 2b,c,d?)
    - Area 3 (recommended practice, only when AMD?)
    - Area 4 (vertical collection surface?)
  - List aerodromes required to provide T & O
    - Area 2: as minimum all AD with AOC Type A/B
    - Area 3: AD with planned AMD
    - Area 4: ILS CAT II/III operations RWY

## National TOD Policy template Part I: Scope definition <sup>3</sup>

### Part I: Scope



- Quality/numerical requirements
  - Same as Annex 15
  - Different National requirements
  - Based on user requirements (e.g. terrain Area 1 with Area 2 accuracy)
- Current compliance
  - Existing data (per type and Area)
    - Meets numerical/quality requirements
    - Data not available
    - Available data does not meet numerical/quality requirements



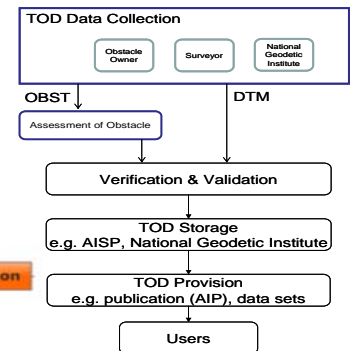
b) Involved Stakeholders:

▪ functions required per type and Area:

- E.g. obstacle data Area 2
  - Regulation
  - Data Source
    - Obstacle owner
    - Data originator
  - Obstacle assessment
    - CNS, AD & procedure design
  - Verification and validation
  - Data repository
  - Data provision
  - Oversight



Surveyor
National civil/military geodetic agencies
Obstacle owner
Obstacle assessment authority
Obstacle repository
Aerodrome operator
Aeronautical information services
National regulatory authorities
Beneficiaries (users)



- Regulation
  - Who will develop /update the national civil aviation regulatory framework to ensure the collection, processing and provision of electronic T & O data for each Area
  - List regulations to be updated/created
  - By when
- Data source (initial baseline)
  - Who will originate obstacles (Area 1, Area 2, Area 3, Area 4)?
  - Who will originate terrain (Area 1, Area 2, Area 3, Area 4)?
  - List existing data sources
  - Formal arrangements
    - Survey requirements based on data quality requirements for each Area, including periodicity



- Obstacles assessment
  - Who will assess the effects of objects penetrating the obstacle collection surfaces on the aviation infrastructure ?
  
  - Based on
    - Policy for aerodrome safeguarding
    - Obstacle authorisation process
  
  - Requires expertise of various aviation domains, i.e. military, CNS infrastructure, aerodrome safeguarding authority, airspace and instrument procedure designers



- Verification and validation
  - Who will V & V existing and new electronic T & O data for each Area?
  - Methods for V & V
  
- Repository
  - Who will store electronic T & O data for each Area?
  
- Maintenance
  - Who will update T & O data for each Area
    - Unless covered by initial origination
    - For Obstacles: should be based on/linked to the national obstacle authorisation process



- Provision
  - Who will provide electronic T & O data for each Area to next-intended user?
    - Formats to be used (e.g. GeoTIFF, shape for terrain)
    - Media/means
- Cross-border data exchange
  - Who will negotiate / agree with adjacent State on exchange of cross-border data ?
    - – mostly relevant for Area 2
  - Principles for exchange and harmonization of common TOD with neighboring States
- Oversight
  - Who will monitor the implementation of electronic T & O data for each Area?
    - Milestones and tasks for affected TOD stakeholders – implementation timeline



- Placeholder section should identify how the defined functions will finance their defined responsibilities and the charging mechanisms (to be put) in place
- State specific – no harmonised guidance
  - ICAO Doc 9082 “ICAO’s Policies on Charges for Airports and Air Navigation Services”
  - ICAO Doc 9562 “Airport Economics manual”
  - ICAO Doc 9161 “Manual on Air Navigation Services Economics”
  - Commission Regulation (EC) No 1794/2006 & 1191/2010
    - common charging scheme for air navigation services
  - EUROCONTROL Doc 15.60.01 “Principles for Establishing the Cost-Base for En-Route Charges and the Calculation of the Unit Rates”



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## Objective INF07 (eTOD) Status

## Objective INF07 (eTOD) Status



### Stakeholders:

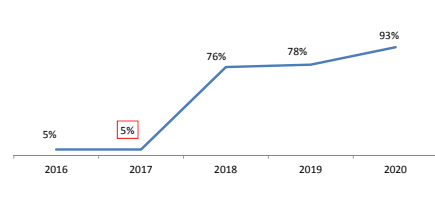
- ANSPs
- Airport Operators
- Regulators

**FOC:** 05/2018

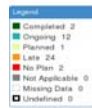
**Planned delay**

**Estimated achievement:** 11/2020

Completion Rate Evolution (% of States completed the objective)



INF07 - Electronic Terrain and Obstacle Data (eTOD)



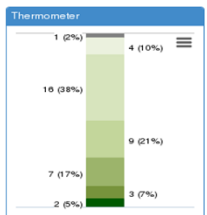
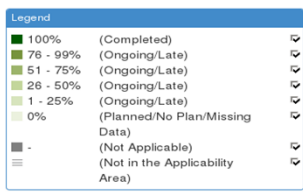
Edition 2017 - Only Applicable Areas



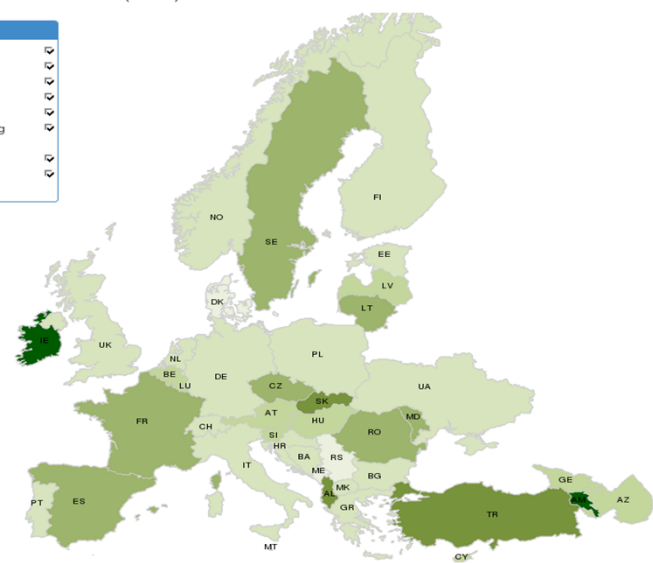


# INF 07 Progress for 2017

INF07 - Electronic Terrain and Obstacle Data (eTOD)



Code	Full name	Progress
LU	Luxembourg	█
MAS	Maastricht UAC	█
MT	Malta	█

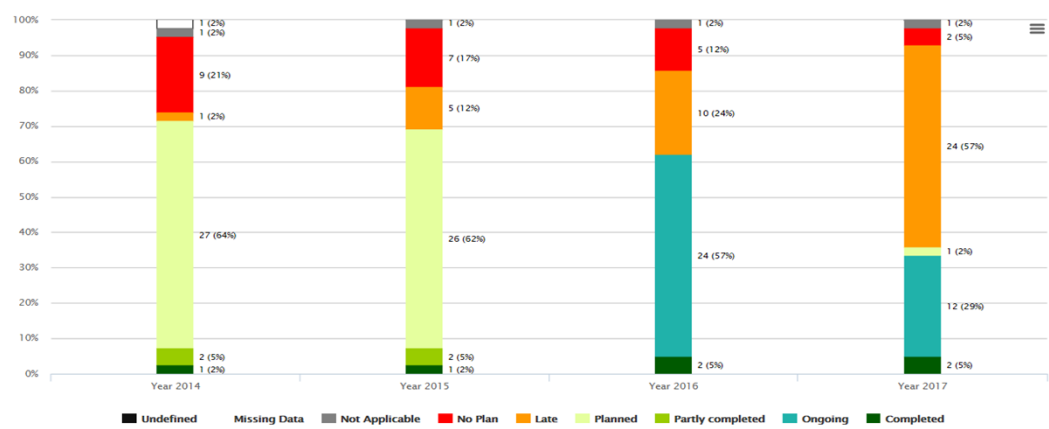


Edition 2017



# INF07 evolution

## Evolution



## INF 07 - Main 2017 developments

- No progress in terms of the number of States completing this objective, only 2 such as in previous cycle – Ireland and Armenia
- There was a significant increase in the amount of States that declared being “late”, a total of 24 States, 14 more than last year
- The number of “No Plan” decreased from 5 to 2 States
- “Establish National TOD Policy” (REG 01) entails a very important activity because other stakeholders actions depend on its availability to further progress and conclude their implementation activities.
- Nevertheless, only (18) States have completed that activity and (20) are Late, the action was due for November 2015.
- For other stakeholder’s lines of action the situation is equally bad as they are dependent on the completion of REG 01.
- The deadline for implementation is approaching, States may consider to address the “Support to States” of EUROCONTROL for possible support on the implementation of REG01.

## More information on TOD

- [aim@eurocontrol.int](mailto:aim@eurocontrol.int); [alexandre.petrovsky@eurocontrol.int](mailto:alexandre.petrovsky@eurocontrol.int)
- TOD community of interest: <https://ost.eurocontrol.int/sites/AISWIM/TOD> (registration required)
- Latest status of eTOD implementation in ECAC Area 1: [https://ext.eurocontrol.int/atmatlas\\_viewer/?mapCode=eTOD](https://ext.eurocontrol.int/atmatlas_viewer/?mapCode=eTOD)
- INF07-eTOD [https://www.atmmasterplan.eu/depl/essip\\_objectives/1000089](https://www.atmmasterplan.eu/depl/essip_objectives/1000089)



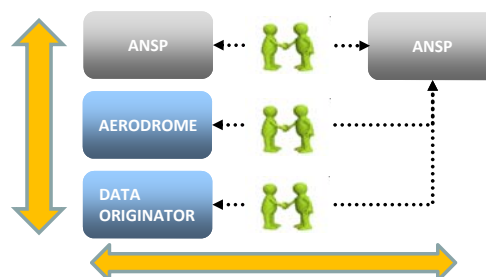
# Formal Arrangements - Needs, Process and Practices

INEA ADQ Implementation Workshop  
ANS Czech Republic  
Prague, 4-6 Sep 2018

Manfred UNTERREINER  
EUROCONTROL  
DECMA / ACS / STAN

## The ADQ Requirement

- Article 6(3)
- **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.
- For Whom?
  - All ADQ regulated parties
  - Potentially also for further interactions per Art 6(5)



## ANNEX IV DATA QUALITY REQUIREMENTS

### PART C

#### Formal arrangements

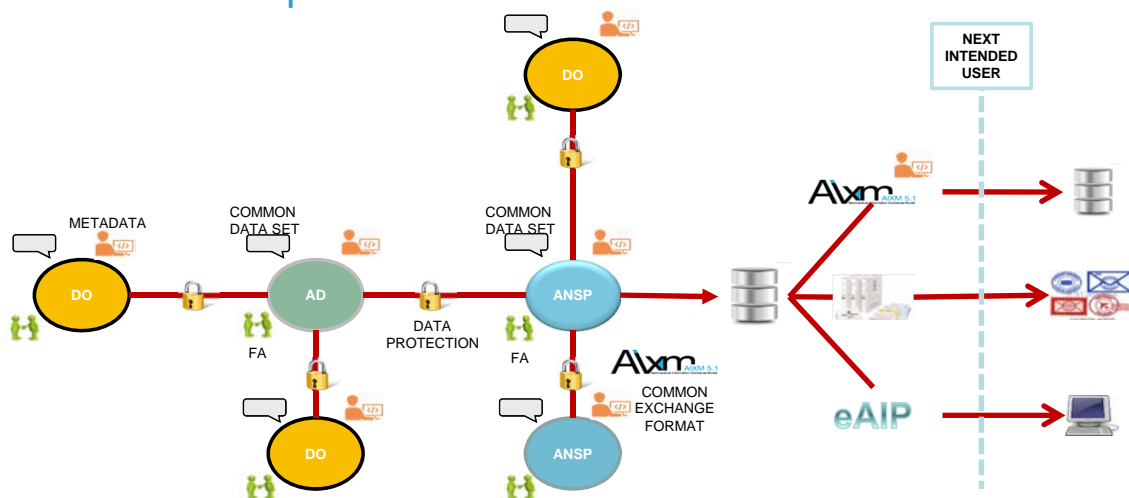
Formal arrangements shall include the following minimum content:

- (a) the scope of aeronautical data or aeronautical information to be provided;
- (b) the accuracy, resolution and integrity requirements for each data item supplied;
- (c) the required methods for demonstrating that the data provided conforms with the specified requirements;
- (d) the nature of action to be taken in the event of discovery of a data error or inconsistency in any data provided;
- (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;
- (f) the party responsible for documenting data changes;
- (g) the means to resolve any potential ambiguities caused where different formats are used to exchange aeronautical data or aeronautical information;
- (h) any limitations on the use of data;
- (i) requirements for the production of quality reports by data providers to facilitate verification of data quality by the data users;
- (j) metadata requirements;
- (k) contingency requirements concerning the continuity of data provision.

3

## ADQ “The Big Picture”

Remember: compliance starts on the DO side...



4

## What are Formal Arrangements (FA)?

- Different **forms** of Formal Arrangements
  - The ADQ FA
  - Service Level Agreements
  - Contracts
  - Checklists (under specific circumstances)
  - Memoranda etc.
- Main **Parties** usually covered by FA
  - Internal/External
  - Bilateral (e.g. Aerodrome and AISP)
  - Trilateral (e.g. plus involvement of CAA)
- Different **media** used for FA
  - Individual FA (e.g. a classic document: paper, pdf etc.)
  - Tool based electronic approaches (e.g. generic check list “tick box”)



5

## Common attributes/criteria for FA

- **Agreed**
  - Discussed and negotiated
  - Clear & specific
  - Understood
- **Documented**
  - Written
  - Relevant
  - Up to date
- **Communicated**
  - Shared
  - Maintained
  - Monitored
- **Signed** (incl. e-signature)
  - Legal commitment
  - Basis for compliance



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# ADQ Template for FA

Insert Organisation 1 Logo Here

Insert Organisation 2 Logo Here

**DATA PROVISION AGREEMENT**

between

*[the name of the entity receiving the aeronautical data or aeronautical information]*  
(hereinafter "The Data Receiver")

and

*[the name of the entity providing the aeronautical data or aeronautical information]*  
(hereinafter "The Data Provider")

ADQ FA template

Its just a template!  
see it as "guide"  
use and misuse as need  
Serve the purpose!

ADQ Form Approved/Version: 10/02/2014

Data Provision Agreement

TABLE OF CONTENTS

1. INTRODUCTION.....	1
1.1 Scope.....	1
1.2 Parties to the Agreement.....	1
1.3 Regulatory Framework.....	1
1.4 Entry Into Force and Termination.....	1
1.5 Definitions and Conventions.....	2
2. SERVICES AND SERVICE LEVELS.....	2
2.1 Service Description.....	2
2.2 Service Levels.....	3
2.3 Data Change Management.....	3
2.4 Demonstrating Compliance.....	4
2.5 Data Errors and/or Inconsistencies.....	4
2.6 Contingency.....	5
3. MANAGEMENT ELEMENTS.....	5
3.1 Rewards and Remedies.....	6
3.2 Escalation Procedures.....	6
3.3 Litigation.....	6
ANNEX A. AERONAUTICAL DATA AND/OR AERONAUTICAL INFORMATION TO BE PROVIDED.....	7
ANNEX B. DATA SET SPECIFICATIONS.....	8
ANNEX C. DELIVERY MEANS.....	9
ANNEX D. DATA EXCHANGE FORMAT.....	10
ANNEX E. DATA QUALITY ATTRIBUTES.....	11
ANNEX F. TIMELINESS REQUIREMENTS.....	12
ANNEX G. METADATA REQUIREMENTS.....	13
ANNEX H. LIMITATIONS ON THE USE OF THE DATA.....	14

# Sample content of the FA Template

Agreement/Entity Reference source not found.

**1. INTRODUCTION**

**1.1 SCOPE**

1.1.1 This Agreement documents the agreed provision of service for the supply of aeronautical data and/or aeronautical information (hereinafter the Data) by [organisation name] (hereinafter the Data Supplier) to [organisation name] (the Data Receiver). This Agreement is overseen and managed by the [organisation name] (The Regulator).

**1.2 PARTIES TO THE AGREEMENT**

1.2.1 The following table describes and names the legal entities and their representatives who have reviewed and approved this Agreement.

Entity	Address	Representative
<i>[Insert Regulator details here]</i>		
<i>[Insert Data Receiver details here]</i>		
<i>[Insert Data Provider details here]</i>		

**1.3 REGULATORY FRAMEWORK**

1.3.1 A number of documents specify the regulatory requirements for the origination, production, storage, handling, processing, transfer and distribution of aeronautical data and aeronautical information. These include but are not exclusive:

- a. REGULATION (EC) No 662/2004 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);
- b. COMMISSION REGULATION (EU) No 73/2010 of 26 January 2010 laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky, as amended by COMMISSION IMPLEMENTING REGULATION (EU) No 1020/2014;
- c. Annex 4 to the Chicago Convention – Aeronautical Charts
- d. Annex 5 to the Chicago Convention - Units of Measurement to be Used in Air and Ground Operations
- e. Annex 11 to the Chicago Convention – Air Traffic Services
- f. Annex 15 to the Chicago Convention – Aeronautical Information Services
- g. Annex 14 to the Chicago Convention – Aerodromes
- h. *[add any National Regulation]*

**1.4 ENTRY INTO FORCE AND TERMINATION**

1.4.1 This Agreement is valid from *[insert validity from date]* to *[insert term date]*.

*alternatively*

1.4.2 This Agreement enters into force on the date of the later signature of the Parties and shall remain in force for an indefinite period unless explicitly terminated by a signed agreement between the Parties.

Page 1

**ANNEX A. AERONAUTICAL DATA AND/OR AERONAUTICAL INFORMATION TO BE PROVIDED BY THE DATA PROVIDER TO THE DATA RECEIVER**

Example:

Data Item	Description
Data Item X	
Data Item Y	
Data Item Z	

**ANNEX B. DATA SET SPECIFICATIONS**

Example:

*The Data shall be provided in accordance with the ADM 5.1 Conceptual Model.*

*The ADM Conceptual Model is the component of the ADM data standard that provides a conceptual model of aeronautical data.*

*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.*

*The model is designed using the Unified Modelling Language (UML).*

**ANNEX E. DATA QUALITY ATTRIBUTES**

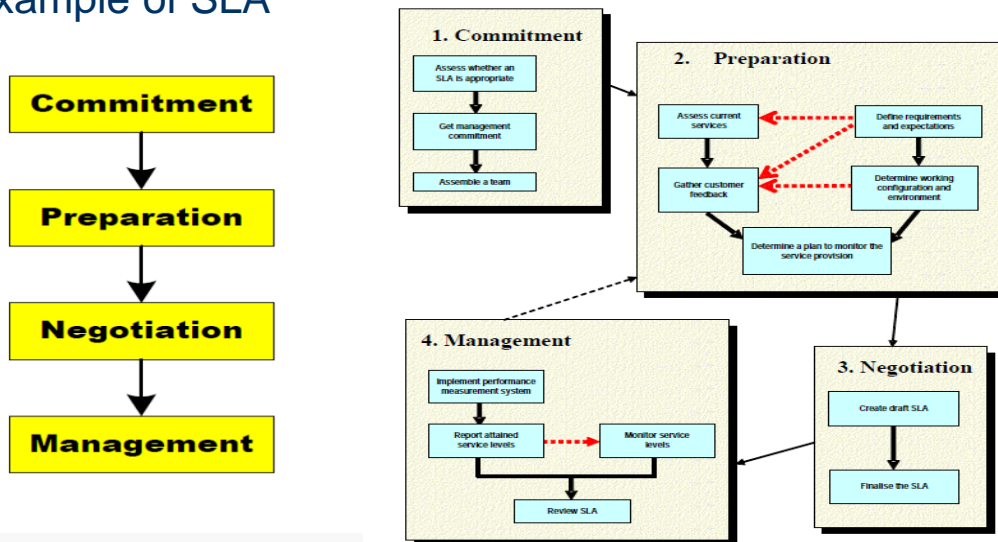
Example (1):

*The Data shall comply with the data quality requirements from the EUROCONTROL Specification for Data Quality Requirements, Edition 1.1, 07/06/2014.*

Example (2):

*The Data shall be collected through a method that ensures that the Data is of sufficient accuracy, resolution and integrity on submission to comply with the requirements of [organisation name or system name] or ICAO Annex 10, 11, 14 and 15 – whichever is more stringent.*

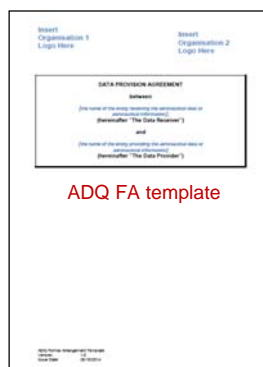
## Generic Process to establish FA based on the example of SLA



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## FA - supporting material

- **ADQ FA Template** [source: ADQi]; Edition 1.1
- **CHAIN SLA Package**
  - Tutorial
  - Guidance
  - Originator Index
  - Template
- **Examples:**
  - FA
  - National derivations of Originator index



<https://www.eurocontrol.int/articles/adq-library>

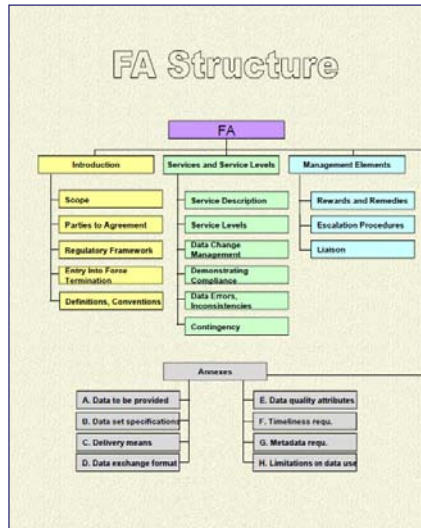
<https://bst.eurocontrol.int/sites/ASWIM/ADQiWG/Deliverables%20Library/Forms/Deliverables%20Library.aspx>

10

# A Practical Help

## Formal Arrangement Implementation Checklist

- Seek management support
  - Gather agreement team
  - Hold agreement meeting
- Prepare for meeting
  - Agree scope of data (use Data Originator Index)
  - Agree data quality requirements
  - Agree service measures
  - Agree FA reporting
  - Agree FA maintenance
- Agree scope of data (use Data Originator Index)
- Agree data quality requirements
- Agree service measures
- Agree FA reporting
- Agree FA maintenance
- Create draft FA
  - Review FA
- Sign FA
  - Implement FA
- Monitor FA
  - Update FA



# Some examples from ADQ implementers



## ADQ Compliance Checklist

Formal scheme according to Regulation (EU) No. 73/2010, Article 6, paragraph 3 for the generation and dispatching of AIP-related aeronautical data

The ADQ-Compliance Checklist serves as a formal contractual arrangement in accordance with Regulation (EU) No. 73/2010 of 26 January 2010 laying down requirements on the quality of aeronautical data and aeronautical information for the Single European Sky.

By submitting the signed ADQ-Compliance Checklist, the undersigned contracting partner undertakes to comply with their needs specified in this contract requirements for each dispatching of AIP-related aeronautical data within the validity period of the contract (see below for details).

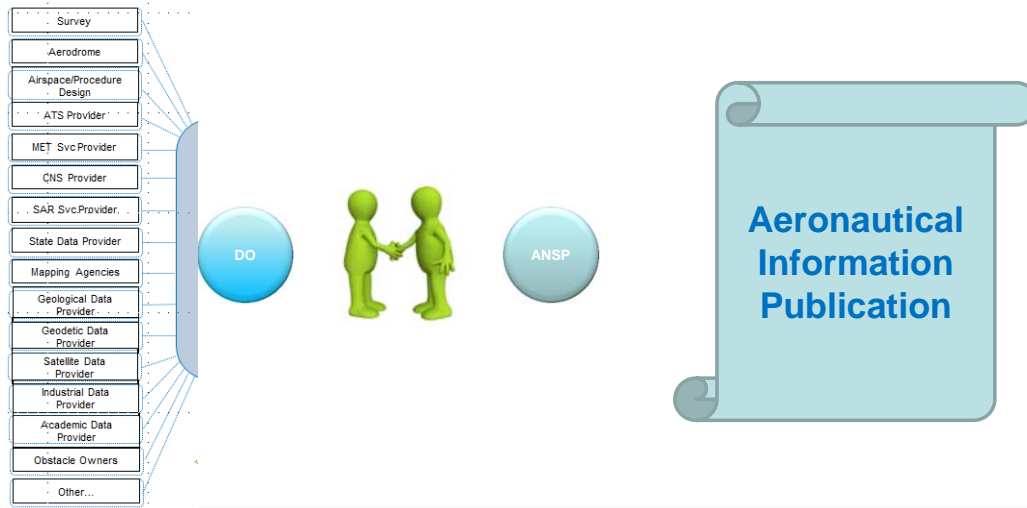
Nr.	Bezeichnung	Datum	Datentyp/Formal	Beispiel	Beschreibung
<b>Informationen aus dem Bereich</b>					
42	Beauftragte Stelle		Text	Leistungsanbieter Name	Betrieb, der die Luftverkehrsdaten an den Betreiber überträgt
43	Genehmigung		Text	7.02.174.12001.0000	Betriebsnummer des Betreibers
44	Beschreibungsbelegnummer		Datum	16.03.2008	Betriebsbelegnummer
45	Herstellerkennung gemäß ICAO-Anforderung		Anforderung/Anforderung	1470 300 02	22-stellige Herstellerkennung gemäß ICAO-Anforderung für die Identifizierung des Herstellers und des Herstellers
<b>Behördliche Prüfung (über vom der zuständigen Behörde auszuführen)</b>					
1010	Behördl. Prüfung des Herstellers (Beauftragter)		Text	Reg. New Stationen	Name der Behörde, die die Herstellerprüfung durchführt
1011	Behördl. Prüfung der Herstellerdaten (Datum, Uhrzeit)		Text	17.04.2013 09:30	Datum/Uhrzeit der behördlichen Prüfung der Herstellerdaten
1012	Behördl. Prüfung der Herstellerdaten (Ergebnis)		Text	Keine Beanstandungen	Ergebnis der behördlichen Prüfung der Herstellerdaten
1013	Behördl. Anmerkungen		Text		Anmerkungen der zuständigen Behörde
<b>Organisatorische und rechtliche Informationen</b>					
10	Eigentümer		Text	Information Technology Group	Eigentümer des Herstellers
101	Telefonnummer des Eigentümers		Text	+43884 110 07 41	Telefonnummer des Herstellers
102	Faxnummer des Eigentümers		Text	072026	Faxnummer des Herstellers
103	Telefonnummer des Betreibers		Text		Telefonnummer des Herstellers
104	Faxnummer des Betreibers		Text		Faxnummer des Herstellers
105	Internetadresse		Text		Internetadresse des Herstellers
106	Regulator / Mitarbeiter		Text		Name des Regulators des Herstellers

<http://www.eurocontrol.int/articles/adq-library>



## Data Originator Index

Understand who and where are the sources...



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## Data Originator Index - Ed.1.2

#1

- Excel spreadsheet defining:
  - ICAO AIP template: Annex 15 App 1 "Contents of the AIP", 15th Ed, Amdt39A
  - Identifiable against: Originators of specific aeronautical data
- Header layers can be expanded/collapsed in two ways:
  - using top left bar frames:
    - click on 1: see only the 3 AIP Parts
    - click on 5: see the full AIP header structure
  - using left bar frames: +/- to drop down per selected chapter/section
- Certain columns are locked (split/frozen) for easier navigation
- Readability: adjust the zoom values

14

# Originator Index



1	Title:	Small Originator Index - Mod Updated to reflect AIP content required by ICAO Annex 15, 14th Edition		
2	Version:	1.1 AIP structure based		
3	Date:	Apr-18		
4				
5	Chapter	Title	Section	Title
6				
7	GEN	General		
8	151 ENR	Enroute		
9	370 AD	Aerodromes		
10	843			
11	844			
12	845			

1	Title:								
2	Version:								
3	Date:								
4									
5	Chapter	Data Originator Department	Name/Function	Data Approval Department	Name Function	Intended Purpose	Data Criticality (Integrity requirement)	Source of Classification	Data Type acc. Source of Criticality
6									
7	GEN								
8	GEN								
9	GEN								
10	GEN								
11	GEN								
12	GEN								

# DOI Principle Structure – Header Layers



- Chapter [Layer1] e.g. GEN
- Section [Layer2] e.g. GEN 2 Tables And Codes
- Sub-section [Layer3] e.g. GEN 2.1 Measuring system, aircraft markings, holidays
- Subsub-section [Layer4] e.g. GEN 2.1.3 Horizontal reference system
- Attribute [Layer5] e.g. 1) name/designation of the reference system

1	Title:	Small Originator Index - Modified Updated to reflect AIP content required by ICAO Annex 15, 15th Edition, AIP Structure based on Annex 15 and AIP Specimen Doc 8126		
2	Version:	1.1		
3	Date:	Nov-18		
4				
5	Chapter	Title	Section	Title
6				
7	60 GEN	General	2	Tables And Codes
8	61 GEN	General	2	Tables And Codes
9	62 GEN	General	2	Tables And Codes
10	63 GEN	General	2	Tables And Codes
11	64 GEN	General	2	Tables And Codes
12	65 GEN	General	2	Tables And Codes
13	66 GEN	General	2	Tables And Codes
14	67 GEN	General	2	Tables And Codes
15	68 GEN	General	2	Tables And Codes
16	69 GEN	General	2	Tables And Codes
17	70 GEN	General	2	Tables And Codes
18	71 GEN	General	2	Tables And Codes
19	72 GEN	General	2	Tables And Codes
20	73 GEN	General	2	Tables And Codes
21	74 GEN	General	2	Tables And Codes
22	75 GEN	General	2	Tables And Codes
23	76 GEN	General	2	Tables And Codes
24	77 GEN	General	2	Tables And Codes

## DOI online

- Via ADQ Library:
- <http://www.eurocontrol.int/articles/adq-library>
- DOI direct:
- [http://www.eurocontrol.int/sites/default/files/content/documents/single-sky/mandates/AIP%20Originator%20Index%20%281.2%29%20incorporating%20ICAO%20Annex%2015\\_15th%20Edition%20AMDT39A.xlsx](http://www.eurocontrol.int/sites/default/files/content/documents/single-sky/mandates/AIP%20Originator%20Index%20%281.2%29%20incorporating%20ICAO%20Annex%2015_15th%20Edition%20AMDT39A.xlsx)

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## To remember

- FA are on the **critical path** to achieve Data Quality
- Formals arrangements are “formal” and represent a **firm commitment**, thus they are **evidence for compliance**
- FA may take **various forms** depending on the given context
- Keep it simple and **be pragmatic**
- Generic FA Process has **4 Main Stages**
- **Don't** draft FAs in isolation and simply impose them
- **Exploit** Guidelines, Spec and Examples.



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Facility of the European Union



# Evaluation and Summary

INEA ADQ Implementation Workshop  
ANS Czech Republic  
Prague, 4-6 Sep 2018

Manfred UNTERREINER  
EUROCONTROL  
DECMA / ACS / STAN

## Programme Day 1



Time	Duration	Topic	Speaker
13:00	10min	Welcome	Jan Klas, General Director, ANS CR
13:10	20	Introduction: Objectives, Program	Eurocontrol, Manfred Unterreiner (MJU)
13:30	60	Data quality drivers and latest developments <ul style="list-style-type: none"> <li>• Why is Data Quality important?</li> <li>• Global and regional aspects</li> </ul>	Eurocontrol, MJU
14:30	25	Break	
14:55	65	ADQ key provisions and means – overview	Eurocontrol, MJU
16:00	30	ADQ status based on ESSIP / LSSIP <ul style="list-style-type: none"> <li>• European view</li> <li>• LSSIP status in CR</li> </ul>	Eurocontrol, MJU CAA, Lukas Vaněk
16:30	30	Main conceptual differences between ADQ and the new EASA Part-AIS incl. consequential amendments to 139/2014 (ADR Regulation)	Eurocontrol, MJU
17:00		Closing day 1	

## Programme Day 2



Time	Duration	Topic	Speaker
09:00	5min	Introduction	Eurocontrol, MJU
09:05	145	Data Origination <ul style="list-style-type: none"> <li>• Data Scope</li> <li>• Request for Data Origination</li> <li>• Data Origination Requirements</li> <li>• Validation and Verification</li> <li>• Other data originators (survey, procedure design etc.)</li> </ul> <p style="text-align: center;"><i>Note 25 min break ca. 10h30</i></p>	ITV, Rudolf Schneeberger (RS) <i>on behalf of Eurocontrol</i>
11:30	45	Q & A on Data Origination	Participants
12:15	60	Lunch	
13:15	60	Data exchange <ul style="list-style-type: none"> <li>• Differences ADQ vs. Part-AIS &amp; ADR Reg.</li> <li>• Main Requirements</li> </ul>	Solitec, Wolfgang Scheucher (WS) <i>on behalf of Eurocontrol</i>
14:15	40	Data-set: <ul style="list-style-type: none"> <li>• Part I - Aeronautical Data Catalogue</li> </ul>	Solitec, WS
14:55	25	Break	
15:20	60	Data-set: <ul style="list-style-type: none"> <li>• Part II - Digital Data Sets</li> </ul>	Solitec, WS
16:20	30	Metadata <ul style="list-style-type: none"> <li>• Differences ADQ vs. Part-AIS &amp; ADR Reg.</li> <li>• Main Requirements</li> </ul>	Solitec, WS
16:50	10	Q & A	Participants
17:00		Closing day 2	

INEA ADQ Implementation Event

## Programme Day 3



Time	Duration	Topic	Speaker
09:00	5min	Introduction	Eurocontrol, MJU
09:05	115	Terrain & Obstacle Data <ul style="list-style-type: none"> <li>• Requirements</li> <li>• Status in Europe based on ESSIP</li> <li>• TOD Policy</li> <li>• Q &amp; A</li> </ul>	Eurocontrol, Alexandre Petrovsky (APE)
11:00	25	Break	
11:25	35	Formal Arrangements <ul style="list-style-type: none"> <li>• Reminder on needs, process and practices</li> </ul>	Eurocontrol, MJU
12:00	30	Event evaluation (round table) WS Summary	Eurocontrol, MJU
12:30	30	Closing remarks	ANS CR
13:00		Closing of WS	

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## Means that would be helpful...

- Formal Arrangements
- ADQ Online Library <http://www.eurocontrol.int/articles/adq-library>
- Data Originator Index (xls)
- ADQ Compliance Checklist (xls)
- Data Origination Specification (Vol. 1 & Vol 2)
- AIXM
  - AIXM confluence <http://aixm.aero/page/confluence>
  - AIXM common coding guidelines
- EASA Easy Access Rules ATM/ANS  
<https://www.easa.europa.eu/newsroom-and-events/news/easy-access-rules-atmans-published>
- EU Legislation in force (the big picture)  
[https://www.dropbox.com/s/d4pyfywuf6l9rme/EU\\_Legislation\\_SES%20%26%20EASA%20%2825Jul2018%29.pdf?dl=0](https://www.dropbox.com/s/d4pyfywuf6l9rme/EU_Legislation_SES%20%26%20EASA%20%2825Jul2018%29.pdf?dl=0)

## Your Feedback please How did this Workshop go for you?

- What Went Well?
- What Did Concern?
- What could improve future workshops?

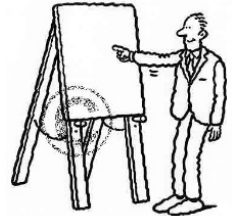


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<b>Aeronautical Data Quality - Implementation Workshop</b> <small>4-6 Sep 2018, ANS, Czech Republic</small> <b>Event Feedback</b>
<small>Your impression counts most for us and your feedback will be enhancing future events. Please use the fields below to share your views. Please return this form on-site or via email to: <a href="mailto:manfred.unterreiner@eurocontrol.int">manfred.unterreiner@eurocontrol.int</a></small>
What did you like most? <div style="border: 1px solid black; height: 40px;"></div>
What may require particular attention or would need enhancement? <div style="border: 1px solid black; height: 40px;"></div>
Any other suggestion you may have? <div style="border: 1px solid black; height: 40px;"></div>

## What Went Well (in this workshop)?

...captured on flipcharts

- The positive and encouraging attitude of the Speakers
- All presentations were extremely professional in terms of content and style, especially TOD with many examples
- Comparison of current ADQ provisions vs. draft EASA 373 rules was highly informative
- Online questions and the Quiz were most welcome and inspiring
- Red line applied in the workshop programme enabled logic and structured learning
- Excellent arrangements and hosting by ANS CR were applauded
- Customised workshop topics/approach addressed main implementation challenges
- Enhanced Awareness on all ADQ matters is of great importance.



## What Did Concern (in this workshop) plus other Suggestions/Improvements

...captured on flipcharts

- Would have liked to look even more at practical issues like how to transform spreadsheet data to AIXM
- More practical examples from other countries would be helpful
- Invite speakers with concrete implementation cases (e.g. the top ADQ implementers)
- Consider to provide an “Implementation Manual” with examples and best practices
- Invite the local Geodetic Agency to provide insights on their activities
- Info concerning Inspire and its relation with ADQ.





## Did we meet the Workshop Objectives?



- Facilitate a common understanding of Regulation (EU) 73/2010 by addressing identified implementation challenges
- Outline main differences between current requirements and upcoming changes, based on draft EASA Reg. 2017/373 including consequential changes to Reg. 139/2014.



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## Summary



- WS Objectives have clearly been met
- Multi stakeholder attendance covering essential regulated parties helped greatly
- Enabled good interactions and discussions amongst participants
- Achieved enhanced common understanding on drivers and needs behind ADQ
- Shared the ADQ Implementation progress noting key achievements
- Took very close look at Data Origination, Data Exchange and TOD requirements
- Shared some good practices & examples from other states
- Outlined a range of MoC/GM that are currently available
- With ADQ still being the legal baseline, explained upcoming EASA Part AIS (Op. 02/18)
- Agreed that continuous effort/interaction is required by all regulated parties
- Emphasized that optimum level of ADQ compliance will be basis for future Certification considering a potentially demanding/short transition phase
- Confirmed that Management support is essential to ensure priorities are correctly established wrt to key drivers like Safety, Capacity, Quality, Interoperability, User expectations etc.



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Thanks to ANS CR for hosting this workshop



Facilitator Team really appreciated to be with you!



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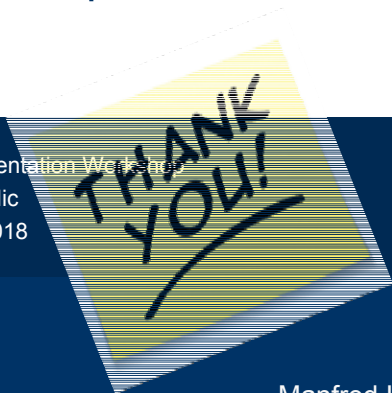
 Co-financed by the Connecting Europe Facility of the European Union



## INEA ADQ Implementation Workshop



INEA ADQ Implementation Workshop  
ANS Czech Republic  
Prague, 4-6 Sep 2018



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