



## eTOD Handling from data originator to end user according to new ICAO Annex 15



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Seminario sobre Datos electrónicos de Terrenos y  
Obstáculos (e-TOD) para el Área 2

Seminar on Electronic Terrain and  
Obstacle Data (e-TOD) for Area 2



# AGENDA

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- Requirements specification
- Aeronautical Data Quality
- Aeronautical Data Chain
- AIXM 5.1 data format
- Origination of Data
- Change Management
- Validation and Verification
- Path to End user
- Digital NOTAM
- Use case – Merida Airport



# REQUIREMENTS SPECIFICATION

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## Industry

- RTCA DO200-B Data Processing, Data Quality Monitoring
- RTCA DO272-D Aerodrome Mapping Database
- RTCA DO2291-C Electronic Terrain and Obstacles

## ICAO Standards

- NEW ICAO Annex 15
- ICAO doc 8126

## Guidelines

- ADQ- Aeronautical Data Quality, EUROCONTROL 2017



# AERONAUTICAL DATA QUALITY

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OBSTACLE

- *Aeronautical Data*

- *Aeronautical Information*

TERRAIN

- *Data Quality*

AERODROME

- *Accuracy*

- *Resolution*

PROCEDURE DESIGN

- *Integrity*



# DATA CHAIN

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Aeronautical data and information transfer should be conducted that ensures the risk of error is sufficiently low as to enable the safe use of the aeronautical data.

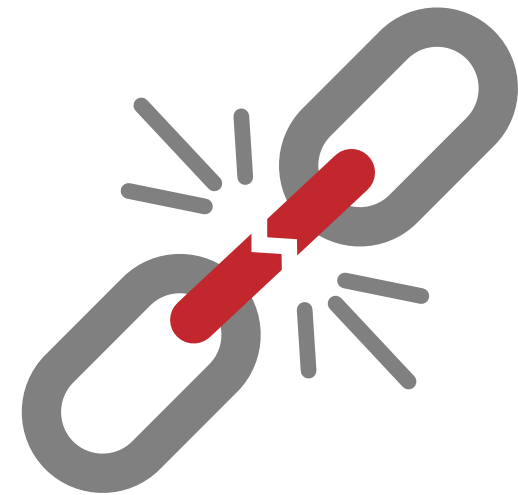


Protection shall be employed for aeronautical data and information transmission to prevent inadvertent or deliberate modification.



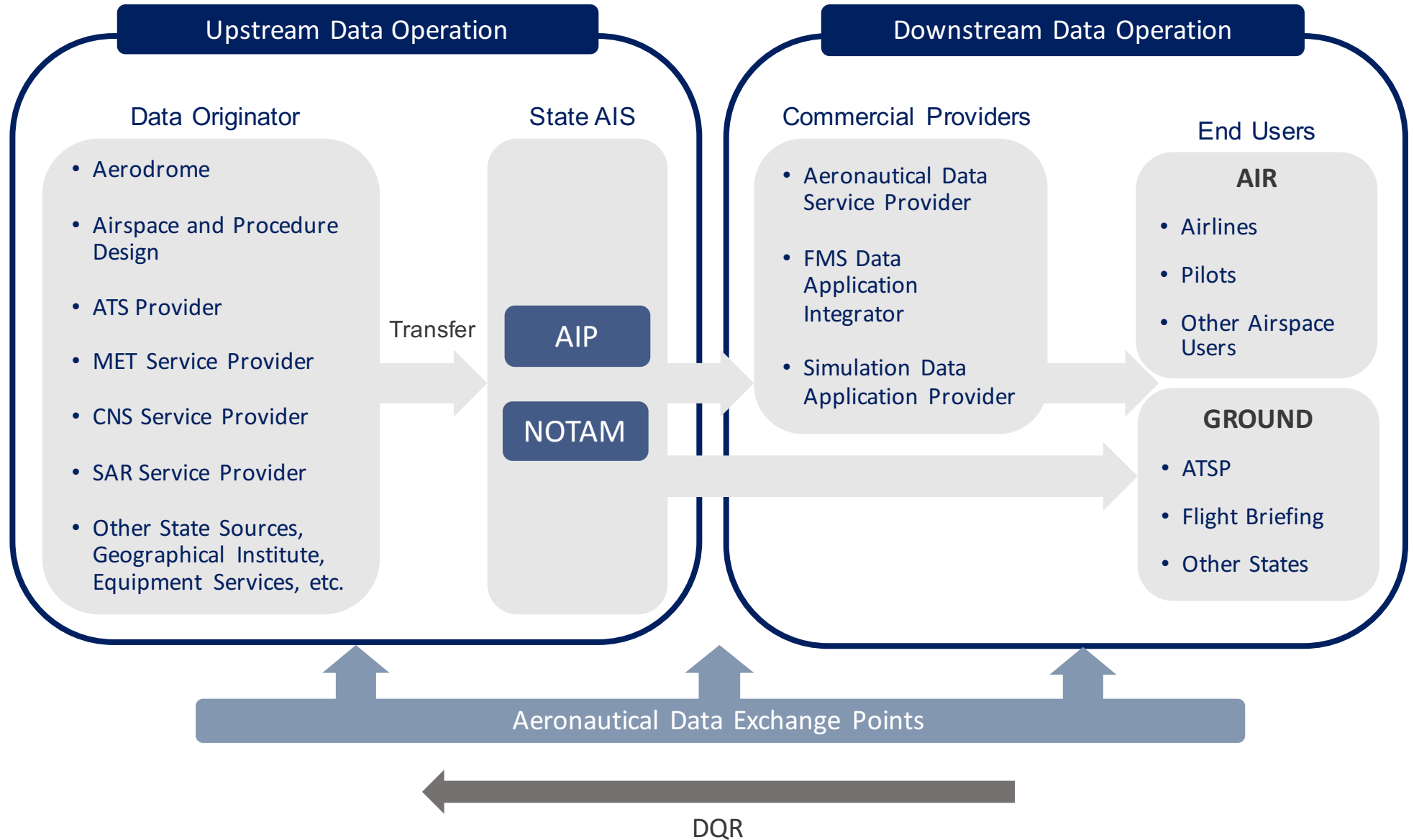
Aeronautical data may need to be transfer via appropriate direct electronic connection.

The problem  
of the **weakest link**  
in the chain





# AERONAUTICAL DATA CHAIN





## WHAT WE EXPECT FROM DIGITAL DATA

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Full **automatic processing** and validation, ensuring the provision of correct, complete and up-to-date data

Information about **restricted airspace and temporary obstacles** will be available in graphical format

**Increase the efficiency** of the information processing chain at all levels



Increased ability of pilots, dispatchers and air traffic controllers to **exploit/maximise the opportunities**

Warning messages will be presented **graphically** in the pre-flight process

Aeronautical Information Management Office. **Easy distribution of aeronautical data to end users**



# AIXM 5.1

Standard for the modelling and exchange of aeronautical data and information

- Aerodrome/Heliport including movement areas, services, facilities, etc.
- Airspace structures
- Organisations and units, including services
- Points and Navaids
- Procedures
- Routes

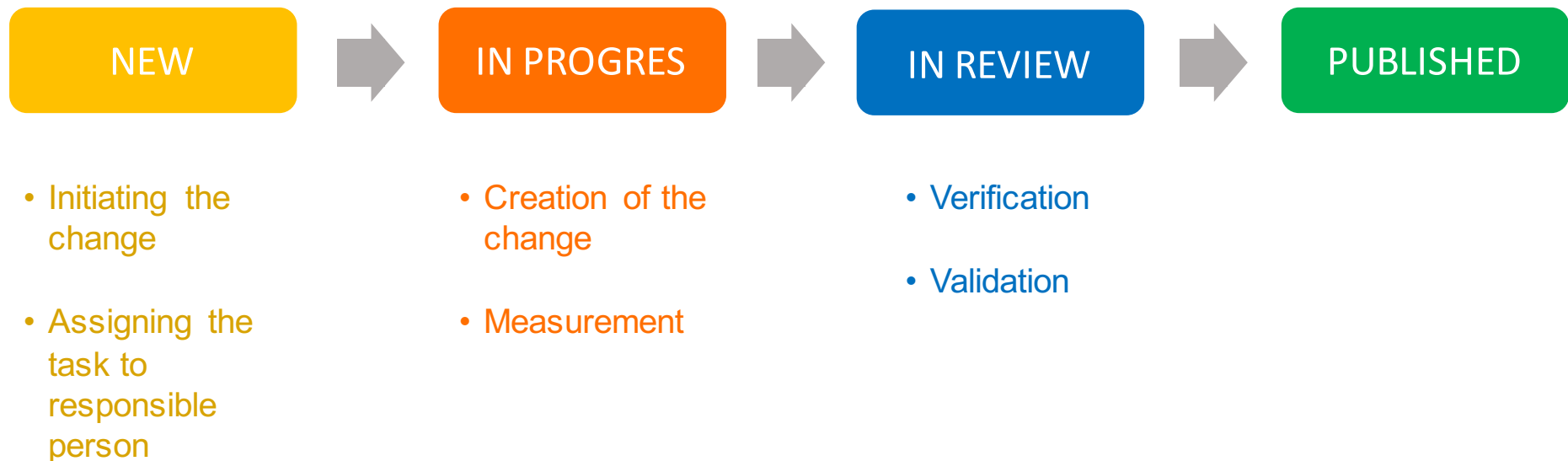




# CHANGE MANAGEMENT

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Change Request Management coordinates all changes in a software landscape





# CHANGE MANAGEMENT

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NEW

IN  
PROGRESS

IN  
VALIDATION

PUBLISHING



DQR

Digital Data Creation

## Satellite Imaginary



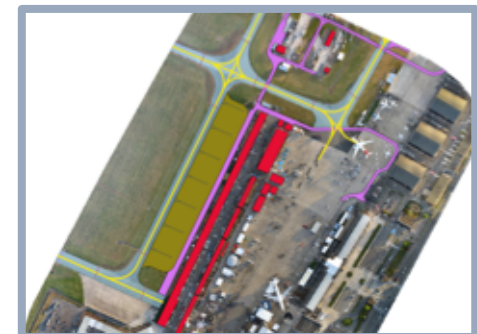
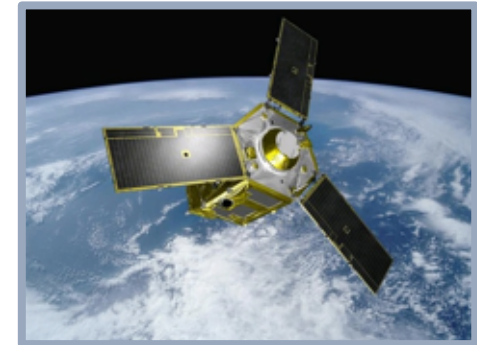
Ability to acquired imagery anywhere in the world in less than 24 hrs. in response to a crisis or natural disaster.



Regular monitoring, as often as every day if required.



50 cm resolution





DQR

Example of DQR

ICAO Annex 15  
EUROCONTROL HARMONIZED LIST

Latitude and longitude

REF ID	Data Item	RESOLUTION	ICAO SOURCE	ACCURACY	ICAO SOURCE	DATA TYPE	INTEGRITY CLASSIFICATION
EH009	Runway threshold, precision approaches	0.1 m or 0.1 ft	Annex 15	0.25 m	Annex 14 V1	surveyed	critical

Elevation / altitude / height

REF ID	Data Item	RESOLUTION	ICAO SOURCE	ACCURACY	ICAO SOURCE	DATA TYPE	INTEGRITY CLASSIFICATION
LL019	Runway holding position	1/100 sec	Annex 15	0.5 m	Annex 14 V1	surveyed	critical



# CHANGE MANAGEMENT

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NEW

IN  
PROGRESS

IN  
VALIDATION

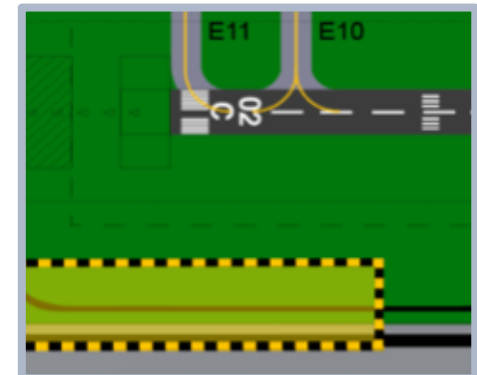
PUBLISHING



# ORIGINATION OF DATA

## Data Originator is measuring the data value

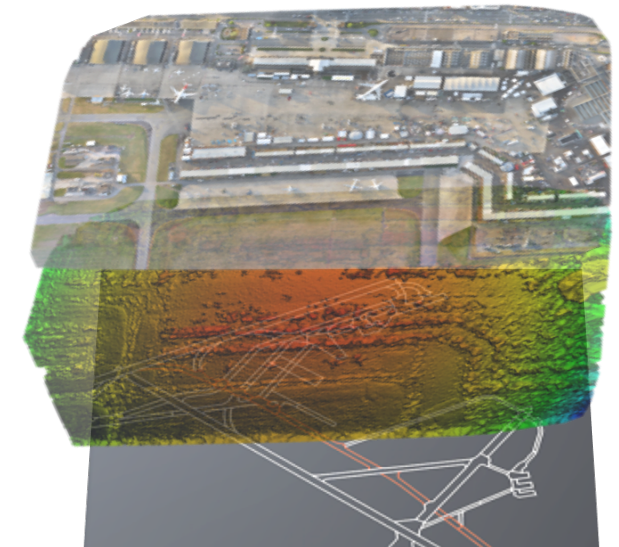
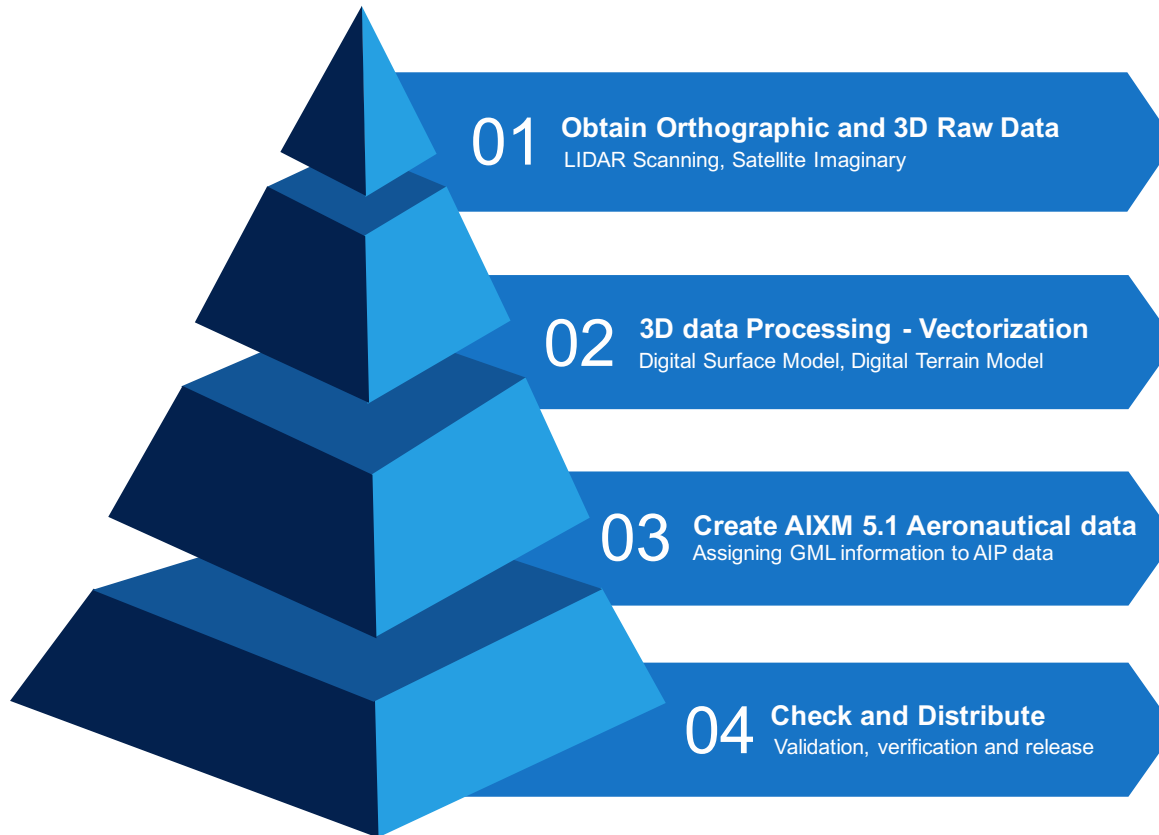
- Data value is associated with a data item and the creation of this value is the act of data origination.
- Data origination should not be confused with the act of 'creating' the data item in the first instance.





# AIXM 5.1 DATA

Digitalize your paper with AIME





# eTOD DATA CLASSIFICATION

Digitalize your paper

Entire territory of the state



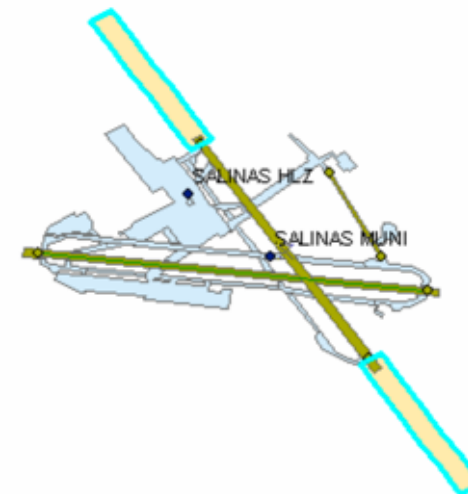
Terminal control area



Aerodrome area



CAT II and CAT III operation area





# eTOD AIXM

Digitalize your paper



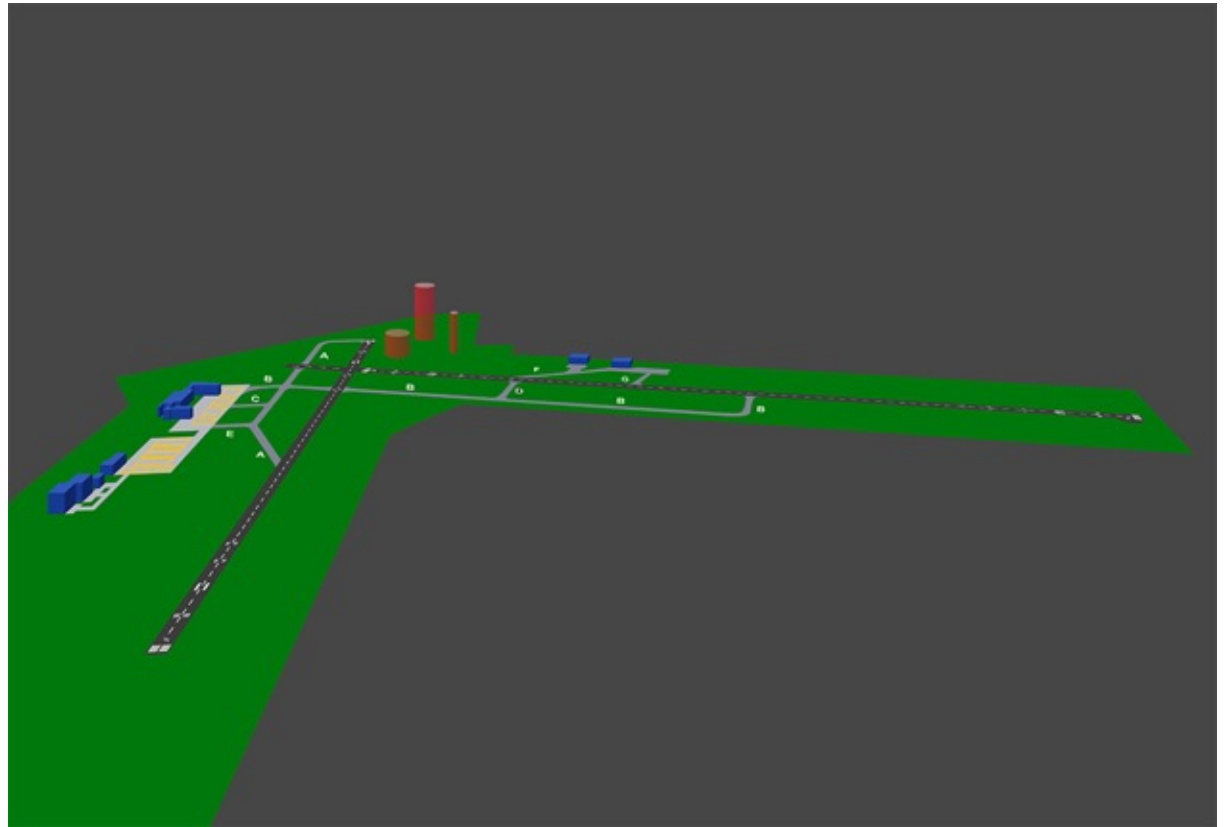
AIXM metadata schema is based on ISO 19115



Compliant with the Commission Regulation (EU) 73/2010



AIXM presents a model that allows for explicit modelling of temporal validity.





# CHANGE MANAGEMENT

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NEW

IN  
PROGRESS

IN  
VALIDATION

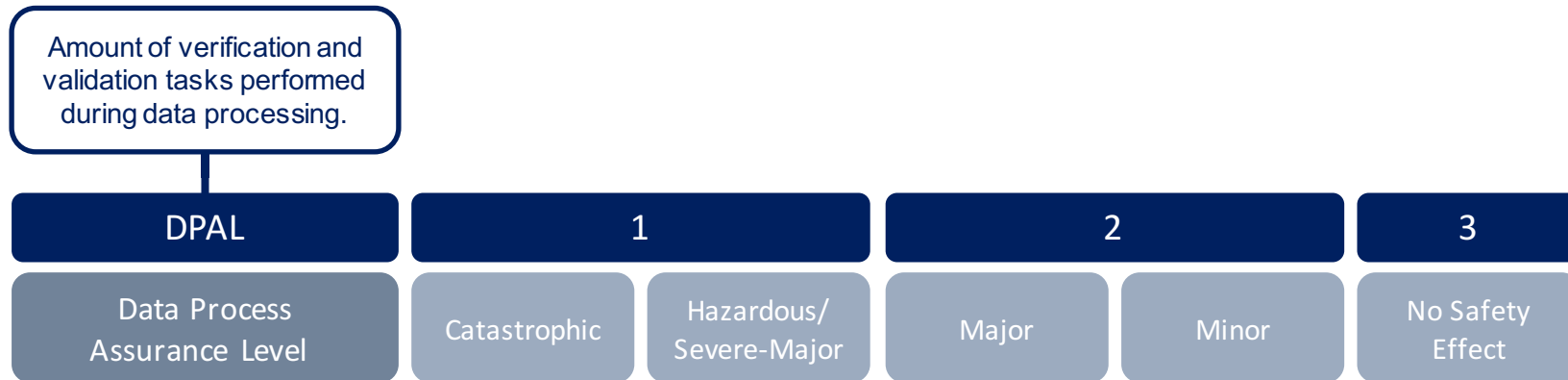
PUBLISHING



# VALIDATION AND VERIFICATION

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The primary objective of the data process is to supply data that meets the DQRs





# VALIDATION AND VERIFICATION

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## VALIDATION

data element is checked as having a value that is fully applicable intended use

Validation by  
Sampling

Semantic  
Consistency

Application

Logical Consistency

## VERIFICATION

checking the integrity of a data element

CRC

Feedback

Independent  
Redundancy

Update Comparison

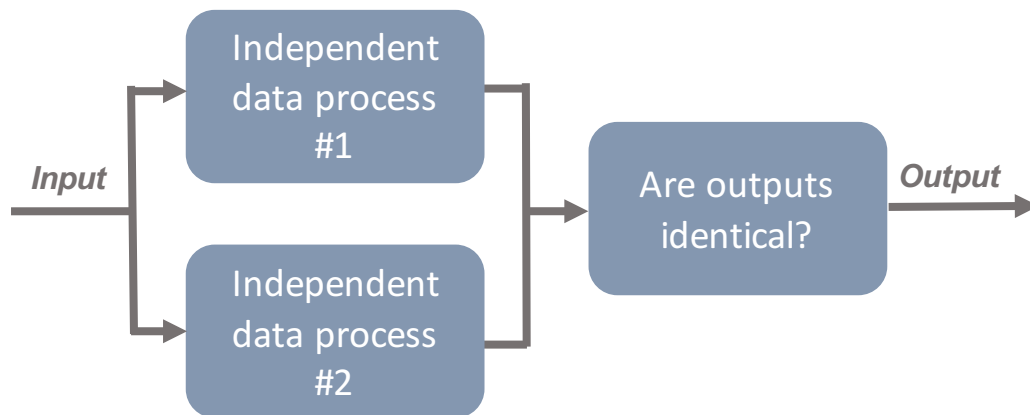


# EXAMPLE - VERIFICATION

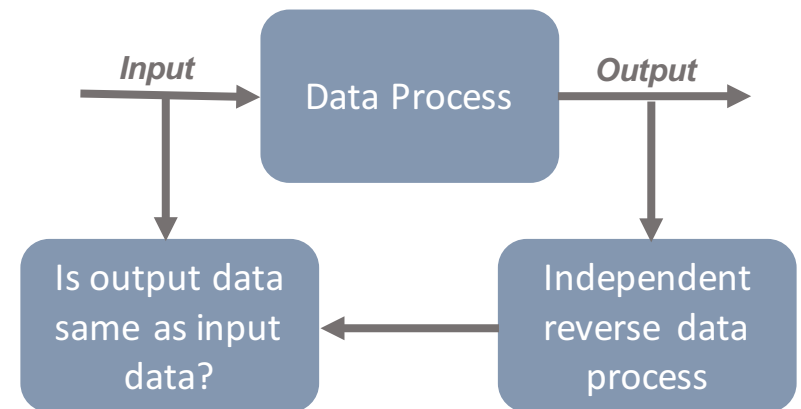
**KEY GOAL:** Automize the verification and validation processes

Aeronautical data and information needs to be validated for correctness, completeness and to check the consistency of the data fields.

## INDEPENDENT REDUNDANCY



## FEEDBACK VERIFICATION





# CHANGE MANAGEMENT

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NEW

IN  
PROGRESS

IN  
VALIDATION

PUBLISHING



# COMPLETE INFORMATION IN DIGITAL DATA AIXM 5.1

Digitalization of airport features



AIP & AIRAC, AIP (Amendment and Supplement)



Digital NOTAM



AMDB



eTOD



AIXM contains more components than the AIP. These additional parts of AIXM do not need to be mapped back to the AIP, as they support other goals: charting, procedure design and encoding, NOTAM information encoding, etc.



An airspace described under section ENR 2.1 of an AIP can be mapped to an instance of AIXM type Airspace.





# END USE OF DATA

AIME converts AIXM 5.1 data to ARINC 816

## ARINC 816-2:

*quick, economic and efficient use of AMDB*



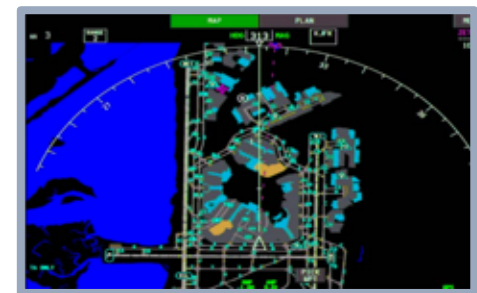
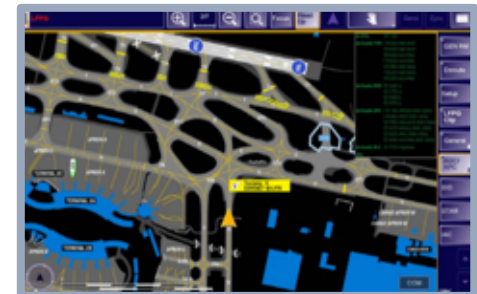
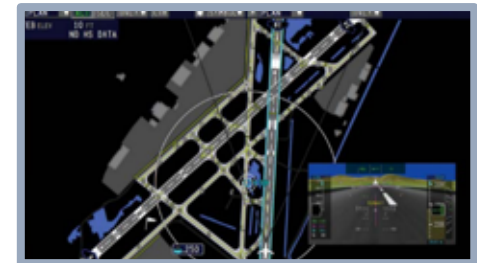
Extra peace-of-mind when taxiing  
1/3 of all aviation accidents are linked to  
runway and surface operations



Features and attributes derived  
from DO-272/ED-99



ARINC 816 for built-in Airbus OANS and  
Boeing AMM, etc.

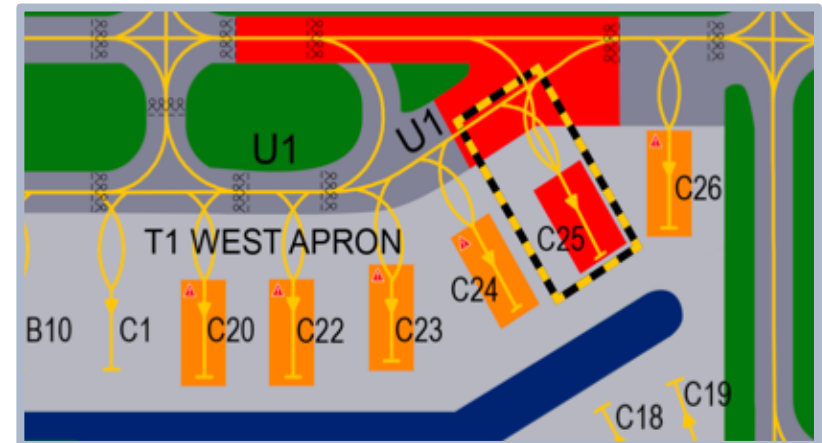




# DIGITAL NOTAM

The NOTAM information is provided as fully structured data set through digital data services. AIXM version 5.1 and further versions support the provision of truly Digital NOTAM.

- Q) WSJC/QMXLC/TV/NBO/A/000/999/0122N10359E005  
A) WSSS  
B) 1708211730  
C) 1710112130  
E) TWY U1 BTN ACFT STAND C25 AND TWY WA CLSD DUE WIP
- Q) WSJC/QMXLC/TV/NBO/A/000/999/0122N10359E005  
A) WSSS  
B) 1708211730  
C) 1710112130  
E) ACFT STANDS C22 C23 C24 AND C26 AVLB LAYOVER ACFT
- Q) WSJC/QMXLC/TV/NBO/A/000/999/0122N10359E005  
A) WSSS  
B) 1708211730  
C) 1710112130  
E) TWY U1 BTN ACFT STAND C25 AND TWY WA CLSD DUE WIP
- Q) WSJC/QMXLC/TV/NBO/A/000/999/0122N10359E005  
A) WSSS B) 1708211730 C) 1710112130  
E) ACFT STAND C20 LTD PUSHBACK FACE SOUTH NOT PERMITTED  
THE ACFT (ON IDLE THRUST) SHALL BE PUSHED BACK ONTO TWY U1 TO FACE NORTH UNTIL THE NOSE OF THE ACFT IS BEHIND THE STOPBAR BEHIND ACFT STAND C1. THE ACFT MAY BREAKAWAY FROM THERE AND TURN INTO TWY VZ. PHRASEOLOGY USED BY SINGAPORE GROUND: PUSHBACK APPROVED, TO FACE NORTH
- Q) WSJC/QMXLC/TV/NBO/A/000/999/0122N10359E005  
A) WSSS  
B) 1708211730  
C) 1710112130  
E) ACFT STAND C25 CLSD DUE WIP





Thank you



*Achieve aviation data of excellent quality to be  
a easily created and delivered for aviation players.*