Verification and Validation in Aeronautical Information

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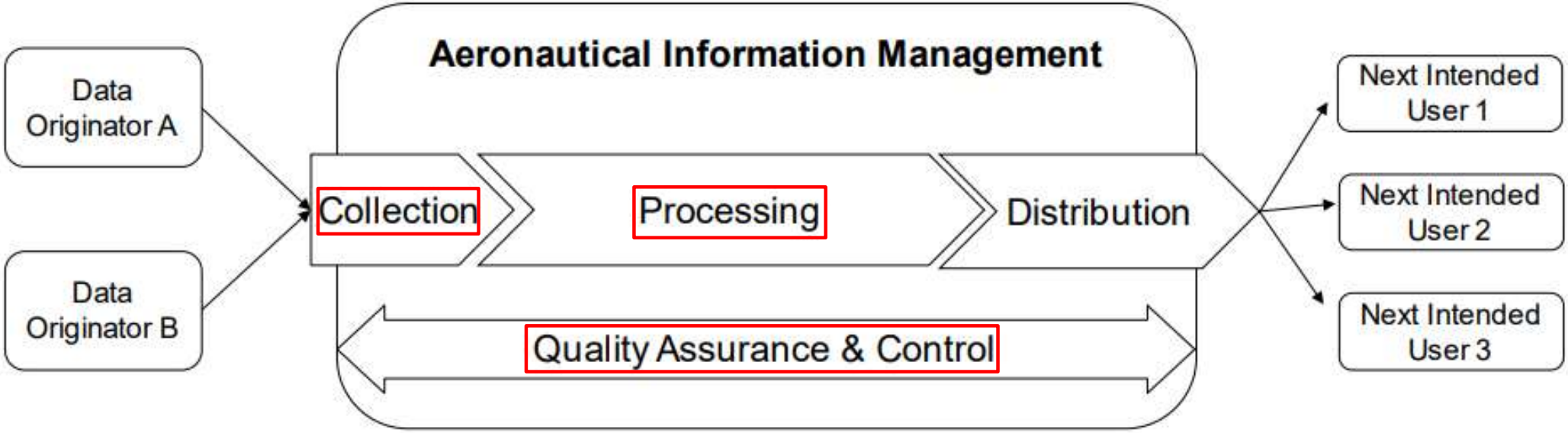
NATIONAL GEOSPATIAL NGA INTELLIGENCE AGENCY

Background

- Increased the demands on airspace capacity and efficiency
- Integrated, responsive global air traffic management (ATM) system
- Migration of paper-based to data-centric
- Data collection is decoupled from the defined aeronautical products
- Facilitate the modernization of the ATM environment with use of System Wide Information Management (SWIM)


Aeronautical Information Management
Data Originator A
Data Originator B
Collection
Processing
Distribution
Quality Assurance & Control
Next Intended User 1
Next Intended User 2
Next Intended User 3

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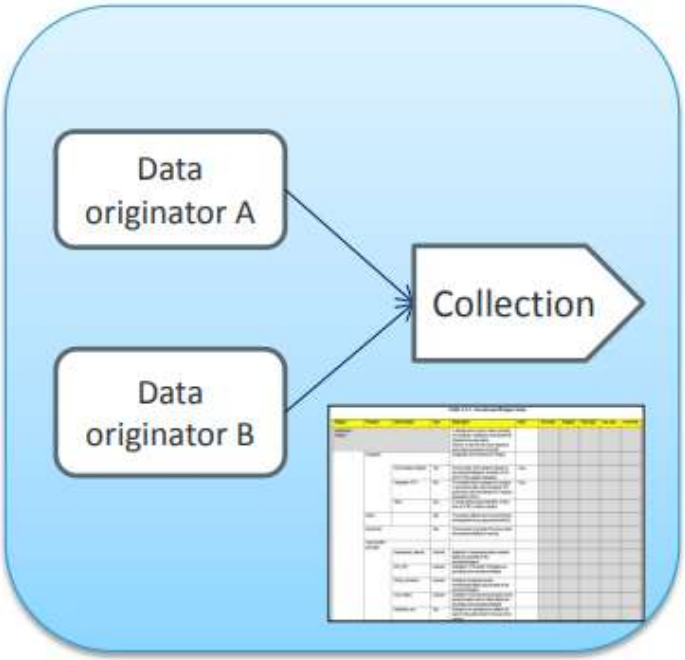
Collection



- High focus on the collection phase to ensure quality
- Clear roles, resources, metadata
- Different constellations for data origination
- Aeronautical Data Catalogue
- Content of a formal arrangement and template

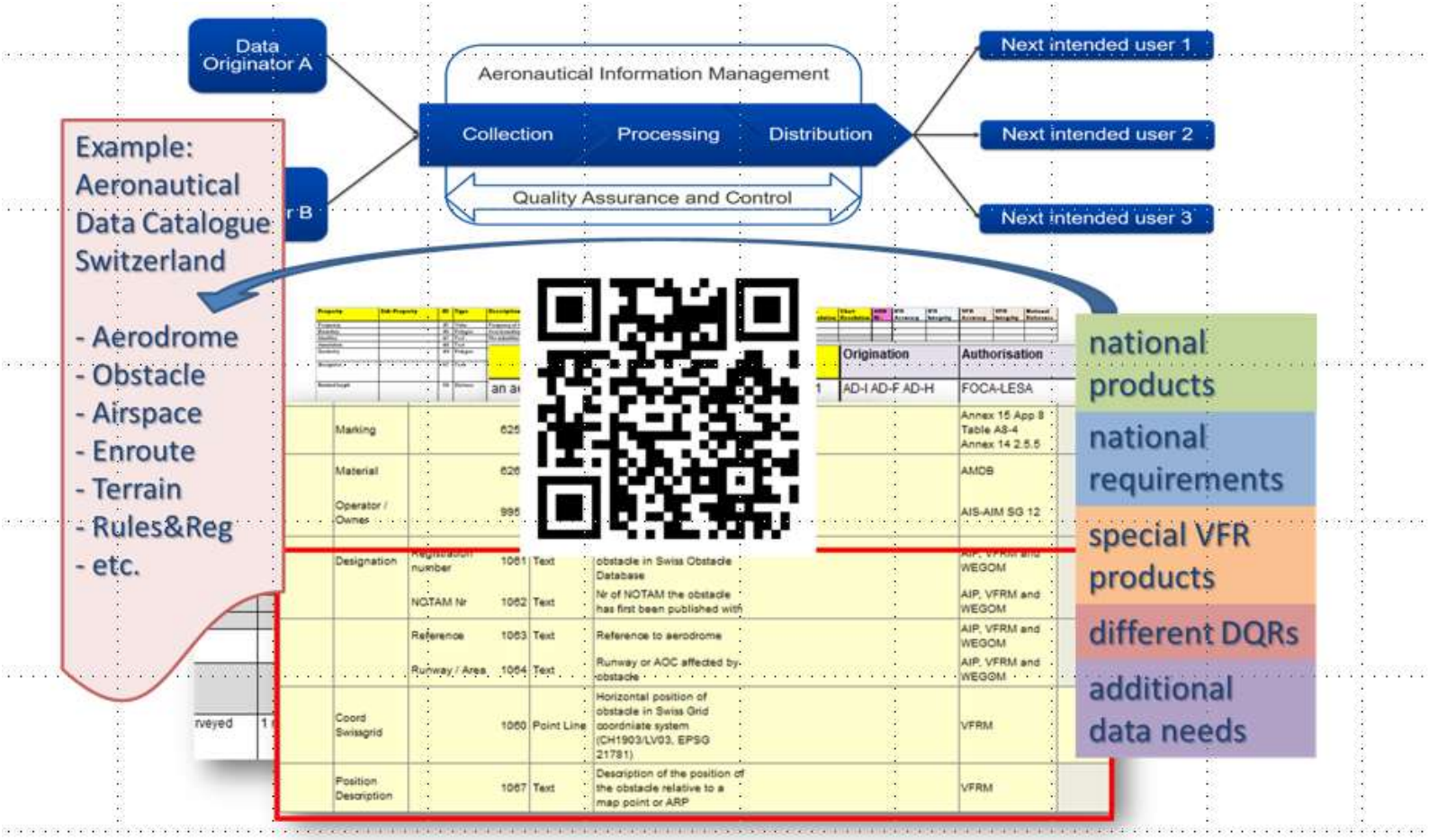
Aeronautical Data Catalogue

Aeronautical Data Catalogue → Data Originator's responsibility to adhere to and submit accurate, current, calculated or surveyed information and data to AIM

Table A1-6 Obstacle data

Description (Notes 1 & 2)	Accuracy	Integrity	Orig Type	Pub. Res.	Chart Res.
Obstacles in Area 2 (including 2a, 2b, 2c, 2d, take-off flight path area and obstacle limitation surfaces) → ***Horizontal position of obstacle***	5 m	essential	surveyed	1/10 sec	1/10 sec
Obstacles in Area 2 (including 2a, 2b, 2c, 2d, take-off flight path area and obstacle limitation surfaces) → ***Elevation of the highest point of the obstacle & Height of the obstacle above ground.***	3 m	essential	surveyed	1 m or 1 ft	1 m or 1 ft

Example for a National Aeronautical Data Catalogue (Switzerland)



NAVIGATION AND AIR TRAFFIC FACILITY DATA (for CIVILIAN & MILITARY use)	
Type of Change	**Method to Make Change**
Air Traffic Service Airway (Non-Regulatory) Data	Use the Air Traffic Service Airway (Non-Regulatory) Data Form, FAA Form 7900-10.
Airport Traffic Control Tower (ATCT) and Terminal Air Traffic Control Facilities Data • ATCT • TRACON • CCF • Remoted Transmitter/Receiver (RTR)	Use the Airport Traffic Control Tower (ATCT) and Terminal Air Traffic Control Facilities Data Form, FAA Form 7900-4.
ARTCC, CERAP, and CCF Data • Includes Remote Communications Air/Ground (RCAG)	Use the ARTCC, CERAP and CCF Data Form, FAA Form 7900-1.
Flight Service Stations (FSS) and Remote Communication Outlets (RCO) Data • Includes Remote Communications Outlets (RCO)	Use the Flight Service Stations (FSS) and Remote Communication Outlets (RCO) Data Form, FAA Form 7900-3.
Instrument Landing System (ILS) Data • ILS • SDF • MLS • ISMLS • LDA	Use the Instrument Landing System (ILS) Data Form, FAA Form 7900-6.
Miscellaneous Activity Area Data • Aerobatic Practice Area • Glider, Hang Glider, Ultralight Area • Parachute Jumping Area • Space Launch Activity Area	Use the Miscellaneous Activity Areas (MAA) Data Form, FAA Form 7900-11.
Navigational Aid (NAVAID) Data • DME • NDB • TACAN • VOR (VOR, VDME, VTAC)	Use the Navigational Aid (NAVAID) Data Form, FAA Form 7900-2.

Another Example

- In the US, there are specific online forms, customized to the element which is being changed
- The online forms have data requirements build into them and have a corresponding Joint Order explaining the requirement.

https://www.faa.gov/air_traffic/flight_info/aeronav/aero_data/Submitting_Data/

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety
Flight Technologies and Procedures

800 Independence Ave., S.W.
Washington, D.C. 20591

MEMORANDUM OF AGREEMENT

BETWEEN

Flight Standards Service, Office of Safety Standards
Flight Technologies and Procedures Division

and

Air Traffic Organization, Mission Support Services,
Aeronautical Information Services (AIS) Directorate

1. Purpose:

This memorandum of agreement defines the process for the development and publication of Flight Technologies and Procedures Division (AFS-400) directives relating to Instrument Flight Procedure (IFP) development and documentation and the Aeronautical Information Services (AIS) release of standard operating procedures and automation tools required for implementation.

Data Processing

- Difference between validation and verification
- Validation and verification as critical components of the Quality Management System
- Validation, examples of techniques:
  - Validation based on metadata
  - Plausibility check of the data
- Verification, examples of techniques:
  - Digital data error detection
  - Feedback testing
  - Independent redundancy

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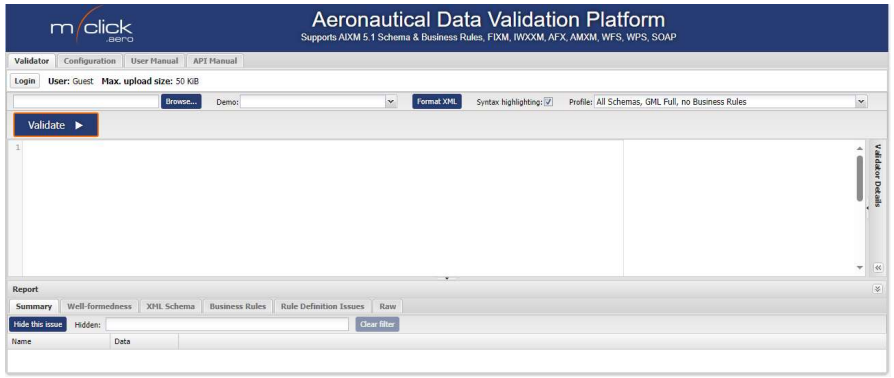
Validation....

Format / Model Validators

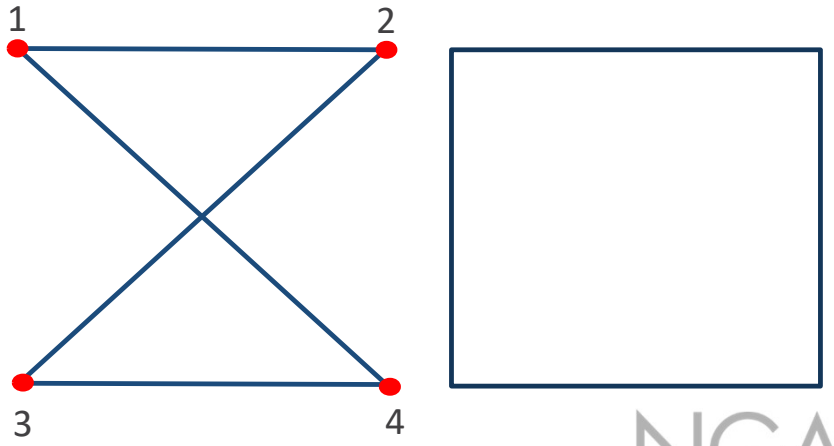
- https://aixm.aero/page/data-verification



Data and/or Product Requirements

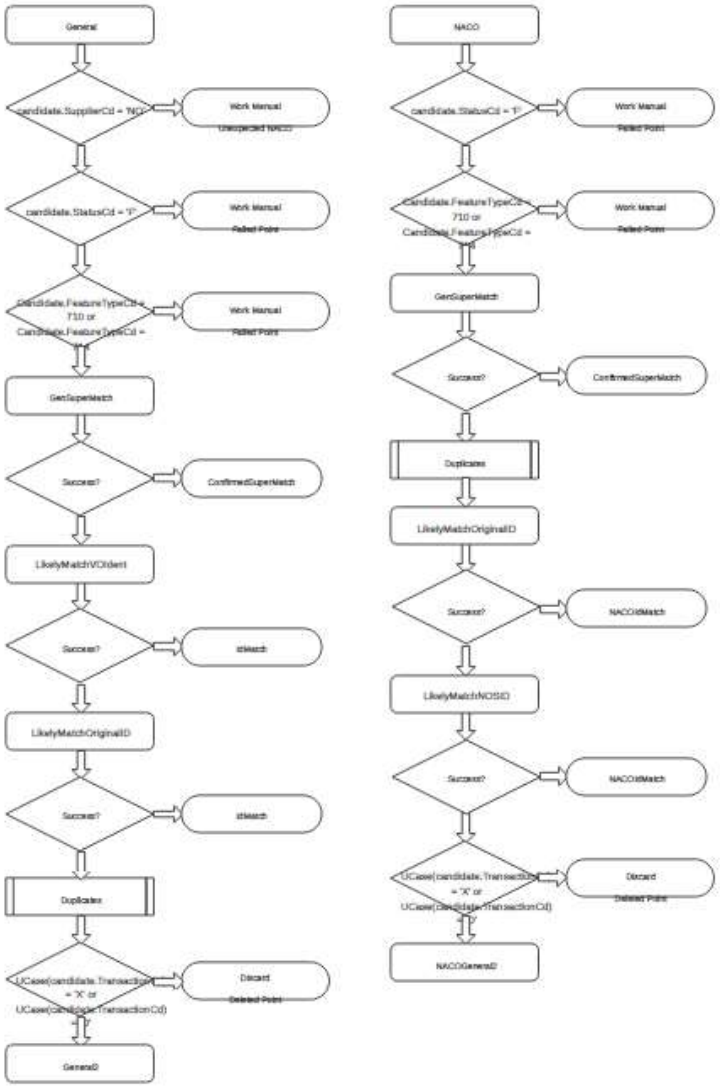
- Business Rules for data bounds / limits

Channel pairing				DME parameters					
				Interrogation				Reply	
					Pulse codes				
						DME/P mode			
DME channel number	VHF frequency MHz	MLS angle frequency MHz	MLS channel number	Frequency MHz	DME/N µs	Initial approach µs	Final approach µs	Frequency MHz	Pulse codes µs
V17X	108.00	–	–	1 041	12	–	–	978	12
17Y	108.05	5 043.0	540	1 041	36	36	42	1 104	30
17Z	–	5 043.3	541	1 041	–	21	27	1 104	15
18X	108.10	5 031.0	500	1 042	12	12	18	979	12
18W	–	5 031.3	501	1 042	–	24	30	979	24
18Y	108.15	5 043.6	542	1 042	36	36	42	1 105	30
18Z	–	5 043.9	543	1 042	–	21	27	1 105	15
19X	108.20	–	–	1 043	12	–	–	980	12
19Y	108.25	5 044.2	544	1 043	36	36	42	1 106	30
19Z	–	5 044.5	545	1 043	–	21	27	1 106	15
20X	108.30	5 031.6	502	1 044	12	12	18	981	12
20W	–	5 031.9	503	1 044	–	24	30	981	24
20Y	108.35	5 044.8	546	1 044	36	36	42	1 107	30
20Z	–	5 045.1	547	1 044	–	21	27	1 107	15
21X	108.40	–	–	1 045	12	–	–	982	12



Validation…
Vertical Obstruction Logic

- Format Validation Logic
  - Datum information (Horizontal / Vertical)
  - Are all the necessary fields populated?
  - Is there a point in the data already?
  - Acceptable for the intended use?

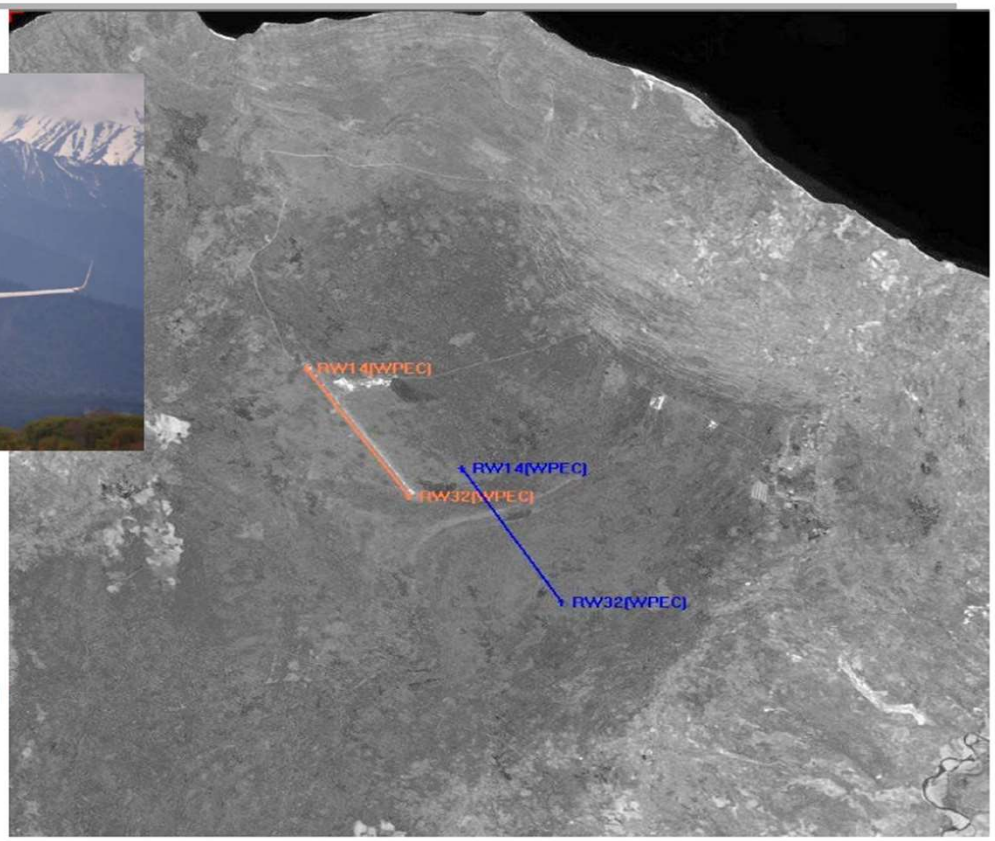


Verification .....

… The airplane flies to the waypoint, right or wrong

Actual Runway Location (orange)

Official AIP Location (blue)



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Quality Assurance and Control

Quality Assurance (PROCESS)

- Data traceability
- Assurance of data integrity along the process

Quality Control (PRODUCT)

- Data error detection and reporting
- Quality checks to ensure compliance with product specifications
- Consistency checks across the information products

THANK YOU

Questions?


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