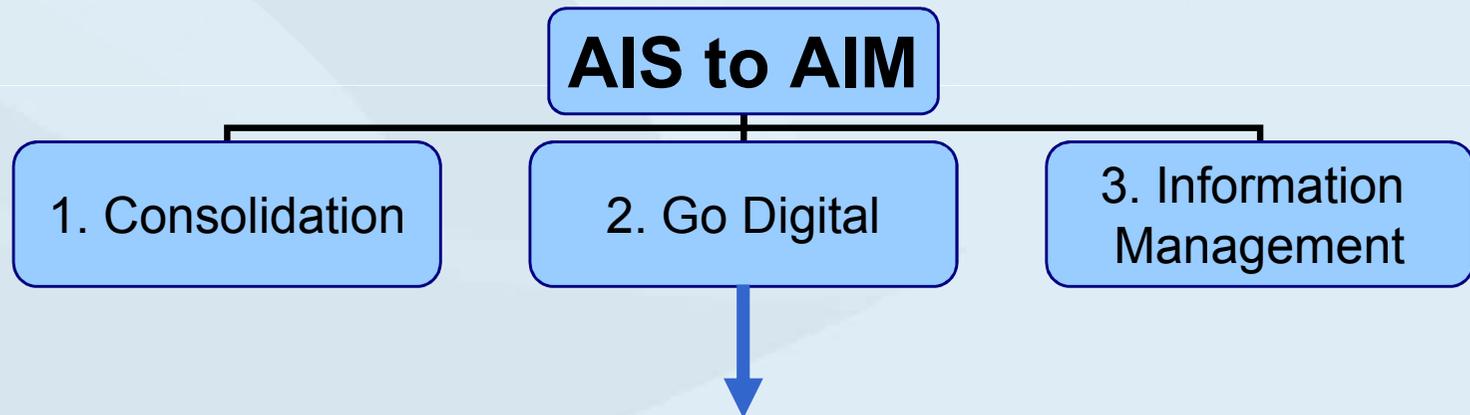
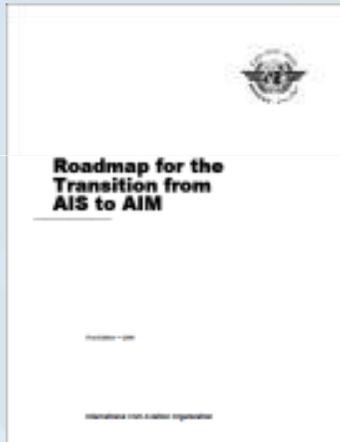


Transition from AIS to AIM

Roadmap Phase 2 – Data quality monitoring

Alexandre Petrovsky
Technical Assistant
EUROCONTROL

Roadmap for Transition from AIS to AIM Phase2



2. Go Digital

P-01 — Data quality monitoring

P-02 — Data integrity monitoring

P-06 — Integrated aeronautical information database

P-07 — Unique identifiers

P-08 — Aeronautical information conceptual model

P-11 — Electronic AIP

P-13 — Terrain

P-14 — Obstacles

2 P-15 — Aerodrome mapping

What is Data Quality?

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

(ICAO Annex 15)



Accuracy: a degree of conformance between the estimated or measured value and the true value.

How close to reality

Resolution: a number of units or digits to which a measured or calculated value is expressed and used

How many digits after comma

Integrity: a degree of assurance that aeronautical data and its value has not been lost or altered since the data origination or authorized amendment.

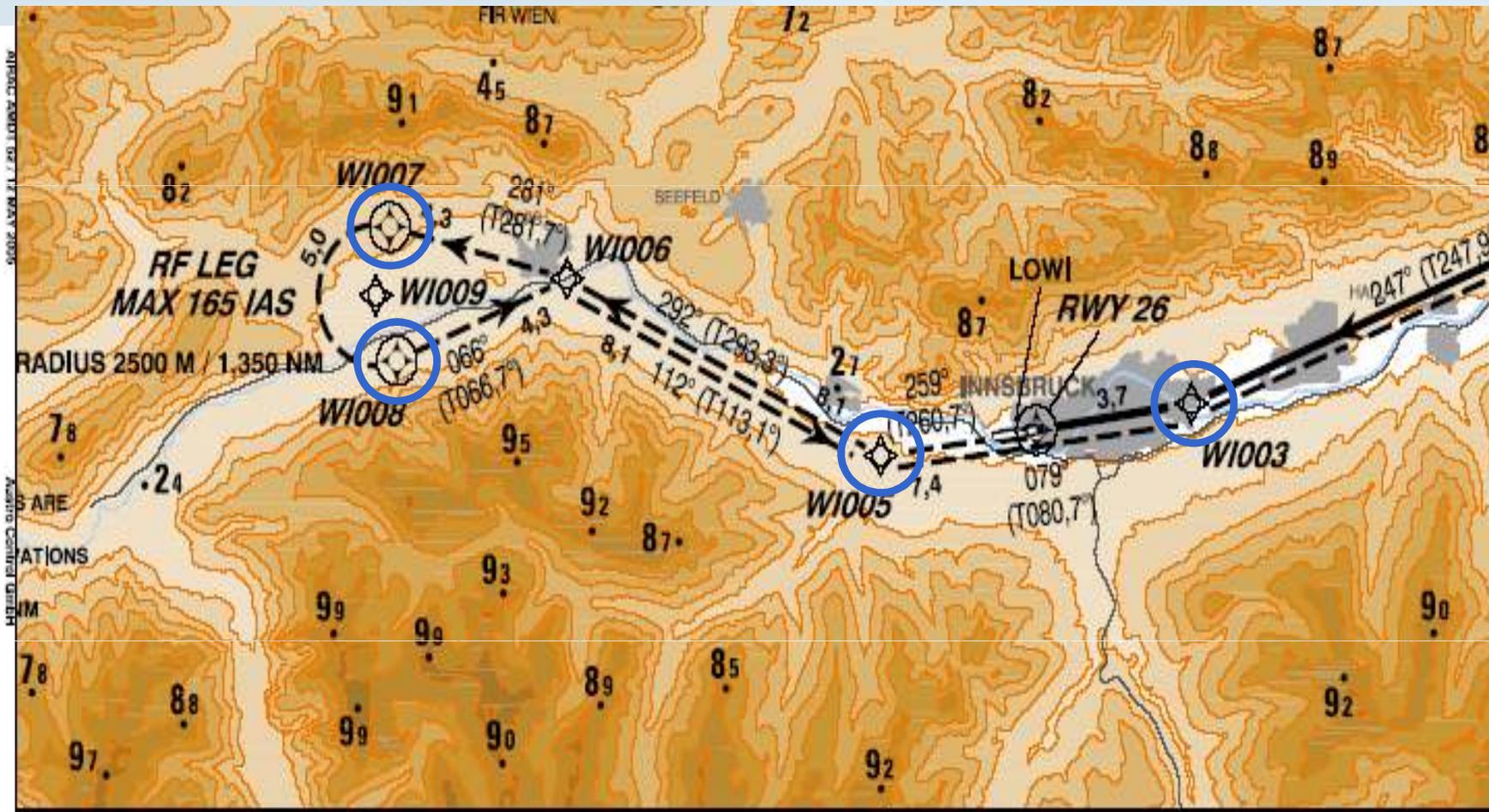
How good is the data

Data Quality – Why?



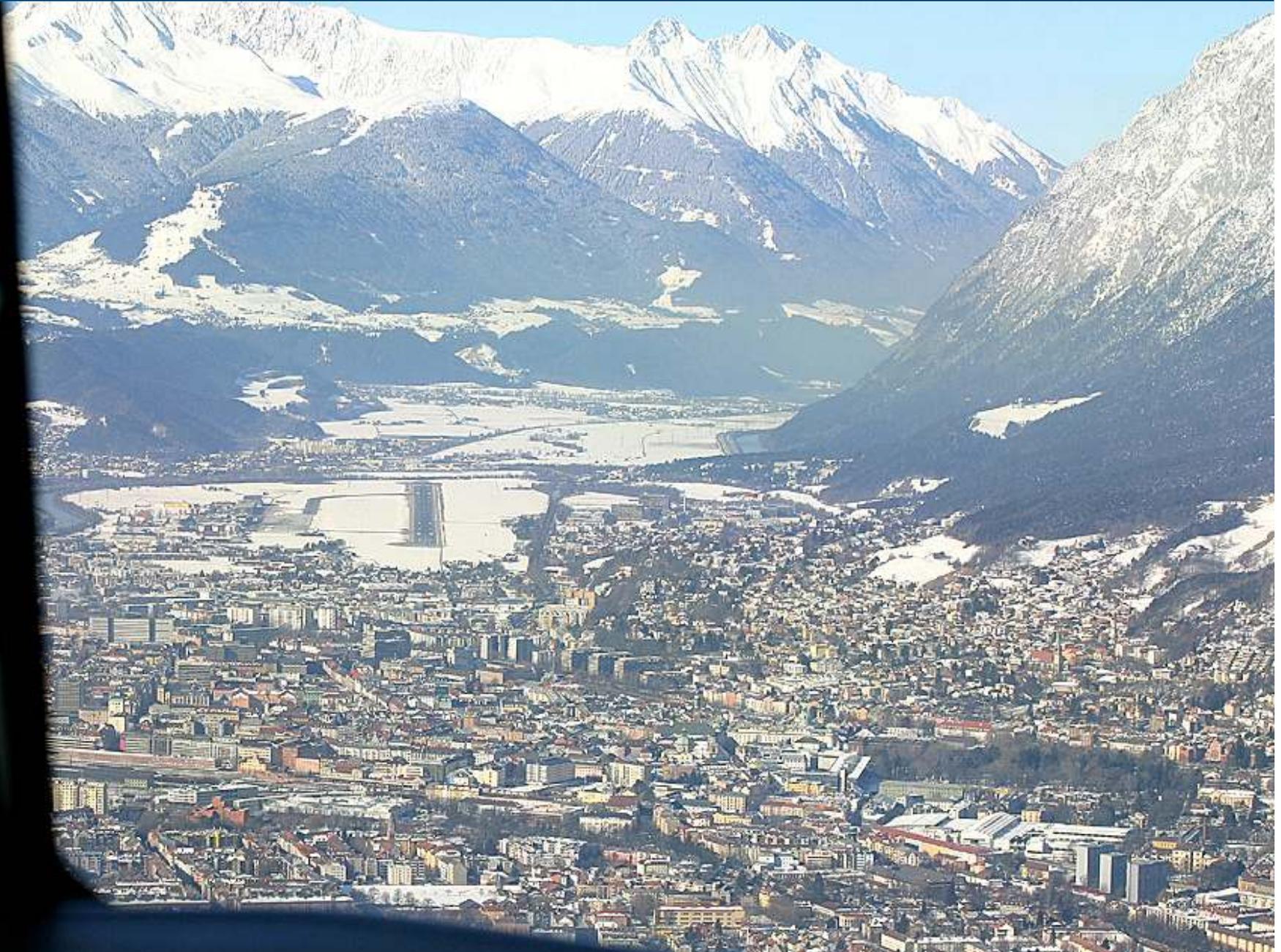
Why high integrity data counts?

Innsbruck, RNP 0,3 approach, RNAV RWY 26



3,7 THRESHOLD RWY 26 160 FT							
OCA (OOCH)		A	B	C	D		
LNAV/VNAV		2600 (707)					
LNAV		N/A					
Grnd speed-Kts		100	120	140	160	180	200
Descent angle 3,5°		619	743	867	991	1115	1239
<p>All Sids/Fs</p> <p>1. GPS and IRS required (SMEDMS, LLZ and VOR/DME updating not authorized)</p> <p>2. Procedure: Required "IMP RNAV" approach "IMP DT"</p> <p>3. Procedure: N/A below AD temp -7°C</p>							
<p>MISSED APPROACH: CLIMB TO 9500 FT VIA RNAV MISSED APPROACH-TRACK TO W1001 AND HOLD.</p>				<p>INNSBRUCK ÖSTERREICH - AUSTRIA RNP 0,3 RNAV RWY 26</p>			

Innsbruck, VFR







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How good is the data

Monitoring Data Accuracy



What is Data Quality?

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

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How many digits after comma

Integrity: a degree of assurance that aeronautical data and its value has not been lost or altered since the data origination or authorized amendment.

How good is the data

ICAO Annex 15 - required Integrity Levels

... a degree of assurance that an aeronautical data and its value has not been lost or altered since the data origination or authorized amendment.

CRITICAL

Runway threshold, runway holding position etc.

Require an integrity value of **10^{-8}** **1 error in 100 M**

ESSENTIAL

Coordinates of en-route nav aids, aerodrome elevation, etc.

Require an integrity value of **10^{-5}** **1 error in 100 K**

ROUTINE

FIR points, Aircraft stands, Airway segments etc.

Require an integrity value of **10^{-3}** **1 error in 1000**

Do we achieve Data Quality requirements?

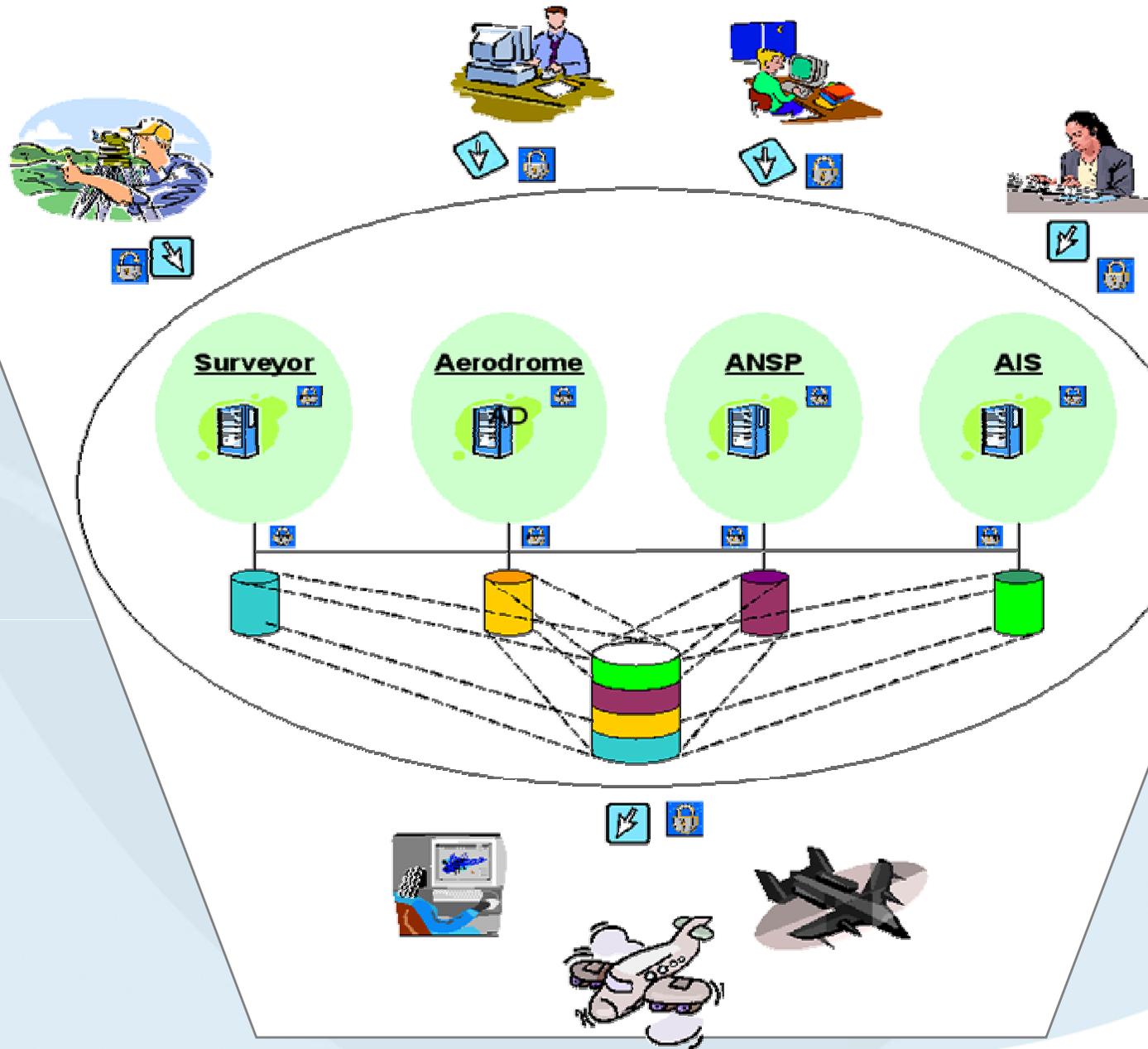
- Optimum 'human processes' achieves an error rate, at best 1 in 1000 or 1×10^{-3}
- Best case: achieve criteria for ROUTINE data, if:
 - Quality controlled environment e.g. QMS
 - Multiple input/control

APPENDIX 7. AERONAUTICAL DATA QUALITY REQUIREMENTS

Table A7-1. Latitude and longitude

Latitude and longitude	Publication resolution	Integrity Classification
Flight information region boundary points	1 min	1×10^{-3} routine
P, R, D area boundary points (outside CTA/CTZ boundaries)	1 min	1×10^{-3} routine
P, R, D area boundary points (inside CTA/CTZ boundaries)	1 sec	1×10^{-5} essential
CTA/CTZ boundary points	1 sec	1×10^{-5} essential
En-route NAVAIDS and fixes, holding, STAR/SID points	1 sec	1×10^{-5} essential
Obstacles in Area 1 (the entire State territory)	1 sec	1×10^{-3} routine
Aerodrome/heliport reference point	1 sec	1×10^{-3} routine
NAVAIDS located at the aerodrome/heliport	1/10 sec	1×10^{-5} essential
Obstacles in Area 3	1/10 sec	1×10^{-5} essential
Obstacles in Area 2	1/10 sec	1×10^{-5} essential

Monitoring Data Integrity



What is Data Quality?

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

(ICAO Annex 15)



Accuracy: a degree of conformance between the estimated or measured value and the true value.

How close to reality

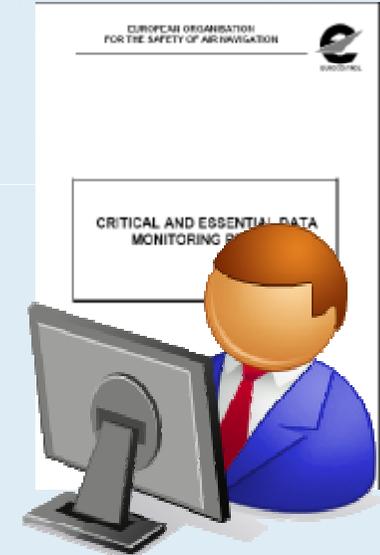
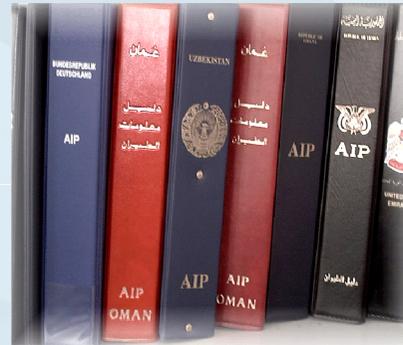
Resolution: a number of units or digits to which a measured or calculated value is expressed and used

How many digits after comma

Integrity: a degree of assurance that aeronautical data and its value has not been lost or altered since the data origination or authorized amendment.

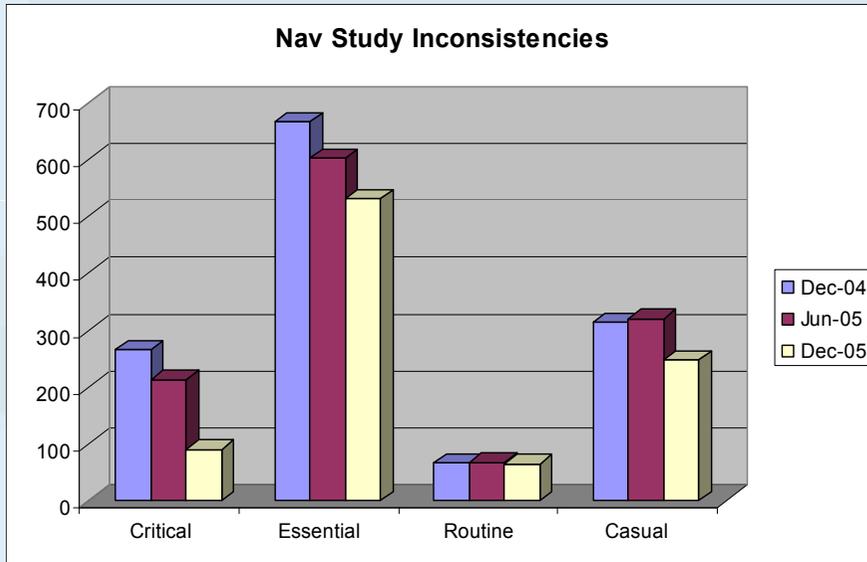
How good is the data

AMMON – Aeronautical Information Measurement and Monitoring



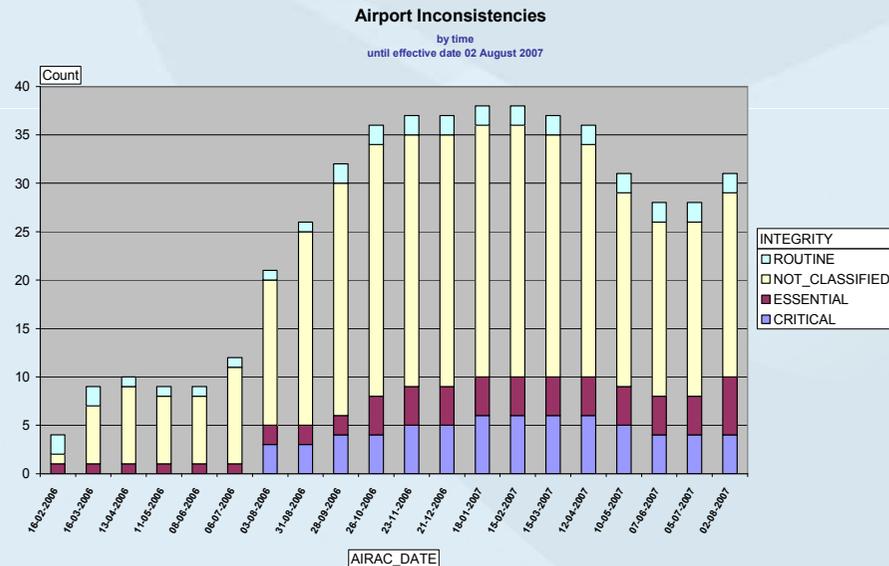
Identify inconsistencies
Inform the States
Follow up
Remedial action
Monitor progress

Monitoring aspect

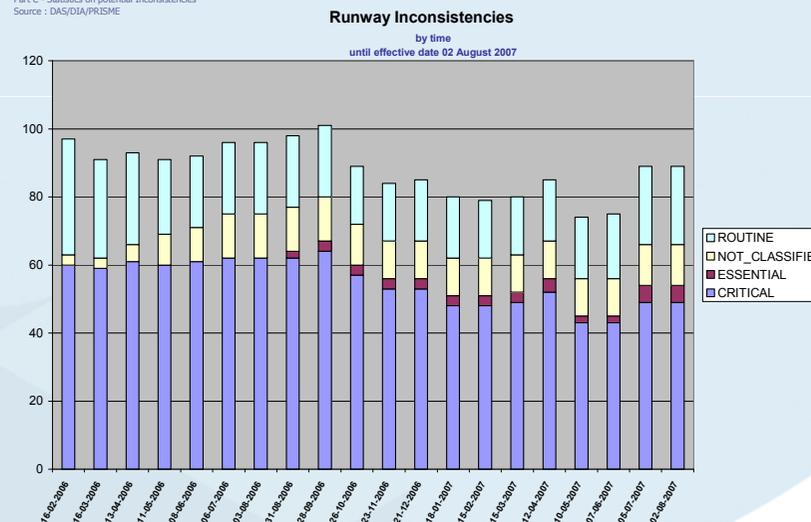


- **Despite Automatic and semi-automatic procedures and QMS**
- **Main Causes of inconsistencies**
 - Non-complete data supplied by the originators
 - AIS errors
 - Ambiguities in ICAO SARPs

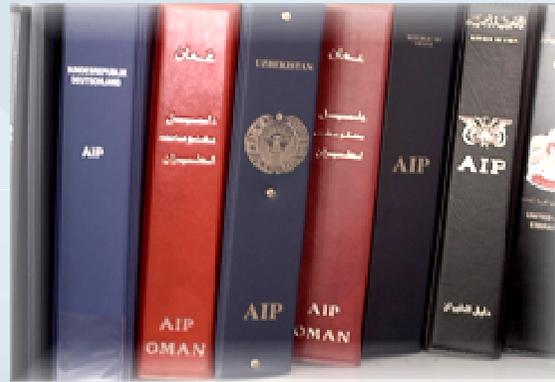
Part C - Statistics on potential Inconsistencies
Source : DAS/DIA/PRISME



Part C - Statistics on potential Inconsistencies
Source : DAS/DIA/PRISME



AMMON Overview



State AIP



Reporting



AMMON Scope

ECAC Area



Critical and Essential Data

ANNEX 1 - ADDITIONAL DATA QUALITY REQUIREMENTS

TABLE 1 - SUMMARY

Category	Priority	Requirement
Availability	High	1.1.1.1
Completeness	High	1.1.1.2
Resolution	High	1.1.1.3
Accuracy	High	1.1.1.4
Consistency	High	1.1.1.5
Timeliness	High	1.1.1.6
Accessibility	High	1.1.1.7
Interoperability	High	1.1.1.8
Security	High	1.1.1.9
Privacy	High	1.1.1.10
Legal	High	1.1.1.11
Technical	High	1.1.1.12
Operational	High	1.1.1.13
Financial	High	1.1.1.14
Human Resources	High	1.1.1.15
Information Systems	High	1.1.1.16
Other	High	1.1.1.17

Availability,
completeness and
publication resolution

Publication & Data Quality Requirements

Which data element?

Where in AIP?

What validation criteria?



Operator

APPENDIX 7: AERONAUTICAL DATA QUALITY REQUIREMENTS

Table A7-1. Latitude and longitude

Latitude and longitude	Publication resolution	Integer Classification
Flight information region boundary points	1 min.	1 = 10 ⁻⁴ essential
F, R, D area boundary points (outside CTA/CTZ boundaries)	1 min.	1 = 10 ⁻⁴ essential
F, R, D area boundary points (inside CTA/CTZ boundaries)	1 sec.	1 = 10 ⁻⁵ essential
CTA/CTZ boundary points	1 sec.	1 = 10 ⁻⁵ essential
En-route NAVAIDS and fixes, holding, STAR/SID points	1 sec.	1 = 10 ⁻⁵ essential
Obstacles in Area 1 (the entire State territory)	1 sec.	1 = 10 ⁻⁵ essential
Aerodrome/heliport reference point	1 sec.	1 = 10 ⁻⁵ essential
NAVAIDS located at the aerodrome/heliport	1/10 sec.	1 = 10 ⁻⁶ essential

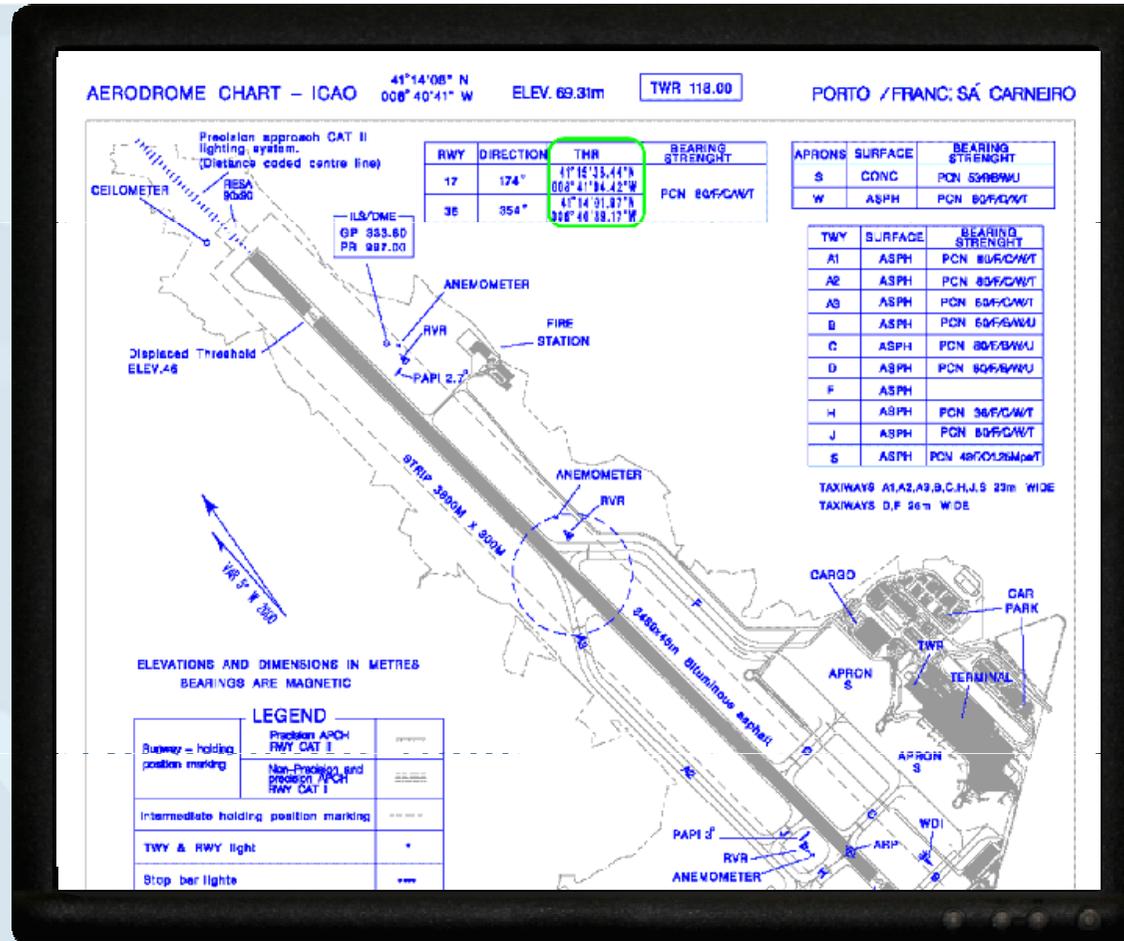
**CRITICAL AND
ESSENTIAL DATA
ATTRIBUTES
ICAO ANNEX 4/15,
APPENDIX 6/7**



What to look for?

Where to look?

Example 'RWY THR'



AMMON Report structure

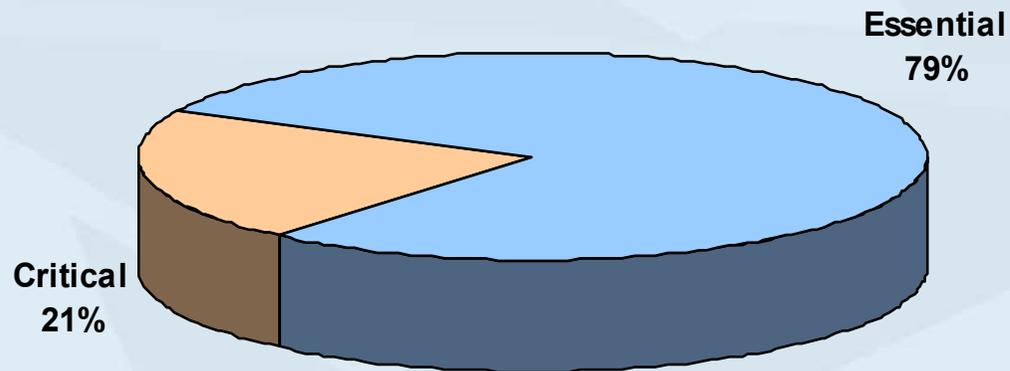
- Part I: General
 - AMMON Overview, Report structure & Recommendations,
- Part II: Data Analysis
 - Compliance with Timeliness
 - Inconsistencies in AIP relating to critical and essential data
 - Trends and Statistics

EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION	
<hr/>	
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AMMON - AERONAUTICAL DATA QUALITY REPORT AIP	
<hr/>	
Edition Number :	1
Edition Date :	2009/06/08
Status :	Released Issue
Intended for :	Restricted audience
<hr/>	
EUROPEAN AIR TRAFFIC MANAGEMENT PROGRAMME	

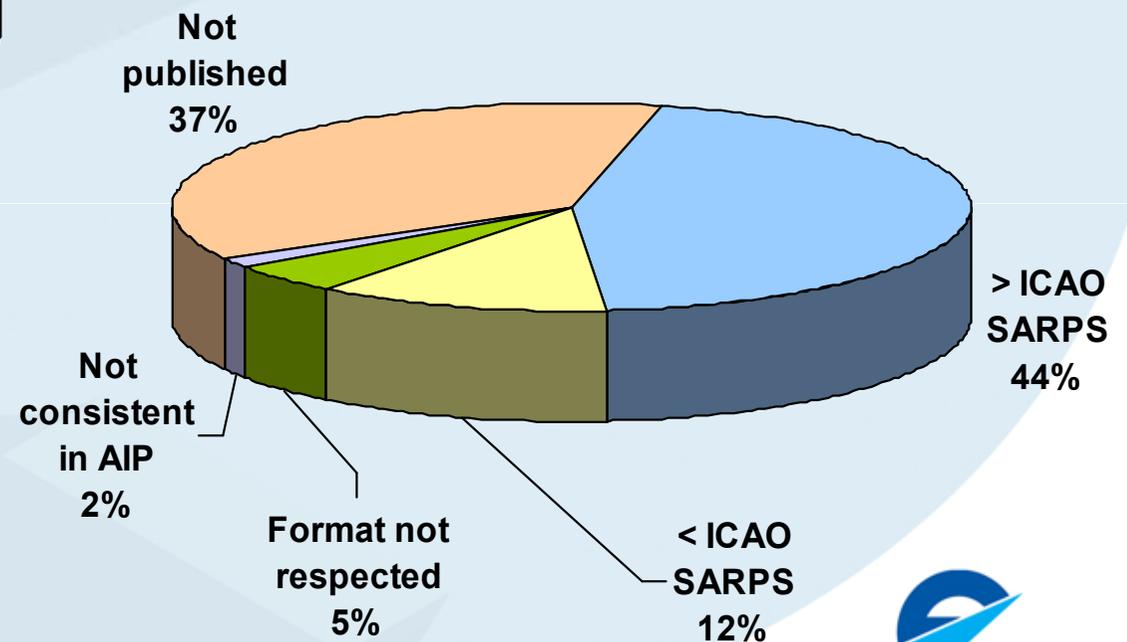
AMMON results

Based on the analysis of 41 ECAC AIP

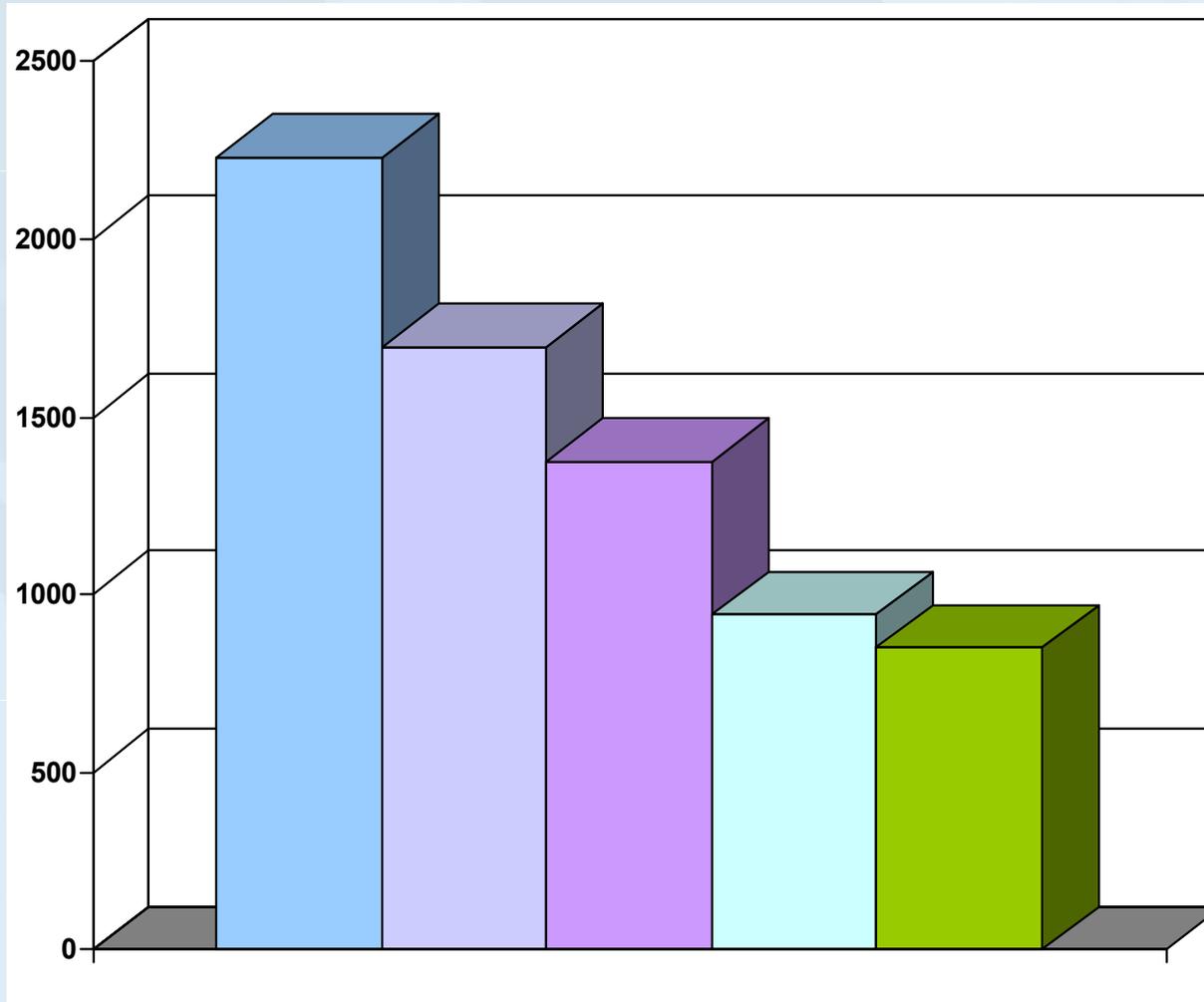
Inconsistencies per criticality



Inconsistencies per type

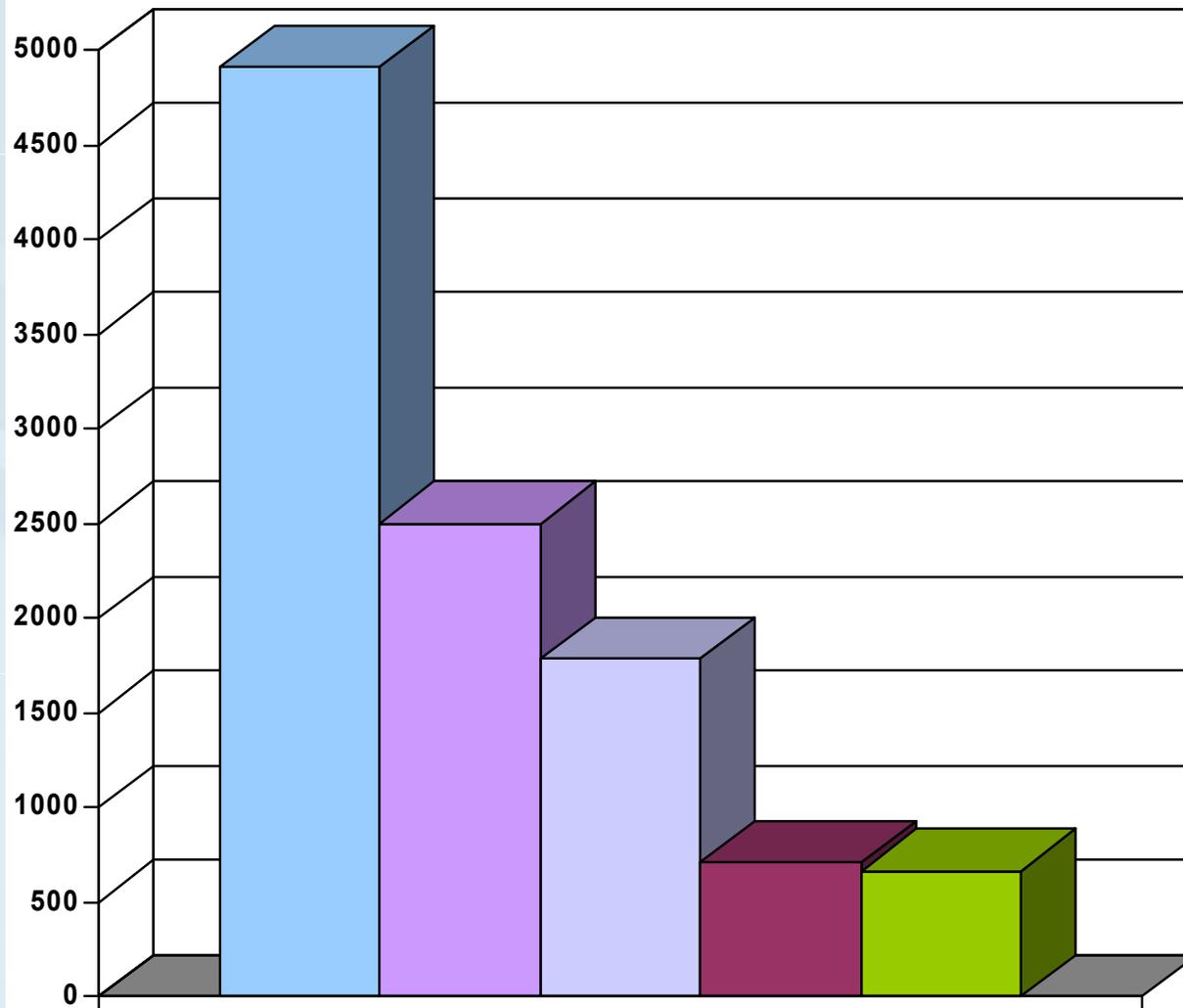


Top 5 - not published



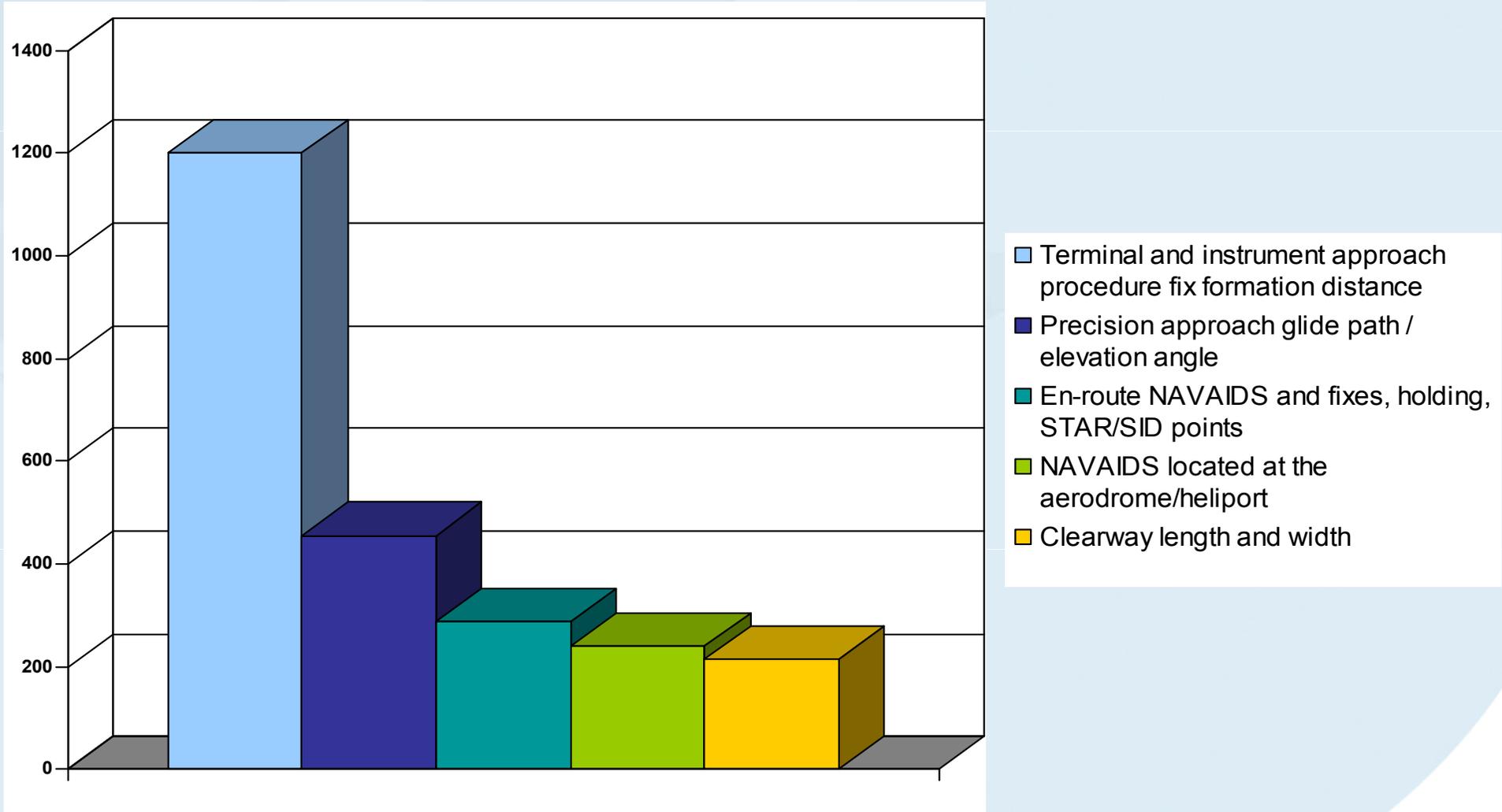
- Final approach descent angle (Non-precision approach or approach with vertical guidance)
- Instrument approach procedure fix formations
- Final approach fixes/points and other essential fixes/points comprising the instrument approach procedure
- Distance measuring equipment (DME)
- Runway end (flight path alignment point)

Top 5 > ICAO SARPS



- En-route NAVAIDS and fixes, holding, STAR/SID points
- NAVAIDS located at the aerodrome/heliport
- Distance measuring equipment (DME)
- Terminal arrival/departure route segment length
- Aerodrome/heliport magnetic variation

Top 5 < ICAO SARPS



Initial findings: SARPS ambiguities



- App1 : 1 m or 1 ft

- App7: 0.1m or 0.1ft

Monitoring - Benefits



- States
 - Comprehensive view of data issues
 - Clarification of ambiguities in ICAO requirements



- ICAO
 - Proposal for changes



- Publication End-Users
 - Quality of data

Summary

- Aeronautical Data Quality – key foundation for present and future ATM data-dependent systems
- Quality of information provided by AIS falls far short of the required values
- There is a need for monitoring data quality – to bring up to ICAO SARPS and maintain in order to support ATM target levels of safety.



www.eurocontrol.int/aim/public/standard_page/qm_ammon.html



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