Building Effective Safety Oversight of AIS and AIM

Day 5: Collaboration and Next Steps

Federal Aviation Administration

Objectives

Complete workshop overview

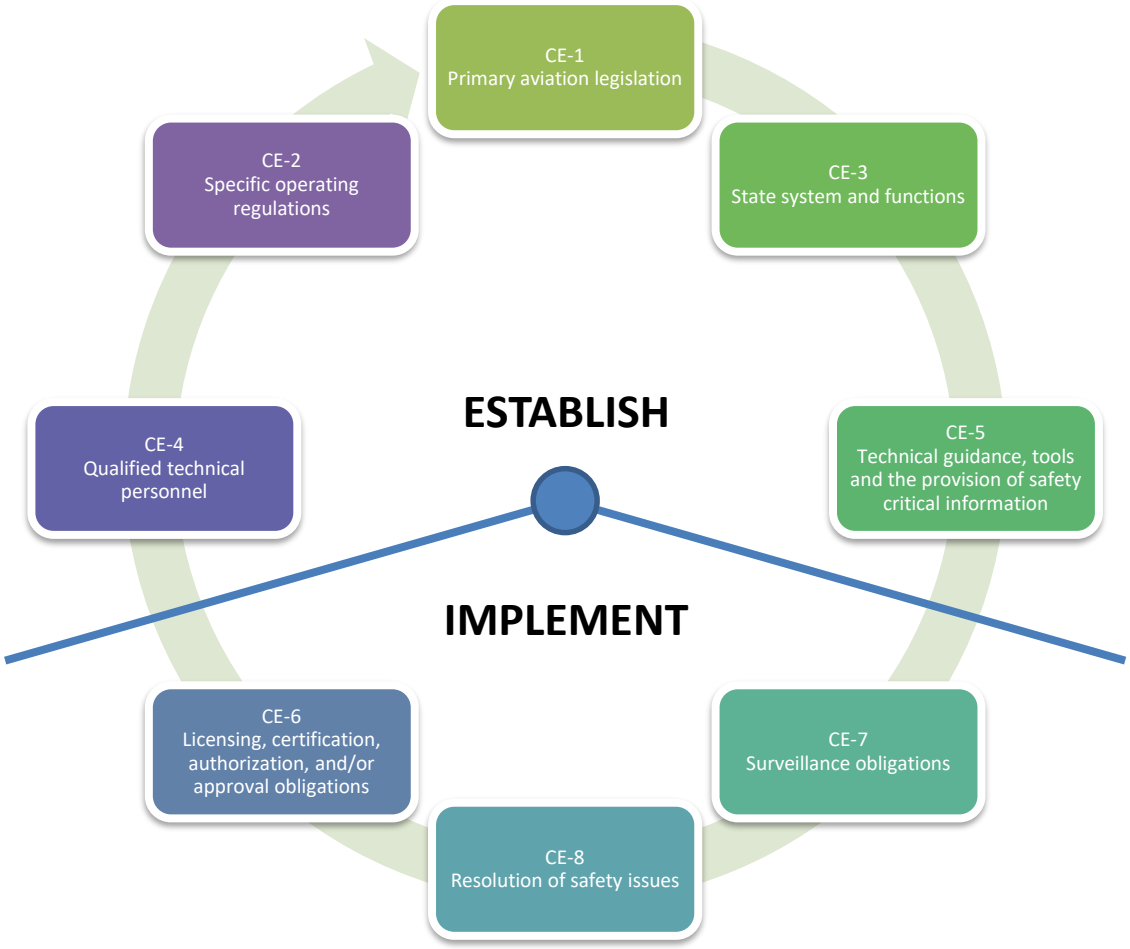
- Essential safety oversight responsibilities
- Critical elements of State safety oversight
- AIS requirements
- Surveillance program
- Surveillance techniques
- The audit process
- QMS
- Risk-based AIS surveillance program

Introduce today's topics

Essential Safety Oversight Responsibilities

- Establish rules
- Perform surveillance
- Resolve safety concerns

Critical Elements of State Safety Oversight



AIS Requirements

- Provide an Aeronautical Information Service
- Receive, collate or assemble, edit, format, publish/store and distribute data and information of its own territory and those areas over the high seas where ATS is provided
- Aeronautical data and information are complete, timely and of required quality
- Aeronautical data and information necessary are made available for the operational requirements of the ATM and flight operations communities
- Issue and receive NOTAM information by telecommunication

AIS Requirements (continued)

- Exchange aeronautical data and information with any ICAO Contracting State upon request at no charge
- Validation and verification procedures are in place
- Metadata is collected and maintained
- Aeronautical data and information is protected in accordance with data error detection, security, and authentication techniques
- Automation is introduced with the objective of improving the timeliness, quality, efficiency and cost effectiveness
- A quality management system is implemented and maintained encompassing all functions of an AIS

AIS Requirements (continued)

Key products and services:

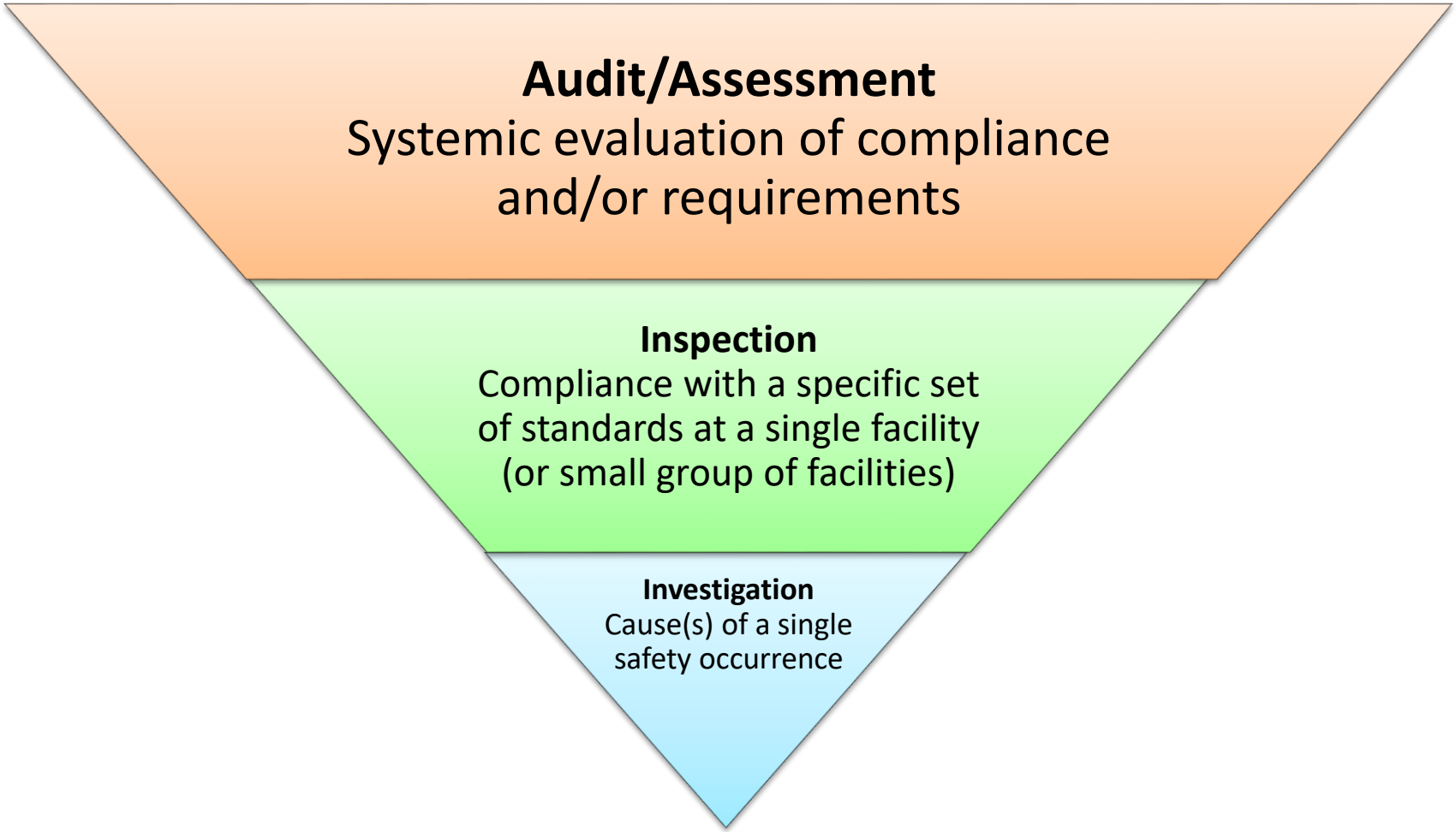
- Aeronautical Information Publication
- Aeronautical Information Publication Amendments
- Aeronautical Information Publication Supplements
- Aeronautical Information Circulars
- NOTAMs
- Pre-flight Information Service
- Post-flight Information Service
- Aeronautical Charts in accordance with ICAO Annex 4

Surveillance Program

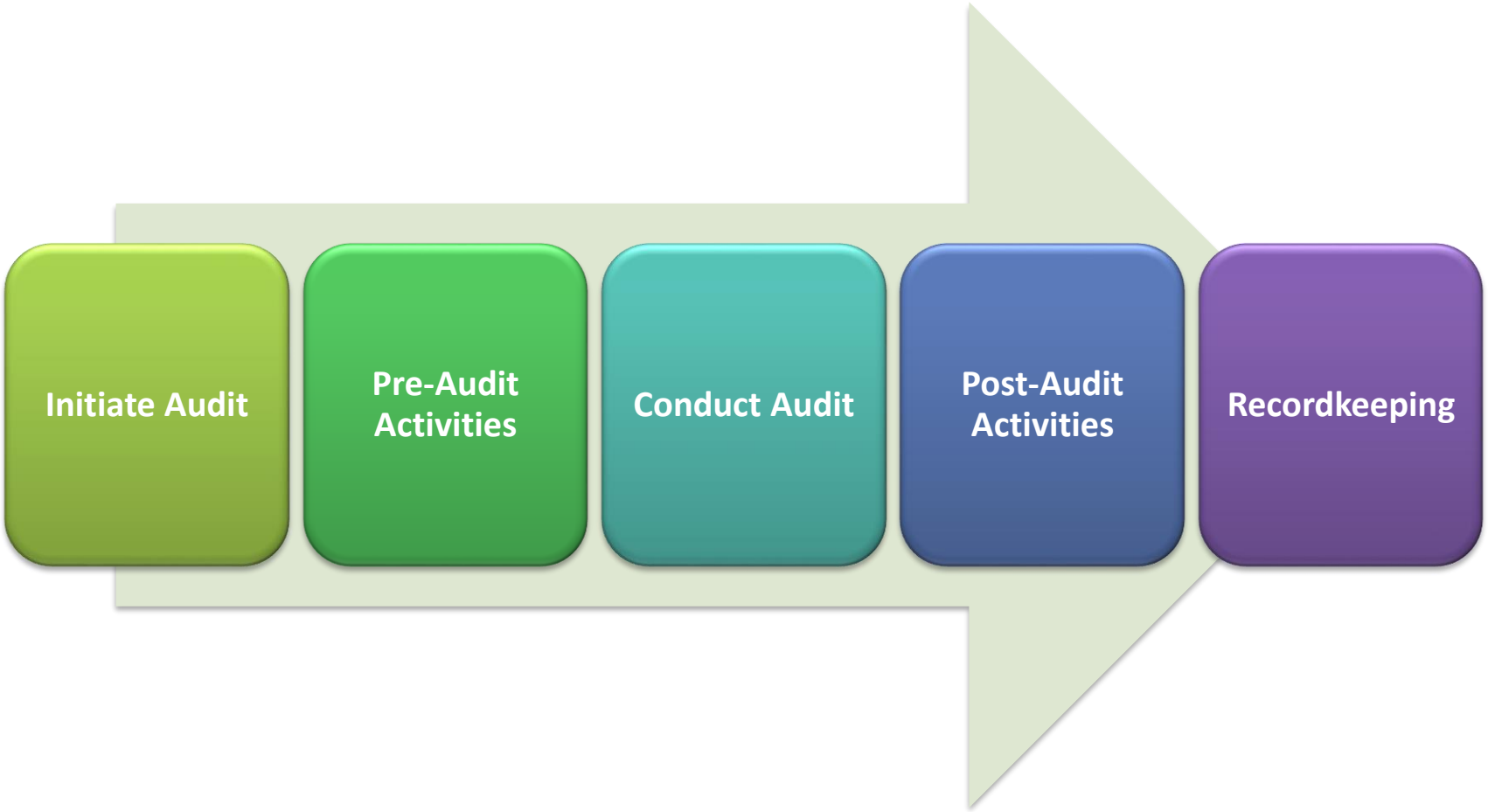
A surveillance program should:

- Be continual or on-going
- Be thorough
- Ensure an ANSP's capability and competency are equal to or exceed those required at the time of original certification
- Require the ANSP's demonstrate operations and maintenance are conducted in accordance with requirements, including a comprehensive and conclusive assessment of competencies.

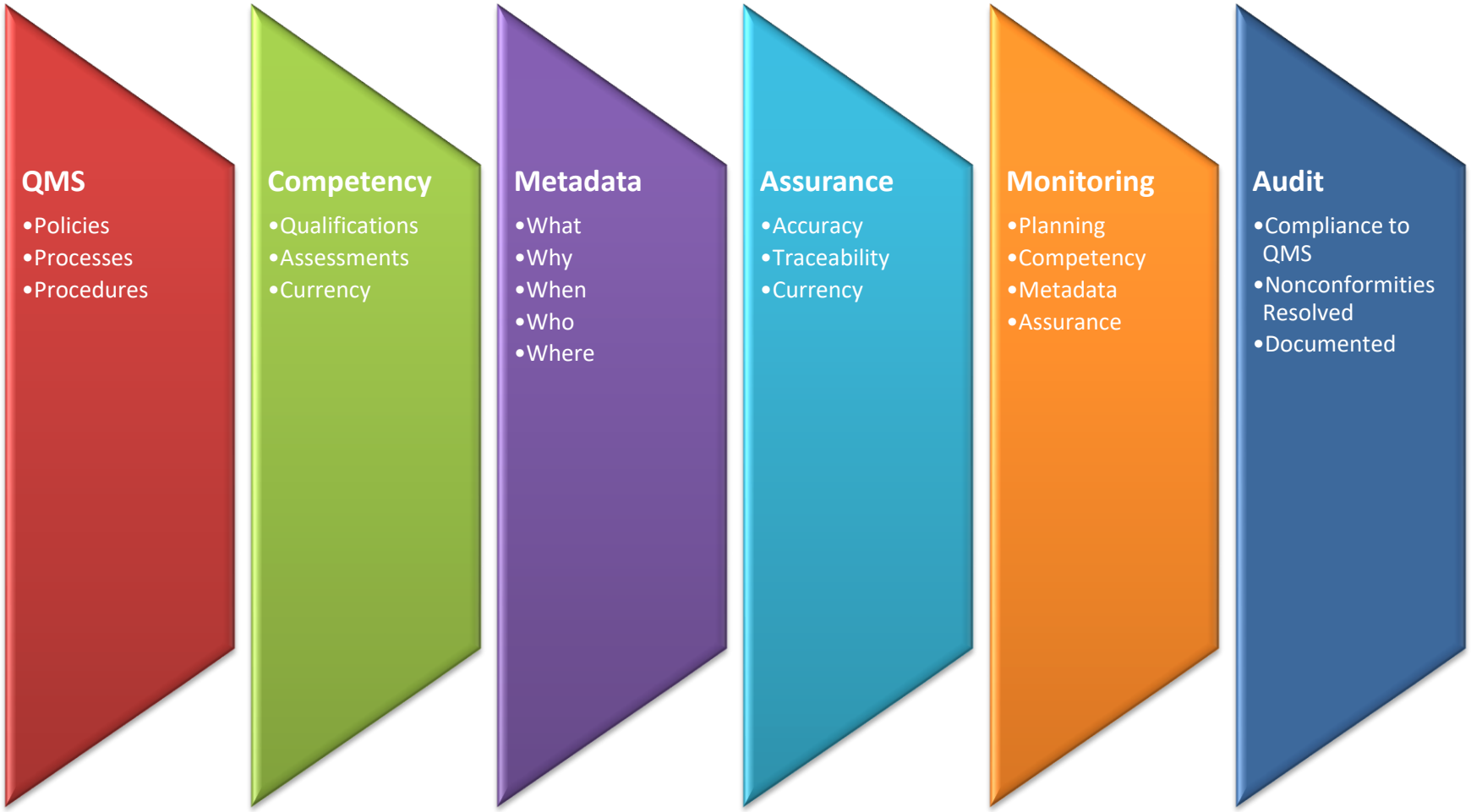
Surveillance Techniques



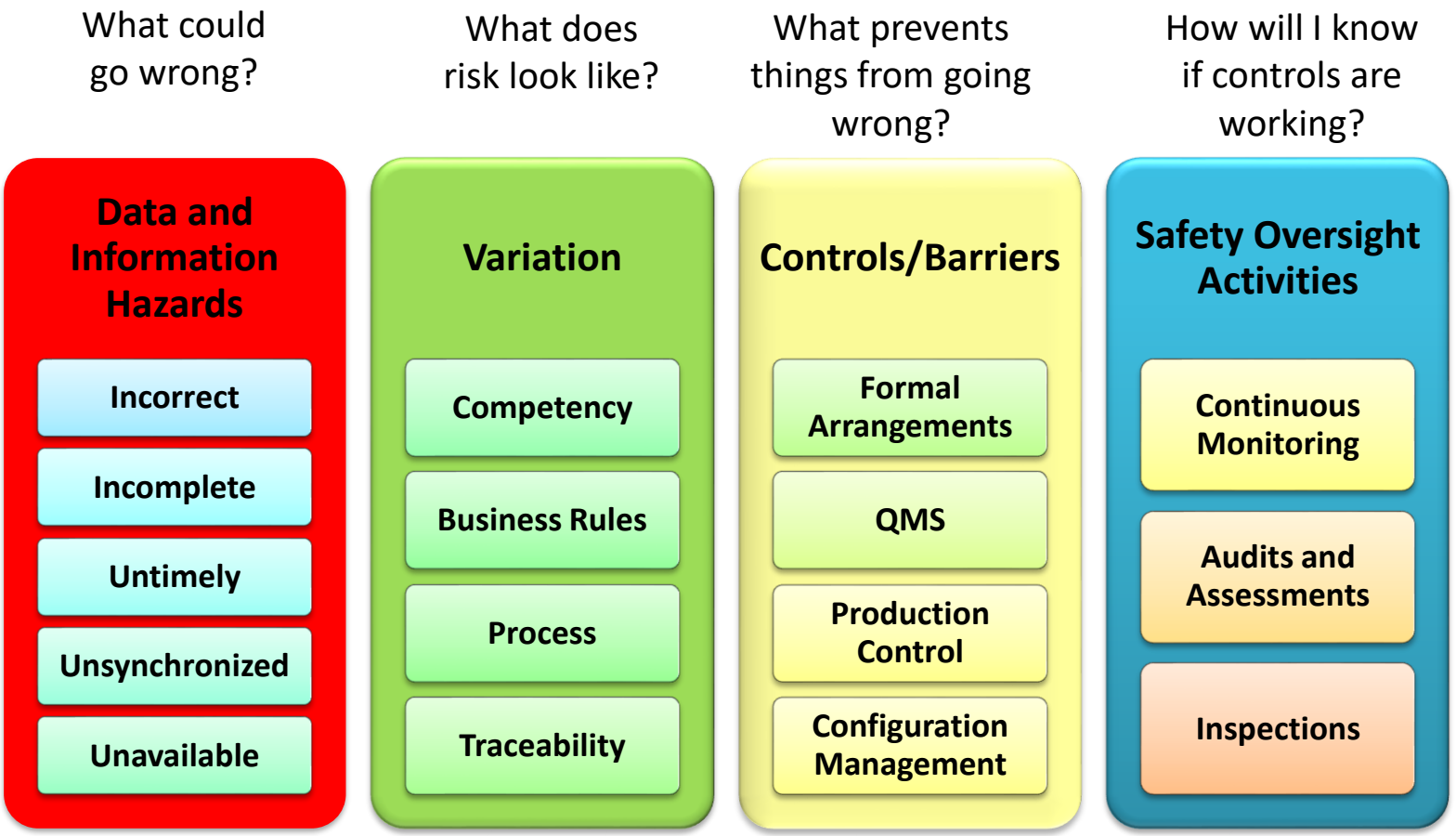
The Audit Process



QMS


QMS
•Policies
•Processes
•Procedures
Competency
•Qualifications
•Assessments
•Currency
Metadata
•What
•Why
•When
•Who
•Where
Assurance
•Accuracy
•Traceability
•Currency
Monitoring
•Planning
•Competency
•Metadata
•Assurance
Audit
•Compliance to QMS
•Nonconformities Resolved
•Documented

Risk-Based AIS Surveillance Program



Today's Topics

- "Going Digital" and Data Sets
- Collaboration and Sharing of Safety Work
- Presentation of Certificates
- Closing Remarks

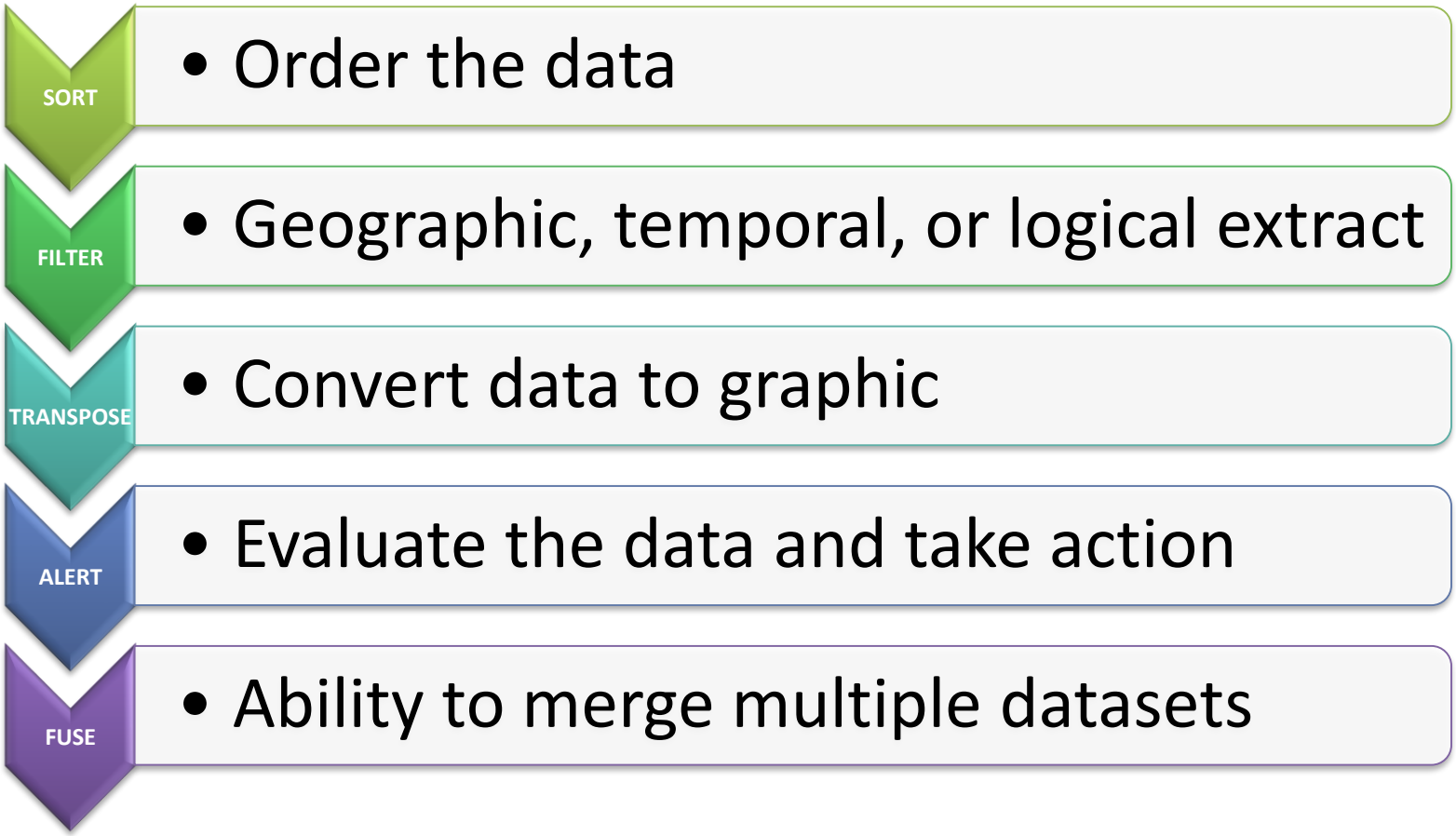
Going Digital and Data Sets

Federal Aviation Administration

Module Objectives

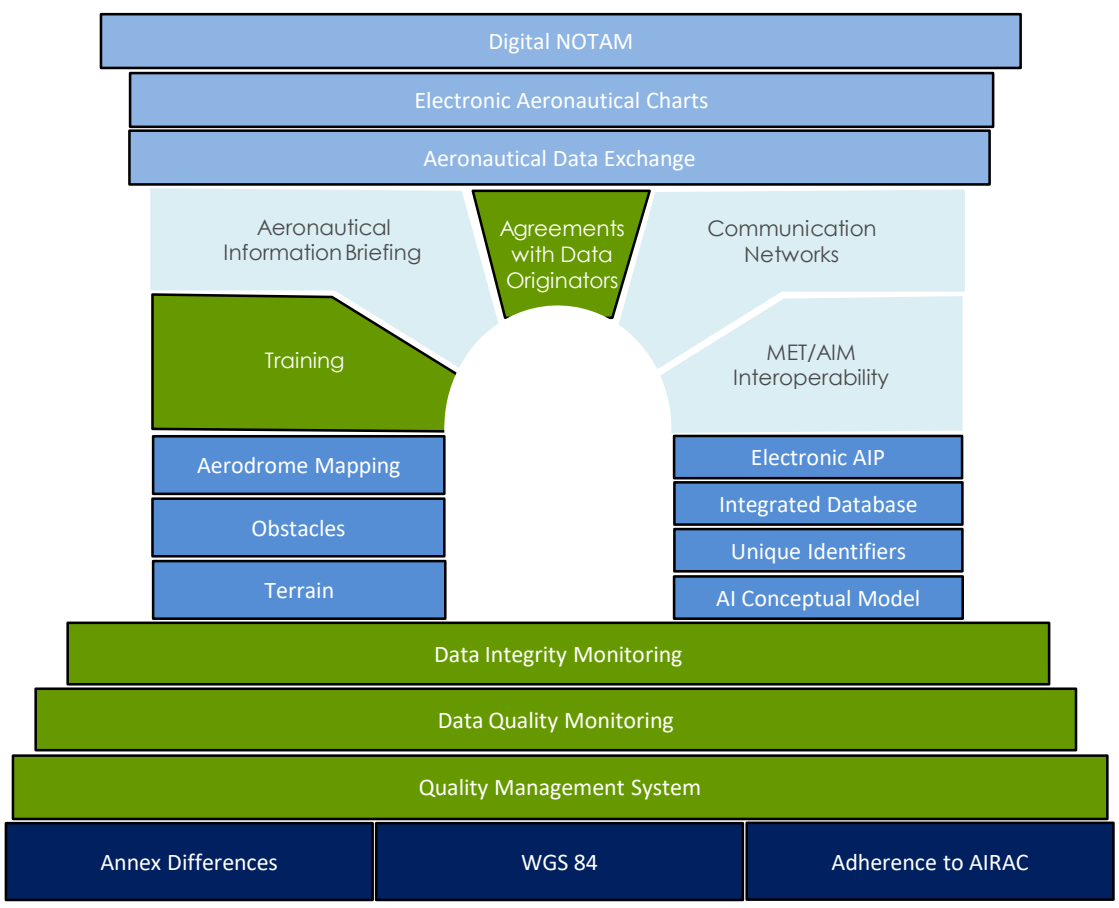
- Understand what “going digital” means
- Understand digital distribution
- Introduce the ICAO data sets and accompanying metadata requirements

The Digital Goal



Source: 2006 Global AIS Congress, Madrid Spain
Presentation by Captain Ed Lyons, FedEx

ICAO Roadmap
Going Digital



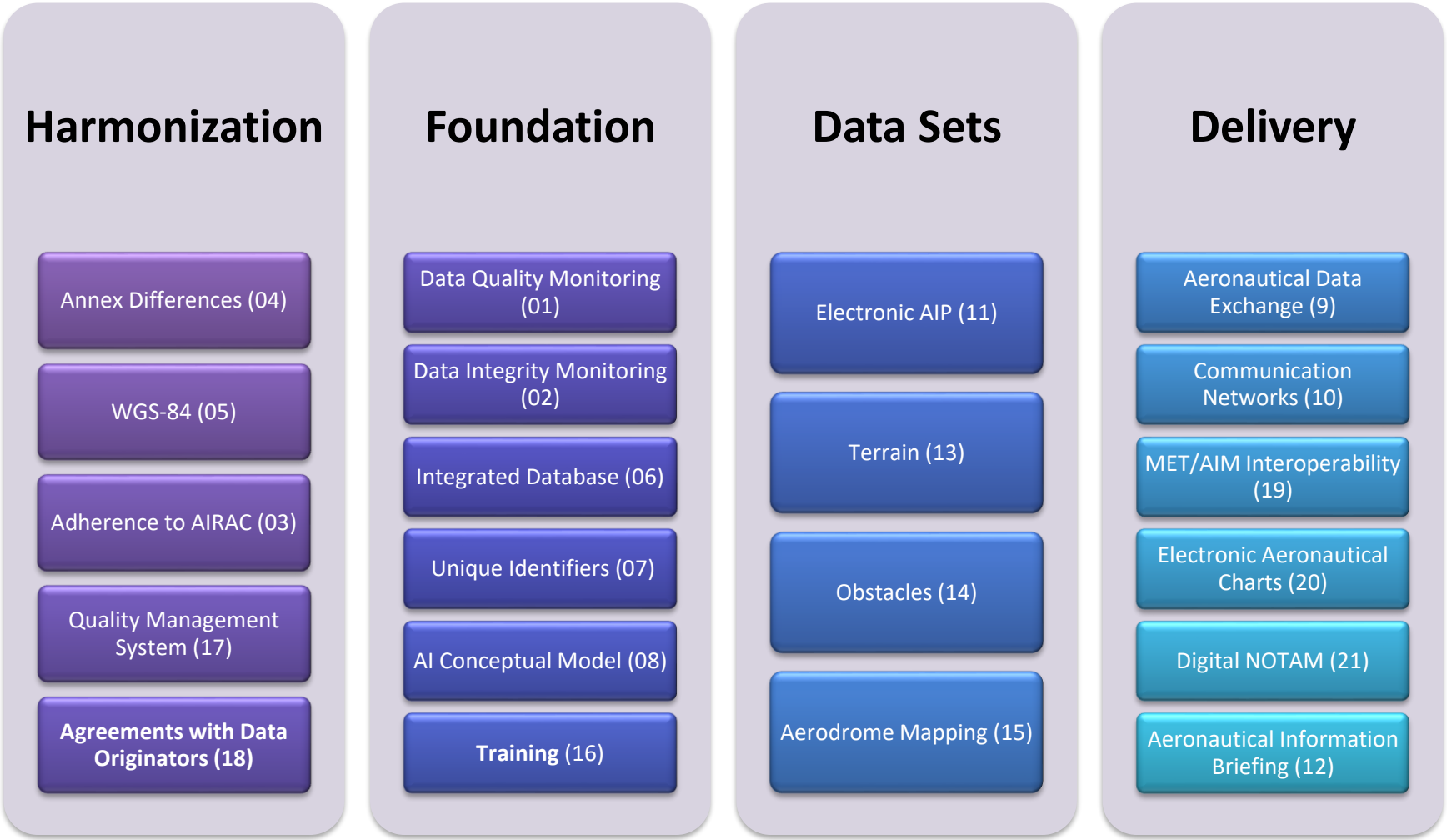
QMS

Phase 3 Information Management

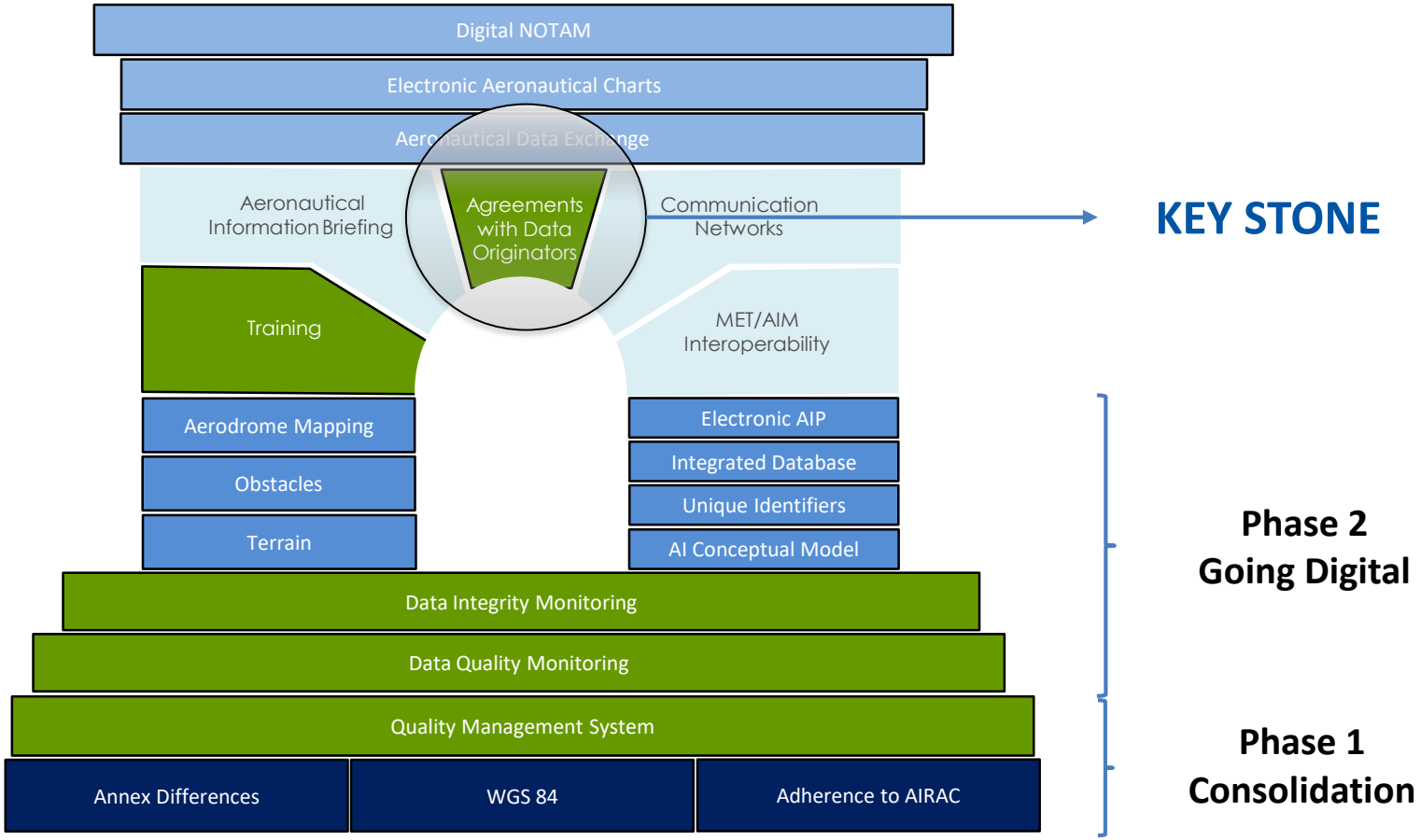
Phase 2 Going Digital

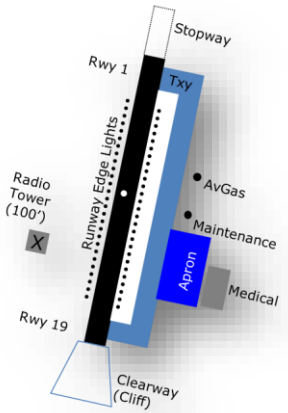
Phase 1 Consolidation

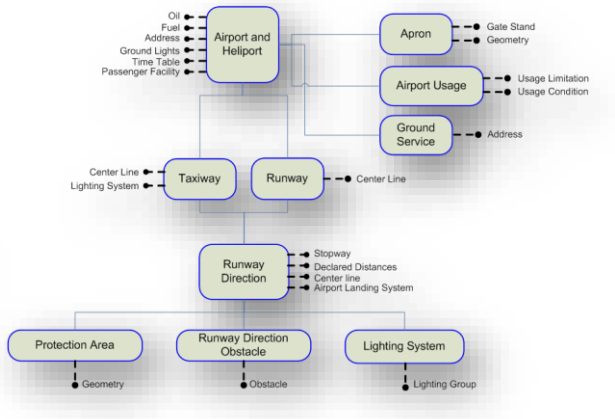
AIS to AIM Roadmap Framework



Formal Agreements





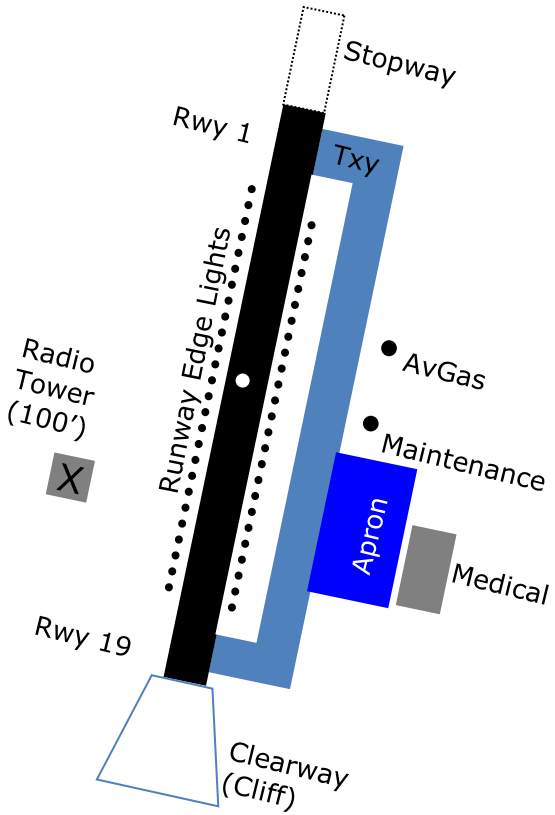


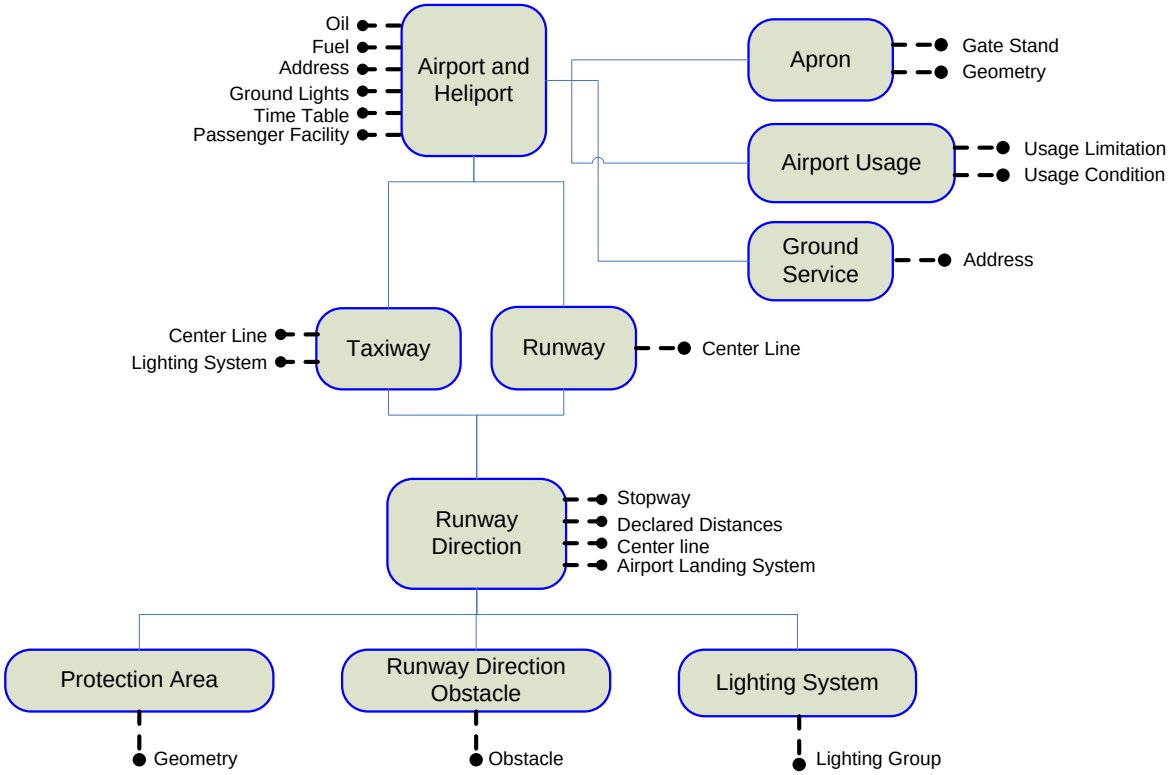
What does “going digital” mean?

UNDERSTANDING DIGITAL DISTRIBUTION

What Does “Going Digital” Mean?

Airports and Runways Example

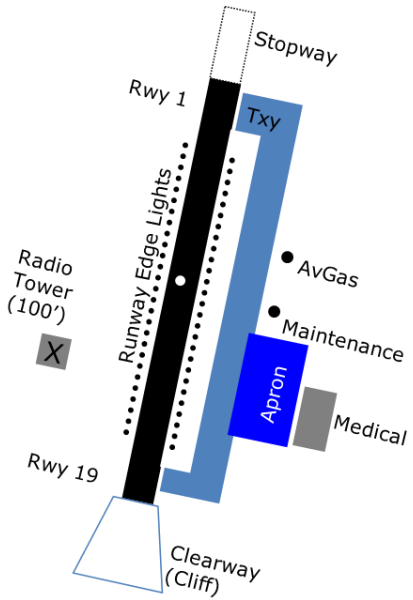




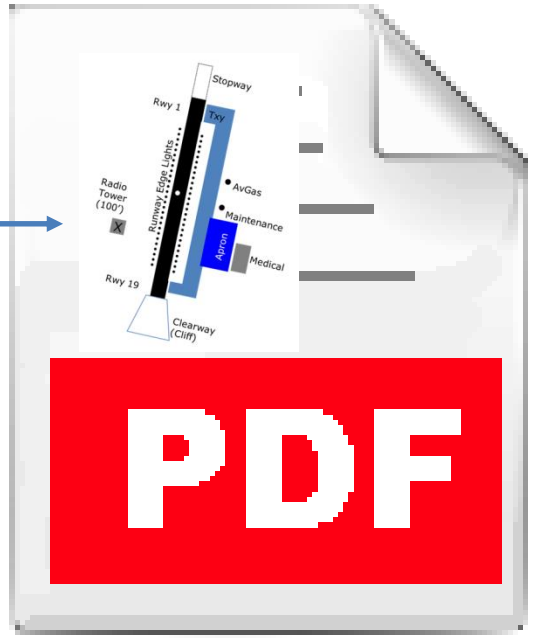
Distribution Media

Electronic Distribution

Analog (Paper Container)



PDF (Electronic Container)



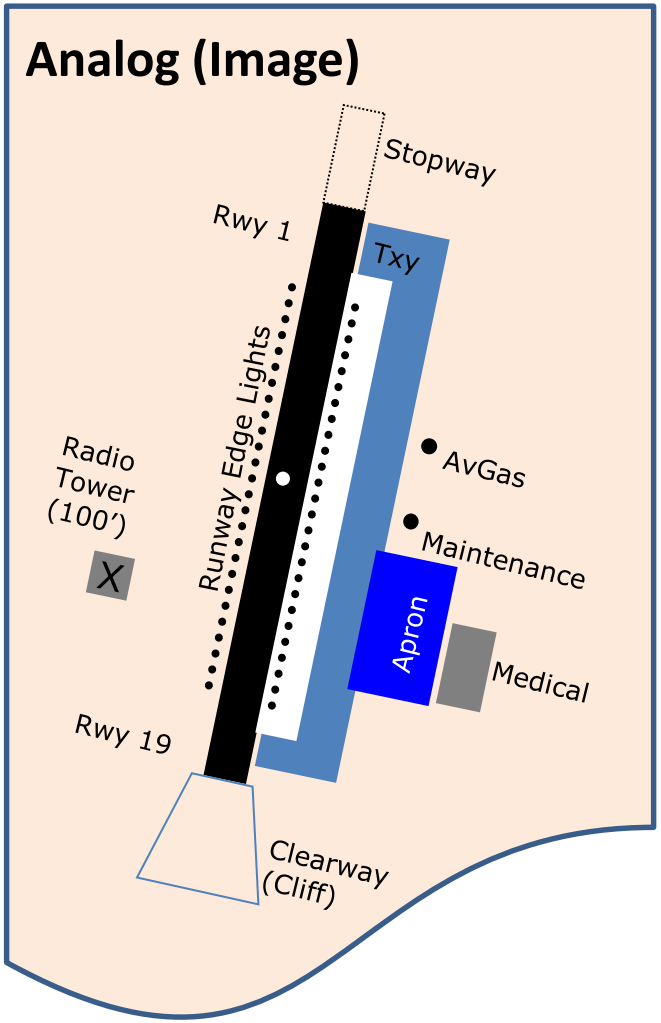
ICAO Dataset (Digital Container)

Structure

Analog vs. Digital

Distribution

Analog (Image)



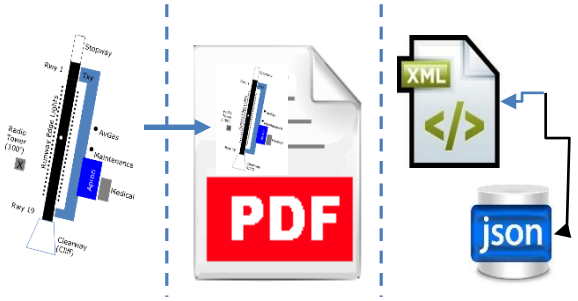
Digital (XML Structured Data in a digital dataset (Container))

```
<Rwy>
  <RwyUid>
    <AhpUid><codeId>IR15</codeId></AhpUid>
    <txtDesig>Runway</txtDesig></RwyUid>
  <valLen>7000</valLen>
  <valWid>500</valWid>
  <uomDimRwy>FT</uomDimRwy>
  <codeComposition>ASPH</codeComposition>
  <codeCondSfc>GOOD</codeCondSfc>
</Rwy>
<Rcp>
  <RcpUid>
    <RwyUid>
      <AhpUid><codeId>IR15</codeId></AhpUid>
      <txtDesig>Runway</txtDesig></RwyUid>
    <geoLat>15.85N</geoLat>
    <geoLong>59.00E</geoLong>
  </RcpUid>
  <codeDatum>WGE</codeDatum>
</Rcp>
```

XML

Distribution Recap

- Paper
  - Legacy mechanism to deliver AIS products
- Electronic [Transmission Mechanism]
  - Transmission of products using electronic systems (i.e., PDF of a scanned image)
  - A PDF as an electronic version of a piece of paper
- Digital
  - Distribution of information, in a designated format, in a pre-parsed manner that allows it to be used for query, filter, alert, and transformation (graphics)
  - Data can be fused to create new information



Annex 15 and PANS-AIM

DATA SETS

Annex 15 Digital Data Sets

5.3.1.1 Digital data shall be in the form of the following data sets:

a) AIP data set;

b) terrain data sets;

c) obstacle data sets;

d) aerodrome mapping data sets; and

e) instrument flight procedure data sets.

Resource: Annex 15, July 2018, Amendment 40

Annex 15 Data Sets

- 5.3.1.2 Each data set shall be provided to the next intended user together with a minimum set of metadata that ensures data traceability.

- 5.3.1.3 A checklist of valid data sets shall be regularly provided.

Resource: Annex 15, July 2018, Amendment 40

Data Set Metadata

PANS-AIM

5.3.2 Each data set shall include the following minimum set of metadata:

a) the name of the organization or entities providing the data set;

b) the date and time when the data set was provided;

c) validity of the data set; and

d) any limitations with regard to the use of the data set.

Resource: ICAO PANS-AIM, July 2018, Edition 1.

Aeronautical Information Model

PANS-AIM

5.3.1.5 The aeronautical information model used should:

a) use the Unified Modelling Language (UML) to describe the aeronautical information features and their properties, associations and data types;

b) include data value constraints and data verification rules;

c) include provisions for metadata as specified in 4.2 and 5.3.2; and

d) include a temporality model to enable capturing the evolution of the properties of an aeronautical information feature during its life cycle.

Resource: ICAO PANS-AIM, July 2018, Edition 1.

Aeronautical Data Exchange Model

PANS-AIM

5.3.1.6 The aeronautical information model used should:

a) apply a commonly used data encoding format;

b) cover all the classes, attributes, data types and associations of the aeronautical information model detailed in 5.3.1.5; and

c) 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 standardization.

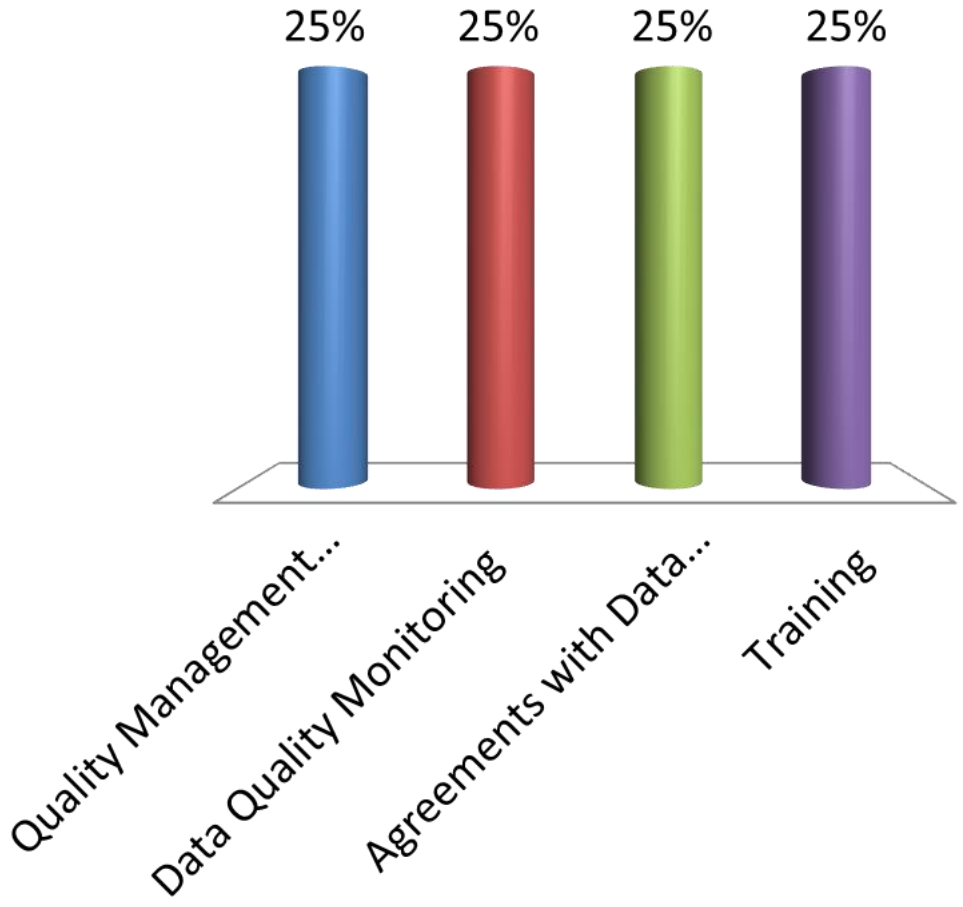
Resource: ICAO PANS-AIM, July 2018, Edition 1.

Data Set Summary

- A data set is a collection of digital data representing an information product.
  - A data set is the container of data/information
  - It should conform to all specifications (context) including format
- The metadata requirements for the data set container are about the container – not the contents; but is required to be published with the data set
- The requirement for traceability to manage the data set remains unchanged

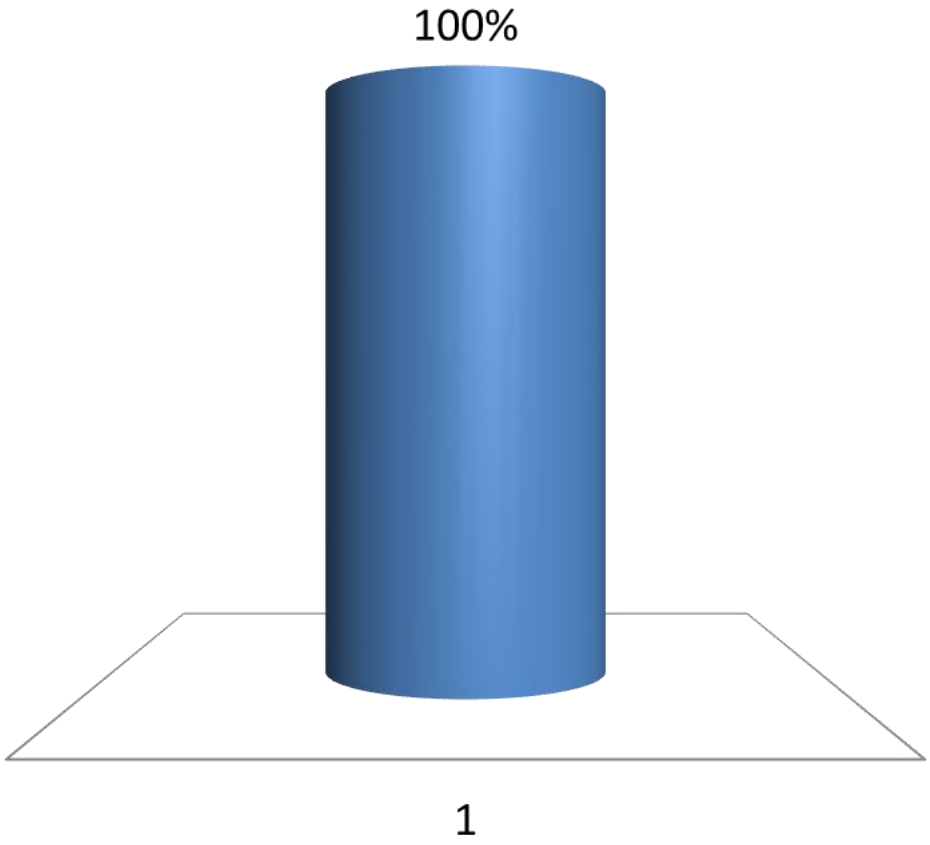
Which of the following is the "keystone" of the ICAO AIS to AIM Roadmap?

A. Quality Management System
B. Data Quality Monitoring
C. Agreements with Data Originators
D. Training



What is digital distribution?

Rank	Responses
1	
2	
3	
4	
5	
6	Other

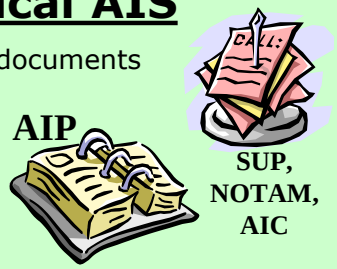


Oversight of the Digital Transition

Managing Product

Classical AIS

- publish documents

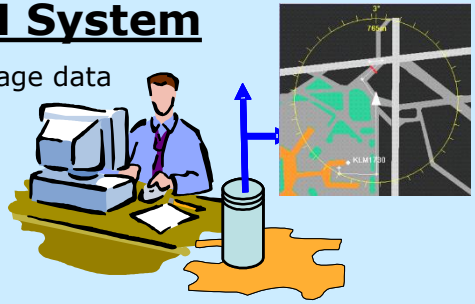


Document content and format is described by:

- ICAO Annex 15, Appendix 1 – AIP Content
- ICAO Annex 15, Appendix 6 – NOTAM format

AIM System

- manage data



Data managed in the system is described by models:

- Aeronautical Information Exchange Model (AIXM)
- AIXM Conceptual Model (AICM)
- Aeronautical Information Reference (AIRM)
- Electronic AIP (eAIP) – on-line presentation format

Managing Data

Major Change = Risk to the Airspace System?

Resource: EUROCONTROL

References

- ICAO Annex 15
- ICAO Roadmap for the Transition from AIS to AIM
- PANS-AIM/Data Catalogue, Doc 10066
- EUROCONTROL
- *Roadmap for the Transition from AIS to AIM*, Roberta Luccioli (ICAO), Dakar, Senegal 2013
- http://www.slideshare.net/OpenDataSupport/introduction-to-metadata-management

Questions and Discussion

Collaboration and Sharing of Safety Work

Federal Aviation Administration

Information Challenge

How could we make the global airspace system perform like a seamless operation?

Module Objectives

Discuss benefits and opportunities for collaboration to improve the safety of aeronautical information products and services

Why Collaboration?

ANSPs/AIS providers are geographically isolated from each other and use different platforms in terms of technologies

- They provide services to significant numbers of customers
- They often rely on third party providers to integrate aeronautical data and information and provide products

Why Collaboration?

- ATM is increasingly relying on data/information
  - Role of aeronautical data/information is changing
  - Aeronautical data/information is stored in different formats and representations
- Supplemental specifications are increasing the complexity of the aeronautical information data chain
  - Many supplemental products cannot be derived from official AIS products
- ANSPs/AIS may find it difficult to manage complex data chains and meet demand for aeronautical information products
- AIS is an economy of scale; high costs, high risk, limited resources, large customer base

Why Collaboration?

- State regulators are required to provide independent safety oversight of large service providers while at the same time keeping up with new international standards
- The ratio of government safety inspector to service provider personnel may be very low
- Regulators may find it difficult to:
  - Adapt to transition from regulation and oversight of legacy aeronautical information products to real-time digital environment
  - Keep up with rapid technology challenges
  - Offer competitive compensation
  - Ensure expertise

Opportunities for Collaboration

Sharing Option	Alignment Factors					In Order to	Achieve Results			
	Share Information	Share Strategy	Synchronize Activities	Share Competencies and Resources	Combine Competencies and Resources		Influence a Common Desired Outcome	Gain Efficiencies & Achieve Desired Outcome	Co-develop a Product or Service	Combine Product/Service Offering into a single end-to-end Delivery
Level 1 Communications	✓						✓			
Level 2 Cooperation	✓	✓					✓			
Level 3 Coordination	✓	✓	✓				✓	✓	✓	
Level 4 Collaboration	✓	✓	✓	✓			✓	✓	✓	
Level 5 Integration	✓	✓	✓	✓	✓		✓	✓	✓	✓

Source: Buchanan, et al (United States Department of State)

Opportunities for Collaboration

- Establishing harmonized requirements and guidance material
- Sharing of safety information and best practices
- Setting and monitoring safety performance indicators
- Issuing licenses and approvals
- Surveillance
- Resolving safety concerns

Improve Collaboration

Strategies to increase collaboration:

- Form or join associations to share lessons learned, information and ideas
- Participate in regional ICAO bodies and events
- Participate in industry associations
- Establish regular meetings between regulator and service provider(s)/AIS to discuss safety concerns
- Promote a positive safety culture in the regulator and service provider(s)/AIS

Possible Collaboration Projects

- Build relationships
  - Regulator to regulator
  - AIS to AIS
  - Regulator to AIS
- Establish common requirements and guidance material
  - Operating regulations
  - Directives and job aids
  - Document (Product) naming and numbering conventions
  - Competency/training rubrics

Possible Collaboration Projects Continued

- Harmonize and share audit topics and checklists
- Develop personnel exchange programs (safety inspectors and/or AIS personnel)
  - Learn new techniques
  - Share resources
- QMS standardization
- Harmonize performance indicators and metrics
- AIS safety culture survey and promotion

What are some other possible areas for collaboration?

Rank	Responses
1	
2	
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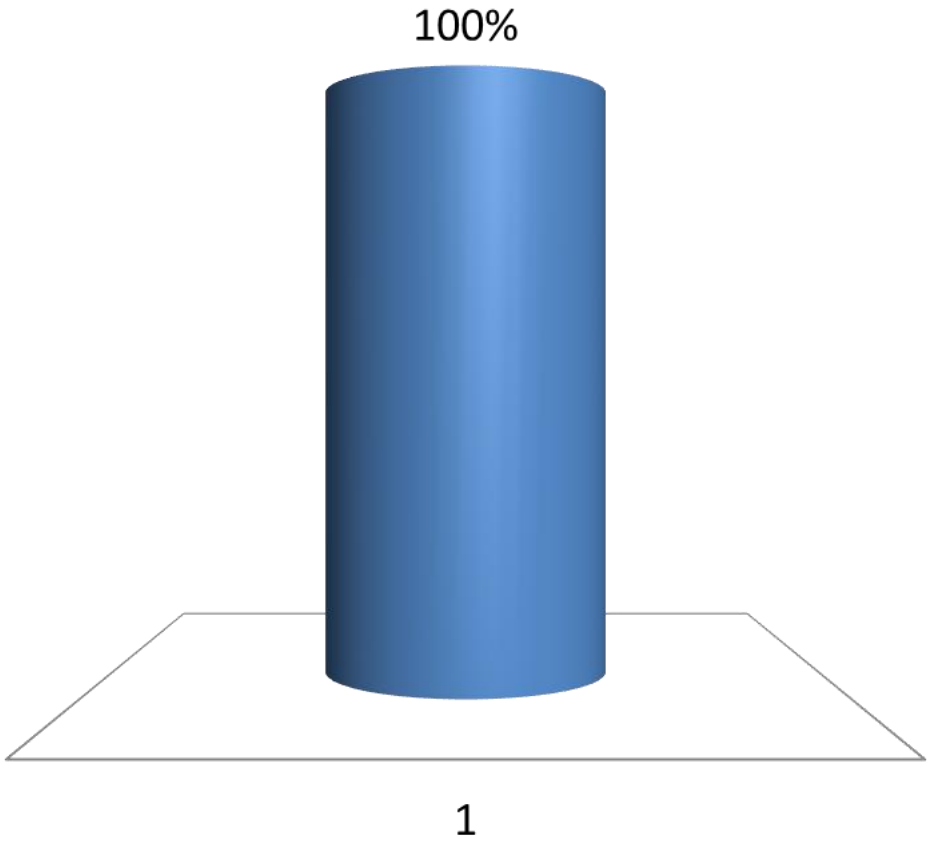
4	
5	
6	Other



Collaboration and Performance Monitoring

- Safety performance monitoring and measurement includes:
  - Selecting safety monitoring indicators
  - Setting alerts and targets relevant for the aviation system
- Performance should be continuously tracked against the indicators and targets
  - Data should be recorded and analyzed to identify trends

Strategies for Safety Performance Monitoring

- Contribute to the ICAO Regional Monitoring Agencies
  - Address cross-boundary occurrences
- Use ICAO reporting requirements already in place to establish safety performance indicators
- Consider adopting indicators used by other States/Regions
- Set reasonable performance targets based on available data and information

Example AIS Performance Indicators

- General
  - Timeliness of publication or service
  - Quality of publication or service
- Formal agreements between data originators and AIS providers
  - Quality of data provided
  - Timeliness of data provided
  - Format of data provided

Source: EUROCONTROL Key Performance Indicators for the Provision of Originated Data

Collaboration and Encouraging a Safety Culture

- Safety culture is the way safety is perceived, valued, and prioritized
  - Reflects the real commitment to safety at all levels in the organization
- Safety culture is important to regulators and ANSPs
- Safety culture can be positive, negative, or neutral

Source: SKYbrary: Category: Safety Culture (http://www.skybrary.aero/index.php/Category:Safety_Culture)

Safety Culture
Positive or Negative?

An organization with a negative safety culture:

- Does not address staff concerns about safety
- Does not learn from safety events
- Does not include safety management in decision-making
- Believes that safety is someone else's responsibility

Source: SKYbrary Toolkit: Safety Culture, A1.3 What is a "good" safety culture? (http://www.skybrary.aero/index.php/Solutions:Safety_Culture)

Safety Culture: Positive or Negative? (cont.)

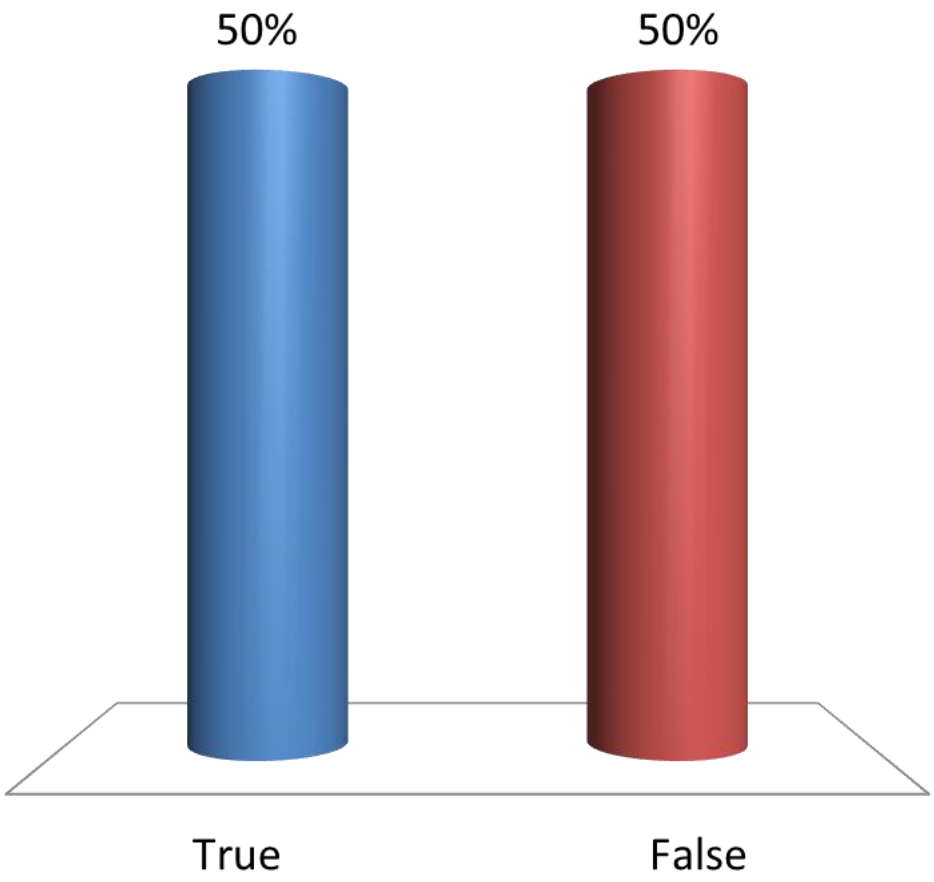
An organization with a positive safety culture:

- Recognizes that safety is a business imperative
- Prioritizes safety over other pressures (economic, societal, etc.)
- Believes that safety is everyone's responsibility

Source: SKYbrary Toolkit: Safety Culture, A1.3 What is a "good" safety culture? (http://www.skybrary.aero/index.php/Solutions:Safety_Culture)

Do you feel that your organization has a positive safety culture?

A. True
B. False



Positive Safety Culture

Reporting

- Encourages employees to divulge information about all safety hazards they encounter

Just

- Holds employees accountable for deliberate violations of the rules but encourages and rewards them for providing essential safety-related information

Flexible

- Adapts effectively to changing demands and allows quicker, smoother reactions to off-nominal events

Learning

- Willing to change based on safety indicators and hazards uncovered through assessments, data, and incidents

James Reason, Managing the Risks of Organizational Accidents, Hants: Ashgate, 1997, p. 196

Improving Safety Culture

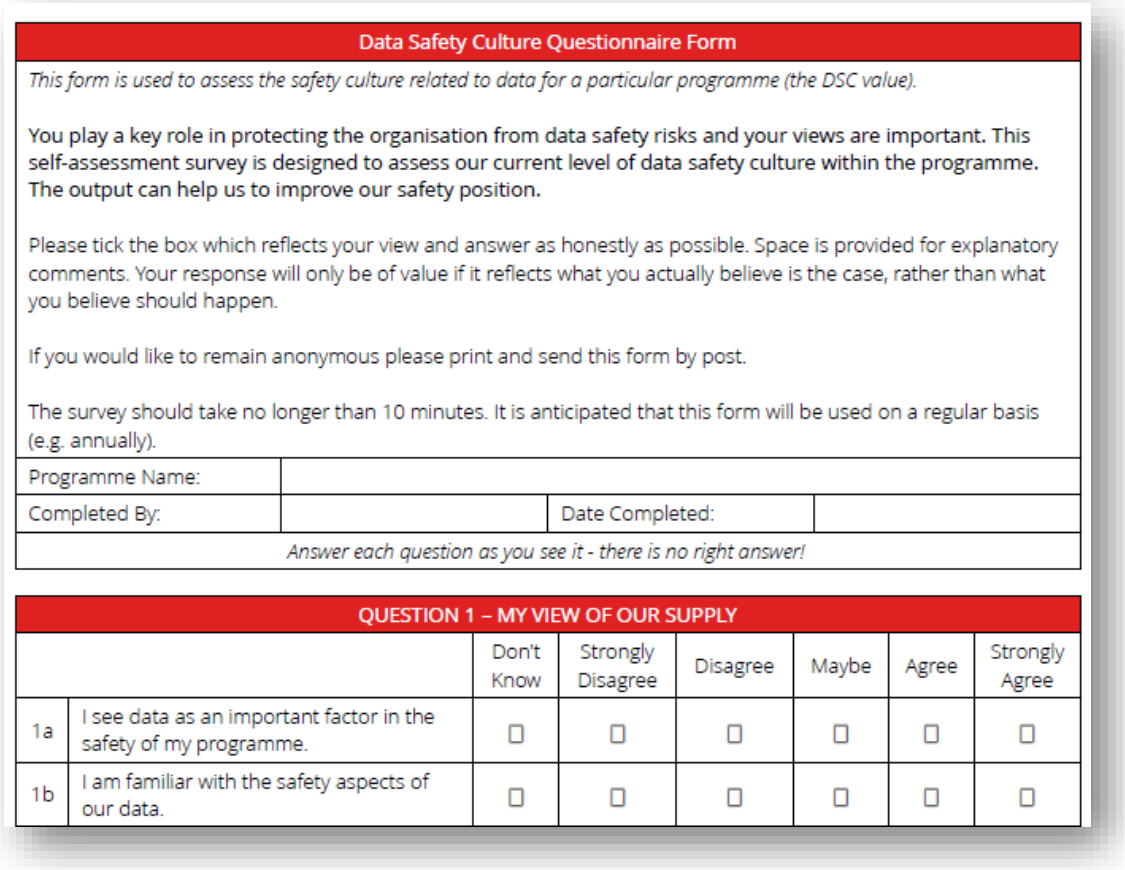
- Require service providers to establish commitment to improving safety culture at all levels of the organization
- Consider a safety culture survey
- Encourage voluntary safety reporting

Measuring Safety Culture

- Conduct a safety culture assessment to:
  - Establish a shared understanding of the organization's (CAA or ANSP) safety culture and identify its strengths and weaknesses
- Strategies for conducting a safety culture assessment:
  - Collaborate with an external, independent assessment team of experts
  - Appoint an internal "champion"
  - Seek staff contribution and involvement

Source: SKYbrary Toolkit: Safety Culture, B1.1-3 (http://www.skybrary.aero/index.php/Solutions:Safety_Culture)

Measuring Safety Culture



Data Safety Culture Questionnaire Form

This form is used to assess the safety culture related to data for a particular programme (the DSC value).

You play a key role in protecting the organisation from data safety risks and your views are important. This self-assessment survey is designed to assess our current level of data safety culture within the programme. The output can help us to improve our safety position.

Please tick the box which reflects your view and answer as honestly as possible. Space is provided for explanatory comments. Your response will only be of value if it reflects what you actually believe is the case, rather than what you believe should happen.

If you would like to remain anonymous please print and send this form by post.

The survey should take no longer than 10 minutes. It is anticipated that this form will be used on a regular basis (e.g. annually).

Programme Name:			
Completed By:		Date Completed:	

Answer each question as you see it - there is no right answer!

QUESTION 1 – MY VIEW OF OUR SUPPLY

		Don't Know	Strongly Disagree	Disagree	Maybe	Agree	Strongly Agree
1a	I see data as an important factor in the safety of my programme.	☐	☐	☐	☐	☐	☐
1b	I am familiar with the safety aspects of our data.	☐	☐	☐	☐	☐	☐

The safety culture questionnaire is a tool to collect data about the current safety culture

- Set of statements that respondents are asked to agree or disagree with
- Designed to elicit responses on a variety of topics that indicate how the ANSP (or regulator!) approaches and manages safety in practice
- Helps the organization appreciate a data safety culture

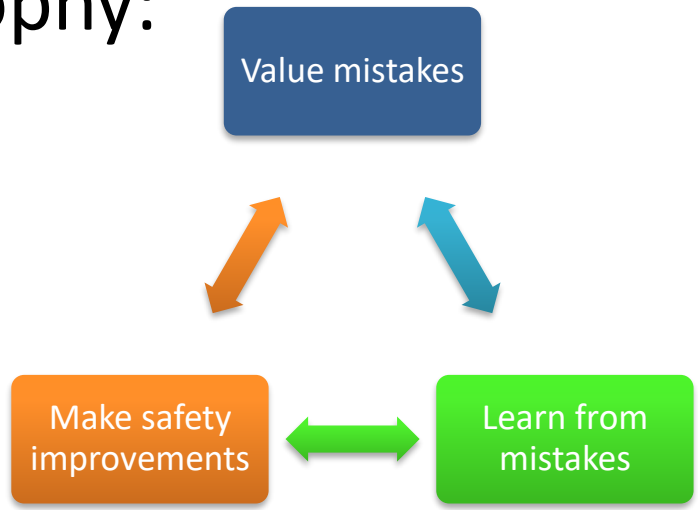
Source: Safety Culture in Air Traffic Management: A White Paper; FAA/EUROCONTROL AP 15/UK SCSC Data Safety Guidance

Improving Safety Culture

- A safety culture assessment may suggest specific opportunities for improvement
- The following practices also support a positive safety culture:
  - Encourage open discussion of safety concerns among staff and management
  - Establish and foster voluntary safety reporting programs

Voluntary Safety Reporting

- Voluntary safety reporting programs are a component of a positive safety culture
  - Non-punitive
- Voluntary reporting philosophy:
  - Value mistakes
  - Learn from mistakes
  - Make safety improvements



Voluntary Safety Reporting

Successful voluntary safety reporting programs require:

- Incentives to report
  - Limited immunity from enforcement and/or disciplinary actions
- Legal protection of identities and reported information (de-identification)
- Collaboration between regulator and service provider(s)
  - Agreement on terms and conditions to be upheld by each party
- Dedicated program manager
- Documented process for report handling and analysis
- Resolution of identified safety issues
- Data-sharing processes to provide access to safety information gathered by the program(s)

References

- CANSO – The Transition from AIS to AIM
- EUROCONTROL Key Performance Indicators for the Provision of Originated Data
- UK Data Safety Initiative Working Group, Data Safety Guidance (SCSC-127B)
- *Moving Towards a Collaborative Decision Support System for Aeronautical Data*, by Rahayu, Rusu and Torabi (2010)
- *Do You Have a Safety Culture?* by Robert Sumwalt
- Safety Culture in Air Traffic Management: A White Paper
- SKYbrary Safety Culture Toolkit (www.skybrary.aero)

Questions and Discussion

Building Effective Safety Oversight of AIS and AIM

Closing

Federal Aviation Administration

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