Building Effective Safety Oversight of AIS and AIM

**Federal Aviation Administration**

Day 4: AIS Oversight

Objectives

Recap Day 3

- Data, information and knowledge

- AIS information factory

- QMS

- Linking AIS and QMS activities

- Production management review

Introduce today's topics…

Data, Information and Knowledge Review
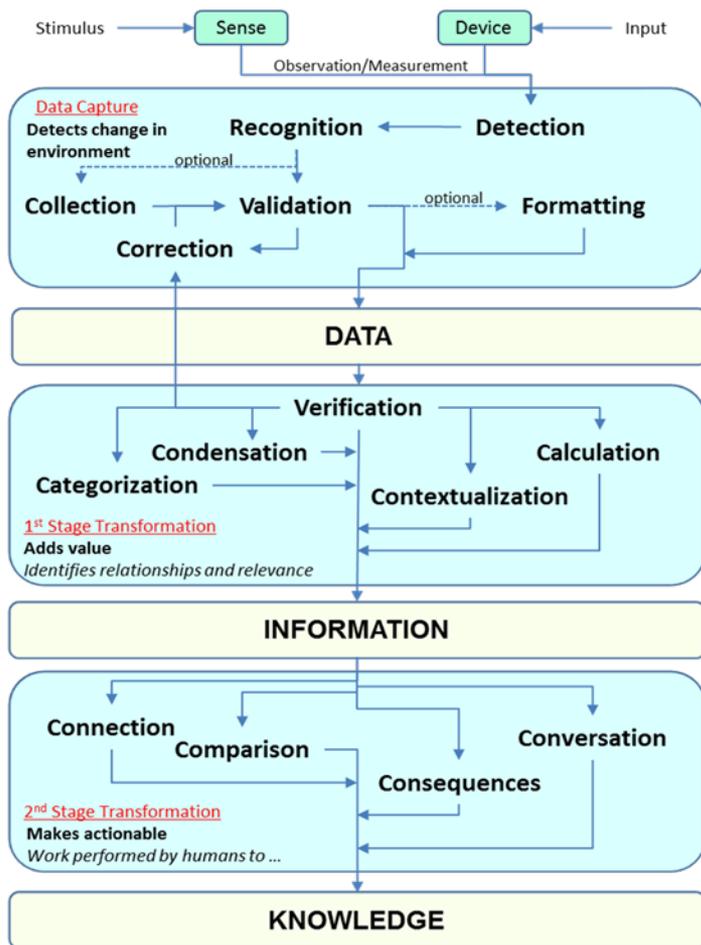
Data Management is about management of data <u>elements</u>

Information Management is about managing the <u>value</u> chain to create context to data

Knowledge Management is about managing the <u>relationship</u> between information and **actions**

AIS Information Factory Review

Data and Information (Collect)

Knowledge (Update)

Information Product and Service (Assemble)

Delivery (Publish)
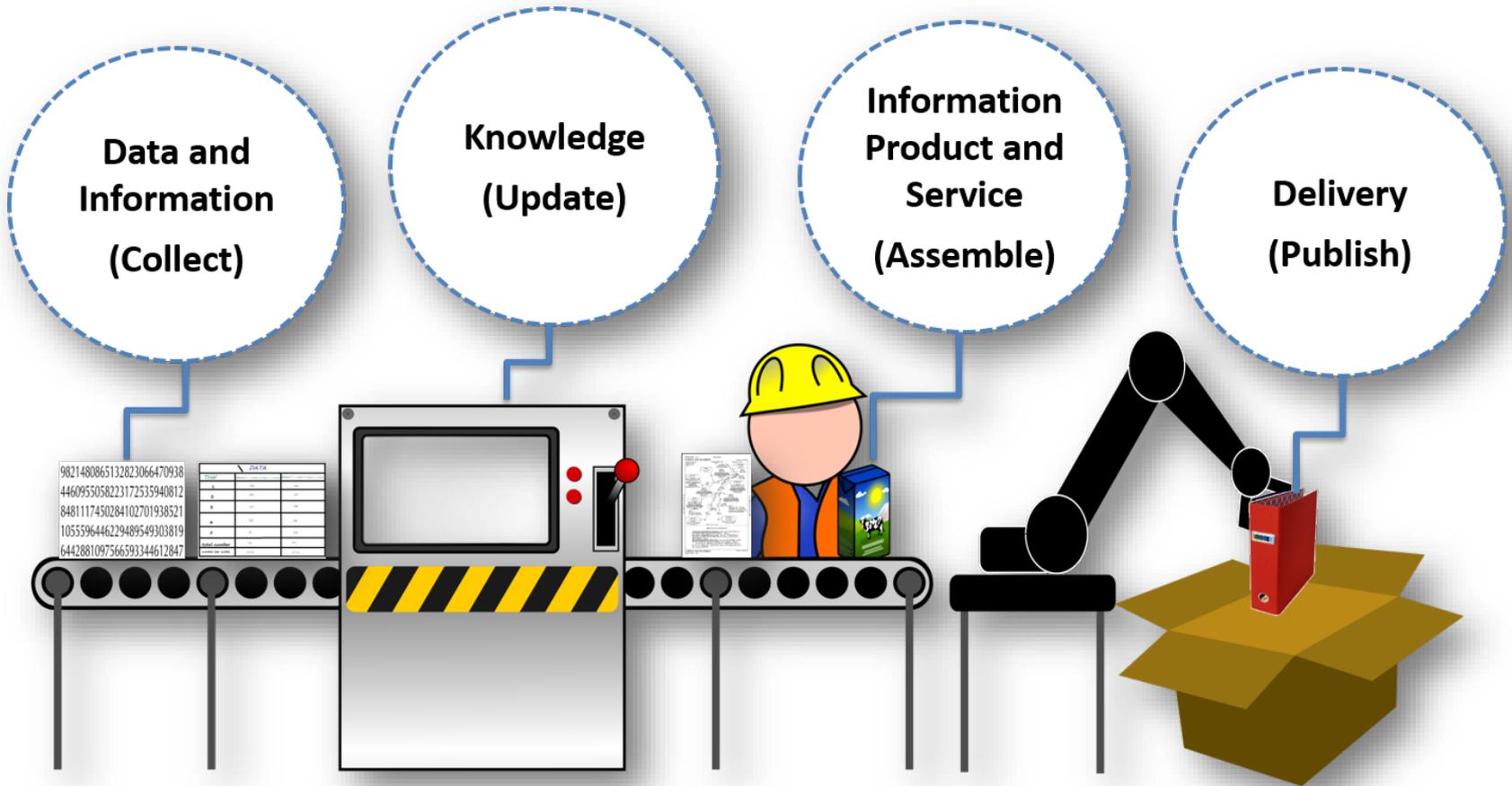
QMS Review

Linking QMS and AIS Activities Review
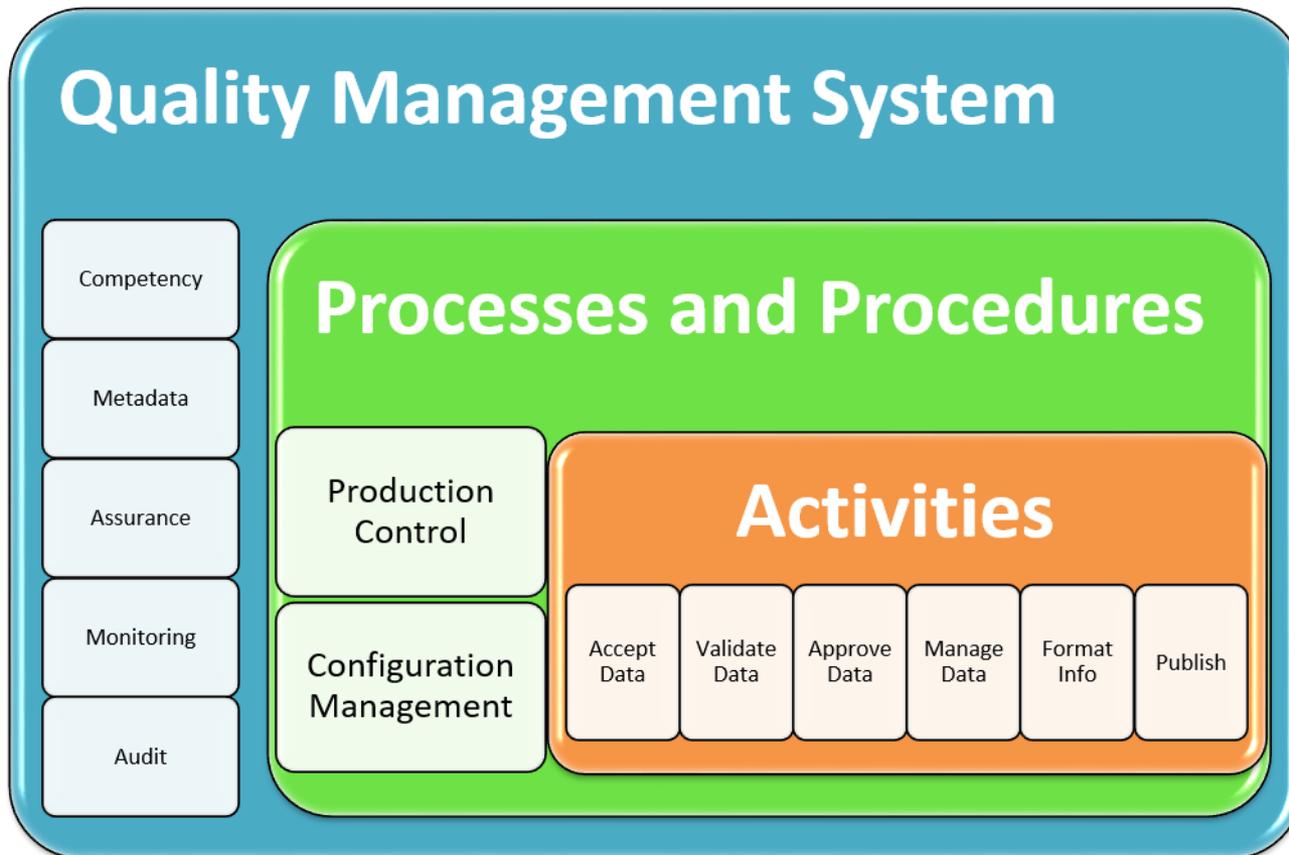
Production Management Review

Information Hazards

- Incorrect Data
- Incomplete Data
- Unsynchronized Data
- Untimely Data
- Data Availability
- Unprotected

Production Control

- Management of the production workflow to coordinate the configuration management of deliverables or outcomes

Configuration Management

- Management of changes to a system (data, products, services) to ensure the performance requirements of the system are maintained

Day 4 Agenda

- Identify the Critical Elements

- Review Universal Safety Oversight Audit Program (USOAP)

- AIP audit exercise

- Validation of observations exercise

- Develop a surveillance strategy

Thoughts or Questions?

Critical Elements and Safety Oversight of AIS/AIM

Federal Aviation Administration

Applying the Universal Safety Oversight Audit Programme Critical Elements to the Safety Oversight of AIS/AIM

Critical Elements (CEs) of a State's Safety Oversight System

CE-1
Primary aviation legislation

CE-2
Specific operating regulations

CE-3
State system and functions

CE-4
Qualified technical personnel

CE-5
Technical guidance, tools and the provision of safety critical information

ESTABLISH

IMPLEMENT

CE-6
Licensing, certification, authorization, and/or approval obligations

CE-7
Surveillance obligations

CE-8
Resolution of safety issues

Source: ICAO Annex 19 and Doc 9734-A

Critical Element 1 — Primary Aviation Legislation

- Primary aviation legislation should establish an safety oversight organization independent from air navigation service providers (ANSPs)

- AIS is one domain within the safety oversight organization that provides oversight of the management and delivery of aeronautical information products and services, throughout the lifecycle from collection of data elements to distribution of information products, ensuring the performance and safety requirements of the aeronautical community are met

Critical Element 2

Specific Operating Regulations

ICAO has developed Sample Civil Aviation Regulations for Air Navigation Services, which address the following:

- Air Traffic Services
- Safety Management Systems
- Instrument Flight Procedure Design Service
- **Aeronautical Information Services**
- Aeronautical Telecommunication
- Aeronautical Meteorology Services

- The Sample Regulations are based on ICAO Standards
  - Aeronautical data and AIS requirements in Parts 11.3 and 11.4

Critical Element 4

Qualified Technical Personnel and Training

- Hire experienced technical experts and train them to become safety professionals

- Develop a comprehensive training program

- Provide for career progression (develop future leaders)

- The AIS safety oversight organization and the ANSP/AIS organization both maintain qualified, experienced, and competent technical personnel

Critical Element 5

Technical Guidance, Tools and Provision of Safety Critical Information

- Develop technical guidance and tools for safety oversight personnel

- Use Standard Operating Procedures to standardize safety oversight, compliance, and licensing functions within an organization

- The regulatory authority must ensure that AIS/AIM safety oversight personnel understand their duties as well as the responsibilities associated with specific roles within the organization

Critical Element 6

Licensing, Certification, Authorization and Approval Obligations

- Establish a licensing program for personnel providing safety-related services

- Distinguish between high, medium, and low-risk activities

- Certification of AIS personnel

- The certification ensures AIS practitioners demonstrate proficiency in a common set of competencies

Surveillance Obligations

- Develop a continuous surveillance program to ensure that the standards of a service provider's capability and competence are equal to or exceed those required at the time of original certification (the baseline)

- Surveillance
  - Collect data about ANSP/AIS operation
- Analysis
  - Review data to measure the degree of compliance with requirements and processes

Critical Element 8

Resolution of Safety Concerns

Prioritize compliance activities according to risk and take enforcement action

   when necessary

 Encourage a safety culture in the oversight authority and service providers

 Corrective Action
- AIS develops, implements, and monitors corrective actions to identified deficiencies as a result of surveillance and analysis

- Follow-Up

- The regulatory authority must ensure that service providers resolve compliance and safety issues in a thorough and timely manner

Thoughts…

Each of the Critical Elements

Questions and Discussion

Federal Aviation Administration
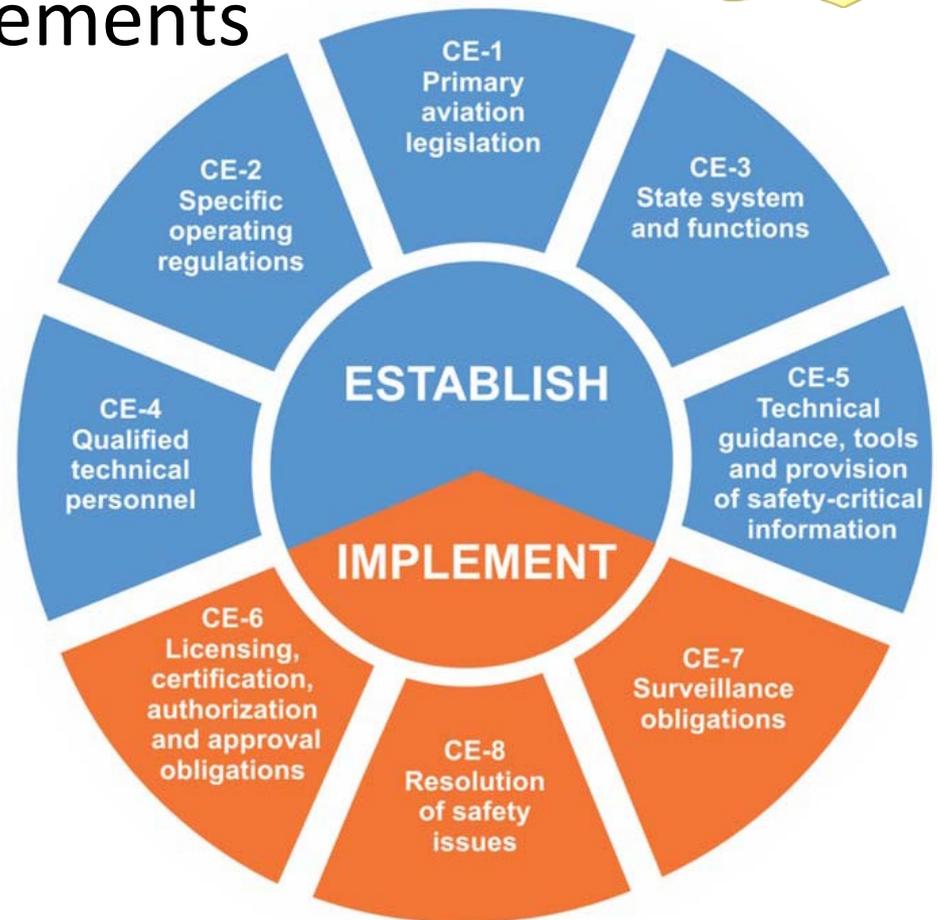
References

- ICAO Annex 19

- ICAO Safety Oversight Manual, Doc 9734-A

- ICAO Sample Civil Aviation Regulations for Air Navigation Services (ANS), 11.3 and 11.4

- FAA Order 1100.161, Air Traffic Safety Oversight

Air Traffic Safety Oversight

Federal Aviation Administration

ICAO Introduction to Universal Safety Oversight Audit Programme (USOAP)

ICAO's Universal Safety Oversight Audit Programme (USOAP)

- ICAO's Universal Safety Oversight Audit Programme (USOAP) was initially launched in January 1999, in response to widespread concerns about the adequacy of aviation safety oversight around the world.

- USOAP audits focus on a State's capability in providing safety oversight by assessing whether the State has effectively and consistently implemented the critical elements (CEs) of a safety oversight system.

- U.S.'s USOAP was performed in 2007 with an overall score of 94%.

ICAO USOAP Activities

- The USOAP Continuous Monitoring Approach (CMA) includes:
  - State Self-Assessments
  - Audits – determine compliance with ICAO SARPs
  - ICAO Coordinated Validation Missions
    - Validate State corrective actions
  - State support for USOAP Audit activities

USOAP
Continuous Monitoring Approach

Promoting global aviation safety

by continuously monitoring and updating

the safety oversight capabilities of all ICAO Member States.

USOAP CMA Audit Areas

Primary aviation legislation and civil aviation regulations (LEG)

Civil aviation organization (ORG)

Personnel licensing and training (PEL)
Annexes 1 and 19

Aircraft operations (OPS)
Annexes 6, 9, 18, 19 and PANS-OPS

Airworthiness of aircraft (AIR)
Annexes 6, 7, 8, 16 and 19

Aircraft accident and incident investigation (AIG)
Annexes 13 and 19

Air navigation services (ANS)
Annexes 2, 3, 4, 5, 10, 11, 12, 15, 19 and PANS-ATM

Aerodromes and ground aids (AGA)
Annexes 14 and 19

USOAP Protocol Questions (PQs)

- PQs are the main tool used during ICAO USOAP CMA audits and continuous monitoring to assess a State's safety oversight capability

- Each PQ is linked to one of the USOAP Critical Elements

ICAO's Eight Critical Elements
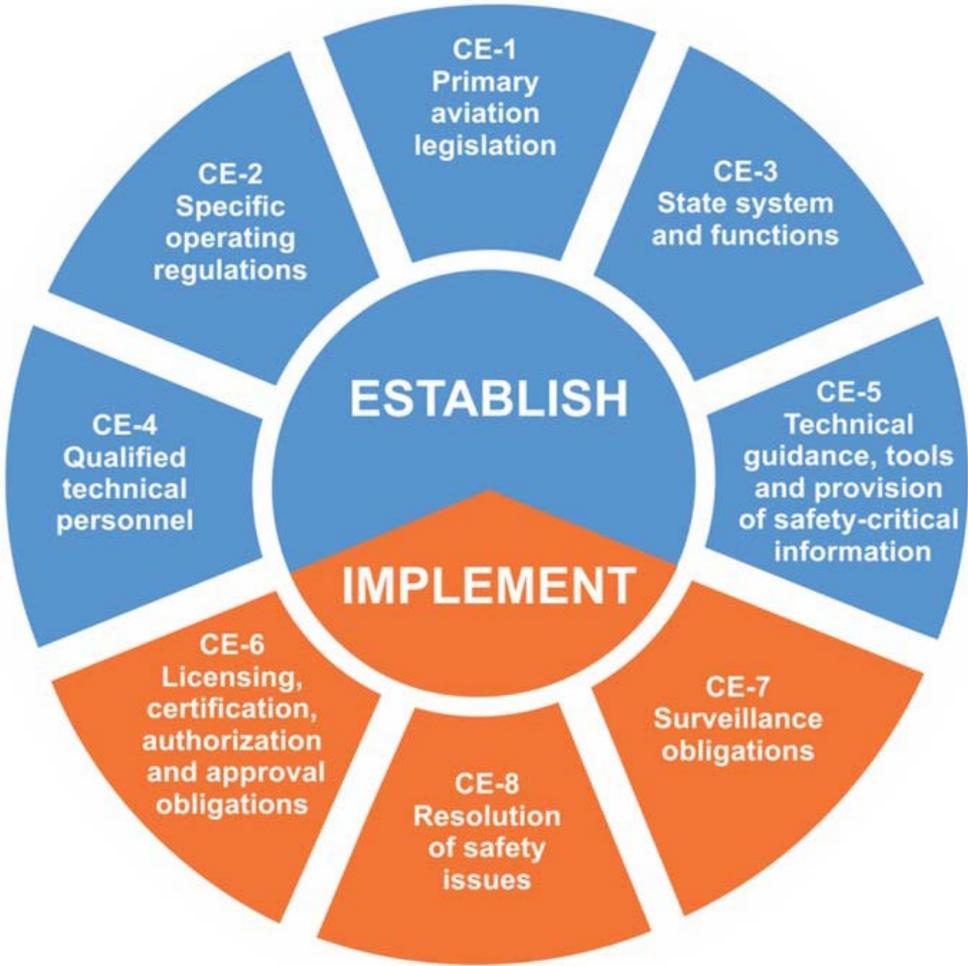
ANS PQs by Critical Elements (CEs)

NO. OF PQS 179

Bar chart showing number of PQs by Critical Element:
- CE-1: 3
- CE-2: 9
- CE-3: 36
- CE-4: 37
- CE-5: 9
- CE-6: 48
- CE-7: 29
- CE-8: 8
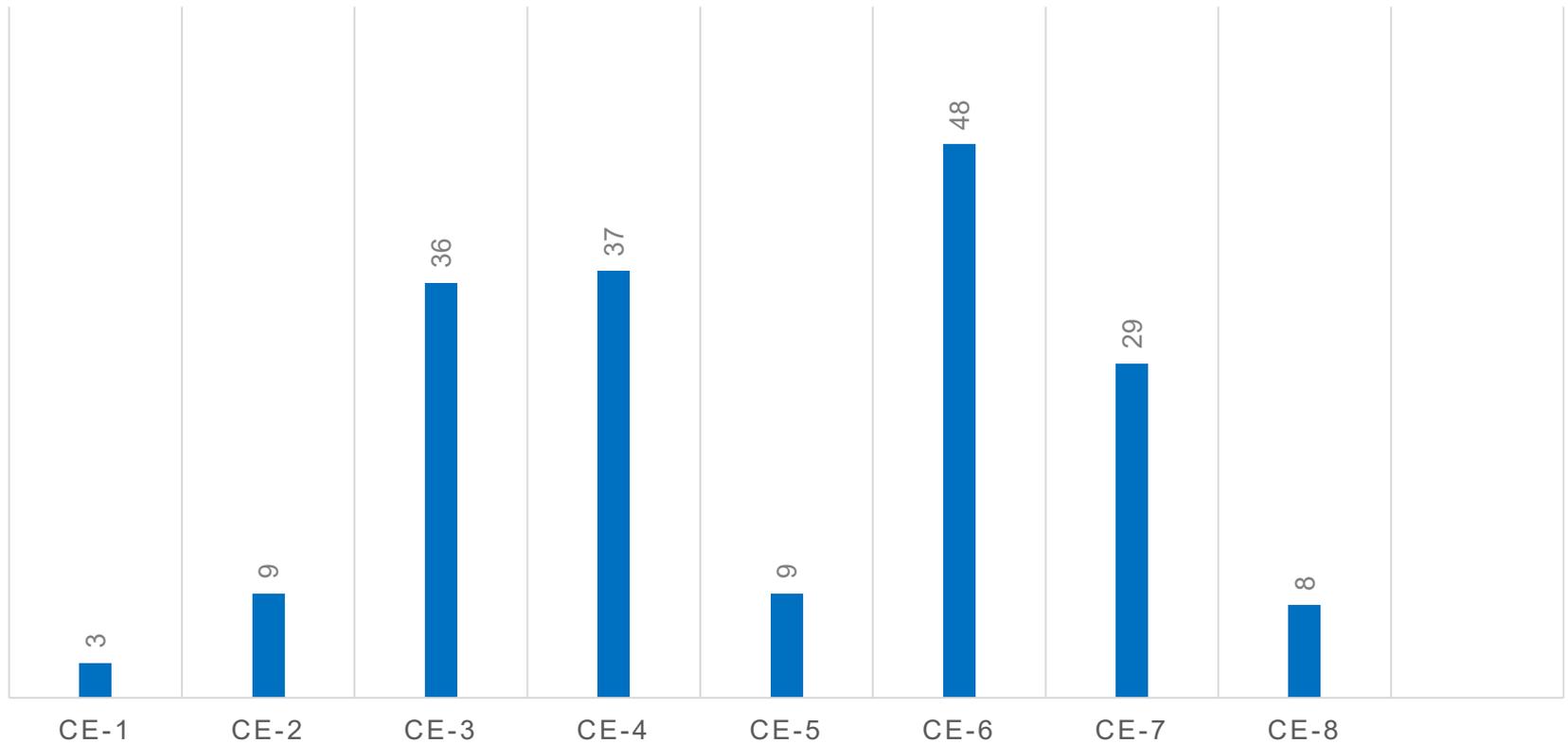
ANS Oversight Required by ICAO

- Air traffic control services
- Safety personnel (air traffic controllers)
- Flight procedures and flight inspection
- Communication, Navigation, and Surveillance services (CNS)
- Aeronautical telecommunication services
- Meteorological services (MET)
- **Aeronautical information services and Aeronautical information management (AIS/AIM)**
- **Cartographic services**
- Search and rescue (SAR)

ICAO Safety Oversight Responsibilities

ICAO State Safety Oversight Manual (Doc 9734 Part A)

What is Safety Oversight?

The process of ensuring that aviation professionals (such as air traffic controllers, engineering/electronics personnel, and others) perform their functions *safely* and *responsibly*

Effective implementation of international Standards and Recommended Practices and associated procedures

*Reference: ICAO Safety Oversight Manual (Doc 9734, Part A)*

Essential Responsibilities

✓ Establish rules

✓ Perform surveillance

✓ Resolve safety concerns

Basic ICAO Safety Oversight Activities

- Issuing licenses and approvals

- Surveillance

  - Monitoring

  - Investigations

  - Audits/Inspections

  - Assessments/Evaluations

- Cooperation with other safety services/organizations

SMS Operating Requirements

FAA Example

NGA/FAA agreements

ICAO

ICAO Annex 19, *Safety Management*

ICAO Document 9859, *Safety Management Manual (SMM)*

FAA

Order 8000.369, *Safety Management System*

Order 8040.4, *Safety Risk Management Policy*

Regulator

Order 1100.161, *Air Traffic Safety Oversight*

Order 8000.365, *Safety Oversight Circulars*

Operator

Order JO 1000.37, *Air Traffic Organization Safety Management System*

Order JO 1030.1, *Air Traffic Organization Safety Guidance*

Safety Risk Management Guidance for System Acquisitions

SMS Manual

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Thoughts…

- USOAP

- Activities

- Critical Elements

- SMS and Surveillance
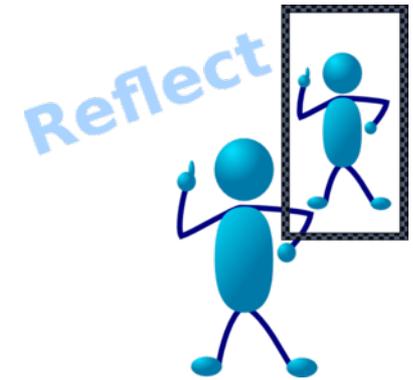
Questions and Discussion

# References

- ICAO Annex 19, Safety Management
- ICAO Safety Oversight Manual (Doc 9734, part A)
- ICAO Safety Management Manual (Doc 9859)

Workshop Exercise #4

Federal Aviation Administration

Audit the AIP

Developing an AIS/AIM Audit

Initiate: Audit Proposal	Concept	Identify Requirements	Methodology	Risk Assessment	**Proposal Briefing***
Pre-Audit: Build	Plan	Verify Requirements	Identify Measures	**Build Audit Checklist(s)***	Interview Questions
Pre-Audit: Readiness Check	Review Checklists	Notification Letter	Data Request	Team Readiness Check	**Pre-Audit Review***
Conduct Audit	Data Request Analysis	Opening Meeting	Interviews and Observation	Closing Meeting	
Post-Audit: Analysis	Consolidate Evidence	Evidence Mapping	Identify Observations	**Validation Briefing***	
Post-Audit: Report	Summary	Compliance Issues	Possible Safety Issues	Comments	Release
Follow-Up	Corrective Action Plan	Follow –up Monitoring			

How many red jellybeans do you see?

Pre-Audit Review

- Does management agree with the audit objective and scope?

- Does the checklist reflect the objective and scope?

- Does the team understand what they are looking for?
  - What evidence is needed?
  - Will you know if something is incorrect or missing?

Conduct the Audit: Data Collection

- Interviews

- Observations

- Records/documentation review

Tips for Successful Audits

- Remember: your focus as auditors is to look for evidence

- Always verify your data/observations

- Keep thorough records of what you observed or reviewed – use checklists and data sheets

- Analyze and review the data/information gathered to determine whether anything is missing

- Protect ANSP/AIS materials and documents

Audit the AIP

EXERCISE

Instructions: Audit the AIP

AIP Atlantis   GEN 0.1-1
                                                       6/27/2006

Part 1 — GENERAL (GEN)

GEN 0

GEN 0.1 PREFACE

1 NAME OF THE PUBLISHING AUTHORITY

The Aeronautical Information Publication (AIP) is published by authority of the Air Traffic Control Atlantis, which is responsible for providing aeronautical information.

2 APPLICABLE ICAO DOCUMENTS

The AIP has been prepared in accordance with the Standards and Recommended Practices (SARPs) of Annex 15 to the Convention on International Civil Aviation and the Aeronautical Information Services Manual (ICAO Doc 8126). Charts contained in the AIP are produced in accordance with Annex 4 to the Convention on International Civil Aviation and the Aeronautical Chart Manual (ICAO Doc 8697). Differences from ICAO Standards, Recommended Practices and Procedures are given in GEN 1.7.

3 THE AIP STRUCTURE AND ESTABLISHED REGULAR AMENDMENT INTERVAL

3.1 The AIP structure

The AIP forms part of the Integrated Aeronautical Information Package, details of which are given in GEN 3.1. The AIP is made up of three parts: General (GEN), En route (ENR) and Aerodromes (AD).
Note: in the AIP all cross references are made to sections, paragraphs or chart numbers

3.1.1 Part 1 - General (GEN)
Part 1 consists of five sections containing information as briefly described hereafter.

GEN 0   Preface; record of AIP amendments; record of AIP supplements; checklist of AIP pages; list of
        hand amendments to the AIP; table of contents to part 1.

GEN 1   National Regulations and Requirements
        Designated authorities; entry, transit and departure of aircraft; entry, transit and departure of
        passengers and crew; entry, transit and departure of cargo; aircraft instruments, equipment and
        flight documents; summary of national regulations and international agreements/conventions;
        differences from ICAO Standards, Recommended Practices and Procedures.

GEN 2   Tables and Codes
        Measuring system, aircraft markings, holidays; abbreviations used in AIS publications; chart
        symbols; location indicators; list of radio navigation aids; conversions of units of measurement;

In your teams:

- Review and update checklist questions as needed

- Access the **Atlantis AIP** files in the **Activities > AIP Audit** folder on the ICAO WACAF website *or* use your State AIP

- Audit the AIP using your team's checklist
  - Record compliance observations and evidence in the checklist

Questions and Discussion

Atlantis ANS Oversight Organization

Validation Briefing

Audit of <insert title>

Presented to: <Audience>

By: <Presenter's Name, Title>

Date: <Date>

Introduction

* Background
  * <Provide description of the audit>
  * <Identify any pertinent events that may have led the Polar ANS oversight organization to conduct the audit>

Objective and Scope

* Objective
* The <insert name of ANS oversight organization> will conduct an audit to determine the <insert name of ANSP/AIS> compliance with <insert audit title> requirements.

* Scope
  * The scope of this audit is <insert scope from audit proposal>.

Focus Areas

* <List the title of each focus area>
  * <Describe each focus area>

Methodology & Requirements

* Methodology
  * <Describe the methods used to conduct the audit, e.g. onsite or desk audit, checklists, interviews, etc.>
* Requirements
  * The audit team evaluated <insert name of ANSP/AIS> compliance with the following requirements:
    * <insert requirement Title and reference>
    * <insert requirement title and reference>

Proposed Observations of Non-Compliance

* The audit team documented <insert number> of observations of non-compliance:
  * <List and describe observations identified during the audit>

Observations of Potential Adverse Safety Impact

* The audit team documented <insert number> of observations of adverse safety impact:
  * <List and describe observations identified during the audit>

Proposed Comments

* The audit team would like to note the following items:
  * <List positive or other items of note identified during the audit>

Audit Report

* Audit Report due to <insert name of ANSP/AIS> by <insert date>.

Audit Team

* Audit Team:
    * <insert team members' name, title (e.g., Audit Team Lead or Team Member>

Questions and Discussion

Module Objectives

- Review safety oversight surveillance obligations
- Build a risk-based surveillance program
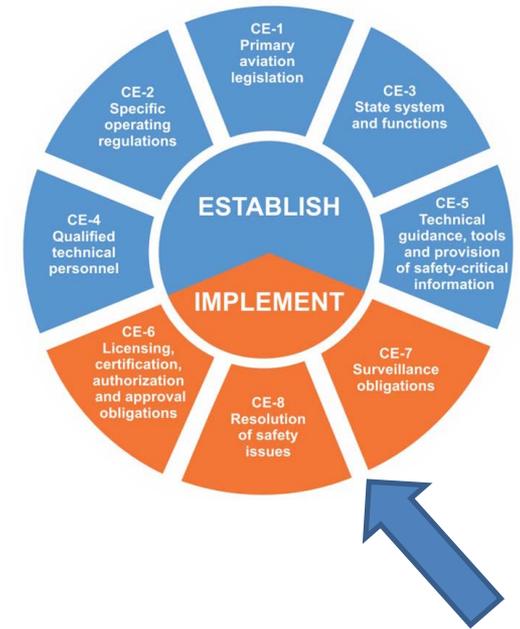
What are we required to do?

A REVIEW OF SAFETY OVERSIGHT SURVEILLANCE OBLIGATIONS

Surveillance Program Components CEs 7 and 8 Review
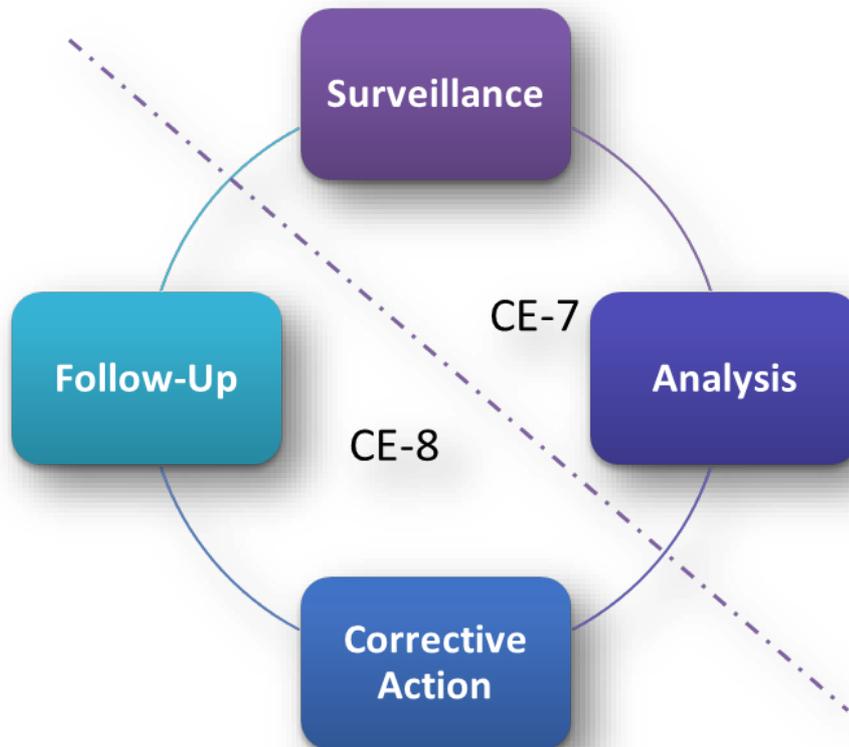
CE-7 Surveillance Obligations

1. Collect operational data
2. Analysis
3. Review data to measure the degree of compliance

CE-8 Resolution of Safety Issues

1. Develop, implement, and monitor corrective action(s)
2. Follow-Up
3. Ensure corrective action(s) have been implemented

Source: FAA/DOT Continuing Analysis and Surveillance System (CASS) Description and Models (http://www.tc.faa.gov/its/worldpac/techrpt/ar03-70.pdf)

Surveillance Obligations Review
(Critical Element 7)

CE-7
Surveillance
Obligations

- The regulatory authority must develop a continuous surveillance program

- Surveillance of AIS should be appropriate for the size and complexity of the aviation system

- This includes the surveillance of designated personnel who perform safety oversight functions on behalf of the Civil Aviation Authority (contract personnel)

Surveillance Program Review

- Ensure the AIS staff are capable by conducting a comprehensive assessment of individual competencies

- Ensure the AIS has the ability to conduct operations and maintenance in accordance with requirements

Source: Concepts discussed in ICAO Safety Oversight Manual, Doc 9734-A

Risk-Based AIS Surveillance Program Review

What could go wrong?

What does risk look like?

What prevents things from going wrong?

How will I know if controls are working?

Data and Information Hazards	Variation	Controls/Barriers	Safety Oversight Activities
Incorrect	Competency	Formal Arrangements	Continuous Monitoring
Incomplete	Business Rules	QMS	Audits and Assessments
Untimely	Process	Production Control	Inspections
Unsynchronized	Traceability	Configuration Management	
Unavailable			
*Unprotected			

Resolution of Safety Issues Review
(Critical Element 8)

CE-8 Resolution of Safety Issues

- Develop, implement, and monitor corrective action(s)

- Follow-Up

- Ensure corrective action(s) have been implemented

How do we develop strategies?

STRATEGIES TO PRIORITIZE AND CONDUCT OVERSIGHT ACTIVITIES

A Strategy is…

A high-level solution to achieve one or more goals

- Direction and scope over a period of time

- Resources configured to meet needs
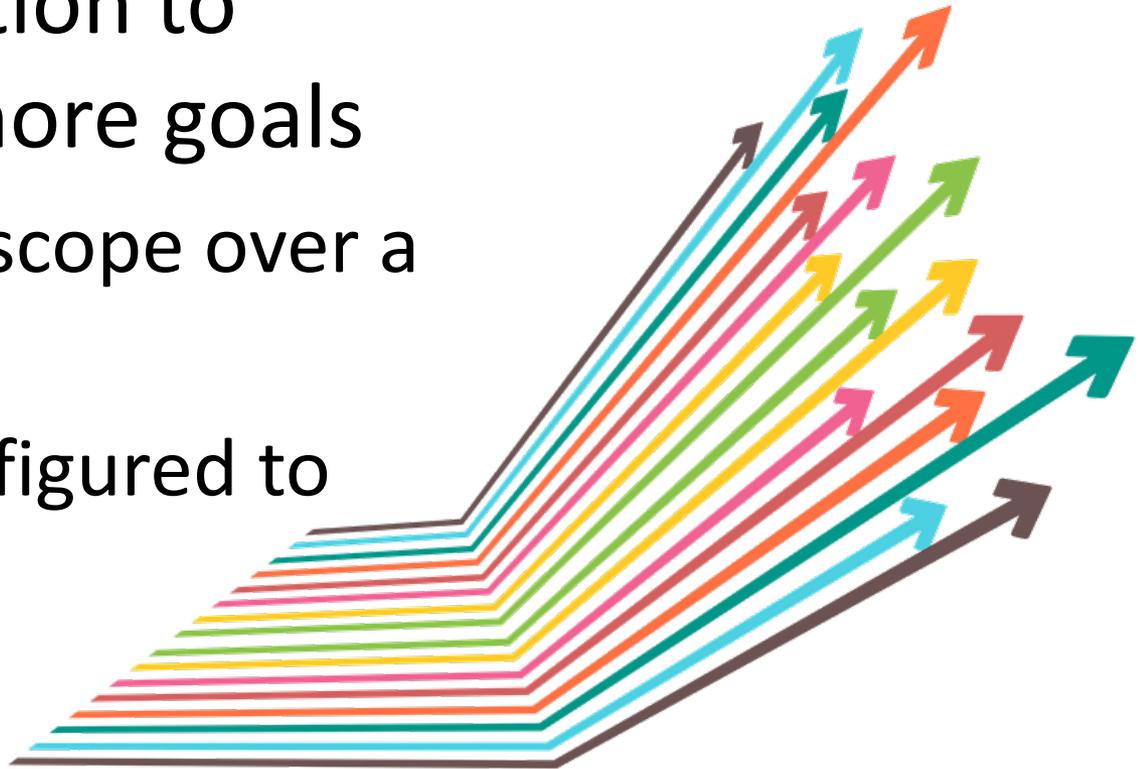
Resources: What is Strategy? MindTools (https://www.mindtools.com/pages/article/what-is-strategy.htm)
The Difference Between a Strategy, a Plan, and a Process by Duncan Bucknell
(https://duncanbucknell.com/2013/04/12/the-difference-between-a-strategy-a-plan-and-a-process/)

Develop a Surveillance Plan

- What are the objectives?

- What will be observed, and why?

- How will it be observed?

- What techniques to be used?

- Will this be scheduled or unscheduled surveillance?

- When will it be observed?

- With what frequency?

Develop a Surveillance Plan
(Continued)
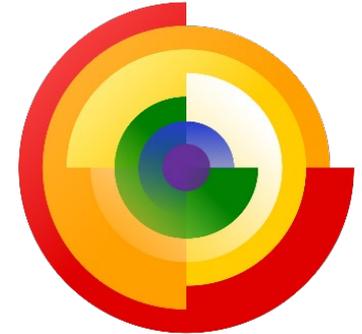
- Consider a multi-year plan

- Establish annual surveillance targets

  - Consider resources

  - Expand on the previous years progress

- Prioritize surveillance topics by estimated risk

- Incorporate follow-up on compliance issues

How can we do surveillance of aeronautical information organizations?

BUILD A RISK-BASED PROGRAM

A Risk-Based Program

- Meets safety oversight responsibilities through a performance-based, risk-focused, and data-informed surveillance system
- Identifies hazards and risks related to mandatory requirements (controls)
- Addresses emerging safety issues
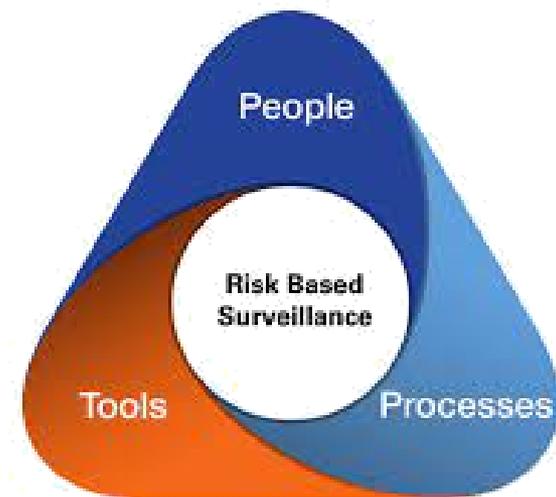
# Build a Risk-Based Surveillance Program
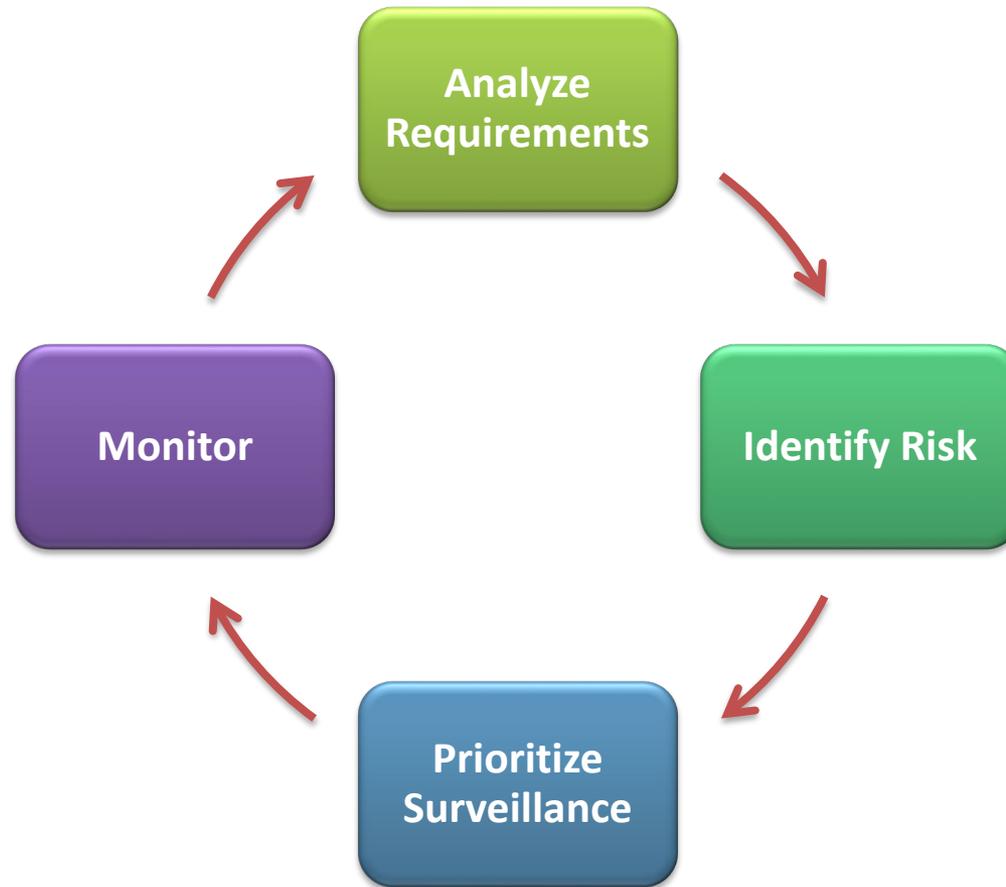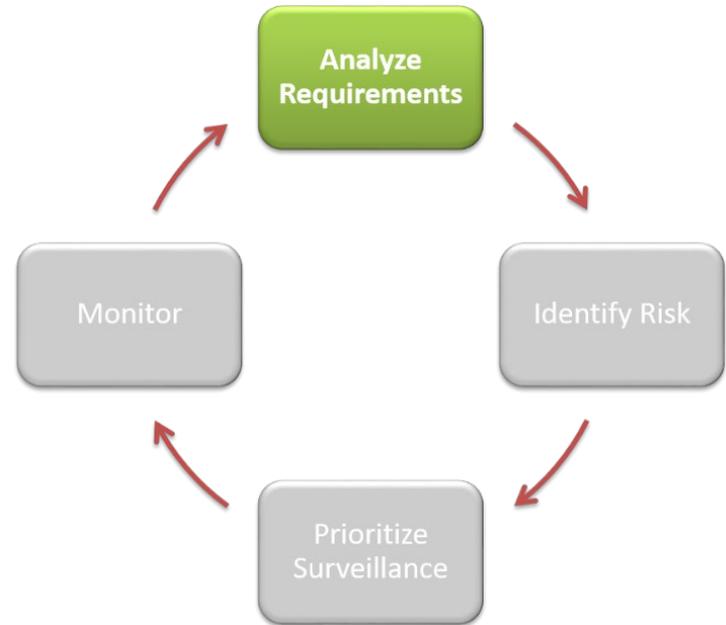
How do we analyze risk?

ANALYZE REQUIREMENTS

Analyze Requirements

- Link State statutes and directives to ICAO SARPs
- Identify requirements that form a basis for surveillance specific to aeronautical data and information:
  - Annex 15 – Aeronautical Information Services
  - Annex 4 – Charting
  - PANS-AIM/Data Catalog (Doc 10066)
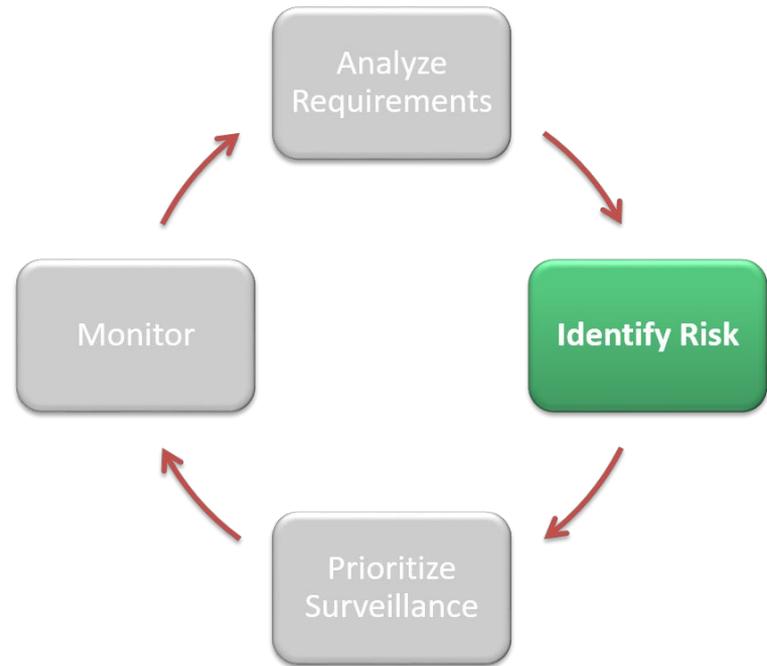
How do we identify risk?

IDENTIFY RISK

Identify Risk

- Corrupt, erroneous, late or missing aeronautical data and information can potentially affect the safety of air navigation

- Data and information hazards:
  - Incorrect
  - Incomplete
  - Untimely
 - Unsynchronized
  - Unavailable
  - Unprotected

Resource: ICAO Annex 15, Amendment 42

Risks in the AIS Information Factory
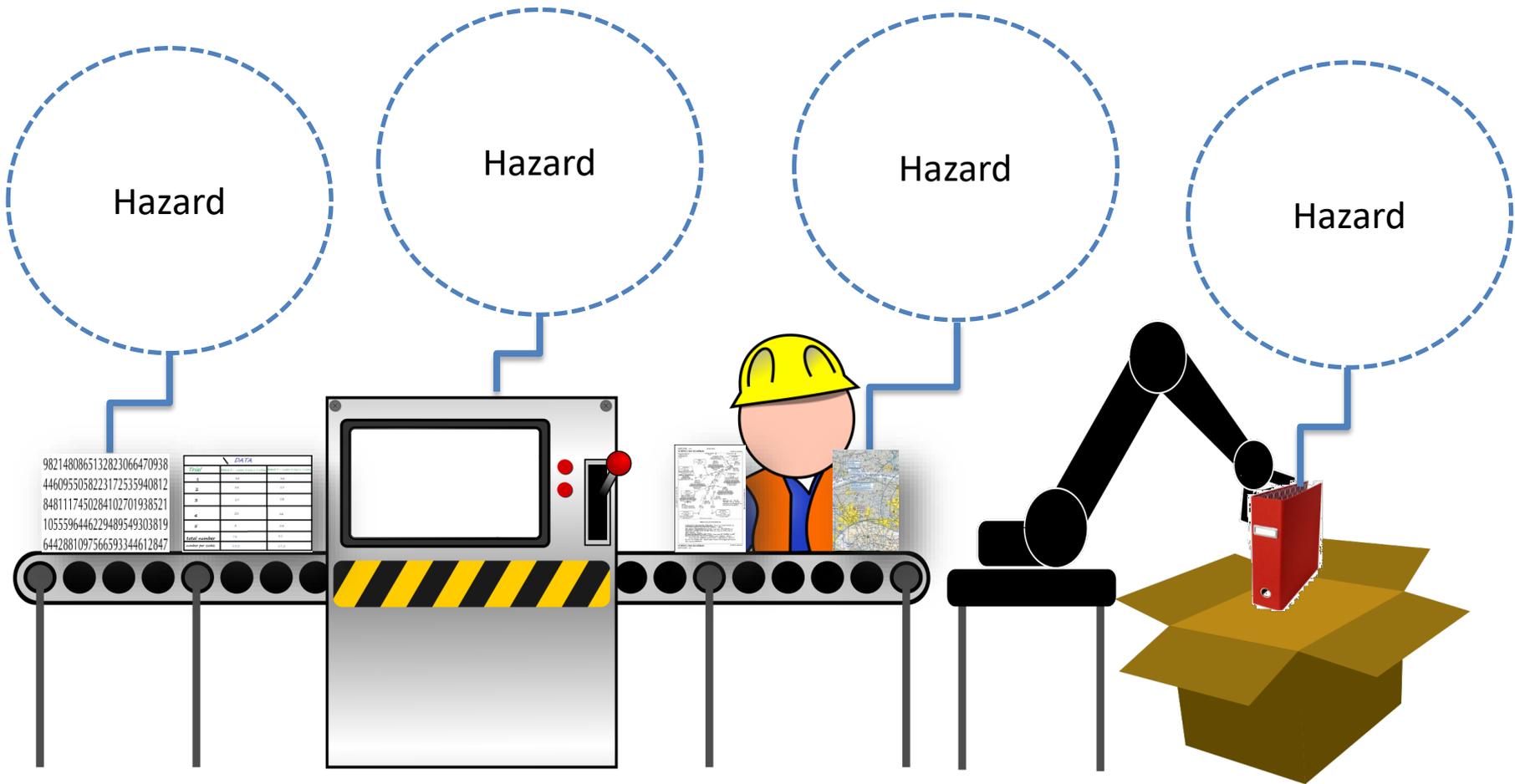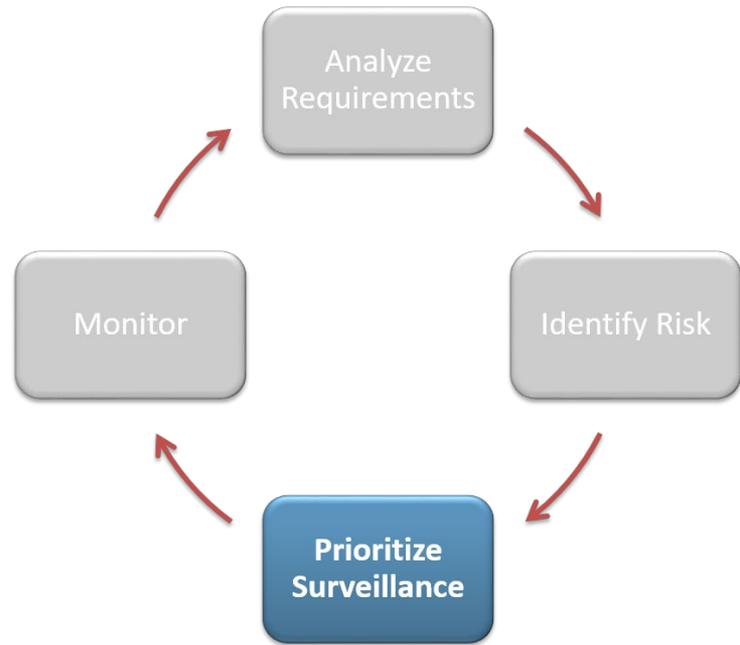
How do we prioritize risk?

PRIORITIZE SURVEILLANCE

Prioritize Surveillance

AIS

Safety Risk

Focus surveillance activities

Possible Surveillance Topics

| Requirements	Products	Services	Data	People

• Information Management
• Quality Management
• Data Protection
• Automation
• Human Factors
• Validation and Verification
	• AIP
	  • Amendments
	  • Supplements
	  • Aeronautical Information Circular
	• Aeronautical charts
	• Terminal Procedures
		• NOTAM
		• Pre flight information
		• Post flight information
		• Telecommunications
		• Distribution
			• Terrain & Obstacles
			• Aerodrome & Heliport
			• NAVAIDs
			• Airspace
			• Routes
			• Points
			• Terminal Procedures
				• Technical qualification
				• Competency
				• Training

Analyze and Assess Risk

Possible Surveillance Topics

Requirements	Products	Services	Data	People

• Information Management
• Quality Management
• Data Protection
• Automation
• Human Factors
• Validation and Verification
	• AIP
	  • Amendments
	  • Supplements
	  • Aeronautical Information Circular
	• Aeronautical charts
	• Terminal Procedures
		• NOTAM
		• Pre flight info
		• Post flight information
		• Telecommuni
		• Distribution		

Risk probability	Risk severity				
	Catastrophic A	Hazardous B	Major C	Minor D	Negligible E
Frequent 5	5A	5B	5C	5D	5E
Occasional 4	4A	4B	4C	4D	4E
Remote 3	3A	3B	3C	3D	3E
Improbable 2	2A	2B	2C	2D	2E
Extremely improbable 1	1A	1B	1C	1D	1E
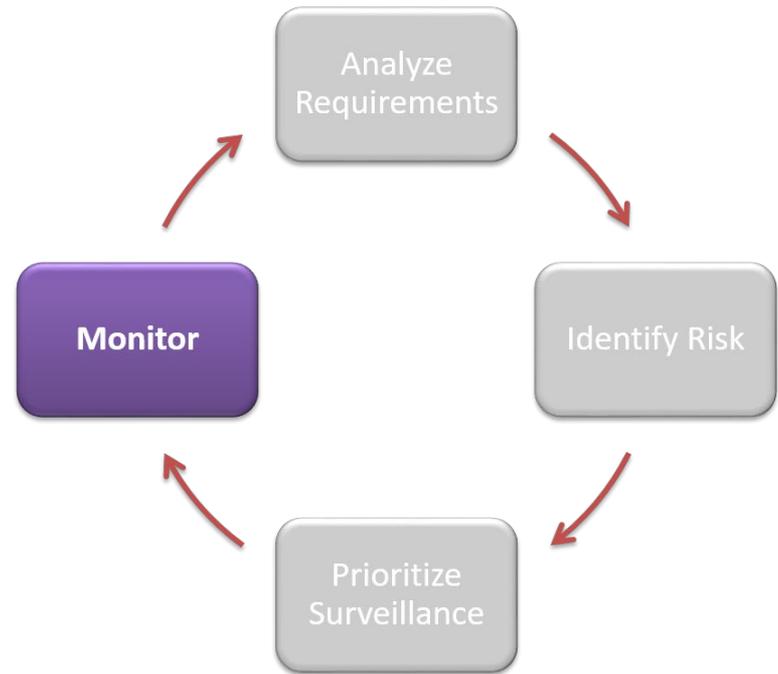
How do we do continuous monitoring?

MONITOR

Monitor

A surveillance activity to enable a safety oversight organization to:

- Follow-up on resolution of compliance issues and other safety concerns

- Identify changes, trends, inconsistencies, gaps or weaknesses in activities or processes

- Determine future surveillance activities

Build a Monitoring Plan

- What are the monitoring objectives?

- What will be monitored and why?

- How will it be monitored?

- What techniques to be used?

- Performance measurements?

- When will it be monitored?

- With what frequency?

- Who will monitor?

Safety Oversight Surveillance Review
Connecting AIS Topic and Process

AIS Quality Management System

- Competency
- Metadata
- Assurance
- Monitor
- Audits

Surveillance Processes and Procedures

- Surveillance (collect operational data)
- Analysis (measure compliance)

Audit Activities

- Initiate Audit
- Pre-Audit Activities
- Conduct Audit
- Post-Audit Activities
- Record-keeping

Thoughts…

- Surveillance activities support safety oversight and resolution of safety concerns

- Surveillance strategies: comprehensive and risk-based program regarding potential surveillance topics

- Surveillance requires collection of data/information and analysis

Questions and Discussion

References

- ICAO Annex 4

- ICAO Annex 15

- ICAO Safety Oversight Manual, Doc 9734-A

- PANS-AIM/Data Catalogue, Doc 10066

- What is Strategy? MindTools (https://www.mindtools.com/pages/article/what-is-strategy.htm)

- The Difference Between a Strategy, a Plan, and a Process by Duncan Bucknell (https://duncanbucknell.com/2013/04/12/the-difference-between-a-strategy-a-plan-and-a-process/)