HAZARD IDENTIFICATION AND RISK ASSESSMENT IN AVIATION

Module 1: Introduction to Hazard Identification and Risk Assessment in Aviation SMS

Module 2: Hazard Identification

Module 3: Risk Assessment Techniques and Strategies

Module 4: Risk Management

Module 5: Monitoring and Evaluation

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1.1 Definition of Hazard Identification and Risk Assessment

- Hazard Identification: The process of identifying potential hazards in aviation operations
- Risk Assessment: The process of evaluating the likelihood and consequences of identified hazards

Hazard Identification and Risk Assessment are essential components of Safety Management Systems in aviation operations

1.2 Importance of Hazard Identification and Risk Assessment in Aviation SMS

- Hazard Identification and Risk Assessment are crucial for managing safety in aviation operations
- Effective Hazard Identification and Risk Assessment can prevent accidents and incidents
- Safety risks can be identified and managed through Hazard Identification and Risk Assessment

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1.3 Regulatory Requirements for Hazard Identification and Risk Assessment

- Regulatory authorities require organizations to have Hazard Identification and Risk Assessment procedures in place

- Hazard Identification and Risk Assessment are mandatory components of Safety Management Systems in aviation operations

1.4 Summary

- Hazard Identification and Risk Assessment are essential components of Safety Management Systems in aviation operations
- Effective Hazard Identification and Risk Assessment can prevent accidents and incidents
- Regulatory authorities require organizations to have Hazard Identification and Risk Assessment procedures in place to comply with safety regulations.

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Module 2: Hazard Identification

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2.1 Purpose of Hazard Identification

- The purpose of Hazard Identification is to identify potential hazards in aviation operations before they cause accidents or incidents

- Hazard Identification is a proactive approach to safety management that helps organizations identify and mitigate safety risks

2.2 Methods and Tools for Hazard Identification

There are several methods and tools for Hazard Identification, including:

- Safety audits and inspections
- Safety surveys and questionnaires
- Incident reporting and analysis

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2.2 Methods and Tools for Hazard Identification

There are several methods and tools for Hazard Identification, including:

- Safety audits and inspections
- Safety surveys and questionnaires
- Incident reporting and analysis
- Job safety analysis (JSA)
- Fault tree analysis (FTA)
- Event tree analysis (ETA)
- Hazard and operability study (HAZOP)

2.2 Methods and Tools for Hazard Identification

Job safety analysis (JSA): Aircraft Fueling

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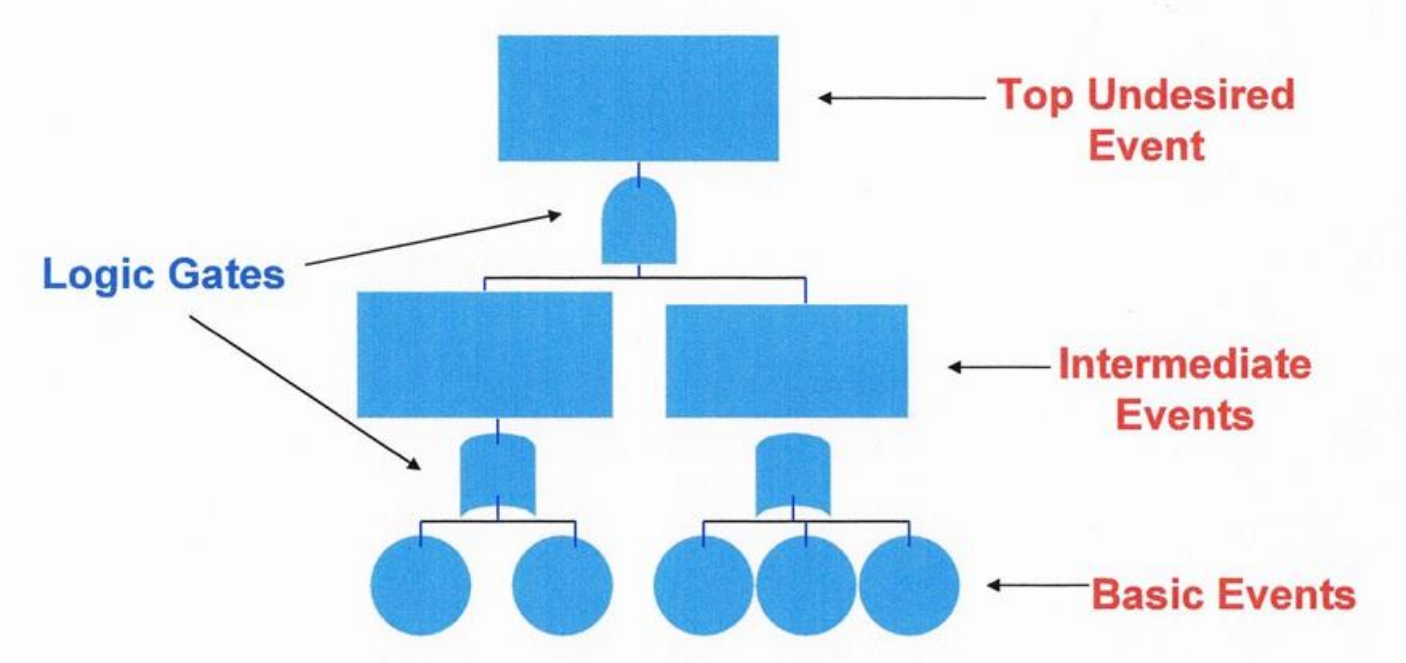
2.2 Methods and Tools for Hazard Identification

Fault tree analysis (FTA)/Event tree analysis (ETA) Examples



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2.2 Methods and Tools for Hazard Identification

Hazard and operability study (HAZOP) Example:

Guide Word	Deviation	Causes	Consequences	Action
Less	Less flow of cooling water	Pipe blockage	Temperature of process fluid remains constant	High Temperature Alarm
More	More cooling flow	Failure of cooling water valve	Temperature of process fluid decrease	Low Temperature Alarm
More of	More pressure on tube side	Failure of process fluid valve	Bursting of tube	Install high pressure alarm
Contamination	Contamination of process fluid line	Leakage of tube and cooling water goes in	Contamination of process fluid	Proper maintainance and operator alert
Corrosion	Corrosion of tube	Hardness of cooling water	Less cooling and crack of tube	Proper maintainence

2.3 Common Hazards in Aviation Operations

Common hazards in aviation operations include:

- Aircraft collisions and near-misses
- Runway incursions and excursions
- Bird strikes and wildlife hazards
- Weather-related hazards
- Mechanical failures and malfunctions
- Human errors and mistakes
- Security threats and risks

2.4 Applying Hazard Identification Techniques in Aviation SMS

To apply Hazard Identification techniques in Aviation SMS, organizations should:

- Establish a Hazard Identification program that is integrated with their Safety Management System
- Train employees on Hazard Identification techniques and encourage them to report potential hazards
- Conduct regular safety audits and inspections to identify hazards
- Analyze incident reports to identify underlying hazards and root causes
- Use Hazard Identification tools such as JSA, FTA, ETA, and HAZOP to identify hazards and assess risks
- Prioritize hazards based on their potential impact on safety and the likelihood of occurrence
- Develop and implement risk controls to mitigate identified hazards

2.5 Summary

- Hazard Identification is a proactive approach to safety management that helps organizations identify and mitigate safety risks
- There are several methods and tools for Hazard Identification, including safety audits, surveys, and questionnaires, incident reporting and analysis, JSA, FTA, ETA, and HAZOP
- Common hazards in aviation operations include aircraft collisions, runway incursions, bird strikes, weather-related hazards, mechanical failures, human errors, and security threats
- To apply Hazard Identification techniques in Aviation SMS, organizations should establish a Hazard Identification program, train employees, conduct regular safety audits and inspections, analyze incident reports, use Hazard Identification tools, prioritize hazards, and develop risk controls

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3.1 Purpose of Risk Assessment

- The purpose of Risk Assessment is to identify, analyze, and evaluate potential safety risks in aviation operations, and to develop and implement controls to mitigate those risks.

- Risk Assessment is a key component of Aviation SMS that helps organizations prioritize and manage safety risks.

3.2 Steps in the Risk Assessment Process

- The steps in the Risk Assessment process include:

1. Identify Hazards: Identify potential hazards that could lead to accidents or incidents in aviation operations.
2. Analyze Hazards: Analyze the potential consequences and likelihood of each identified hazard.
3. Evaluate Risks: Evaluate the risks associated with each identified hazard by considering the consequences and likelihood of occurrence.
4. Develop Controls: Develop and implement controls to mitigate identified risks.
5. Monitor and Review: Monitor and review the effectiveness of implemented controls and revise them as necessary.

3.3 Qualitative and Quantitative Risk Assessment

- Qualitative Risk Assessment involves the assessment of risks based on subjective judgments and qualitative data. It is useful for identifying potential hazards and developing risk controls.

- Quantitative Risk Assessment involves the use of mathematical models and statistical analysis to assess risks based on quantitative data. It is useful for analyzing complex risks and evaluating the effectiveness of risk controls.

3.4 Risk Assessment Techniques and Strategies

There are several Risk Assessment techniques and strategies that can be used in Aviation SMS, including:

- Bowtie analysis: A technique that visualizes the relationships between hazards, potential consequences, and risk controls.
- Failure modes and effects analysis (FMEA): A technique that identifies potential failure modes and their effects on safety.
- Risk matrix: A tool that assesses risks based on their likelihood and consequences and assigns them a risk rating.
- Scenario analysis: A technique that assesses the potential consequences of specific scenarios or events.

3.4 Risk Assessment Techniques and Strategies

There are several Risk Assessment techniques and strategies that can be used in Aviation SMS, including:

FMEA Example

System _____
Subsystem _____
Component _____
Design Lead _____
Core Team _____

Potential Failure Mode and Effects Analysis (Design FMEA)

Key Date _____

FMEA Number _____
Prepared By _____
FMEA Date _____
Revision Date _____
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Item / Function	Potential Failure Mode(s)	Potential Effect(s) of Failure	Sev	Potential Cause(s)/ Mechanism(s) of Failure	Prob	Current Design Controls	Det	RPN	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
											Actions Taken	New Sev	New Occ	New Det	New RPN
Landing Gear															
Landing Gear System: Provide safe and reliabe operation during takeoff and landing	Failure to extend	Inability to Land	9	Damage to aircraft upon landing/fire	3	Sensors to detect failure/manual LG cycle	3	**81**							

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3.5 Applying Risk Assessment Techniques and Strategies in Aviation SMS

To apply Risk Assessment techniques and strategies in Aviation SMS, organizations should:

- Establish a Risk Assessment program that is integrated with their Safety Management System.
- Train employees on Risk Assessment techniques and encourage them to report potential risks.
- Use Risk Assessment tools and techniques to identify and evaluate risks.
- Prioritize risks based on their potential impact on safety and the likelihood of occurrence.
- Develop and implement risk controls to mitigate identified risks.
- Monitor and review the effectiveness of implemented controls and revise them as necessary

3.6 Summary

- Risk Assessment is a key component of Aviation SMS that helps organizations identify, analyze, evaluate, and manage safety risks.
- The Risk Assessment process includes the identification of hazards, analysis of hazards, evaluation of risks, development of controls, and monitoring and review.
- Qualitative and Quantitative Risk Assessment are two methods for assessing risks in aviation operations.
- Risk Assessment techniques and strategies include Bowtie analysis, FMEA, Risk matrix, Scenario analysis, and Safety culture assessment.
- To apply Risk Assessment techniques and strategies in Aviation SMS, organizations should establish a Risk Assessment program, train employees, use Risk Assessment tools and techniques, prioritize risks, develop and implement risk controls, and monitor and review their effectiveness.

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Using the picture:

1. Identify key hazards and associated risks
2. Select a risk assessment technique to assess the identified risks
3. Develop risk management strategies to mitigate identified risks
4. Discuss how you can apply these skills in your organization

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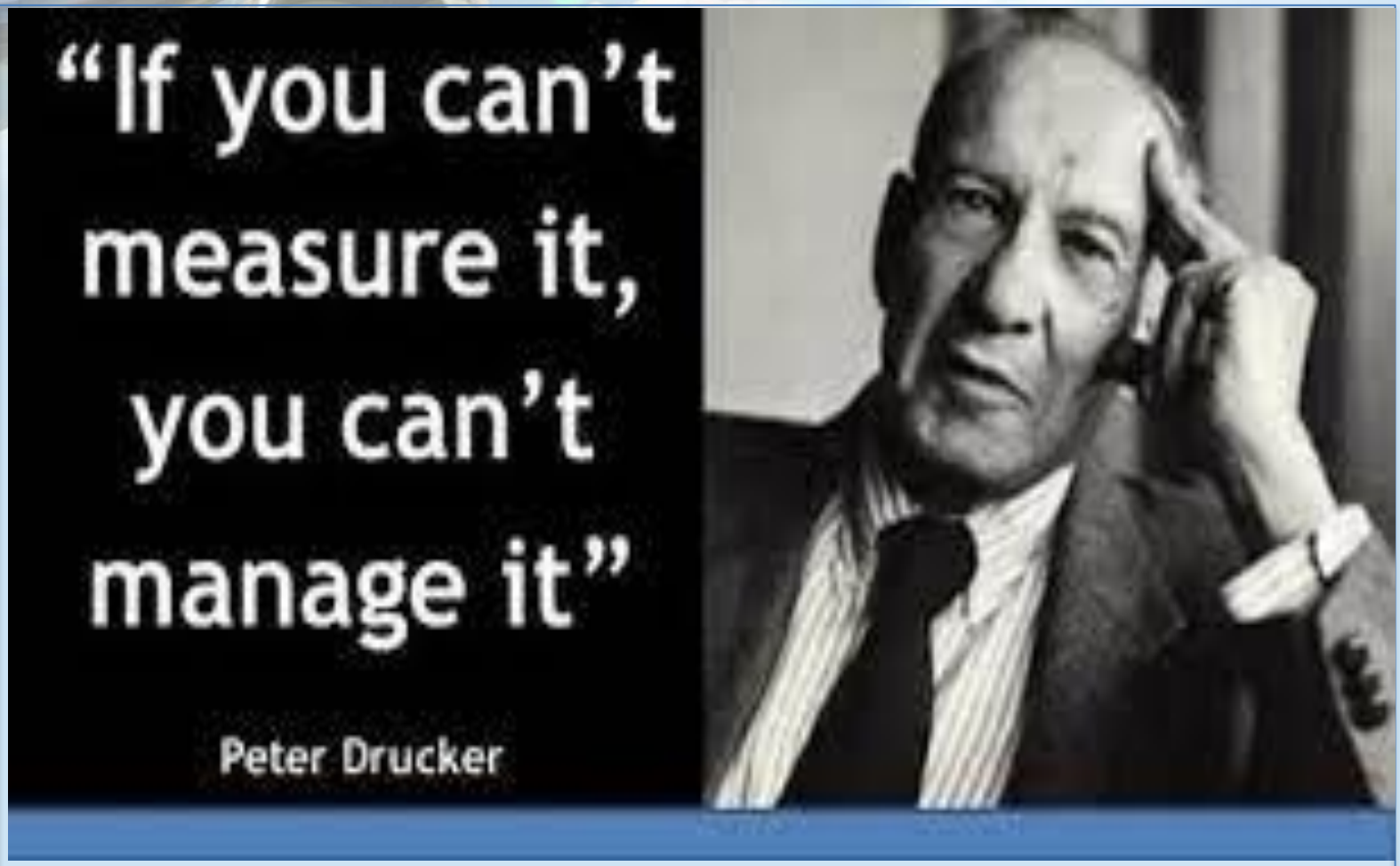
5.1 Principles of Monitoring and Evaluation

- A systematic and continuous process of gathering and analyzing data to measure the performance and effectiveness of an SMS.
- It is critical as it provides a means to measure the effectiveness of safety management processes and identify areas for improvement. It enables the identification of trends, patterns, and areas of concern, allowing for proactive and preventive actions to be taken.

5.1 Principles of Monitoring and Evaluation



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5.1 Principles of Monitoring and Evaluation

1. Clear objectives and measurable indicators that are aligned with the safety goals and objectives of the organization. (S.M.A.R.T)
2. Data should be collected from multiple sources, including incident reports, audits, and surveys, to ensure a comprehensive assessment.
3. Action-oriented and should inform decision-making processes
4. Should involve the participation and collaboration of all stakeholders, including employees, management, and external parties such as regulatory authorities
5. Should provide timely and relevant reporting of safety performance and effectiveness to key stakeholders
6. Should be a continuous and ongoing process

5.2 Key Performance Indicators

- KPIs are S.M.A.R.T values to indicate the progress of an organization towards achieving its goals, also used to evaluate the effectiveness of the SMS
- The KPIs provide actionable insights that can help the organization to improve its performance. It is also important to ensure that the KPIs are reliable and based on accurate data.
- Should be aligned with the organization's goals and objectives, monitored and evaluated regularly to identify necessary adjustments.

5.3 Monitoring and Evaluation Techniques

- Self-audit and self-assessment
- Internal audits and inspections
- External audits and inspections
- Surveys and feedback mechanisms
- Incident reporting and investigation
- Safety performance monitoring systems

5.4 Continuous Improvement of the SMS

- Ongoing process of identifying and implementing improvements in an organization's operations, processes, products or services to enhance its overall efficiency, quality, and performance, based on safety performance data
- Developing and implementing corrective and preventive actions
- Monitoring the effectiveness of corrective and preventive actions

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THANK YOU

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