Objective

- At the end of this module, participants will be able to apply the fundamentals of hazard identification and analysis through a case study.

Outline

- Two definitions
- First fundamental – Understanding hazards
- Second fundamental – Hazard identification
- Third fundamental – Hazard analysis
- Fourth fundamental – Documentation of hazards
- Questions and answers
- Points to remember
- Exercise 04/01 – International airport construction project (See Handout N° 3)
Two definitions

- **Hazard** – Condition, object or activity **with the potential** of causing injuries to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function.
- **Consequence** – Potential outcome(s) of the hazard.
  - A wind of 15 knots blowing directly across the runway is a **hazard**.
  - The potential that a pilot may not be able to control the aircraft during takeoff or landing is one of the **consequences** of the hazard.

First fundamental – Understanding hazards

- There is a natural tendency to describe hazards as their consequence(s).
  - “Unclear aerodrome signage” vs. “runway incursion”
- Stating a hazard as consequence(s) disguises the nature of the hazard and interferes with identifying other important consequences.
- Well-named hazards allow to infer the sources or mechanisms of the hazard and allow to evaluate the loss outcome(s).

Examples of natural hazards

- **Severe weather or climatic events:**
  - E.g.: hurricanes, major winter storms, drought, tornados, thunderstorms, lighting, and wind shear.
- **Adverse weather conditions:**
  - E.g.: icing, freezing precipitation, heavy rain, snow, winds, and restrictions to visibility.
Examples of natural hazards

- Geophysical events:
  - E.g.: earthquakes, volcanoes, tsunamis, floods and landslides.
- Geographical conditions:
  - E.g.: adverse terrain or large bodies of water.
- Environmental events:
  - E.g.: wildfires, wildlife activity, and insect or pest infestation.
- Public health events:
  - E.g.: epidemics of influenza or other diseases.

Examples of technical hazards

- Deficiencies regarding:
  - E.g.: aircraft and aircraft components, systems, subsystems and related equipment.
  - E.g.: an organization’s facilities, tools, and related equipment.
  - E.g.: facilities, systems, sub-systems and related equipment that are external to the organization.

Examples of economics hazards

- Major trends related to:
  - Growth.
  - Recession.
  - Cost of material or equipment.
  - Etc.

Second fundamental – Hazard identification

- In order to identify hazards, consider:
  - Design factors, including equipment and task design.
  - Procedures and operating practices, including documentation and checklists.
  - Communications, including means, terminology and language.
  - …
Second fundamental – Hazard identification

- Consider:
  - **Organizational factors**, such as company policies for recruitment, training, remuneration and allocation of resources.
  - **Work environment factors**, such as ambient noise and vibration, temperature, lighting and protective equipment and clothing.
  - ...
### Hazard identification

<table>
<thead>
<tr>
<th>Specific conditions</th>
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<tbody>
<tr>
<td>Unexplained increase in safety-related events or infractions.</td>
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<tr>
<td>Major operational changes are foreseen.</td>
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<td>Periods of significant organizational change.</td>
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</table>

### Third fundamental – Hazard analysis

#### ABC of hazard analysis

- **A** – State the generic hazard *(hazard statement)*
  - Airport construction
- **B** – Identify specific components of the hazard
  - Construction equipment
  - Closed taxiways
  - …
- **C** – Naturally leading to specific consequence(s)
  - Aircraft colliding with construction equipment
  - Aircraft taking wrong taxiway
  - …

### Fourth fundamental – Documentation of hazards

- Appropriate documentation management is important as:
  - It is a formal procedure to translate operational safety data into hazard-related information.
  - It becomes the “safety library” of an organization.

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*ICAO Safety Management Systems (SMS) Course*

*Module N° 4 – Hazards*
Fourth fundamental – Documentation of hazards

- Tracking and analysis of hazards is facilitated by standardizing:
  - Definitions
  - Understanding
  - Validation
  - Reporting
  - Measurement
  - Management

Reactive method
- ASR
- MOR
- Incident reports
- Accident reports

Proactive method
- ASR
- Surveys
- Audits

Predictive method
- FDA
- Direct observation systems

Method
- Identification
- Management
- Documentation
- Information

Feedback
- Trend analysis
- Re-evaluate strategies and processes
- Re-evaluate strategies and processes

Inform
- Person(s) responsible for implementing strategies
- Implement strategies
- Assign responsibilities

Assess the consequences and prioritize the risks

Safety bulletins
- Report distribution
- Seminars and workshops

The focus of hazard identification

- Hazard identification is a wasted effort if restricted to the aftermath of rare events.

ICAO Safety Management Systems (SMS) Course
Module N° 4 – Hazards
**Questions and answers**

- **Q:** Define the concept of hazard.
- **A:**
  - **Hazard** – Condition, object or activity with the potential of causing injuries to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function.

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**Questions and answers**

- **Q:** Provide three examples of areas/factors to consider when identifying hazards.
- **A:**
  - **Design factors**, including equipment and task design.
  - **Procedures and operating practices**, including documentation and checklists.
  - **Communications**, including means, terminology and language.

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**Questions and answers**

- **Q:** Name three specific circumstances when hazard identification is essential.
- **A:**
  - Unexplained increase in safety-related events or infractions.
  - Major operational changes are foreseen.
  - Periods of significant organizational change.
Points to remember

1. Hazards have potential consequences.
2. Sources of hazard identification
3. ABC of hazard management.
4. Hazard documentation: the “safety library” of an organization.

International airport construction project

- **Group activity:**
  - A facilitator will be appointed, who will coordinate the discussion.
  - A summary of the discussion will be written on flip charts, and a member of the group will brief on their findings in a plenary session.

- **Scenario:**
  - Construction project to extend and repave one of the two crossing runways at an international airport (100,000 movements a year).
Three-phase construction project

Scope of the work

1. Phase 1:
   - Extend the length of RWY 09-27 by 900 meters westward and width from 30 to 45 meters from a point 100 m from the intersection with RWY 18-36, and strengthen the runway extension (from asphalt to concrete) to increase its Pavement Classification Number (PCN).
   - Extend the length of TWY Delta by 900 meters westward.
   - Estimated time to complete the work: Seven (7) months.

2. Phase 2:
   - Construct and enlarge new threshold entrance and holding zone at TWY Charlie.
   - Extend the width of RWY 09-27 from 30 to 45 meters and strengthen (from asphalt to concrete) this part of the runway up to a point 200 m before intersection TWY A-B to increase its PCN.
   - Estimated time to complete the work: Five (5) months.

3. Phase 3:
   - Complete the construction work of RWY 09-27 for the central area of the last 350 m at the intersection of RWY 09-27 and RWY 18-36 (from asphalt to concrete), increase its width from 30 to 45 meters and its PCN.
   - Estimated time to complete the work: Two (2) months.
Scope of the work

- Runway 18-36 utilization during the construction work
  - Continuous utilization of RWY 18-36 during the three-phase construction project.
  - RWY 18-36 length is 3,850 m and the distance available from threshold RWY 18 to intersection RWY 09-27 is 2,600 m.
  - Information must be provided to airport users.

Identify hazards

- Your task
  - Identify the hazards using brainstorming techniques.
  - Brainstorm a list of possible hazards, their components and their consequences (use a flip chart).
  - Complete the attached log (Table 04/01) as follows:
    - List type of operation or activity
    - State the generic hazard (hazard statement)
    - Identify specific components of the hazard
    - List hazard-related consequences
  - It is recommended to conduct the analysis per phase of construction.

Table 04/01 – Hazard identification

<table>
<thead>
<tr>
<th>No</th>
<th>Type of operation or activity</th>
<th>Generic hazard (hazard statement)</th>
<th>Specific components of the hazard</th>
<th>Hazard-related consequences</th>
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