Module 5

Interim Measures

Language Proficiency Implementation Plan Workshop (Dubai, UAE, 28 to 31 January 2008)

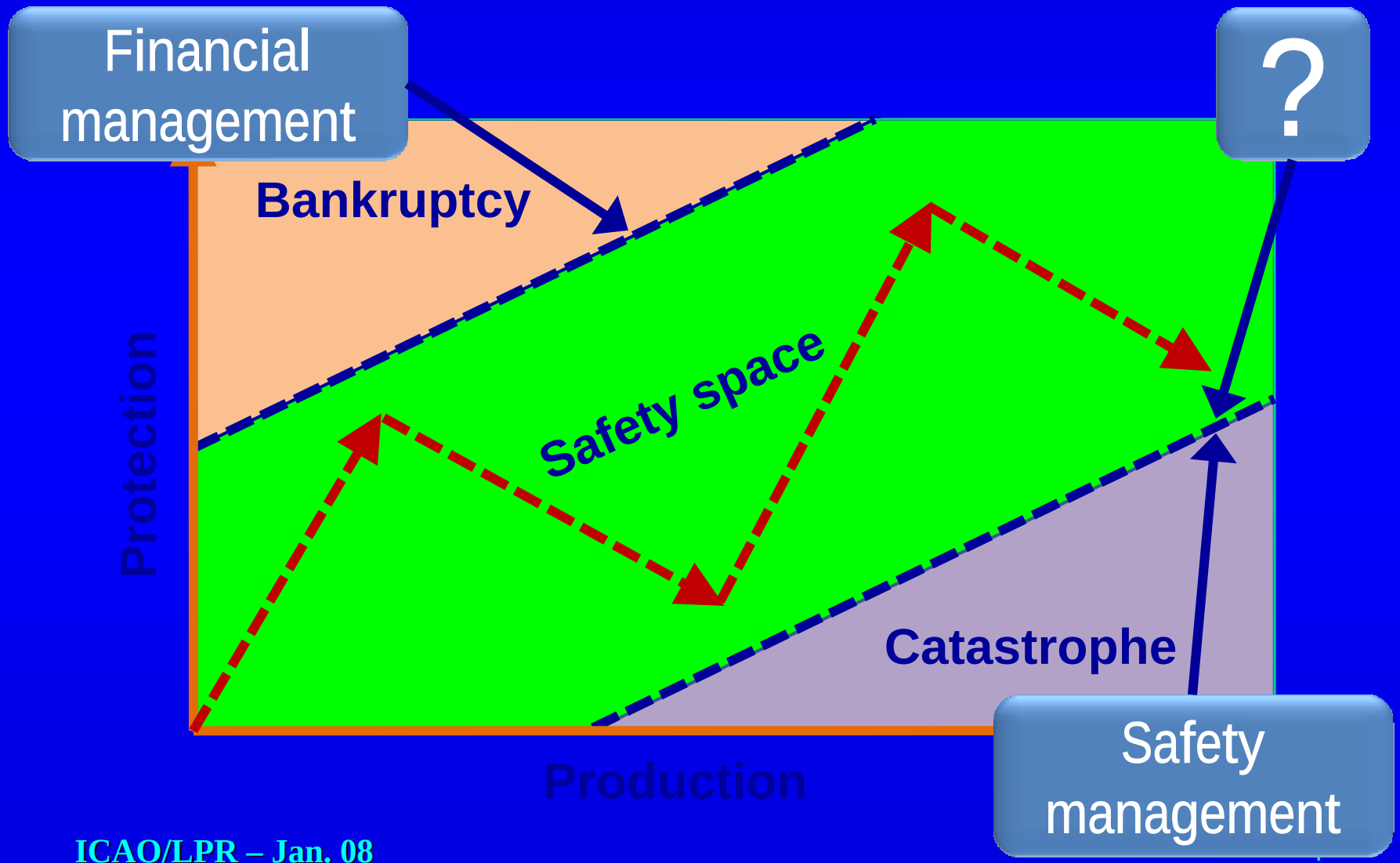
Module Objective

Identify potential hazards and risks that may arise from non-compliance with language proficiency requirements with a view to introducing interim mitigating measures if necessary

Outline

- Key safety management concept
- Definitions
- Understanding hazards
- Identifying hazards
- Analysing hazards
- Risk management
- Risk probability
- Risk severity
- Risk assessment and tolerability
- Risk control / mitigation

Safety Space



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.**

For example: 1) A wind of 15 knots blowing directly across the runway is a hazard. 2) Language Proficiency in Communications is a hazard. 3) Aerodrome signage is a hazard.

Consequence – Potential outcome(s) of the hazard

For example: 1) 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. 2) and 3) that a runway incursion may occur is one of the consequence of the hazard.

Understanding hazards

Types of hazards

- **Natural**
- **Technical**
- **Economic**

Examples of natural hazards

Severe weather or climatic events:

- E.g.: hurricanes, major winter storms, drought, tornadoes, thunderstorms lighting, and wind shear.

Adverse weather conditions:

- E.g.: Icing, freezing precipitation, heavy rain, snow, winds, and restrictions to visibility.

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.**

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
- interferes with identifying other important consequences.

Identifying Hazards and Specific Components of Hazards

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.
- …

Identifying Hazards and Specific Components of Hazards

… 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.
- …

Identifying Hazards and Specific Components of Hazards

… consider:

- **Regulatory factors**, including the applicability and enforceability of regulations; certification of equipment, personnel and procedures; and the adequacy of oversight.
- **Defences** including detection and warning systems, and the extent to which the equipment is resilient against errors and failures.
- **Human performance**, including medical conditions and physical limitations.

Identifying Hazards and Specific Components of Hazards

Specific conditions

- **Unexplained increase in safety-related events or infractions.**
- **Major operational changes are foreseen.**
- **Periods of significant organizational change.**

Analyzing Hazards

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
  - …

Analyzing Hazards for Language Proficiency

ABC of hazard analysis

- A – State the generic hazard ***(hazard statement)***
  - **Communications**
- B – Identify specific components of the hazard
  - **English language proficiency in RT communications**
  - **Phraseology**
  - **…**
- C – Naturally leading to specific consequence(s)
  - **Runway incursion**
  - **Airspace incursion**
  - **…**

Analyzing Hazards

Efficient and safe operations or provision of service require a constant balance between production goals...

- ***maintaining regular aerodrome operations during a runway construction project***

...and safety goals

- ***maintaining existing margins of safety in aerodrome operations during runway construction project***

Aviation workplaces may contain hazards which may not be cost-effective to address even when operations must continue.

Sources of Hazard Identification

Internal

- **Flight Data Analysis**
- **Company voluntary reporting system**
- **Audits and surveys**

External

- **Accident reports**
- **State mandatory occurrence system**

As a reminder

- **Predictive**
- **Proactive**
- **Reactive**

Questions

- What is a hazard?
- What is a consequence?
- Give an example of hazard and of a related consequence

Answer

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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Consequence – Potential outcome(s) of the hazard

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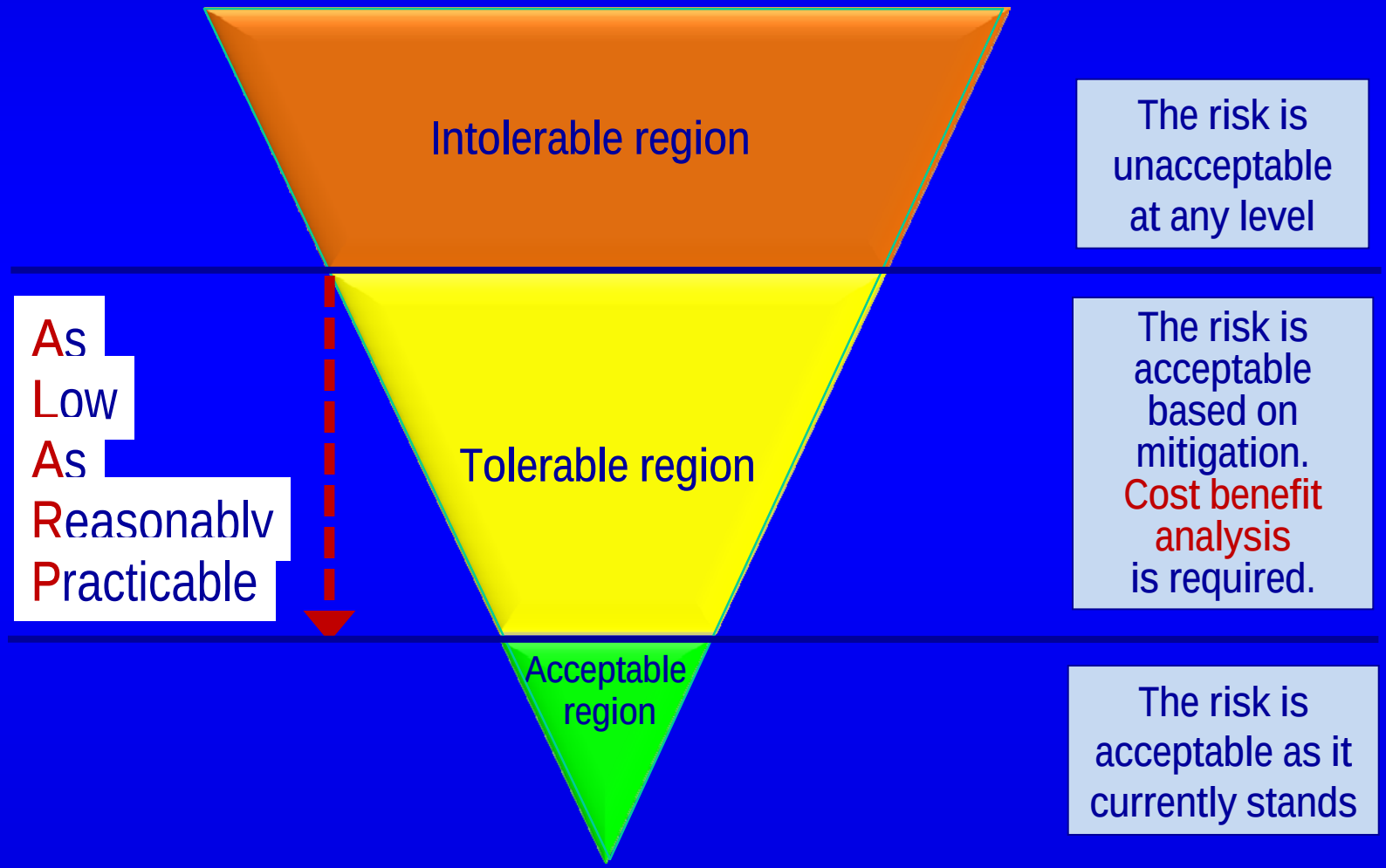
Definition of risk

Risk – The assessment, expressed in terms of predicted probability and severity, of the consequence(s) of a hazard taking as reference the worst foreseeable situation.

- 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.
- The assessment of the consequences of the potential loss of control of the aircraft by the pilot expressed in terms of probability and severity is the **risk**.

Risk Management



Risk Management

What is it?

- **The identification, analysis and elimination, and/or mitigation to an acceptable level of risks that threaten the capabilities of an organization.**

What is the objective?

- **Aims at a balanced allocation of resources to address all risks and viable risk control and mitigation.**

Why is it important?

- **A key component of safety management systems.**
- **Data-driven approach to safety resources allocation, thus defensible and easier to explain.**

Cost-benefit analysis

Direct costs

- **The obvious costs, which are easily determined. The high costs of exposure of hazards can be reduced by insurance coverage.**
  - **Purchasing insurance only transfers monetary risk,** does not address the safety hazard

Indirect costs

- **The uninsured costs. An understanding of uninsured costs (or indirect costs) is fundamental to understand the economics of safety.**

Cost-benefit analysis

Indirect costs may amount to more than the direct costs resulting from exposure to hazards:

- Loss of business
- Damage to the reputation
- Loss of use of equipment
- Loss of staff productivity
- Legal actions and claims
- Fines and citations
- Insurance deductibles

Risk probability

Definition(s)

- Probability – **The likelihood that an unsafe event or condition might occur.**

Risk probability

Questions for assessing the probability of an occurrence:

- Is there a history of occurrences like the one being assessed, or is the occurrence an isolated event?
- What other equipment, or similar type components, might have similar defects?

Risk probability

... questions such as:

- What number of operating or maintenance personnel must follow the procedure (s) in question?
- How frequently is the equipment or procedure under assessment used?

Risk probability

Probability of occurrence		
Qualitative definition	Meaning	Value
Frequent	Likely to occur many times *(has occurred frequently)*	**5**
Occasional	Likely to occur some times *(has occurred infrequently)*	**4**
Remote	Unlikely, but possible to occur *(has occurred rarely)*	**3**
Improbable	Very unlikely to occur *(not known to have occurred)*	**2**
Extremely improbable	Almost inconceivable that the event will occur	**1**

Risk severity

Definition

- Severity – **The possible consequences of an unsafe event or condition, taking as reference the** worst foreseeable situation.

Risk severity

Define the severity in terms of:

- **Property**
- **Finance**
- **Liability**
- **People**
- **Environment**
- **Image**
- **Public confidence**

Risk severity

Questions for assessing the severity of an occurrence:

- How many lives are at risk?
  - Employees
  - Passengers
  - Bystanders
  - General public
- What is the environmental impact?
  - Spill of fuel or other hazardous product
  - Physical disruption of natural habitat

Risk severity

… questions such as:

- **What is the severity of the** property or financial damage?
  - **Direct operator property loss**
  - **Damage to aviation infrastructure**
  - **Third party damage**
  - **Financial impact and economic impact for the State**
- **Are there** organizational, management or regulatory implications **that might generate larger threats to public safety?**
- **What are the likely** political implications **and / or** media interest?

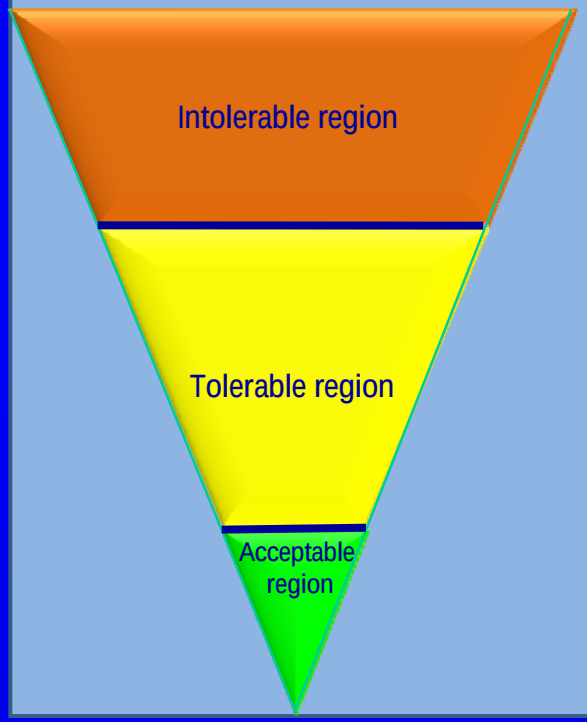
Risk severity

Severity of occurrences		
Aviation definition	Meaning	Value
Catastrophic	➢Equipment destroyed. ➢Multiple deaths.	A
Hazardous	➢A large reduction in safety margins, physical distress or a workload such that the operators cannot be relied upon to perform their tasks accurately or completely. ➢Serious injury. ➢Major equipment damage.	B
Major	➢A significant reduction in safety margins, a reduction in the ability of the operators to cope with adverse operating conditions as a result of increase in workload, or as a result of conditions impairing their efficiency. ➢Serious incident. ➢Injury to persons.	C
Minor	➢Nuisance. ➢Operating limitations. ➢Use of emergency procedures. ➢Minor incident.	D
Negligible	➢Little consequences	E

Risk assessment

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	2E

Risk tolerability

Risk management	Assessment risk index	Suggested criteria
	**5A, 5B, 5C, 4A, 4B, 3A**	Unacceptable under the existing circumstances
	5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C	Acceptable based on risk mitigation. It might require management decision
	3E, 2D, 2E, 1A, 1B ,1C, 1D, 1E	Acceptable

Risk control/mitigation

Definition(s)

- Mitigation – Measures to address the potential hazard or to reduce the risk probability or severity.
- Risk mitigation = Risk control

(Mitigate – To make milder, less severe or less harsh)

Risk control/mitigation

Strategies

- Avoidance – **The operation or activity is cancelled because risks exceed the benefits of continuing the operation or activity.**
  - ***Operations into an aerodrome surrounded by complex geography and without the necessary aids are cancelled.***

Risk control/mitigation

Strategies

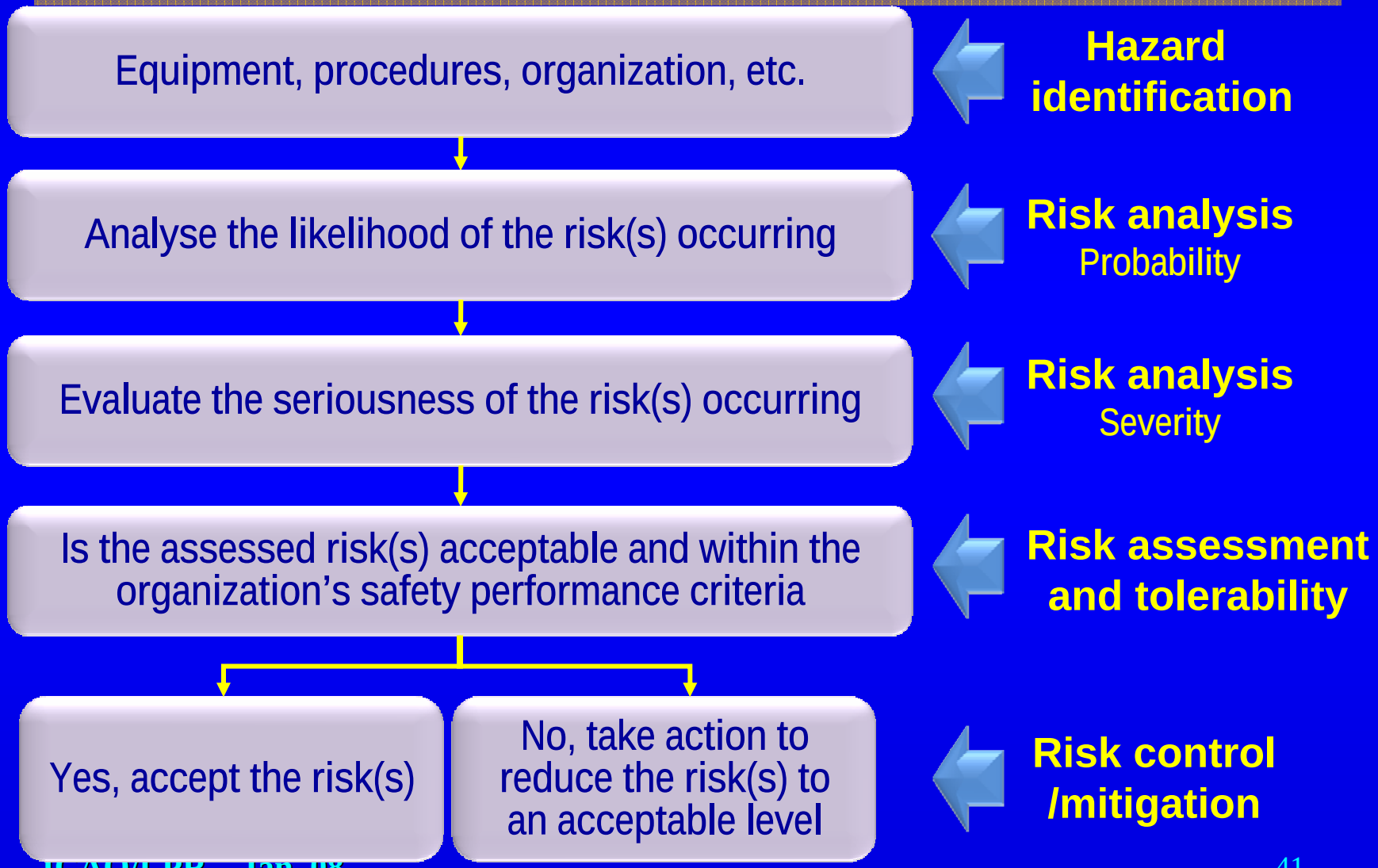
- Reduction – **The frequency of the operation or activity is reduced, or action is taken to reduce the magnitude of the consequences of the accepted risks.**
  - **Operations into an aerodrome surrounded by complex geography and without the necessary aids are limited to day-time, visual conditions.**

Risk control/mitigation

Strategies

- Segregation of exposure – **Action is taken to isolate the effects of risks or build-in redundancy to protect against it.**
  - **Operations into an aerodrome surrounded by complex geography are limited to aircraft with specific/performance navigation capabilities.**
  - **Non RVSM equipped aircraft not allowed to operate into RVSM airspace.**

Safety risk management at a glance



Defences

Recalling the three basic defences in aviation:

- **Technology**
- **Training**
- **Regulations**

Defences

As part of the risk mitigation, determine:

- **Do defences to protect against such risk (s) exist?**
- **Do defences function as intended?**
- **Are the defences practical for use under actual working conditions?**
- **Is staff involved aware of the risks and the defences in place?**
- **Are additional risk mitigation measures required?**

As a reminder

There is no such thing as absolute safety – In aviation it is not possible to eliminate all risks.

Risks can be managed to a level "as low as reasonably practicable" (ALARP)

Risk mitigation must be balanced against:

- **time**
- **cost**
- **difficulty of taking measures to reduce or eliminate the risk (i.e. managed).**

Effective risk management seeks to maximize the benefits of accepting a risk **(a reduction in time and cost) while** minimizing the risk itself**.**

Job Aid

Type of Operation or activity	Generic Hazard (Hazard Statement)	Specific Component of the hazard	Hazard-related consequences	Existing defences to control risk(s) and risk index	Further action to reduce risk(s) and resulting risk index
Pilots – Commercial Multi-pilot Operations					
General Aviation-Multi-pilot Operations					
General Aviation-Single pilot Operations					
Controllers					
Aeronautical Station Operators					

Implementation Plan

Pilots (international operations)	2008	2009	2010
Commercial multi-pilot operations			
General aviation multi-pilot operations			
Commercial single-pilot operations			
General aviation single-pilot operations			
Controllers			
Aeronautical Station Operators			