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INTEGRATED RISK MANAGEMENT PROCESS TO MEET HIGH LEVEL OF ATM PROVISION

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Abstract. *The definition of risk has been introduced. The structure of Risk Management has been described in details. Strategies of risk control and mitigation have been analyzed. Integrated Risk Management has been described. Risk Management calculation as well as tools and methods have been proposed.*

Keywords: Integrated Risk Management, Risk Management.

Introduction

The common definition of risk is unavoidable and present in virtually every human situation. It presents in our daily life, public and private sector organizations. There are many accepted definitions of the risk in use which depend on the context.

The common concept of all definitions is the uncertainty of the outcomes. Definitions differ due to their characteristics of the outcomes. Sometimes the risk is described as having only adverse consequences, in other cases it is given as neutral one.

According to ICAO risk is the assessment expressed in terms of predicted probability and severity of the hazard consequence(s) as reference to the worst foreseeable situation.

Risk refers to the uncertainty of future events and outcomes. It is the expression of the probability and impact of an event with the potential to influence on the achievement of an organization's objectives [1].

Risk Management

Risk management is the identification, analysis and mitigation to an acceptable or tolerable level of those hazards, as well as the subsequent risks, that threaten the viability of an organization.

Considering safety management, the system risk management is a formal process composed of the system description, the hazards identification, the risk assessment, the risk analysis, and the risk control [2].

Thereby elements of risk management are:

Hazard identification is the identification of undesired or adverse events that can lead to the occurrence of a hazard and the analysis of mechanisms by which these events may occur and cause harm. Both reactive and proactive methods and techniques should be used for hazard identification.

Risk assessment is identified hazards which are assessed in terms of criticality of their harmful effect and ranked in order of their risk-bearing potential. They are often assessed by experienced personnel or by utilizing more formal techniques and through analytical expertise. The severity of consequences and the likelihood (frequency) of occurrence of hazards are determined. If the risk is considered acceptable, operation continues without any intervention, if it is not acceptable, risk mitigation process is engaged.

Risk mitigation – if the risk is considered to be unacceptable, then the control measures are taken to fortify and increase the level of defenses against that risk or to avoid or remove the risk, if this is economically feasible.

Broadly adopted generic visual representation of the safety risk management process is depicted beneath (fig. 1).

There are many accepted definitions of risk management in use. Some scientists describe the risk management as the decision-making process, excluding the identification and assessment of risk, whereas others describe risk management as the complete process, including risk identification, assessment and decisions around risk issues [2].

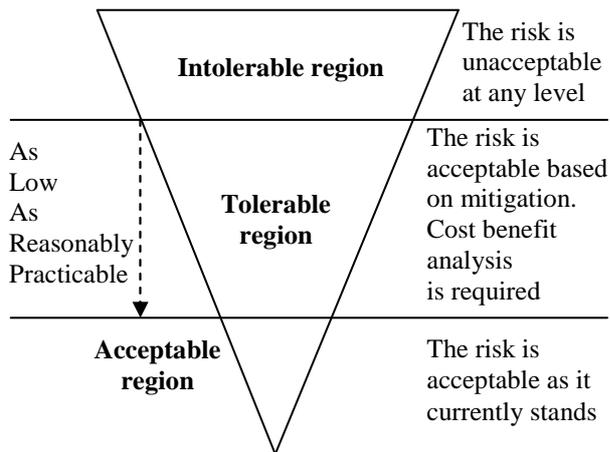


Fig. 1. Risk Management

Risk probability

The process of revealing the safety risks of the consequence of hazards under organizational control starts by assessing the probability that the consequence of the hazard will be materialized during operations aimed at delivery of services. This is known as assessing the safety risk probability.

Safety risk probability is defined as the likelihood that an unsafe event or condition might occur.

A typical safety risk probability of occurrences table is shown below (tab. 1) [2].

Table 1. Risk occurrence probability

Value	Qualitative definition (and meaning)
5	Frequent (Likely to occur many times)
4	Occasional (Likely to occur some times)
3	Remote (Unlikely, but possible to occur)
2	Improbable (Very unlikely to occur)
1	Extremely improbable (Almost inconceivable that the event will occur)

Risk severity

When the safety risk of an unsafe event or condition has been assessed in terms of probability, the second step in the process of revealing the safety risks of the consequences of hazards under organizational control is the assessment of the severity of the consequences of the hazard if its damaging potential materializes during operations

aimed at delivery of services. This is known as the assessment the safety risk severity.

Safety risk severity is defined as the possible consequences of an unsafe event or condition, considering as reference the worst foreseeable situation.

A typical safety risk severity table is shown below (tab. 2) [2].

Table 2. Risk occurrence severity

Value	Aviation definition (and meaning)
A	Catastrophic (Equipment destroyed. Multiple deaths)
B	Hazardous (A large reduction in safety margins, physical distress or a workload when the operators cannot be relied upon to perform their tasks accurately or completely. Serious injury. Major equipment damage)
C	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)
D	Minor (Nuisance. Operatinal limitations. The use of emergency procedures. Minor incident)
E	Negligible (Little consequences)

Risk tolerability

The next step in the process of revealing the safety risks of the consequence is the assessment of the tolerability of the consequence of the hazard if its damaging potential materializes during operations aimed at delivery of services. This is known as the assessment of safety risk tolerability.

First, it is necessary to obtain an overall assessment of the safety risk. This is achieved by combining the safety risk probability and safety risk severity tables into a safety risk assessment matrix (tab. 3). Figures in the matrix reflect the tolerability regions in the inverted triangle [2].

Secondly, the safety risk index obtained from the safety risk assessment matrix must be transported to a safety risk tolerability matrix that describes tolerability criteria.

Thereby indexes regarding the intolerable region have suggested criteria as “Unacceptable under the existing circumstances”.

Table 3. Safety Risk Assessment matrix

Risk probability	Risk severity				
	A	B	C	D	E
5	△ 5A	△ 5B	△ 5C	○ 5D	○ 5E
4	△ 4A	△ 4B	○ 4C	○ 4D	○ 4E
3	△ 3A	○ 3B	○ 3C	○ 3D	□ 3E
2	○ 2A	○ 2B	○ 2C	□ 2D	□ 2E
1	□ 1A	□ 1B	□ 1C	□ 1D	□ 1E

- △ – intolerable region
- – tolerable region
- – acceptable region

Indexes regarding the tolerable region have suggested criteria as “Acceptable based on risk mitigation and it might require management decision”.

Indexes regarding the acceptable region have suggested criteria as “Acceptable”.

Strategies of risk control and mitigation

The final step is the process of revealing the safety risks of the consequence of an unsafe event through control/mitigation strategies.

There are three main strategies for safety risk control/mitigation:

- 1) Avoidance is the strategy when the operation or activity which is cancelled because safety risks exceed the benefits of continuing the operation or activity.
- 2) Reduction is the process when the frequency of the operation or activity is reduced.
- 3) Segregation of exposure is the process when action is taken to isolate the effects of the consequences of the hazard or build-in redundancy to protect against hazard.

Integrated Risk Management

Nowadays processes of operation become more complicated demanding more integrated Risk Management approach. It is no longer sufficient to manage risk at the individual activity level or in functional blocks. Organisations around the world have benefits from a more comprehensive approach which is dealing with all their risks.

Integrated Risk Management is a continuous, proactive and systematic process to understand, manage and communicate risk from all known aspects.

Integrated Risk Management requires permanent assessment of potential risks of every level and then

aggregate the results at the corporate level to facilitate priority setting and improved decision-making.

Integrated Risk Management does not focus only on the minimization or mitigation of risks, but also supports activities that foster an innovation, so that the greatest returns can be achieved with acceptable results, costs and risks.

Visual representation of integrated risk management process structure is shown below (fig. 2).

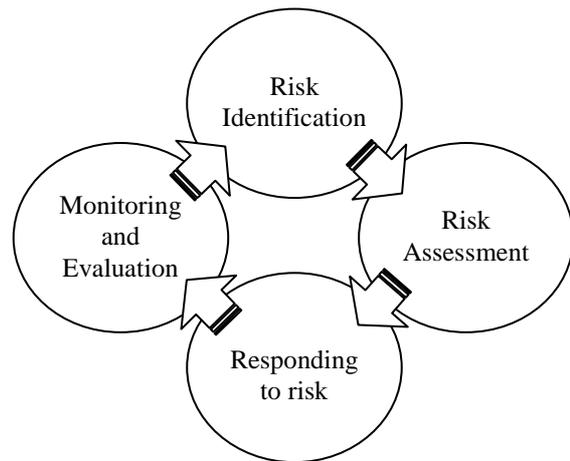


Fig. 2. Integrated Risk Management

Activities of elements of Integrated Risk Management process structure are:

- 1) Risk Identification – Issues Identification (Defining the problems or opportunities, scope, context and associated risk issues. Deciding on necessary: people, expertise, tools and techniques);
- 2) Risk Assessment:
 - Key risk areas assessment (Analyzing results of environmental scan and determining the categories of risk to be addressed);
 - Likelihood and impact measurement (Determining degree of exposure, expressed as likelihood and impact, of assessed risks, choosing tools);
 - Risk ranking (Ranking risks, considering risk tolerance, using existing or developing new criteria and tools);
- 3) Responding to risk:
 - Desired results setting (Defining objectives and expected outcomes for the ranked risks);
 - Options development (Identification and analysis of the ways to minimize threats and maximize approaches);

- Strategy selection (Choosing a strategy of operations);
- Strategy implementation (Development and implementation of a plan);
- 4) Monitoring and Evaluation – improving the Risk Management process locally using effectiveness criteria, reporting on performance and results.

Risk Calculation

The risk exposure is calculated as the product of both probability and the overall cost where the risk occurs. Risk exposure identifies the effective current cost of a risk, and it can be used to prioritize risks that require countermeasures:

$$R_e = P_{re} \sum R_o,$$

where R_e is a risk exposure;

P_{re} is a probability of risk occurrence;

$\sum R_o$ is total loss if risk occurs.

After Risk Identification we may consider a number of possible countermeasures. Risk reduction leverage indicates a value of the 'return on investment' for countermeasures and thus can be used to prioritize possible countermeasures:

$$R_{rl} = \frac{R_{er}}{C_c},$$

where R_{rl} is risk reduction leverage of a countermeasure;

R_{er} is reduction in risk exposure;

C_c is cost of countermeasure.

Tools and Methods

In technical terms various tools and techniques in the process of Risk Management can be used:

- risk maps: different charts and diagrams that help identify, discuss and understand sources and types of risks and disciplines necessary;
- modeling tools: scenario analysis and forecasting models to show the range of possibilities and to build scenarios into contingency plans;

- framework on the precautionary approach: a principle-based framework that provides guidance on the precautionary approach in order to improve the predictability, credibility and consistency of its application across the federal government;

- qualitative techniques: such as workshops, questionnaires, and self -assessment to identify and assess risks;

- Internet and organizational Intranets: promote risk awareness and management by sharing information internally and externally.

Several practical methods that could be used to provide guidance are:

- a managers' forum: where risks are identified, proposed actions are discussed and the best practices are shared;

- an internal Risk Management advisory function: dedicated to risk management as well as to special unit or associated with an existing functional unit; and tool kits: a collection of effective risk management tools such as checklists, questionnaires, best practices [1].

Conclusions

The Integrated Risk Management enhances traditional risk management.

The Integrated Risk Management framework is the first step in establishing the foundation for more strategic and corporate Integrated Risk Management in the departments and in the government. In future, the framework will be supported by the tools and guidance documents as well as be complemented by other Risk Management initiatives [1].

References

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