

MANAGEMENT AND RISK ASSESSMENT IN AIRPORT PRACTICE

Michal Rohal' – Ján Kolesár

The object of article is point out processing the diploma work which characterises current methods in the field of assessment of safety setting and operation risks at civil airports. By means of the analysis of safety setting in airport activities it refers to the way and possibilities of exploitation of available modern methods of risk assessment. Safety analysis, danger identification, assessment and counting of risk are applied in selected operation areas of the airport.

K e y w o r d s. Risk Assessment, Hazard, Risk, Airport, Risk Management, Methods of Risk Assessment

1 INTRODUCTION

A task of this diploma work is making analyze of risk. This analysis should give an answer to the question what kind of hazards is the airport exposed to, how much is its operation vulnerable towards these hazards, how high is the probability that a hazard will occur and what influence would it have on the whole airport operation.

At the beginning, it is necessary to note that terms RISK and HAZARD are often considered the same. It is essential to realize that a hazard can be a source for one or more risks and that the hazard does not represent a risk itself. Hazards only misuse the vulnerability leading into danger which is a risk that can be lowered via precautions protecting the operation of airport against the impact of these hazards.

2 RISK MANAGEMENT

The first chapter describes the theoretical basis of management and risk assessment. Beginnings of the risk management date from the start of 50s of 20th century. At that time, a new field of human activity called the "Risk Engineering" was established with focus on the minimisation of risks. It has undergone several changes, it has standardized some terms through normalisation institutions and it further develops under the name "Risk Management". The standardisation of terms was performed by technical standards committee ISO TC 176 which also standardizes the norms of Quality Management. This connection is logical because rising of the quality which is supported by quality

management leads to the minimization of risks to which Risk Management tries to arrive at.

Risk Management is modern discipline enjoying full rights. It is included in the sphere of management knowledge and abilities. It belongs to basic tools for the decisions of a manager. Its underestimating may lead into high financial losses, in some extreme cases up to operation stopping.

Risk Management can be defined as a logical and systematic method of determining the linkages in numerous activities, functions or processes of risks identification, their analysis, assessment, lowering and continuous monitoring that enables to minimize losses and maximize the opportunities.

The major role of risk management is to recognize, evaluate and lower the risk as much as possible and put it on such level that is acceptable for problem-free activity performance and working of a corporation. To reach this condition, each risk must go through process of risk management.

To the main parts of the risk management belong:

- *risk identification* – process which finds and localises the risk and determines what, for what reason and how it can happen;
- *risk analysis* – transformation of available information about the risk for approximation of risk according to evaluation of possible consequences, probability of occurrence, priority of risk as well as its classification;
- *risk assessment* – process that evaluates acceptability of the risk by means of its analysis;

- *risk management* (dealing with risk) – that part of the risk management which works out decisions for accepting and/or lowering of the risk and implementation of these decisions;
- *risk judgement* – summary of analysis and risk assessment;
- *monitoring* - observation of risk indicators and reduction activities;
- *communication* – provides information about particular risk management processes as well as about risks.

3 APPLICATION OF RISK ANALYSIS ON AIRPORT PROCESSES

Core of work is to apply risk management at airport processes. An important aspect of risk management in the civil aviation is the setting of the level of a certain risk acceptability which we are willing to accept owing to the overall safety and the consequences which would appear in case of exceeding the protection and securing of safety at civil airport. Securing the safety in civil aviation is an obligatory service for the public. Extent of safety precautions must be proportional to the size of the risk and hazards to which is this safety system exposed to.

Risk analysis, we call the process through which we find out objective sources for establishing of appropriate, adequate and effective safety precautions. If we judge risk in cases of exceeding physical, mechanical, technical and modal protection of civil airports, it is in most cases very complex and wide-ranging process. We must assess not only the technical facilities and readiness of the airports, human factor in aviation, ability of immediate reaction but also many other hardly predictable agents and phenomena (e.g. terrorism, criminality, political conditions, economic issues, standardization and harmonization of techniques, type of air transport, etc.).

Deductive approach to solving the issue of risk assessment in the field of civil airport protection is possible on the basis of utilisation of statistics, phenomena and hazards with which we had met already in the past in the aviation working. By means of analytical methods, we can examine and detect possible causes of existence of hazard

and possible forms of particular risks, based on the risks in air force, solving their causes or probabilities which lead into various forms and possible scenarios of coping with safety at airports.

We exploit inductive approach more often in the field of risk assessment and risk evaluation in safety system of protection of civil aviation. We judge various scenarios of possible danger of protected buildings or interests only with the help of the theory of probability and estimations of the extent of damages caused in case of hazard or illegal act commitment. Analytical approach to risk assessment and the degree of the hazard is based on the modelling of risks with the help of measurable statistic parameters in case of the utilisation of inductive methods (e.g. damage extent, length of a judged period, number of transported passengers, amount of transported cargo, etc.). For this purpose, it is appropriate to exploit the way of simulation modelling, many times with the use of the abstract models.

The subject of the identification of hazards in civil aviation is to find out all dangers and assumptions that may lead into the existence of illegal act and endangering of safety in the field of airports' safety and aviation transport process. The aim is to define these hazards, find out the causes, refer to the consequences, assess existing state of protection and suggest the changes in the safety system. For this purpose, it is essential to work out a register (catalogue) of possible hazards, finding of sources for hazards, and the selection of vulnerable positions in the setting. We can purposefully classify particular hazards within every examined environment individually (e.g. human error, illegal action, failure of technical facilities, default on technological technique, etc.).

To the aims of the risk analysis from the catalogue of hazards is an appropriate method of risk evaluation to assign a numerical or a verbal statement of the degree of risk. This can be performed by scientific methods, e.g. Kitt's method of point's assessment of particular hazards, tree method, failure analysis, safety system and its impacts or by logical means such as synthesis, abstraction, generalisation, etc.

3.1 Risk of emerging breakdowns on motion aviation surfaces

Air force runways represent a specific group in the group of infrastructure owing to their dimensions, different type of strain and temporal problems with their repairs and reconstructions. Way of reconstruction must be chosen very carefully because when the selection is wrong, it comes about again to the fast development of breakdowns.

Concrete is the main construction material for the airport surfaces. Concrete airport surfaces are continually assessed and repaired so that they satisfy the requirements of aviation. If the airport surface fails, it has catastrophic consequences.

It may come about creation of various breakdowns at the airport surfaces. Damage of particular construction layers of cement-concrete surfaces at the airport not once negatively affects operation function, safety (safe landing and taking off of the airplane), power, eligibility (straightness, bearability, braking effects) and serviceability of these surfaces (costs of repairs and maintenance) in great measures. Breakdowns may arise by the impact of various external physical, mechanical as well as chemical influences. They are characterised by the extent of damage (damage rate) and their amount (occurrence intensity).

Qualitative evaluation of operation capability and the conditions of airport surfaces is possible to perform by means of the safety analysis of damage risk on RWY – according to the damage degree of the surface, danger in aviation working and impacts. In the safety analysis through judgement of cement-concrete airport surface, the principal problem is the establishment of the rate (of acceptable) risk that is defined by coefficient of operation capability of airport surfaces. This coefficient is a principal parameter when evaluating qualitative condition of motion surfaces at the airport.

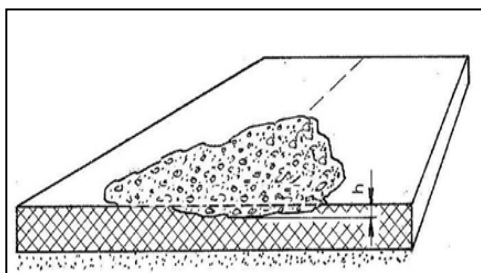


Figure 1: Breakdown on RWY

Failure of airport movement areas	Irrelevant risk	Acceptable risk	Medium risk	Adverse risk	Unacceptable risk	Value
	Value					
	1 - 3	4 - 10	11 - 50	51 - 100	101 - 125	
Disorders of dilatation gaps			32			32
Cracks in the airfields cover				60		60
Pit			25			25
Pothole			36			36
Corrosion of the surface			27			27
Superficial breakup of surface			16			16
Tight or spaced gap			32			32
Interactional horizontal shift of cement –plates			12			12
Interactional vertical shift of cement –plates			36			36
Broken edge of plate			16			16
Crushed corner of plate		6				6
Broken corner of plate		6				6
Broken plate			30			30
Decline of plates				64		64
Ripple of plate				80		80
Coefficient of acceptable risk		12	262	204		$K_a = 30$

Figure 2: Analysis of failure on the airport movement areas - FMEA

3.2 Risk of the emergence of act of unlawful interference

Catastrophes, disasters, technological and technical breakdowns as well as various epidemics represent the civil forms of danger, so called critical or extraordinary situations. Man and his action is under these conditions and consequences influenced predominantly by the worry for his life, life of his relatives, fear from endangering and loss of the property, etc. However, between actual dangers do not belong only above mentioned hazards. There is also extremism, terrorism and criminality. Sometimes it is impossible to separate these three hazards because their features are mutually overlapping.

When preventing their existence and early minimizing of risk impacts, it is useful to recognize the reasons for risk emergence and define the types and possibilities of the misusing of technical as well as human potential or a gap in the organisation and protection of the building.

For the solution of more complex systems to which belongs also safety protection of the airport, it is possible to use the Ishikawa diagram to identify the causes and effects also called “fishbone diagram”. I used this diagram to investigate possible causes of the occurrence of act of unlawful interference at the airport. This technique helped me to structure the problem in smaller parts and to identify the possible causes. Generally, the diagram supports the creation of deeper ideas and graphic interpretation provides an excellent grasp. It prevents infantile and partial solutions and presents relative importance and relation among the particular parts of the problem. Diagram graphically interprets the analysed primary and secondary causes that caused the problem being solved (effect). Every fundamental factor is further analysed and there is a search for partial causes.

3.3 Risk of the loss or damage of the luggage

The major focus of air transport is to transfer from one point to the second point. When we speak about transport we do not mean only transport of passengers but also of their hand and

registered luggage. Owing to this fact, it is necessary for the airport infrastructure to have the luggage handling system on such level that is demanded by modern aviation. The breakdown of luggage handling systems leads in most cases into the collapse of the whole check-in, what is more sometimes up to the airport blockade. These systems perform the identification, separation and transport of the luggage.

The requirements for the handling system and also for the whole process are proportionally rising along with the volume of transport or in other words with the rising number of passengers, air destinations and flights. Many airports found the solution in a fully-automatic luggage handling system which has fewer errors when selecting the luggage than a manual manipulation that is many times reason for the loss of luggage.

Loss of luggage, its damage or lateness is a nightmare of not only one passenger. The prevention against these problems can be the risk analysis with the method of “fault tree analysis” (FTA). FTA analysis has at civil airport wide application and it is possible to apply it in almost every area. In this case, I applied this method on the issue of the safe process of handling with the registered luggage. The hazard of the luggage loss

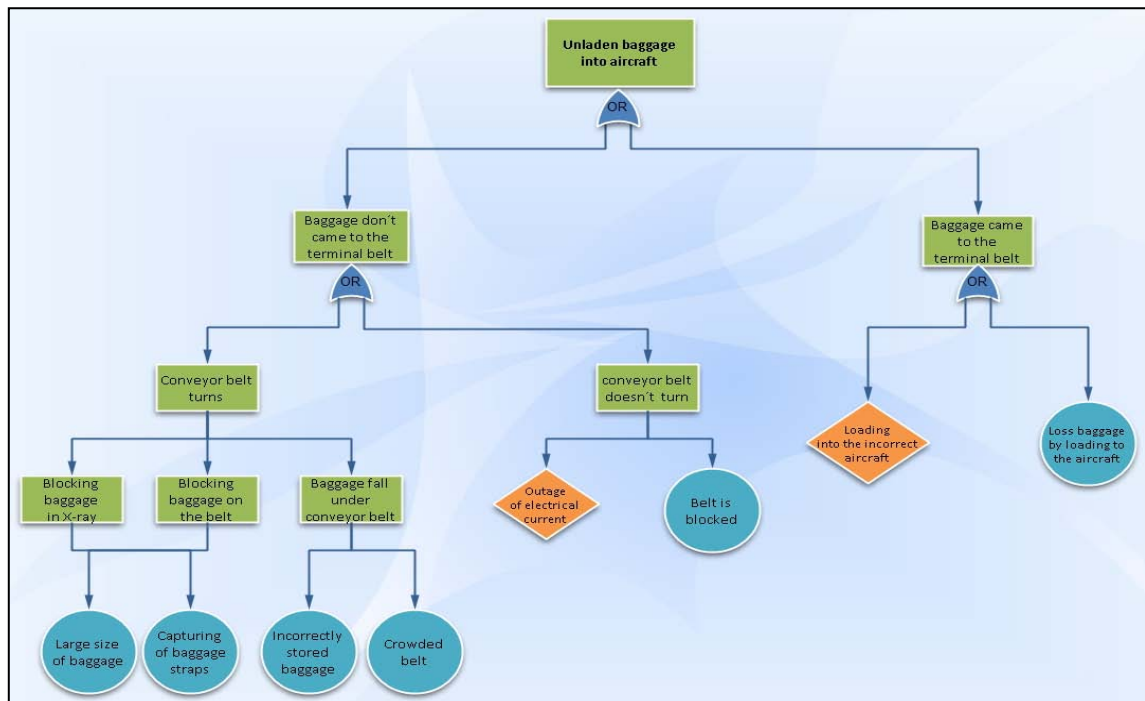


Figure 3: Fault tree analysis

or its mechanical damage belongs to the main risks of luggage handling process.

3.4 Risk that follows from the car transport operation at the airport

Car transport is an inseparable part of each airport, if it concerns tankers transporting fuel or water, motor vehicles transporting the luggage, fork-lift trucks, etc. Therefore it is essential to pay appropriate attention not only to the economic aspect of car transport but also to safety aspect. This kind of transport can be characterised as independent productive process of which the primary product is the transport.

Working of every car transport, inter- corporate or public as well as activities that are related to it (manipulation with the load, storing, ...) represent large amount of risks. It is caused mainly by rising requirements for the quality and time. More factors influence the driving in the airport space. These factors are the condition and characteristic of a road, measures and the types of transported material as well as consequences existing at the operation.

Some of the highly-developed countries (USA, United Kingdom, Canada, Switzerland, Australia, a. other) systematically make use of risk analysis of the car transport at the airport by means of approved controlling checklists. Method of checklist can be applied also on the conditions of the airports in the Slovak Republic. According to the investigation of a particular goal, that means the condition of safety management of car transport at the airport, this checklist counts only with the answers yes or no. Sometimes in the practice there is utilised also the method of catalogue letters which is characterised by providing more of possible answers.

Values gotten by risk analysis through the method of checklist are evaluated by means of evaluation table.

5 CONCLUSION

Aim of this article was to inform the readers about the issues of risk management and selected risk analysis that followed from the airport operation. For the evaluation of identified

risks, various methods were used –FMEA method, Ishikawa diagram (fishbone diagram, cause-and-effect diagram), FTA method and Checklist method. All of these methods are an important part of preventing the risk emergence because it is more appropriate and easier to get rid of the source of the risk than problems that are caused by it.

BIBLIOGRAPHY

- [1] MERNA, T. – AL-THANI, F. F.: Risk management, 2007, ISBN 978-80-251-1547-3
- [2] SMEJKAL, V. - RAIS, K.: Řízení rizik ve firmách a jiných organizacích, 2010, ISBN 978-80-247-3051-6
- [3] HOFREITER, L.: Zásady a principy analýzy rizik v oblasti fyzickej a objektovej bezpečnosti, Žilina, 2006.
- [4] ŠIMÁK, L.: Manažment rizik, Žilina, 2006.
- [5] ŠEBESTA, M. – SCHWARZ, R.: Management rizik, Brno, 2003.

AUTHOR(S)´ ADDRESS(ES)

Bc. Michal Rohal, Faculty of Aeronautics, Technical University of Košice, Rampová 7, 041 21 Košice, Slovak Republic, michal.rohal@student.tuke.sk
Ing. Ján Kolesár, PhD. Faculty of Aeronautics, Technical University of Košice, Rampová 7, 041 21 Košice, Slovak Republic, jan.kolesar@tuke.sk

Reviewer: Ing. Ján FERENC, PhD.