

## Safety analysis of risk in air transport

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### **Abstract:**

The aim of the article is to point out the possibilities of using security analyses in the field of identification of risks in the civil airport security systems. Analysis of security risks in aviation is, particularly in the recent past, an area of great consideration, which significantly influences the process of implementing security measures in civil aviation. Its results are also the basis for financial analyses of the investment and operating costs of airport security, which is reflected substantially in the economy of the whole airport. While there are many different tools and security analysis techniques at hand, a thorough analysis represents an investment of hundreds of man ours and engagement of experts from all airport operations segments thus a thoughtless analysis conducted only for the sake of itself would represent an unnecessary waste of resources.

### **Keywords:**

identification of risks, security system, acceptable risk, acts of unlawful interference in civil aviation, security analysis

## INTRODUCTION

Aircraft, airports, and air transport in general have recently become the object of extremist and terrorist groups but also a target of individuals who abuse aviation to commit various illegal activities. The nature and objectives of committing acts of unlawful interference in aviation may be various – political, military, social,

religious, cultural and other. These potential threats require increased demands on ensuring of aviation safety and security.

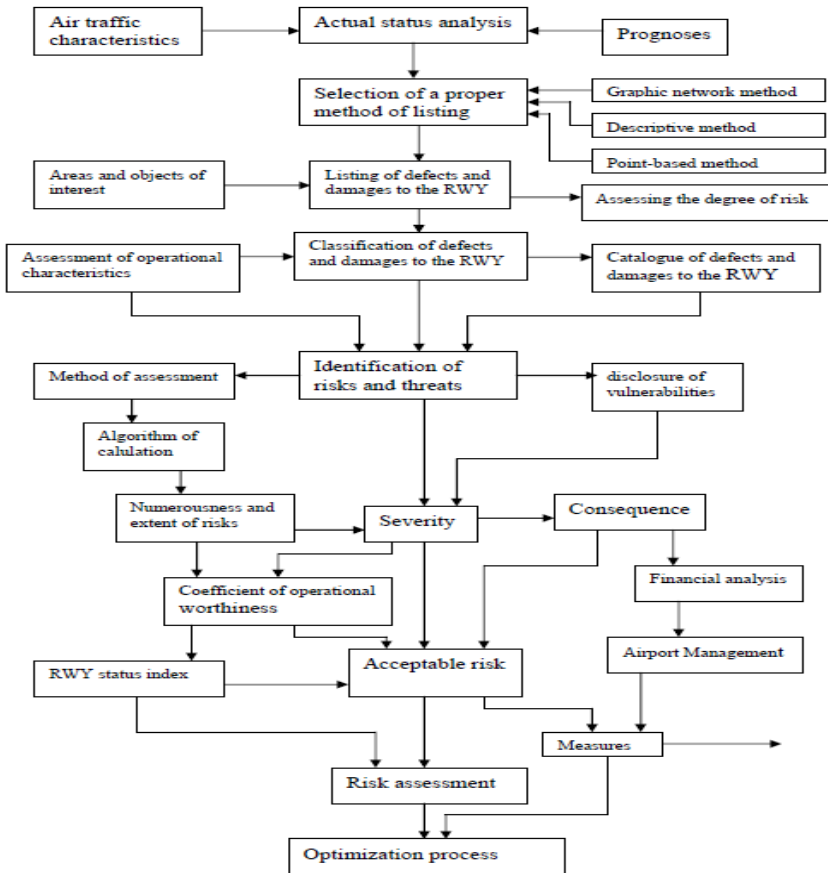
Being prepared for acts of unlawful interference in aviation means not only to follow and perform prescribed control procedures but also to know the security hazards, to identify possible threats and to take effective measures to prevent offenses against aviation industry. These tasks are performed by the safety management of the airports and the air operators. All these are supposed to have developed relevant analyses and plans for resolving different crisis situations.

## **1. SAFETY ANALYSIS OF RISK IN AIR TRANSPORT**

One of the security analyses that security management of airports and airlines is concerned with is the identification of the specific hazards and potential threats of acts of unlawful interference in aviation. The identification process is only possible if we know the characteristics of the dangerous situation and the risks that jeopardize the safety of air transport. This knowledge is the main criterion in assessing the risks and the potential danger of acts of unlawful interference in aviation, with regard to the reliability of the airport security system.

A number of well-known methods and process approaches can be used to develop security analysis and risk identification in the structures of airport security systems. These methods can determine the nature of the risks and their possible consequences on air transport in more detail so we can process the information and data acquired. Using these methods, we can also determine the degree of acceptable risk that we are able and willing to accept within the framework of sufficient and reliable protection. The analytical evaluation process of risk identification also provides possibilities for optimization and proposals for measures to improve the overall state of protection and security of civil aviation.

A fundamental problem in security analysis is the determination of the level of acceptable risk. It is very difficult to predict the consequences and further development of unlawful acts in civil aviation. It is partially possible by the use of statistical data and analyses of offenses committed, the knowledge of the actual regional security situation and the assessment of the likelihood of the possible occurrence of unlawful acts. However, the identification of the acceptable risk boundaries is only possible in real-time, under realistic circumstances and depending on the possibilities of overcoming airport security and control barriers by potential intruders.



**Fig.1.** Flow chart of risk identification and civil aviation security and safety optimization process

To carry out risk analysis and assessment in security and control processes at airports, we can use the risk analysis and risk analysis chart (Figure 1). The flowchart can be applied with some limitations to other aviation operations that can be used to analyse various crises and states in crisis management. A similar

approach can also be applied in the area of crisis management of air traffic services and aviation technology maintenance, in the field of aircraft technical handling, airport maintenance, in the field of human behaviour and other areas of security management.

The biggest problem when using the risk analysis chart in these security subsystems is the determination of the acceptable risk coefficient. This can not be achieved in every area of aviation and airport security. In air traffic management, aviation technology maintenance and aircraft technical handling there is no value for the acceptable risk coefficient, because the maximum level of safety has to be ensured.

## **2. CIVIL AIRPORT SECURITY AND SAFETY RISK IDENTIFICATION**

When analysing security risk in the field of security and protection against acts of unlawful interference, it is necessary to assess the actual state of security, with an emphasis on the existing legal environment, the nature of the local conditions and the fulfilment of the required conditions for security insurance. As part of the protection and security of airports it is also necessary to take into account prognostic and security analyses, which might specify possible foreseeable dangerous conditions and situations in the near future. This is also important in the view of providing enough financial, material and personnel resources.

The identification of security processes and civil aviation security issues must be considered within the framework of a comprehensive solution for the protection of the entire airport facility and the different types of protection involved.

An important part of the analysis is the identification of hazards, the causes of their occurrence and the sources of risk, taking into account both the external and internal conditions of the airport security system. Only in this way can we define the possible consequences, determine the frequency of risks and estimate the likelihood of their occurrence. Based on these identifiers, we can use the appropriate method to calculate the acceptable risk coefficient as the primary identifier, through which we are able to verify the functionality and reliability of the security system and of its operational and technical features as part of the overall analysis.

The process of optimization can be appropriately applied in the analytical process of risk identification and subsequent risk assessment, where mathematical models and simulation models are then designed to provide the most effective way to address the issues of the civil aviation safety and security system protection against acts of unlawful interference.

In order to perform this analysis, one of the existing methods of identifying risks and potential hazards can be selected. There are methods of both mathematical and graphic modelling of risks. However, the principal criterion for selection of an appropriate method should be to determine the most likely cause of risk in the security system. This concerns, in particular, the assessment of the weakest elements in the airport security system, but also of elements in the man – machine interface, such as the airport security officer and the control and detection device.

Risk analysis and threat assessment of the possible acts of unlawful interference in civil aviation are processes that should primarily serve the needs of decision-making processes of airport security management.

### **3. CATALOGUE OF POSSIBLE CAUSES AND CONSEQUENCES OF RISK**

As part of the risk analysis, it is desirable to create a list of possible causes of the risks and their consequences. The catalogue can be elaborated in the form of defining the structural elements in the determination of the threatened objects (airport, airplane, airline passenger, aircrew, etc.), but also from the process point of view (passenger handling process, air cargo transport, airport perimeter protection, etc.).

A table of possible causes of the risks and their consequences in terms of processes and hazard identification can serve as a tool for processing the catalogue. Part of such analysis should also be the description of existing security measures with a suggestion of new progressive measures in the control process at civil airports.

Based on the identification of risks and the identification of potential hazards in civil aviation, we can select the method of risk analysis and calculation, result verification and the design of optimization measures.

A suitable method, among other known methods, is e.g. scoring method, “fish bone” method or the “failure mode and effect analysis” method. The applicability of one of the methods is determined by its suitability, availability and clarity in assessing safety analysis results and outputs.

A generally applicable method of analysis of safety and risk assessment in the field of civil aviation protection against acts of unlawful interference is the scoring method of sources of risk with the use of “threat assessment cards”. These cards need to be developed for each type of threat and include the possible consequences of this threat. Threat classification is the result of a score assessment of the consequences depending on the level of threat and the degree of acceptability, respectively unacceptability of the risk.

The final evaluation can be performed by means of a mathematical calculation of all threats in the form of a risk matrix, or by means of a programmable algorithm through computational techniques.

Safety analysis of risk assessment and identification can also be used in other technical and technological processes at aerodromes, in the technical handling of aircraft, in the process of assessing the share of human performance in completing security character tasks, in assessing the occurrence of errors and failures in the ergonomic systems of man – machine and others.

## **CONCLUSION**

Analysis of security risks in aviation is, particularly in the recent past, an area of great consideration, which significantly influences the process of implementing security measures in civil aviation. Its results are also the basis for financial analyses of the investment and operating costs of airport security, which is reflected substantially in the economy of the whole airport. While there are many different tools and security analysis techniques at hand, the final decision on which techniques to choose should reflect on the available information as well as on the desired form of outputs and on probable tools that we want to further use and pair the outputs with. A thorough analysis represents an investment of hundreds of man ours and engagement of experts from all airport operations segments thus a thoughtless analysis conducted only for the sake of itself would represent an unnecessary waste of resources.

## **REFERENCES**

- [1] ŠČUREK, R.: *Studie analýzy rizika protiprávních činů na letišti*, Učební texty, Technická univerzita Ostrava, 2009

- [2] KOLESÁR, J.: *Modelovanie optimalizácie systému zabezpečenia ochrany a zaistenia bezpečnosti vojenského letiska*, Dizertačná práca, VLA Košice, 2002
- [3] KOLESÁR, J.: *Ochrana civilného letectva pred činmi protiprávneho zasahovania*, Vysokoškolská učebnica, TUKE, Košice 2010, ISBN 978-80-553-0357-4
- [4] SEK (2009) 791 - *Oznámenie Komisie Rade a Európskemu parlamentu o posilnení CBRN bezpečnosti v EÚ "Akčný plán EV v oblasti CBRN bezpečnosti"*. JLS-2009-00779-00-01-EN-REV-00 z 24.6.2009. Brusel.
- [5] ACI C16 / 09 *Požiadavky leteckého úradu SR na systém manažérstva bezpečnosti*. Bratislava, 2009.
- [6] PETRUF, M.: *Logistika krízových situácií (e-learning monografie)*. TU Košice, Košice, 2006. Digital Support, ISBN-80-8073-378-3.
- [7] *Rozhodnutie Európskeho parlamentu a Rady č. 1313/2013/EÚ o mechanizme Únie v oblasti civilnej ochrany* (Ú. v. EÚ L 347, 20.12.2013, s. 924).
- [8] TICHÝ, M.: *Ovládání rizika*. Praha: C.H.Beck, 2006. ISBN 80-7179-415-5.
- [9] PETRUF, M.: *Logistika krízových situácií. e-learningová učebnica – Digital support*, FBERG TU Košice -2005 , 250s. ISBN 80-8073-378-3.
- [10] PAČAIOVÁ, H., a kol.: *Bezpečnosť a riziká technických systémov*. Sjf TU v Košiciach, Viena, s.r.o. ISBN 978-80-553-0180-8.
- [11] SZABO, S. - NĚMEC, V. - SOUŠEK, R.: *Management bezpečnosti letiště*, Brno, Akademické nakladatelství CERM 2015, 172 p., ISBN 978-80-7204-933-2.
- [12] MADARASZ, L.: *Metodika situačného riadenia a jej aplikácie*. University PRESS Elfa,s,r,o,Košice. ISBN 80- 88786-66-5
- [13] PROCHÁZKOVÁ, D.: *Bezpečnost, krízové řízení a udržitelný rozvoj*. Univerzita Jána Amose Komenského Praha, 2010, ISBN 978-80-86723-97-6