

THE EMERGENCE OF A CRISIS SITUATION IN AIR TRANSPORT, AS A CONSEQUENCE OF THE FAILURE OF THE HUMAN FACTOR

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Crisis situations and crises of different character and their causes create an essential part of the life of human beings. On the basis of a thorough analysis, it is possible to define measures which reduce a risk of failure of a human agent to an acceptable level of the measures to increase the reliability of the human factor, also includes human factor issues of crisis situations pointed in the article, which may occur in the aviation and are caused by the human factor. The human factor can be considered as one of the fundamental and frequent consequences of crisis situations. The process of prevention of crisis phenomena may be a sufficiently effective itself if it is solved and comprehensively ensured.

Keywords: crisis, crisis situation, crisis management, human factor, aviation accidents,

1 INTRODUCTION

Currently, the concept of the safety is becoming a more and more discussed problem. It is one of the main assumptions of the further positive development of human society. In air traffic safety in all areas of civil aviation is currently given the first place. Causes affecting the accident rate in air transport, may be broken down from several points of view and according to several factors. The human factor is the wide area of the analysis, which is aimed predominantly as qualitative. It searches for and assesses the importance of the individual human activities and analyses their impact on reliability of a man or a device.

2 DEFINING THE CONCEPTS OF CRISES, CRISIS SITUATIONS AND CRISIS STATES

It is necessary to make every effort to properly define and describe the crisis phenomena and the search for the causes of their occurrence.

Crisis- from the Greek language, derived from "krino",

reflects the urgent need, feeling of uncertainty, the search for rescue [1].

Crisis situation- it is a situation that negatively effects and seriously undermines or changes the economic or social state operations, a territorial unit or a specific subject. It's a quirky or

very difficult to predictable the course of phenomena and activities after the disturbances that threaten the lives of people and the steady-state systems, environment, economy ... [1].

Crisis state – we define it as a condition of the social, natural, technical or technological system that is different from the stable status and operates on the entire system of degradation [1]. It is connected with the failure of the existing mechanisms of management and with the need for the application of special procedures, tools and techniques.

The progress and stages of crisis

The crisis is often a subjective matter and a man in the course of life is undergoing a heavy life tests. The progress of the crisis is to some extent determined also by the circumstances under which it takes place. The intensity of the exposure and the impact of the demanding living situation for an individual depends on the current situation in which the individual resides or is overloaded by obligations and whether the social surroundings can accept, promote a man and help him. [1].

Slight signs of crisis -they are observable by the general public, only to a narrow circle of experts. In this period, it is difficult to make an adequate response and prevent the spread of the crisis, because it is not possible to determine the cause clearly. [2]

The acute phase of the crisis -is the period of crisis, when there is a mismatch between the planned processes and facts absolutely clear and unequivocal. [2]

Chronic stage of crisis -occurs in the case the use of the measures taken to avert the crisis failed completely. Despite its partial easing, the cause of the crisis was not properly localized and sufficiently paralysed, which may be graded again. [2]

The stage of resolving the crisis- it is characterized by the acquisition of the balance of the system and the readiness to start its rehabilitation. [2]

3 CRISIS MANAGEMENT IN SOLVING THE CRISIS PHENOMENA

The crisis management is an interdisciplinary science that deals with the management of human activities, as purposeful activities of humans. [1]

Its primary mission is to develop a methodology of management with emphasis on the achievement of the effectiveness of this activity in relation to the aims. It's also the art to know how to solve specific crisis phenomena and to choose responsible approaches in specific conditions and environment. [3].

Given the nature of crisis management, we can define it as the theoretical problem or a branch scientific. The fundament is a theoretically revised discipline, which has its subject matter and the method of study. It provides us with a certain procedure, how to detect, eliminate and prevent crisis situations.

Features of crisis management [4]:

- a) the planning function
- b) the organisation
- c) human resource management
- d) leading of inspection.

4 HUMAN FACTOR IN AIR TRANSPORT

In Slovakia cars have killed almost as many people as aircraft accidents per year throughout the world. The aircraft, however, as cars, are machines and have statistic right to fail.

The human factor – a term that includes the knowledge of biology is an interdisciplinary, sociology, psychology and the natural science, which aims to achieve optimal consistency between human being and environment with a view to minimize the number and scope of human errors and their subsequent effects [5].

There is no doubt that the theoretical basics of prevention of air accidents have been created throughout the decades. During the World War I the headquarters found out that the most common causes of losses are not the shootings down, but an inappropriate **psychological profile of the pilots for 60%** of causes. The human factor is a cause of more than two-thirds of air accidents and includes the errors caused by the reduced attention, wrong decision making, misunderstanding of the requirements when dealing with a crisis situation. [6].

The influence of a human factor on the accident rate in air transport

In the air traffic, the safeness is always put on the first place of importance. Causes affecting the accident rate in air transport, may be broken down from several points of view and according to several factors. It depends not only on the technical conditions of the ground equipment, but especially **on the human factor – the pilot**. Professional investigations and analyses of factors affecting the safety of air accidents confirmed that the human factor in air transport is increasingly becoming crucial. It is considered that 70-80% of air accidents are affecting by a human factor, although, often, other reasons are reported. [7]

The ICAO statistics show that the classification of errors is as follows: [8]

- procedural errors 40,8%
- communication errors, 9.7%
- knowledge/skills 9,2%

- incompetence of 40,3%

Not only a human being – a pilot causes an air accident. Less air accidents are caused by technical and meteorological factors. Aircraft accidents are always a result of a sequence of several unlucky errors, there is often a communication problem or communication error, while individual errors are errors themselves almost insignificant. Statistics show that, for each aircraft flight the average is 1.9 of an error caused by the crew [8].

Human factor in aviation accidents

Air transport has a considerable^{c)} importance in international transport, because it is the fastest and convenient form of transportation. The definition of the human factor and the causes of failure in aviation we have reviewed in the previous chapter, in this part of our work, we want to pay attention to **air accidents**. The historically first air accident happened to brothers Wrights on 17th September 1908. [6]

Air accident means an event [9]:

- in which there was, in connection with the implementation of flight, a serious damage to the health or killing persons, except for cases where injury or death occurs from natural reasons, if a person caused the death of another person or themselves.
- the malfunction or damage to the aircraft, which has an impact on its airworthiness,
- the destruction or disappearance of the aircraft.

The air accident is associated with the operation of an aircraft which has happened between the time when any person enrolled into the aircraft with the intention to carry out the flight and time of all such persons has left the aircraft and in which [9]:

- one person is fatally or seriously injured as a result of,;
 - the presence in the aircraft, or;

- direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or;

the direct action of the gas stream.

or,

- the aircraft is destroyed, or damaged so that the damage:

adversely affected the strength of the structure, power, or flight characteristics of the aircraft,

- it will require major repairs or replacement of the affected parts,

or the aircraft is missing or is on an inaccessible place completely

Air Incidents mean other events, such as an airline accident associated with the operation of an aircraft which had or could have an impact on the safety of air traffic. [9]

Despite the fact that the Technologies hve constantly improved, aviation accidents still occure. The cause of almost all of the casualties was the human factor. In most cases this was the faulty pilotage. Gradually, the training program which is known as the Crew Resource Management (CRM) has been implemented to the operational procedures, the rules of effective cooperation between the various members of the crew. Its aim is to study the human factor effectively.

Analysis of the actual state of air accidents

ICAO statistics show that the rate of accidents, every 10 years, is decreasing by about 25%. In the beginning of the 1980s and the beginning of the 1990s are substantially unchanged even in comparison with today's results. [10]

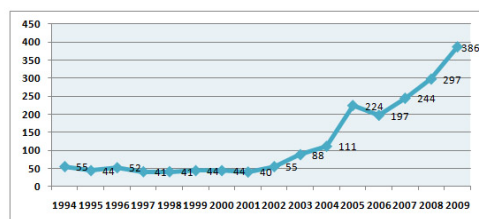


Figure. 1 The total number of air incidents during the observed period [11]

Shell Model

The SHELL Model is a scheme of relations of a man and other individual components. The main factor of this model is a human being. The Model was proposed in 1972 by Professor E. Edwards and about 3 years later modified into the actual form by F. H. Hawkins. The name of the model was created from the initial letters: SOFTWARE, HARDWARE (technical equipment), the ENVIRONMENT (environment), LIVEWARE (a man) [8].

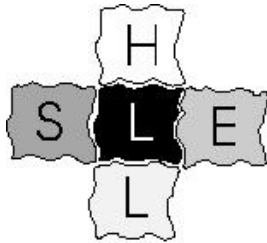


Figure 2 Model SHELL [12]

5 ANALYSIS OF SELECTED CRISIS SITUATIONS

The research sample investigates the most serious crisis situations, or aviation accidents or incidents. The human factor is the wide area of the analysis, which is aimed predominantly as qualitative. It searches and assesses the significance of individual human activities and analyses their impact on the reliability of the human being.

The objective of the analysis

The aim of the analysis is the identification of air accidents caused by the failure of the human factor. Further, in the article we point on the air accident which we want to analyze from the view of reasons of human failure. Subsequently, we will try to propose a model that will include procedures to be carried out in order to eliminate crisis situations.

Analysis [6]:

30/06/1956 - the collision of two aircraft over the Grand Canyon, USA

Analysis of the causes of an aviation accident:

clouds which shorten the time for visual identification of the other aircraft,

the congestion caused by duties in the crew cabin

physiological limitation of a human being - a pilot in observing which reduces the time to detect another aircraft.

12/11/ 1996 collision of two aircraft over Delhi, India

Analysis of the causes of an aviation disaster:

According to the result of investigation main reason of accident was the **human factor**, especially, the crew of the Kazakh aircraft. The airport received the clear instruction to start descending, but the crew of the Kazakh aircraft incorrectly recalculated height in feet to meters and flight level and flew directly into the path of Boeing from Saudi Arabia.

01/07/2002 collision between two aircraft over the Bodam Lake

Analysis of the causes of an aviation disaster:

the air traffic controller made wrong decision probably under the influence of work overload, that night Skyguide had technical problems and bad organization of night services

during the accident the system maintenance took place and Skyguide was working parttime only.

27/03/1977, collision of aircraft at take-off, Tenerife

Analysis of the causes of an aviation disaster:

The captain of KLM acted under considerable pressure and distress, because he knew that at airport there was probably the dense fog and probably in several minutes the runway visibility would be so bad that it would be not possible to take off. The problem in the communication and high level of stress caused that the captain of KLM considered sound in the headphones and an some short words which he couldn't understand properly as permission to

departure. Air traffic controllers didn't understand pilots as well.

According to the internet pages the most common human errors causing air accidents are described in the following picture:

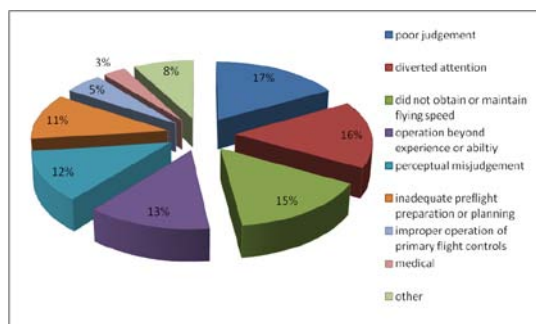


Figure. 3 The most common types of failures of human factor [13]

THE PROPOSAL TO ELIMINATE CRISIS SITUATIONS

In this contribution we propose some steps to eliminate risks caused by flight personnel.

The suggested steps are the following:

- more precise distribution of tasks to crew members on board of the aircraft,
- training and courses organized more often in the field of crisis management to improve the capacity to anticipate the following situation, increase enough theoretical knowledge and practical experience, language courses for the crew training on managing stress and time pressures, not only for pilots, but also other members of the crew,
- frequent checking and tests of physical and psychical crew abilities,
- implementation of frequent tests for addictive substances (alcohol, drugs, medicine...) before and during the flight,
- better organisation of work and rest periods during the work shifts-sufficient sleeping time before and during the performance of the work, breaks,
- using of appropriate communication methods,
- adaptation of legislation – in the area of defining the terms,

- constantly refilling and updating crisis manuals.

6 CONCLUSION

Crisis situations and crises are an essential part of the life of human beings. Dealing with any incidents or crises, using the minimum of resources and effort to achieve the maximum effect is not possible without effective preventative measures. It is therefore necessary to deal with the crisis preventatively before they happen. Respecting these principles considerably facilitates and streamlines rescue work and increases their effectiveness. The crisis management plays an intrinsic role in the processes of preparation and solving of actual crisis situations.

BIBLIOGRAPHY:

- [1] www.cvmpsvr.sk/projekty/8/Krizovy_manazment_I..doc
- [2] http://fsi.uniza.sk/kkm/old/publikacie/km/km_kap_2.pdf
- [3] Novák Ladislav a kol. *Krízové plánovanie*, 2005, Žilina ŽU, s. 208, ISBN 80-8070-391-4.
- [4] http://fsi.uniza.sk/kkm/old/publikacie/km/km_kap_3.pdf
- [5] HOLLÁ, K., MORICOVÁ, *Ludský faktor vs. Ludský činiteľ*, V. 2010. Posudzovanie spoľahlivosti ľudského činiteľa v priemyselnych. In *Zborník z konferencie „Riešenie krízových situácií v špecifickom prostredí“ konanej dňa 2. – 3. 6.2010 v Žiline*. Žilina : EDIS – vydavateľstvo ŽU, 2010. ISBN 978-80-554-0202-4, s. 221-227.
- [6] Bína Ladislav, Žihla Zdeněk. 2011. *Bezpečnosť v obchodní letecké doprave*. Brno 2011, 213 s. ISBN 978-80-7204-707-9.
- [7] Roman Topolčány, Bugaj, M: *Nehodovosť civilného letectva SR*. Technická prevádzka lietadiel – vplyv údržby na prevádzkovú spoľahlivosť lietadiel, DDP, ŽU Žilina, 2003.
- [8] <http://www.aeroweb.cz/clanek.asp?ID=2434&kategorie=3>

- [9] Zákon č. 143/1998 Z. z. o civilnom letectve.
- [10] Michal Hrbek, Vladimír Smrž. 2010. *Lidský činitel v letectví* : Ročník 5., Číslo III., 2010, s. 95
- [11] <http://www.profiipilot.sk/clanky/odborne-clanky/letecke-mimoriadne-udalosti-na-slovensku-v-cislach>
- [12] <http://www.skybrary.aero/index.php/File:Liveware.jpg>
- [13] <http://www.squidoo.com/aviationhumanfact>
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