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The role of human element in aviation safety

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Abstract Each industry is characterized that without human factor will not be able to function. This also applies to aviation, which focuses mainly on human labour. This sense of security what provides staff workers, on what the shoulders are the duty of care not to create a hazard before, during and after the flight. On the civil and military airports they employ staff not only flying but also ground handling. These include: auditors, managers flights, technicians, ground handling runway and apron, cargo department employees, firefighters and other emergency services, personnel service to passengers in the terminals, customs, security, and even people like hawkers, law enforcement officers, managers and managers of the various sectors. Each of these professions is responsible for a different aspect of the airport, and is necessary for the proper conduct of flight operations and passenger services and ensuring security. In the largest airports with lots of terminals with dense air traffic performance characteristics of employed people, the variety of tasks, and thus the level of complexity of the operation resemble a small town. In order for it to function efficiently is all you need is a good organization, through which cooperation between all departments of work is smooth and provides quick action in dangerous situations. Each employee should know their role and perform the desired function best, so to fill up the board and the workforce to reliably performed its duties and to the performance of their work brought economic profits.

Keywords aviation safety, human factors, transport management

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1. Introduction

Aviation is one of industry, which is based on the work of the human labour. Man has constructed an airplane, be like a bird fly up into the air, making it later means of transport which can move travellers and wares to distant places in short period of time. The aviation industry has developed and gives employment for many people, who working in factories producing airplanes and on the airports. One of the key elements to maintaining the vitality of civil aviation is to ensure safe, secure, efficient and environmentally sustainable operations at the global, regional and national levels.

With the growth and development this sector of transport has also increased the risk of mistake which is taken from each course. Introduced the concept of "human factor" which is defined as an operation between people and the environment air. It focuses on the people who affected by the direct action involving aviation [10]. It is also based on the problem of a system which is used for determining aircraft maintenance. It also has an impact on flight safety taking into account the risk involved.

In the aviation industry is very easy to make mistakes occur. Risks that may occur involving the safety of the crew operating the aircraft, apply to the management of the organization by air. The process of safe flight focuses on a job people and systems but also contain on it events which include the risk of mistake at the same time resulting in an accident. Airplane crash is never caused by one reason. Usually based only on during the cause-effect, in which each cell contributes to an accident. Avoiding would be possible in the case of interrupted for any reason. However only after the accident we appeared to be wearing this thing, which contributed to this accident. Unreliability of the security system is compared to the model of Swiss cheese. Then compares the causes of the holes in the cheese and in the case that it falls on each other when there is an accident. Should take into account this issue that accidents which occur always contain a cause, which the perpetrators are people [2]. Sometimes it is only sub-factor but in some cases it focuses on yourself all the blame. Therefore, conducted human resources management systems which focus on the analysis of the human and role in the airline industry.

As its primary indicator of aggregate safety in the global air transport sector, ICAO studies the accident rate based on scheduled commercial air traffic with a Maximum Take-off Weight (MTOW) above 2250 kg [14]. Aircraft accidents are categorized using the definition provided in Annex 13 to the Chicago Convention-Aircraft Accident and Incident Investigation. Figure 1 shows the global accident rate (accidents per million departures) over the years 2005-2014.

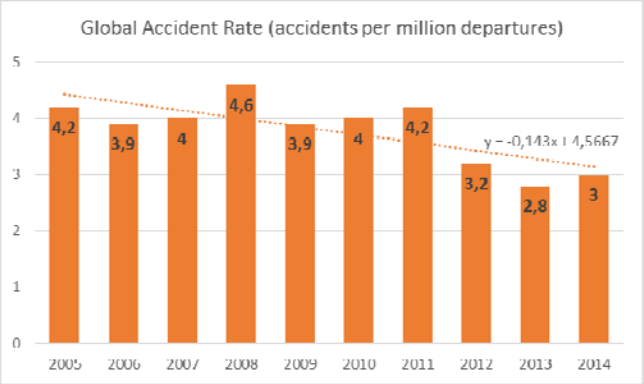

Figure 1. Global accident rate (accidents per million departures) over the years 2005-2014 (Developed on the basis of [14, 15]).

2. The emergence of the concept of human factors and model the formation of accidents

On account of dynamics of development that occurred in aviation, there has been greater focus on the role what made people in this area. Also there was a need to define this phenomenon and set them the concept of the human factor. It was created in the twentieth century by Arthur S. Reber who defined it as a term relationship occurring between human and machine. It includes the psychological aspects and may be related to factors which are the environment, people, work performed. Searching for the causes of air accidents, human action is not treated as an element that could contribute to the tragedy. When started happening cases of disasters, where the human was one of the reasons. Human factors were seen as acting as one of the important roles in the aviation security system. The concept of human reasoning is as knowledge of familiarity with the aircraft, operational systems and equipment for flight attendants, acting in accordance with the rules and based on technical knowledge, operations and logistics. In order to better analyse the human factor they created system HFACS (Human Factor Analysis and Classification System) that allows to explore aviation incidents and accidents. It is based on the creation of drawing conclusions and creation actions what can reduce the risk of occurrence of which is connected to the presence of the human factor.

Based on what says the definition of security, you might say that human is one of the most uncertain elements in aviation, the focus is on it is all the attention, when assessing the safety of the flight [9].

2.1. Swiss Cheese Model

Performing research on disasters we used models, which make it easier to understand the sequence of cause - effect occurs during the tragedy. One of such models is developed by James Reason'a model based on a comparison of Swiss cheese. He says that the crash takes several events, overlapping and forming the so-called chain of events. The investigating aviation accidents are mainly based on this model. In figure 2 shows the "Swiss Cheese Model".

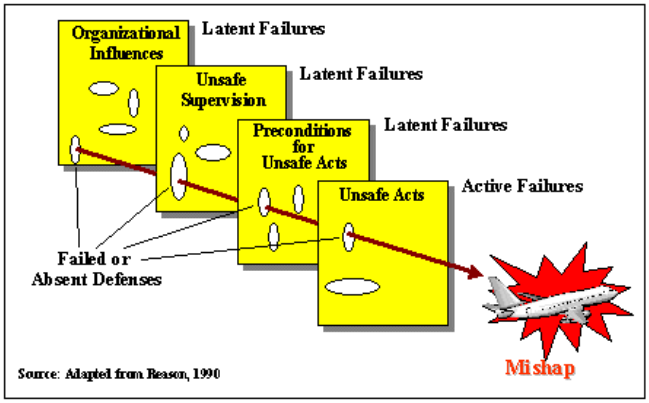

Figure 2. Swiss Cheese Model by James Reason [13].

This allows you to find all the factors that affect the operation of the crew. These include the danger what made the crew, the lack of proper management and wrong supervision of operations. Using the model Reason'a come to the conclusion that, despite upgrades of equipment and systems and the experience of crew, there are mistakes what have tragic consequences. Factors that may lead to an accident can occur at any time during the flight. Therefore, pilots are not the only one who is responsible for the security but also ground handling [9].

2.2. Model SHELL

Another model used in the assessment of safety and risk is the model of Hawkins – SHELL. In figure 3 shows the Hawkins - SHELL theoretical model.

Figure 3. Hawkins - SHELL model [8].

The model name comes from the initials of the components: Software (procedures, symbols), Hardware (machines, aircraft), Environment (environment, the context in which L-H-S system works) and Liveware (the human) [8]. It describes the interaction between the factors associated with the flight.

3. Human activities at the airport

The causes of airplane crashes do not always have a relationship with the proviso that the guilty is the crew, or the

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machine. Their reason may be on the ground and focus on the employees handle. A job at the airport based on the continuously changing factors and forces to adjust their actions. This is due to the fact that there is a situation where at one time happening several adverse events that may occur in the event of unexpected failures or actions are done wrongly. A person undergoes training to be able to cope with stress so that has the ability to some extent collide with the disaster. Even that, not everyone can cope with it. Contributes to the possibility of mental illness and the factors affecting the operation of the employee. These include:

- Vibration equipment,
- Work in noise,
- Severe traffic,
- Temperature.

Person who is working in airport ground handling should be characterized by:

- Auto discipline,
- The ability to perceive risk,
- Impose 'self,
- Knowledge and appropriate preparation for work at the airport,
- Process of thinking and decision-making,
- A willingness to take informed risks.

It is known, however, that the airports are working of inadequate schemes, which are also accepted by the board. It usually affects the relationship between workers who are in difficult situations dump the blame on the pilots [16].

At the airport there are various organizations that have their own goals and objectives. However, primarily focus on providing security, so that the economy airline operates at a high level. There are situations when it comes to making a mistake, which in the worst case ends as disaster. It does not have to come to it in the air, there were cases of the tragedy that occurred at the airport. They are caused by bad weather, poor technical equipment at the airport (mainly small regional airports that are not equipped with modern navigation equipment) or misunderstanding pilot with the controller. The combination of all these circumstances led to the greatest catastrophe that took place on earth. At the airport in Los Rodeos, which at the time of the tragedy was very crowded, on the airport area collided two aircraft, Boeing 747 Pan Am and KLM line. It got to this situation because of the bad weather prevailed. The airport did not have adequate radar and pilot KLM ignored command of controller [7]. In this disaster life has lost 583 people.

Another example of the disaster which occurred at the airport was the collision of aircraft Aeroflot, which upon landing in Omsk collided with preservatives airfield machines. The main cause of taking the fact that the controller snapped a nap and did not inform the plane of the difficulties on the runway [3].

A similar situation occurred during the flight of the Boeing 747 Singapore Airlines. Plane during a stopover in Taoyuan in harsh weather conditions collided with machines repaired standing on the waist. Contributed to the fact that the pilot mistook runway that took turn and additionally renovated portion of the runway was not protected [6]. In this disaster life has lost 83 persons.

4. Human and work on board

In the aviation industry for some time, we will notice that there is a contradiction between security and the economy and profits. It also meets on board airplanes. Requirements what is imposed on staff are in fact treated only in a theoretical way. They focus mainly on the interest in traveling and providing them with all sorts of in-flight amenities. It happens that the event will only focus on safety, which previously was treated as secondary, because important aspect on which the focus is making money, not their issuance. Employees are required to able to control the situation in the case of the tragedy, take care of the passengers, and while the fact that they tried to be kind, with subject to the manners and friendly atmosphere. To make sure the crew performed them duties as well must issue a suitable method of motivation. These include:

- Satisfaction with the work done,
- Financial incentives,
- Issuing a positive opinion.

The most common is the presence of tensions that arise between employees, handling aircraft and passengers. Stewardesses have to deal with variety of travellers and each of them has a different purpose and expectations as to the flight. Their tasks are skilful and communicate with everyone. Conflicts occur on board the aircraft are mainly there of three reasons:

- Flight safety,
- Board as a place of work,
- Excessive demands passenger.

In travels what take long hours travellers can easily divided on several groups:

- Friendly,
- Euphoric,
- Indifferent,
- Frustrated,
- Aggressive.

Of course, employees depend to most of the passengers showed positive features, but there are those that explode aggression. The tasks of the workers should then reassure the person that did not pose a threat to others.

Each employee the aircraft shall receive appropriate training on hazardous behaviour among passengers [11].

4.1. The crew on board and in the cockpit

The technical development of the aviation industry has led to the modification of aircrews. On-board computers are more automated allowed that reduce pilots to two. However, people who are in the crew getting more it's all because most aircraft are wide-run. The work of both teams is done in two ways, despite the fact that the deck crew took over some of the responsibilities of pilots. There have been cases that person did not listen stewardess what result to disaster. It has been extended through training in crew management to both

teams easier to the councils and managed jointly solve problems [11].

4.2. The phenomenon of air terror

In terms of aviation terrorism is an activity that is intended to intimidate and confusion of society. It occurs when sweeping a group want to provide any information. Despite all the security measures which accompany airports and airplanes still occur bringing on board bombs or weapons. One of the biggest terrorist attacks which made the history of the world was the attack of September 11, 2001, when the 4 civilian aircraft have been abducted and eliminated in the United States, depriving life nearly 3000 people. Although outnumbered, they occupy staff and passengers against several bombers on board there is fear, because such people can attack using this for what will be on the board. The fight against terror in the world has been going on for a long time. In spite of better security, do not always possible to prevent the attack, especially since making preparing for it for several years analysing any solution [11].

5. CRM - Crew Resource Management

In order to improve safety training started covering a range of crew resource management. NASA launched it at a conference on management controls. They discussed issues related to the mistakes made by the pilots, the decisions made by the board in the face of tragedy. In Europe, on the other hand, research was conducted that involved human impact on air accidents. Then focuses on providing training for pilots in order to reduce the risk of errors, thus bringing to life the CRM system. Training is carried out in this system were held in several sessions.

CRM program based on the provisions of JAR (Join Aviation Requirement). The definition of what defines them right is skilful and effective use of resources consisting of other employees, and its purpose was to determine demonstrate leadership and communication skills.

Based on the study on the basis of CRM applications received that only by working in a team can get a variety of performance and security. Despite the fact that every person is different and has different restrictions on the physical and psychological issues. Focusing on this, can make a mistake, the result of which there is a tragedy. It is important then to transmit specific information and focus on the individual elements that led to the disaster. Using communication and knowledge of the events that have already taken place is a chance for it to avoid future similar situations.

To be able to talk about CRM training, remember to keep the merits of the content. It contains within it about 10 topics:

- Errors caused by human, a chain of mistakes and decisions in order to avoid,
- Transport security policy,
- Stress and dominion over it,
- To absorb and process information,
- Decision making,
- Agreement and coordination between staff,
- Leadership and synergy,
- The impact of automation on the system,
- Differences in personality,
- Air accidents.

Using the CRM system resulted in improved safety. This is influenced not only the development of aviation, but also the fact that the airline industry is based on companies from different countries that work in environments that require cooperation between sectors [1].

6. Human in the face of the plane crash

The plane crash is a tragedy not only for the families of victims, but also for the entire aviation environment. Conducted the investigation, analysis and research, sooner or later, indicate the circumstances which could have been prevented or not. It is hard to find a single cause, since an accident caused by a series of phenomena. Identifies the main phenomenon causing tragedy.

In the history of aviation there have been aircraft accidents, which took place from the application of the human hand. One of the recent crash of the Airbus A320 German wings line that crashed on March 24 2015 the French Alps. According to the prosecution of French as a cause of mental disorders is given a second pilot, who after leaving the captain's cabin, preceded to the aircraft descent procedure, thereby killing all passengers [17]. A similar situation was faced in 1997, where the plane EgyptAir fell into the Atlantic after the co-pilot in the presence of the captain turned off the engine Boeing 767 machines, saying that Allah entrusted the fate of flight [17].

Another example of an accident caused by humans is the flight of Aeroflot, which took place in 1994. Here primarily to blame stupidity captain, this led to the death of 75 people, including two of their children, which are the cause of this event. The captain let them go into the cabin and pilot the machine on autopilot, not noticing that it has been turned off. The co-pilot tried to save the situation, but the plane was too low to bounce up and hit the forest [17].

To the accident can also help employees handle. One such disaster occurred over the Germans in 2002, when there was a collision of two aircraft in the air. Blamed for the event traffic was controller who serves in performing a single movement control center focused on flights less demanding attention, regardless of the situation, that have on one line two planes. Could also take into account the fact that he had problems with the radar, but in this situation should be more focus on what is happening in the air [12]. Another example of the controller fault and lead to the tragedy was the flight of the Boeing 727 which collided with a light aircraft. The event took place in 1978 and claimed the life of 144 people. It came as a result of late transmission of information to pilots that they are on a collision course with another plane, thinking that he is on view operating the machine. Small plane hook the Boeing in result leading to the fire and collapse to the ground [5].

To the disaster may also help unwell feeling pilot. This event took place at the International Air Demonstrations in

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Radom in 2007, when during acrobatic shows there has been a collision between two aircraft aerobatic team "Iron". Takes up the cause of the fact that one of the pilots who died, was elderly and was flying while under the influence of drugs for hypertension. This was resulted in a delay in response and late effects in the event of a collision. The manoeuvre was to the front bypassing airplanes flying in front of each other [4].

7. Conclusions

The role of the human factor in the aircraft industry is very important. However the term "human error" does not help in the prevention and investigation of aviation events, although it shows us where the system failed it does not tell us anything about the causes that led to the failure [8]. Safety awareness what feel a person who using air services allows them to focus on the pleasures of travel. It also affects the economy and efficiency of services. It should also be remembered above all that human supports surveillance system in air transport. Analysis of accidents and incidents allowed determining the 12 so-called causes of wrong what call dirty dozen. These include:

1. Facilities,
2. Lack of resources,
3. Pressure,
4. Stress,
5. Lack of knowledge,
6. Carelessness,
7. Distraction,
8. Lack of communication,
9. Fatigue,
10. Lack of assertiveness,
11. Routine,
12. Lack of cooperation on the team.

The purpose of understanding why people make errors is to produce safety reports and recommendations that will help prevent aircraft accidents [8].

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