A HUMAN FACTOR IN THE PROCESS OF ENSURING SAFETY IN AVIATION ORGANIZATIONS

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ABSTRACT

The common belief that safety in aviation is created through global and regional international aviation organizations is true, however it does not fully convey the core of the problem. The standards and directives shaping the safety system in aviation are important, however these are merely strategic tools for shaping the policy and safety strategies in aviation. The real activity in this area is performed at the very bottom of the aviation structure, directly in an air company, particularly in an airline, that is, by a carrier who provides carriage and cargo services. The reason for initiating research in this area was an attempt to find answers to the following questions: to what extent does safety policy pursued by air companies influence the image of those companies as well as the assessment and safety feeling on the part of the passengers? Is investment in safety profitable from the standpoint of an airline? The above-mentioned problems, presented in a form of a report of the conducted research, constitute the bulk of this article. It should be noted that the fragmentary research undertaken in the course of work over the subject of safety conditioning in airlines may form the basis to plan further research in this area.

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KEY WORDS

Safety in aviation, safety threat in aviation, emergencies.

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Introduction

Air transportation is one of those rare branches which despite turmoil and economic crises has been systematically growing. The number of passengers is constantly rising and it should be noted that within one decade the number doubled. It refers both to international trends as well as local airline services. According to data available, in 2002 Okęcie Airport in Warsaw was visited by over 5 million passengers and six years later, in 2008 the number equalled almost 10 million. This figure remains still

at the same level. The transportation needs of Poles, based on any kinds of estimates, do not exceed 20 million passengers annually. The number of passengers who are checked at the Okęcie Airport amounts to approx. 12 million. Therefore, this situation does not vary from international trends.

Development dynamics of air transportation

In 2015, airlines around the world carried 3.1 billion passengers and 49.3 million tons of cargo, in regular flights[1]. One should add that in 2009, despite the beginning of the economic crisis, over 2 billion people used airline services, and this figure might serve as a reference point. Despite an extremely difficult situation worldwide, in 2013, a growing demand on passenger carriage was observed. This trend continued throughout the whole of 2016, therefore it can be considered relatively stable. During this time, the average passenger load factor remained on the level of approximately 80%. Air transportation, in spite of catastrophes and incidents in aviation, is invariably considered to be the safest means of airlifting people and property.

Personal qualities of airline personnel

Airlines which are responsible for passenger carriage remain under constant pressure of cheap airlines and thus are forced to cut the costs, which does not bode well for proper attitudes to the issue of safety. Taking into account flying, technical and maintenance personnel, airlines base upon a ready-made "product", currently available on the job market. Looking at the problem of accidents in aviation, however, one may assume that causality of accidents and incidents in aviation, particularly those linked with the human factor, are rooted in mistakes committed at the beginning of an aviation career, as early as in basic training and upbringing of young aviation adepts. This is when individual causes which are long-lasting and difficult to eradicate, resulting from the student – instructor relationship, are shaped. Moreover, an increasing commercialization of air training and a wider access to aviation should also be taken into consideration. The negative personal attributes of pilots or serving personnel are acquired in the initial process of training. The habits affect the future work of airlines, and consequently their economic status. The most common bad habits are in the first place: nonchalance, irresponsibility, excessive recklessness, disrespect towards knowledge and experience, promoting cunning and occasionally carelessness, in aviation. This also pertains to ensuring safety of passenger carriage, so to the perception of reliability of airlines. In this system, man is and must be the most important. This is where one should add that the majority of air catastrophes, according to various estimates reaching the level of almost 90%, are caused by the human factor, that is by individual and group competencies, which form the required level of safety in an air company. This is where the role of a properly understood process of examining air accidents and rational, unbiased prevention – free from corporation solidarity – proves significant. A vital interest of executives managing the safety of air companies, is to gradually diminish the occurrence of air accidents, possibly to eliminate them entirely. Moreover, the duty of the manager is to do their utmost so that a similar situation would not recur in the future. How can it be achieved? By asking such a straight-forward question, one may expect only the following answer: airlines must not save on training and preparation

[1] More on: http://www.prtl.pl/rynek_lotniczy_przewozy_pax,33167,1

of their personnel, in particular pilots and key servicing personnel.

The aim of conducting this type of research was to establish a way of perceiving safety in aviation organizations. For a long time it has been believed that a key role in the shaping of safety is played by international aviation organizations, especially the International Civil Aviation Organization as well as regional organizations. The author does not quite share this view, pointing to a crucial role of air companies themselves (airlines) which treat the standards and directives defined at the highest levels as a certain direction of shaping the safety policy which needs to be further organized and implemented on an executive level. This is exactly the role of airlines and air companies. In the course of the research, in this case often rudimentary and fragmentary, the following research objectives have been resolved: in what way the selection of airline personnel and shaping human resources policy affect an enhanced image and safety of the offered services? What is the target training system in airlines in order to face the aviation requirements? What is the role of simulator training and which training areas might be supported by simulator training? To what extent might the experience and conclusions stemming from studying various air incidents prove useful for training and improving the security of the company?

At the beginning of research, the author assumed a working hypothesis, which stated that the role of international aviation organizations exerts an indirect (political) influence on shaping aviation safety. The real responsibility in this area rests on air companies and this is where future attention should be focused since in the scope of their activity, responsibility and competence, there is the "key" to the implementation of standards and directives adopted at the highest levels, i.e. real possibilities to provide safe carriage and safe aviation services.

In the least complicated model of shaping safety in aviation, which refers to safety policy in airlines, training activities should focus on such components as: crew performance in emergencies, aircraft efficiency, including adequate equipment and preparation for the nature of conducted tasks, the efficiency of the system which prepares and supports air operations as well as operation and efficiency of ground handling at the airport. Each of the components mentioned above, by itself, constitutes a sophisticated area of individual and complex competences. It is also a source, or rather a peculiar generator of threats, susceptible to the existence and interaction of various types of internal interferences, e.g. environmental operating conditions, exploiting an aircraft, protective devices and additionally, the so called "human factor" that is experience and internal emotional state of the crew, which further affects the execution of a flight.

The level of safety has been systematically growing and is significantly higher than it used to be, e.g. in the 1980s. Besides, the level of technological advancement of aircraft has been on the increase, which can be seen in the degree of advancement of air constructions, and, most of all, the advancement of systems supporting air operations. The cabin of a contemporary aircraft, to a larger extent, reflects modern electronic control systems of increasingly higher advancement and becomes more and more modern and thus a demanding working station, which "bombards" the pilot with a great deal of data, occasionally requiring action or a proper reaction to an incoming impulse.

Man in the safety system of an aviation organization

Pilots working for contemporary carriers, particularly those operating on long-distance routes, for the most part of the flight, often for 10-15 flight hours, focus their attention on controlling onboard instruments, i.e. passive piloting an aircraft, merely monitoring flight parameters and conducting radio correspondence. Other activities connected with piloting an aircraft are performed by an onboard computer. In this way, modern piloting of an aircraft is becoming increasingly advanced aviation engineering. Therefore, it has a lesser and lesser element of the past air fantasy. Depriving the crew of the necessity to concentrate on the task eliminates emotions that are typical for the "manual" piloting of an aircraft and leads to routine. This is a new source of safety threat in aviation.

For airlines this has become a new phenomenon, whereas for the flying personnel it is not. For a long time this has been an observation of pilots who often claim that modern flying downgrades the pilot's role to an emergency "module' for aircraft automated systems, which executes steering in the open mode. This may seem to be a slightly strange approach, particularly for people who look at aviation operation from the passenger's position, an airline customer. However, it does not look strange from the position of an aviation expert, since it only proves the capabilities of modern aviation technology. What does it mean in practice? Considerable changes in the manner of piloting, since the pilot responds only when there is a deviation from the set algorithm of the autopilot operation, usually confirmed by a proper alarming signal which forces the pilot to react, for instance, by taking control of the aircraft. The contemporary pilot has been limited to the role of an operator, whose task is, first and foremost, to monitor the passing information in the plane cockpit. The time has come to start a discussion whether this could be a ground-located cockpit, similar to unmanned aerial vehicles, where the crew might simultaneously operate three or four operating machines. There is no shade of doubt that such a situation will occur in the future. Even at the present moment one should wonder over the new role of an air carrier, changes in the training system and the system of passenger service.

A growing amount of information seems to pose a safety threat in aviation, especially to the carrier. It is a consequence of rising technological advancement, which, in order to insure efficient operation of aircraft systems, needs to process a larger amount of information, including the environmental situation of air operation, the condition of the aircraft, air and ground situation of the aircraft, etc. Thus, the amount of information addressed to the pilot is constantly on the increase, however the time and spatial conditions of modern air operations result in shrinking of the time necessary for an analysis of the incoming data. It influences the optimalization of the decisions taken, and so the crew performance in emergency and extreme situations. In each of these situations, the crew performance may differ, from passive to active. It depends on training and individual crew preparation.

The investigation of air incidents

Let us consider passive crew performance in piloting an aircraft based on the case involving an Airbus A 320 with 144 passengers on board. The situation took place in 2009. The aircraft took off from San Diego airport and was to land in Minneapolis. It was piloted by two experienced pilots, who became so absorbed in their

conversation and preoccupied with work on their personal laptops that they did not even notice that they flew 240 km over the final route point. The crew did not respond to any air traffic controllers and lost count of time. The American authorities thinking that it might be a terrorist attack, alerted the military aviation. Later on it appeared that, following the official statement of the American National Transportation Safety Board, the reason was inattention[2]. This case may lead to two opposing conclusions: firstly, in the aviation system man is the weakest link; secondly, only man remains the weakest link in the chain of air events. Meanwhile, a crew which is properly prepared for an execution of tasks, diminishes the probability of an accident in extreme situations.

This is illustrated by another example, probably the most spectacular one in the history of aviation. It refers to an incident which happened in 2009, also involving an Airbus 320. The airliner carried 150 passengers and six crew members. It took off from La Guardia airport in New York, and was bound for Charlotta in North Carolina. After the take-off, at the altitude of 3,200 feet, it collided with a flock of wild geese and had its two engines shut down. The aircraft captain made the right decision to make an emergency landing on the Hudson River in the centre of Manhattan. The incident ended safely. Both the passengers and the crew members were unaffected by the situation. This event confirms the pilot's role in the aviation system, because the machine would not have taken such a decision. Acting on algorithms set by man, the autopilot (machine) would have been searching for an airport, which would definitely end up tragically.

[2] American aviation authorities started an investigation into aircraft pilots of Northwest Airlines who carried 144 passengers and 5 crew members on board, for over an hour, did not make contact with ground control and by over 240 km passed the aircraft where they were to land, see: http:/wiadomosci.wp.pl, posted: 2009-10-23.

It seems that a remedy for this type of problems is proper training. Proper, that is giving possibilities of checking any in-flight possibilities, even the theoretical ones, prior to the likely occurrence of such mishaps. It requires a great deal of technological advancement of simulation systems so that they would be able to reflect reality as closely as possible. A question arises whether such training, carried out in laboratory conditions, with no resulting awareness of the executed actions, implemented procedures and decisions will improve safety. Such a discussion took place in the aviation profession towards the end of the past century. The main reason for the willingness of airlines to accept the necessity of simulator training was increasing costs, and, consequently, an additional financial burden affecting the condition of a company. Moreover, pilots were not particularly eager to undergo such training, mostly due to the fact that the construction and capabilities of the then simulators reflected the real flight environment to a very minimum extent.

Can technology be a source of a threat?

The cockpit of a contemporary airplane resembles a multi-person laboratory rather than an individual pilot's working station. The limitations of pilot perception and, at the same, time requirements he faces in order to interpret and process hundreds of various types of data, translate into the assumptions and demands for air constructions. Therefore, a wide range of directive indicators is used which deliver to the crew, as much as possible, already processed collective information, gathered from various groups of instruments. The automatization, introduced in such a way, not only facilitates piloting an aircraft, but is also beneficial due to the ongoing standardiza-

tion, as it enables faster and easier training for a new type of an aircraft. This solution, however, has got certain drawbacks.

Excessive digitization and automatization, which can be more and more observed in the cockpits of contemporary airplanes, requires time necessary to prepare the crew to use the systems. Complications arise during acquisition of more extensive and advanced knowledge, which is indispensible to master and operate the modern systems in practice. There appear threats of errors and mistakes, whose consequences might prove disastrous, as in the case of the Boeing 757 aircraft, owned by Airlines 965 company, which crashed into the peak of the El Deluvio mountain on 20 December 1995 in the vicinity of Buga, Columbia. The result of this catastrophe was the death of 158 persons at the site[3]. Therefore, as it seems or has been proved before, technology comes closer to the limits of the pilot's perception, which calls for new solutions, and perhaps, as it has been already mentioned, moving the aircraft cockpit to the ground station, likewise unmanned aerial vehicles.

The technology which might be exploited for this purpose has been available over a long time. The only problem which has been noticed by operators, in this respect, is to overcome the psychological barrier in passengers. Today it is difficult to imagine loading an aircraft that will fly across the ocean without the crew. For the pilot it should not make much difference whether he is alone in the aircraft cockpit or in the cockpit on the ground. It should be noted that on the ground there is more room for developing additional systems and possibly positioning other crew members, if it is considered necessary. There is no doubt that it will happen in the foreseeable future. It is only a matter of time when people will get used to it, as we can now observe trains without a driver, running in many airports, e.g. in Frankfurt or Atlanta. There are also driverless underground trains (metro), transporting millions of passengers and this fact does not seem to scare anyone[4]. It should be remembered, however, that higher automatization automatically puts forward higher demands on the party of the personnel and the pilot who must become familiarized with the capabilities and operation of the systems so that in special situations he could independently solve problems, also those unforeseen by constructors. This objective must be facilitated by simulators.

Simulators find application mostly in learning basic pilotage on an airplane and helicopters and in the training of crew members. They can be applied in conducting continuous training as well as training various advanced parts of future combat missions by performed by military aircraft crews, which in turn not only lowers the general training costs but also enhances its efficiency and general safety of air training. Raising safety standards in training directly stems from the use of state-of-the art technologies and simulation techniques. Thus, simulators enable, on the one hand, to master basic pilotage elements, on the other hand, however, they serve to prepare flying personnel to cope with emergencies. Therefore, it is possible to familiarize pilots with extreme emergencies which may appear in real flight conditions, and cannot be practised in a realistic way during regular flights or during training flights in military aviation, without exposing the equipment and the crew. This is the real advantage of simulators.

[3] More information in : *Katastrofa lotu American Airlines 965, http://pl.wikipedia.org/wiki.*

[4] Underground in Dubai – fully automated system of trains opened on 9 September 2009 became one of the longest fully automated systems of trains in the world, see: http://pl.wikipedia.org/wiki.

High safety costs

Airlines are fully aware of safety costs. More and more commonly we can hear a statement that safety is too costly. The observed improvement in safety results from investments before the crisis, which now brings results. Will it be so in the future? It is difficult to say which approach will prevail: economical rationalism or passengers' interest. Maybe a solution will be found to compromise both? Ander the pressure of the crisis, airlines more frequently admit that "safety is poor business". That is why, various kinds of technological inventions meant to improve safety are purchased rather reluctantly. There is no investment in protective equipment. No extra protective devices are ordered, although they are offered by aircraft manufacturers. As long as doubts of airlines are understandable, because they take into account profitability, it is more difficult to comprehend why aviation authorities do not attempt to impose new solutions. Clearly, they should exercise more interest in this respect.

However slowly, this system is changing. Aircraft safety indicator of 60 major airlines is rising, and in this respect indicators coming from 2011 may be considered as particularly good. Air traffic is growing along with flight safety. The most dangerous airline is Japanese All Nippon Airways, confirmed by the data of the International Air Transport Association (IATA), which presented its analyses in Geneva, indicating explicitly that the level of civil aviation safety is still on the increase, despite the growing traffic. This is proved by the number of air catastrophes, which occurred in the 1980s or 90s; for instance, as far as 1996, 2,272 passengers lost their lives, whereas in 2011, as a result of air crashes only, or rather as many as 498 persons died. The tragedies occur usually during domestic flights, that is over short distances which do not exceed 500 km. In comparison, four times more persons died on German roads at the same time[5].

The positive result obtained by airlines is not accidental. It is backed up by the years of much effort, being a consequence of more and more technically efficient airplanes, but also of increasingly efficient and capable monitoring systems. In addition, pilots are better trained and prepared for any kinds of likely situations. Africa was at the bottom of the ranking lists of aviation safety statistics for a long time. However, the establishment of the African Civil Aviation Agency (ACAA) in 2007 improved the safety of African airlines[6]. Regrettably, Russia still takes the last position in these ranking lists. The safety level of Russian aviation is known to be catastrophic due to outdated machines, lack of funds for maintenance, incomplete personnel and crew members training, along with poor infrastructure of small airports in the country's province, in particular.

Five most hazardous airlines, according to the German Jet Airliner Crash Data Evaluation Centre (JACDEC) are: Chinese airline – Hainan Airlines, Emirates Etihad Airways, Hong Kong Cathay Pacific Airways, and Finnish Finnair (each time the safety indicator is below 0.006[7]). The most dangerous world carrier was considered All Nippon Airways with the aircraft safety indicator equalling 0.005.

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5 See: *Bezpieczeństwo lotów to żaden interes*, http:// www.dw.de, posted 18 July 2014.

6 Ranking: Najbezpieczniejsze linie lotnicze świata, http:// www.dw.de, posted 9 January 2012.

7 The primary aircraft safety indicators, recommended by the International Civil Aviation Authority – ICAO are indicators which characterize the number of air crashes per 100,000 flying hours, or per 100 million flying kilometres, see: Żurek, *Wybrane metody oceny bezpieczeństwa w lotnictwo*, edited ITWL, 2009.

Conclusion

To sum up, it should be mentioned that aviation safety is created on the ground, in an air company. Flying culture forms the basis of this system, where then appropriate training and preparation of personnel to execute all tasks connected with aviation is of primary importance. Aviation organizations should treat safety as a special obligation with regard to passengers. This may sound as truism, although the author did not have such an intention. The most important issue is an attitude to safety policy in aviation organizations, which means that it is an attitude to people who are a real asset of the company, because it is man – crew who take final decisions, especially in emergencies. Airlines should prioritize the preparation of pilots to take decisions in such situations. Thus, training does pay. Airlines should not save money in this matter, because the safety of passengers and carried goods are affected. Consequently, the level of offered services, including the economic situation of the company, suffers. This is where the "vicious circle" is closed, proving that the personnel's interest translates into the condition and a good name of the company which employs the personnel and treats appropriately.

The experiences collected by the aviation branch with regard to safety serve to raise the level of safety while travelling by plane. The experiences may also be exploited in the aspect of organization of the safety system not only in other transportation branches, but also in a widely understood economic activity in the interface man- contemporary technology.

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