



HUMAN FACTORS AND ITS SOLUTIONS FOR FLIGHT SAFETY

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Abstract

This article analyzes the human factors affecting flight safety in the aviation sector, the causes of its occurrence, and ways to mitigate risks. Human errors, psychological and physiological factors, crew resource management (CRM), modern training systems, and the importance of safety culture are highlighted. The results of the study show that effective management of the human factor is an important condition for ensuring flight safety.

Keywords: Flight safety, human factor, aviation, crew, CRM, safety culture, human error.

Introduction

Despite the fact that aircraft maintenance and operation in aviation is one of the safest types of operations, the majority of aviation accidents are caused by the human factor. At the same time, the emergence of new modern aircraft and the use of automated control workstations will necessitate a constant increase in human training. Although modern aircraft are developed based on high technologies, human participation is of great importance in their control, technical support, and flight organization.

Therefore, studying the impact of the human factor on flight safety and developing measures to reduce it is one of the most pressing issues.

The essence of the human factor.

The human factor is understood as the interaction of a person's psychological, theoretical knowledge, physiological, and social characteristics with technical systems. In aviation, the human factor includes errors and decisions related to the



activities of pilots, flight control bodies, maintenance personnel, and other support groups.

The human factor in flight safety is divided into:

- making a wrong decision;
- negligence;
- communication and communication errors;
- stress and psychological pressure;
- fatigue and insomnia;
- insufficient qualifications.

Making bad decisions - One of the most important human factors affecting flight safety is making bad decisions. Since aviation is a complex profession and is carried out in a rapidly changing environment, pilots, flight control officers, and other support specialists are required to make clear and well-founded decisions in a short period of time. Errors in the decision-making process can pose a serious threat to flight safety.

Incorrect decisions are caused by various factors. In particular, insufficient information, incorrect assessment and analysis of the situation, high stress levels, decision-making in a short time, illness, fatigue, and increased workload negatively affect a person's ability to think. In such cases, the pilot may fail to fully analyze the existing risks or make a decision without adequately assessing the alternatives.

Thus, the decision-making process is one of the key factors ensuring high-quality flight safety, and the reduction of errors occurring in this process significantly increases the overall safety level of the aviation system.

Inattentiveness: Inattentiveness (distraction) is one of the important human factors that negatively affect flight safety. In the field of aviation, every action and decision-making requires a high level of attention. Even minor negligence by the pilot, air traffic controllers, or maintenance personnel can lead to serious consequences, including accidents or catastrophic events.

Inattentiveness usually occurs as a result of fatigue, insomnia, stress, mental strain, increased workload, or prolonged repetition of the same tasks and improper analysis of information exchange. In such cases, the employee's ability



to concentrate decreases, and the process of receiving and analyzing important information during the exchange slows down. As a result, necessary instructions may be overlooked or incorrectly executed.

Thus, negligence is one of the most dangerous manifestations of the human factor, and its reduction is one of the important conditions for ensuring flight safety. A high level of concentration, enhancement of theoretical knowledge, and effective application of discipline and control mechanisms significantly increase the level of safety in the aviation system.

Communication and communication errors: Communication and communication errors are among the human factors that significantly impact flight safety. In the aviation system, information exchange between pilots, air traffic control authorities, maintenance personnel, and other specialists must be continuous, prompt, and accurate. Any incorrectly transmitted information, incomplete or misunderstood information can cause dangerous situations during the flight.

Conclusions are drawn based on the analysis of aviation accidents, which shows that one of the causes of many accidents and incidents is communication errors. Therefore, in modern aviation, great attention is paid to developing a communication culture, avoiding errors, using standard radio phraseology, and ensuring open communication between crew members.

Accurate, timely, and complete transmission of information, as well as effective cooperation between the crew and air traffic control, play an important role in ensuring flight safety.

Stress and psychological pressure: Stress and psychological pressure are among the most important human factors negatively affecting flight safety. Aviation is a highly responsible profession, a type of activity requiring complex technical systems and rapid decision-making and transmission, under which pilots, air traffic control officers, and other aviation specialists work under constant psychological stress. A certain level of stress can increase a person's alertness, but exceeding the norm leads to a decrease in attention, a slowdown in the thinking process, and an increase in the number of errors.



During flight, stress is caused by various factors. Unfavorable meteorological conditions, technical malfunctions in aircraft, emergencies, high air traffic density, time constraints, and the sense of responsibility for passenger safety cause severe psychological stress among pilots. In addition, long flights, misunderstandings with colleagues, a tight work schedule, and insufficient rest on time also lead to increased stress levels.

In aviation practice, a number of measures are applied to reduce stress and psychological pressure. In particular, it is recommended to conduct regular psychological training sessions, conducting stress management interviews, maintaining regular communication between colleagues and crews, practicing emergency situations on simulators, and strictly adhering to a timely work-rest schedule.

In recent years, special attention has been paid by aviation personnel to the regular monitoring of the psychological state of employees, the organization of consulting services, and the implementation of mental health support programs. This approach allows for the reduction of risks associated with the human factor and the further enhancement of flight safety.

Fatigue and insomnia: Fatigue and insomnia are among the most significant human factors negatively impacting flight safety in aviation. Since the professional activities of pilots, air traffic control officers, and maintenance personnel require a high level of attention, quick thinking, and responsibility, it is important to maintain proper physical and mental health. Insufficient rest or sleep disturbances reduce the work capacity of the human body and increase the likelihood of various errors.

Fatigue and insomnia are among the serious threats to flight safety, as they reduce human attention, memory, imagination, reaction speed, and decision-making abilities. To mitigate these risks, it is necessary to adhere to a work and rest schedule, use modern fatigue management systems with exercises, and regularly monitor the physical and mental health of employees. These measures will serve to increase the level of safety in the aviation system and reduce the number of accidents related to the human factor.

Insufficient qualifications: Insufficient qualifications are one of the most important human factors negatively affecting flight safety. Aviation is a complex



type of activity that requires a high level of knowledge, practical, theoretical, simulator skills and constant professional training, and the level of qualification of the specialists working in it is of decisive importance for the safe performance of flights. In cases where the professional training of pilots, air traffic controllers, maintenance personnel, and other aviation specialists is insufficient, errors may occur and the level of safety may decrease.

In modern aviation, special attention is paid to the principle of continuous education, simulator training, and training in advanced training courses. According to this principle, specialists must regularly study new technologies, international standards, and safety requirements. Furthermore, the mentorship of young personnel by experienced specialists is considered one of the effective methods for enhancing professional skills in accordance with the "ustoz-shogird" tradition.

Therefore, regular professional development of aviation personnel, the mentorship of young personnel by experienced specialists, the introduction of modern training programs, and the strengthening of practical and technical training are important conditions for ensuring flight safety.

Solutions to reduce the human factor

Although it is impossible to completely eliminate errors related to the human factor in the aviation system, their negative impact can be significantly reduced. To achieve this, it is necessary to constantly improve organizational structures, technical information, theoretical and practical knowledge, and training equipment, as well as to comprehensively apply psychological and educational measures. In modern aviation, managing the human factor is considered one of the priority areas for ensuring flight safety.

Crew Resource Management One of the most effective ways to reduce the human factor is the crew resource management system. The Crew Resource Management Program aims to improve collaboration between pilots, flight attendants, air traffic controllers, and other technical support specialists. The main goal of this approach is to minimize the likelihood of errors by using available human and technical resources as efficiently as possible.



During crew resource management training, specialists are taught effective mental communication, teamwork routines, leadership sphere, situation assessment, stress management, and correct decision-making skills. Research shows that open communication and mutual control among crew members play an important role in the early detection and elimination of hazardous situations.

Regular training and simulator sessions. One of the important means of ensuring aviation safety is regular theoretical and practical training. Along with the constant improvement of theoretical knowledge, it is also necessary to constantly develop practical skills.

With the help of modern aviation simulators, pilots and air traffic control officers train in situations that are as close as possible to real flight conditions, technical problems on the ground, and the elimination of hazardous natural phenomena. Simulators jointly simulate emergency response measures such as engine failure, fire, severe turbulence, communication disruptions, and navigation system failures. Such training develops the ability of specialists to quickly and correctly make decisions in complex situations, correctly analyze the situation.

Fatigue risk management system. Fatigue is one of the main factors threatening flight safety. For this reason, many airlines have and use rest rooms on a permanent basis according to the established schedule.

This system serves to plan employees' working and rest periods on a scientific basis. The fatigue risk management system monitors biological rhythms, sleep quality, workload, and flight duration. As a result, cases of inattention, decreased reaction speed, and poor decision-making caused by fatigue are prevented.

Psychological preparation and stress management. Aviation specialists often work under high psychological pressure. Emergencies, negative communication with colleagues, difficult meteorological conditions, and heavy responsibilities lead to increased stress levels.

Therefore, in modern aviation, special attention is paid to psychological training programs. Through specialized training, pilots and air traffic control officers develop skills in managing stress, maintaining emotional stability, and working effectively under pressure. In some airlines, psychological counseling services



are also organized in special psychological rooms, which support the mental health of employees.

Modern technologies and automation. In recent years, modern technologies have been widely implemented in aviation to reduce the human factor. The use of automatic control systems, digital navigation tools, digital automated control points, artificial intelligence-based monitoring systems, and warning devices will help prevent human error.

For example, systems that warn of dangerous approaches to the ground through automated devices, devices that prevent aircraft collisions through automated navigation systems, and automatic flight systems reduce the pilot's workload and increase the level of safety. However, automation does not completely eliminate the human factor, so it is necessary for employees to have high qualifications in working with technology.

Regular professional development of personnel. The development of aviation technologies requires specialists to constantly acquire new knowledge and skills. Therefore, it is important to regularly improve the qualifications of pilots, air traffic control officers, and maintenance personnel.

Professional development courses, seminars, international trainings, engineering competitions, and scientific research develop the professional competencies of researchers. This will serve to reduce errors related to the human factor and ensure flight safety.

Conclusion

The role and the human factor play an important role in ensuring flight safety. Fatigue, stress, technical difficulties, and human error are among the main causes of aviation accidents. These risks can be significantly reduced through regular training, staff training, the development of fatigue management systems, and a safety culture. In modern aviation, the management of the human factor remains one of the most critical areas for improving flight safety.

Therefore, studying the impact of the human factor on flight safety and developing measures to reduce it is one of the most pressing issues.



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