

## The Importance of Human Factors in Aviation Companies

Seçil ULUFER KANSOY<sup>1</sup>, Kaan BAKANOĞLU<sup>2</sup>

<sup>1</sup>(Civil Aviation, İstanbul Aydın University, İstanbul, Turkey)

<sup>2</sup>(Commercial Pilot, İstanbul, Turkey)

**ABSTRACT:** For companies, the human factor is an important issue. Because there is movement everywhere human beings exist. Where there's movement, there's a better chance of mistakes. Especially for airlines, the human factor is a very important factor. Therefore, the human factor in aviation; With direct consideration of human performance, it is possible to explain as principles that provide the safe process between human and other system elements. Since the emergence of aviation, human beings have always existed and will continue to exist in the future. Due to human nature, human beings are prone to error. With the slightest mistake to be made in aviation, very large irreversible accidents can occur. Serious losses were experienced in aviation in the face of this situation, which is named as the human factor. As a result, by taking various measures in the aviation industry, the human factor was kept at a minimum level and flight safety was tried to be kept at maximum level.

**KEYWORDS** –Aviation, Business, Human Factor

### I. INTRODUCTION

The human factor is a human condition that people have in their own body by nature and can cause positive and negative consequences in some cases. Although this situation can be prevented, since it cannot be completely reset, businesses have to take the necessary precautions against the human factor. There are bad experiences in the aviation sector due to the human factor. For this reason, this study shows how the human factor affects businesses and especially how it harms the aviation industry and the measures taken against it.

### II. HUMAN FACTORS

The terms human factors and ergonomics are used in common terms in the literature. While the term "ergonomics" is used in Europe, the terms "human factors" or "human factors engineering" are used in America. The origin of ergonomics used in Europe reaches to work psychology, biomechanics and workstation design. On the other hand, human factors science is based on experimental psychology targeting human performance and system design. [1]

If we need to define the human factor in general, it can be defined as “Human factors refer to environmental, organizational and work factors and human and individual characteristics that affect behavior in the workplace in a way that can affect health and safety”. As can be understood from this definition, there are 3 basic points within the human factor. These; the job, the individual and the organization. The job can be shown as the nature of the task, workload, working environment, and procedures. The tasks to be performed must be designed taking into account both human limits and the strengths of people. As an individual, the competence, personality, attitude and risk perception of the person can be shown. Individual traits can affect behavior in a complex way. However, some characteristics such as personality are fixed. In addition, other characteristics such as skills and attitudes can be changed or improved. Organization, on the other hand, can be shown as working model, workplace culture, resources, communication and leadership. These factors are ignored when designing work tasks, but as a result of this ignoring, this leads to a negative impact on individual or group behavior. [2]

### **III. HUMAN FACTORS IN AVIATION**

Approximately 50 years after the aviation industry first emerged, the human factor has been used in aviation. In the 1940s, human factors began to be investigated as an independent discipline in England. After the Ergonomics Research Society was established in England in 1950, similar developments took place in America in 1957 and the Human Factors Society was established. With these developments, the International Air Transport Association (IATA) held a conference on Human Factors in Istanbul in 1975. With this conference, human factors in civil aviation have started to be included and officially recognized. One of the results obtained with this congress was to meet the training need on human factors in air transportation. [3]

The term Human Factors has become more popular with the advancement of the commercial aviation industry and as a result of human error rather than mechanical failure at the root of most aviation accidents or incidents. Some measures have been developed against errors caused by human factors. One of the measures developed is that in the early 1900s, Industrial Engineers Frank and Lillian Gilbreth tried to reduce human error in medicine. In their study, they developed the read-back concept in order to avoid mistakes in the material exchange between doctor and nurse in operating theaters. For example, when the doctor said "scalpel", the nurse said "scalpel" and handed the scalpel to the doctor. Today, the same procedure is used in aviation. For example, if a directive is given to an aircraft by the air traffic controller, the pilot has to read back the given directive. Thanks to this situation, misunderstanding or incomplete understanding caused by human factors is prevented. [4]

The largest human-related accident in the aviation industry occurred in March 1977 in Tenerife. In this accident, two Boeing 747 aircraft that diverted to another airport due to the terrorist attack at the airport they should normally go to collided on the runway and it was the biggest accident in aviation history with the death of a total of 583 people. In this accident, 2 747 aircraft of KLM and Pan Am Airlines collided. Investigations after the accident showed that there was a misunderstanding between the co-pilot of the KLM plane and the speech of the air traffic controller, and the KLM plane took off even though the air traffic controller did not give take-off permission. However, when the KLM plane was moving on the runway, it was not possible to see the Pan Am plane taxiing on the same runway due to weather conditions. As a result of all these situations, 2 747 aircraft ready for take-off collided on the ground, causing the death of 583 passengers and crew. As a result of the research, it has been shown that this accident is a human-induced stress. It was observed that the crews of both planes were already stressed by the fact that they could not go to the airport because of the attack, they waited for hours, and there was little time left for their duty to expire. On the other hand, Tenerife air traffic controller also had a busier day than normal time due to the planes diverting to Tenerife airport as a result of the attack on the airport. It has been said that the Spanish controller could not notice this misunderstanding because he spoke English with other aircraft and was under stress. With this accident, much more attention has been paid to the human factor in the aviation industry and the necessary training has begun to be given. [5]

Studies have shown that, the human factor is around 70% is affected the accidents and incidents in aviation. In the studies it was shown that the entire control of an airplane flying thousands of feet high, traveling at hundreds of knots and loaded with fuel was in the pilot, while at the same time, the monitoring of other systems, aircraft and air system, control of the team and ensuring the continuity of communication was shown to cause stress. It has been shown that the flight performance and decision-making powers of pilots are negatively affected as a result of the stress resulting from these reasons. In addition, aviation is a risky and stress-rich environment due to reasons such as speed, temperature change, pressure change, noise, vibration, hypoxia disease, exhaust smoke and lack of activity. It is also shown that flight safety is negatively affected by all these factors affecting stress. [6]

On January 15, 2009, a bird entered both engines of US Airways' Airbus 320 aircraft after taking off from New York, and all engine power was lost. As a result of this accident, the pilot landed the plane into the Hudson River. In the accident investigations, it was investigated why the pilot did not land the plane at the airport but into the river. In the simulation studies, it has been observed that the plane can successfully land at the nearest airport if the pilot reacts immediately to return airport after birds entering the engine. However, due to human factor, when the delay of 35 seconds was added to understand what the incident was about and to start

the necessary procedures, it was observed that the plane could not reach the airport and crashed. As a result, it was seen that the pilot made the right decision by landing in the river. In this accident, the human factor was pointed out and it was said that the decision made by the captain was the best decision. [7]

#### **IV. PRECAUTIONS FOR HUMAN FACTORS**

With the Crew Resource Management (CRM) concept, which is designed to reduce the mistakes of air crews and increase the efficiency of the task, it is aimed to use the knowledge, materials, equipment and bilateral relations of the teams in the best and correct way. With CRM studies, the importance of human factors studies has been officially recognized in the aviation industry. [8] For a flight mission to be carried out safely, it is important to use the available resources of people, equipment and information effectively and correctly. CRM refers to the coordination and communication of the team, the resources inside and outside the cockpit, and the authority provided by the captain pilot with the support of other team members. With CRM, all resources and hardware required for flight safety are used efficiently. Each resource used contributes directly or indirectly to flight safety and has an impact on flight efficiency. [9]

In order to prevent problems caused by human factors, different solutions and alternatives should be found. At the same time, each company should periodically provide refresher training and keep the information of its employees new. Up-to-date training provides awareness. Awareness also has an important place in terms of aviation sector. Especially pilots related to awareness receive detailed training. When aviation accidents are examined, explanations are made on how to work to prevent accidents caused by the human factor. The importance of CRM and awareness issues comes up once again here. CRM should be strengthened with the trainings given and awareness should be increased at the same time.

In one study, the classification of human factors competencies of the people to be recruited during the job application as the precautions taken against human factors. With this classification, the suitability of the people for these jobs was measured with the relevant interviews before hiring them, and thus, they tried to keep the error rate at the lowest level after they were recruited. On the other hand, it was also stated in the same study that the classification of human factors is not done in most places. It was also stated that the exact definition of the work to be done in the recruitment processes in the aviation sector should be made correctly and the competencies of human factors should be specified in the advertisements according to their types. [10]

SHELL model has been developed to explain human factors in aviation in the best way. SHELL model consists of various components. These components are respectively; Software (procedures and symbols), Hardware (machines and aircrafts), Environment and Liveware (the human). In the SHELL model, human was taken as Liveware and formed the center of the SHELL model. Liveware has become a core component, along with being the center of the model humanly, and other components have been adapted to fit it. In the Liveware-Hardware relationship, the relationship between human and machine is mentioned. For example, designing and producing the seats of airplanes in accordance with people, designing screens according to the characteristics of sensory information processing or designing cockpit controls in accordance with people can be given as examples. In the Liveware-Software relationship, the relationship between human and procedures, manuals, checklists and computer software is mentioned. In the Liveware-Environment relationship, the relationship between human and environment is taken into consideration. For example, flight suits, flight suits, pressurization, air conditioning, sound insulation can be given. In this way, environmental factors and people have been tried to be harmonized with each other. Finally, Liveware-liveware relationship and interpersonal relationships are discussed. Examples include leadership, collaboration between team members, teamwork or interpersonal interaction. [11]

#### **V. CONCLUSION**

Aviation has developed throughout history and will continue to evolve. Throughout the history of aviation, human has always existed and will continue to exist in aviation. Various studies are carried out for the aircraft aiming to disable the human being in the use of aircraft and intended to be flown without a pilot. However, it seems that these studies will not come to a conclusion in the near future. Even if the pilots are disabled, there will be cabin crews to be found for the safety of passengers and passengers who will fly in the

aircraft. At the same time, in order to ensure that these aircraft can continue their operations safely and continuously, there will be people who are in various tasks such as maintenance team and ground handling team. For this reason, it will not be possible to remove human and human factors from aviation.

With the development and popularity of aviation, the number of flights increased and densities started to be experienced. As a result of intense workload, people's stress levels have also increased and people have started to have problems in their work due to human nature and they have started to be unable to do the work properly. As a result of these difficulties, various accidents and incidents have been experienced in the aviation industry worldwide. The results obtained from these accidents and incidents showed that 70% of the accidents were caused by human beings. In this direction, serious measures have been taken against the human factor in the aviation industry.

With the measures taken and additional training, the human factor was tried to be minimized. Along with the CRM studies, human relations have been regulated as required by the job, and various procedures have been developed within the CRM rules to avoid skipping the necessary checklists or making mistakes without realizing it. In addition, with the SHELL model, all details from both the production of the aircraft to the usage stages have been designed and made suitable for human beings.

The developments achieved as a result of these bad events remind us of the saying "rules in aviation are written in blood". The rules that exist in the aviation sector have been obtained as a result of previous bad experiences. For this reason, aviation companies provide training to pilots, cabin crews, maintenance crews, ground handling crews, in short, all crews at various times. With these trainings, aviation companies aim to keep flight safety at the highest level by keeping human factors at the lowest level.

Within the aviation sector, the human factor should be understood and explained in detail. Because safety is a priority and anything that may have caused an accident should be examined. Thus, safety should always be kept at the highest level. The human factor is also important in terms of the Safety Management system. Organizations, companies, managers, authorities have been given responsibilities to explain and understand this issue in detail. With the developing and advancing technology, the sector is also growing and developing. Keeping technological progress up to date and adapting to technology can also prevent accidents caused by the human factor. The human factor is a process in itself and is managed within a system. It should also be taken into account in terms of all enterprises.

It will continue to maintain aviation development in the future. Perhaps the developments that are considered impossible today will be very easy in the future. However, as long as human beings continue to exist in the world, the human factor will continue to exist. For this reason, the subject of human factor should continue to be investigated continuously in the future. A new aircraft to be designed and produced must be designed according to human responses and designed accordingly. In addition, accidents and incidents that have occurred as a result of human factors should be examined and the crews should be kept ready for those situations by providing various trainings.

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