SPECIFIC ASPECTS OF QUALITY AND SAFETY MANAGEMENT IN AEROSPACE FIELD

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ABSTRACT
One of the most important technical features in aerospace field is safety, through this paper we try to define the basic concepts of security, risk and risk management in aviation. In order to avoid unforeseen situations, it is necessary to improve safety, which is a reflection of risk management in the aviation industry, and at the same time, it is necessary to increase the capacity to identify problems before they become a significant problem. Currently, air accident investigations and aircraft safety inspections are now more effective, while improvements in manufacturing technology and better quality control of safer aircraft are now safer. The strategy of continuous improvement refers more precisely to the safety management in the aerospace field which is based on the continuous improvement of aircraft performance through the use of testing means through certain advanced technical systems. Safety management with the role of analyzing risks and improving the performance of aircraft. As safety management is also characterized by aircraft performance, there will be in various stages of research and development of an aircraft the need to verify using wind tunnels certain performance values determined by computer simulations. Following this trend, space chain organizations have continually invested in resources as a way to support their survival in the global marketplace, but these organizations have difficulty assessing the effect of their quality improvement programs and identifying key factors for their success. program failure. The purpose of this paper is to analyze the risks and improve the performance of aircraft in terms of aerospace safety management.

KEYWORDS: *aircraft performance, aviation, improvement, management, safety management.*

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1. INTRODUCTION

Improving the safety of airlines is reduced to multi-parameter arrangements. Jet engines offer an unmatched level of safety and reliability compared to previous piston engines. These days engine manufacturers are supposed to have eliminated the possibility of engine failure. The evolution of electronics, the most important introduction of digital instruments - known as the "glass booth" in the 1970s – and the development of fly-by-wire technology in the 1980s are also extremely important results in the development of security.
Improvements in navigation equipment, sensors and air traffic control technology have also played a significant role.

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Crew or cockpit resource management and data monitoring, which tries to lower the risk of human error, is another significant security advancement in recent years. For instance, in-cabin data monitoring systems, which include digital audio and visual recording equipment, are now frequently utilized to both look for accident causes and detect safety trends that may be addressed through training.

A study of the causes of aviation accidents in recent years shows that the main cause of these accidents is human error. If 50 years ago, about 80% of accidents were caused by poor design or technical problems and only 20% were due to the human factor, today the figures are reversed in proportion.

Fast and dependable air services depend on safety, and through worldwide cooperation in aviation safety by governments and industry groups, through ICAO, commercial planes have become the safest mode of transportation.

The 193 ICAO cooperating nations are currently pursuing a number of programs and targets pertinent to current key areas of international aviation safety planning, surveillance, and risk reduction in order to achieve their current global safety target of zero deaths by 2030, while also strengthening their regulatory capacity.

Aviation accidents continue to be terrifying, however, and safety has been a top priority for the aviation industry for the past 100 years, so technology, training and risk management have together led to commendable improvements (Oprean & Țîțu, 2008).

The flight is considered to be the safest form of transport and this is true in terms of long-distance deaths. According to the Civil Aviation Authority, the death rate per billion kilometers traveled by plane is 0.003 compared to 0.27 by rail and 2.57 by car.

2. THE CONCEPT OF OPERATIONEL SAFETY VERSUS THE CONCEPT OF SECURITY IN THE SPECIFIC INDUSTRY

The process of safety management must be methodical and closed-loop process for identifying hazards and managing risks, aiming to minimize loss of life, property, damage or financial and social losses. Companies must decide what needs to be looked into from the perspective of safety because it might be tough to set or define safety boundaries depending on the financial factors or economic resources.

A key activity that supports safety management is safety risk management. A central part of management is that you cannot manage what cannot be measured. Therefore, it is crucial to assess how seriously the risks' effects will be felt (Prasad & Tata, 2003). According to ICAO, this is risk management's primary contribution to the safety management process (2009). Because the risks are constant, the risk can never be reduced by taking more mitigation measures.

After the fire of the Apollo AS-204 test on January 27, 1967, which resulted in the deaths of three astronauts, the aerospace industry started to systematically express concern about the risk assessment approach. The National Aeronautics and Space Administration (NASA) had to pay salaries and expenditures for 1,500 individuals involved in the ensuing investigation as well as $ 410 million in additional costs as a result of this incident, which resulted in a severe loss of public support.

Prior to the Apollo crash, NASA relied on its contractors to apply "good engineering practices" to provide quality, assurance, and control. Since the shuttle disaster, NASA has developed quantitative risk analysis procedures to support security throughout the human space travel design and operating phases (Cunha & Alves, 2014).

Risk analysis has a wide range of goals and parameters. The largest resource commitments in this area have been made by the nuclear industry, particularly in the area of probabilistic risk analysis.

However, in terms of the design and management structures of operations, the methodologies have not yet been fully incorporated with those already in use in the aerospace sector. (Cunha & Alves, 2014).
Depending on the viewpoint, the idea of aviation safety had a variety of meanings, but they all shared the same fundamental concept: the potential for total control (Hussin et al., 2012). Prior to the 1970s, safety concerns were mostly influenced by technological reasons; however, as time went on, safety started to take human factors into account. At this time, technical, human, and organizational elements are starting to be seen as part of a systematic viewpoint on safety.

3. BASIC CONCEPTS OF AVIATION SECURITY, RISK AND RISK MANAGEMENT IN AEROSPACE INDUSTRY

A key activity that supports safety management is safety risk management. Therefore, it is critical to assess how serious the risks' effects will be (Hussin et al., 2012). According to ICAO, this is the primary benefit of safety risk management to the safety management process (2009).
Additionally, as the risks will always exist, the risk cannot be eliminated by taking more mitigation measures.
As these programs are frequently guided by set assumptions about the airline's future demands and are subject to numerous technical uncertainties, the development of new technologies for commercial aviation entails enormous risks to technology (Sukhikh et al., 2012). The length of development processes and the fact that uncertainties change based on the aircraft make the impact of these uncertainty much worse.
Unfortunately, determining an aircraft's performance cannot be done using the regular procedures required to complete all tasks linked to the design, production, and testing of an aircraft.
Unfortunately, determining an aircraft's performance cannot be done using the regular procedures required to complete all tasks linked to the design, production, and testing of an aircraft.
As a result, experimental aerodynamics is essential for the development and upgrading of aircraft for use by the military, the civilian government, and in space (Sukhikh et al., 2012). Since the late nineteenth century, the design and construction of specialized experimental setups known as wind tunnels have been necessary in order to conduct testing on models of complicated processes in fluid mechanics.
As a result, since the invention of aircraft, wind tunnels have been successfully employed as a tool to design novel aerodynamic designs.
Perception of risk in aviation
If until the last decade there was a unilateral desire to discover more the culprits of an aviation event, lately most studies in the field are aimed at discovering the true causes that generate events in the system and finding solutions sometimes of great generality to reduce them. globally. Moreover, the study of the aviation security system determines in many cases as the main element of causation, the management (Dmitriev et al, 2020). This is because he is responsible for the integration of all subsystems, resource management, operator training, mission execution, error elimination, the overall organizational and execution of aviation.
Fifty years ago, about 80% of accidents were caused by poor design or technical problems, and only 20% were due to the human factor. Today, the figures are reversed in proportion, about 80% of accidents are human-caused and only 20% are technical-related (Dmitriev et al, 2020).
Obviously, the human factor presupposes a favorable work and technical environment that takes into account the limits and possibilities of human work, but also a rigorous selection of human operators that leads to the optimization of human performance with the systems used various operations that allow him to fulfill the tasks entrusted to him (Hussin et al., 2012). This means that

the operation of reading the surrounding instruments, of interpreting this reading, of elaborating strategies and tactics of custom actions, of transmitting information to the other members of the airspace management system, is done successively and not in parallel. of what is generally believed. So everything happens, as if all the information that enters the operator's brain circulates and comes out in one way (Cunha & Alves, 2014). That is why operators operate in a single channel, being interconnected and thus creating a continuous chain of communication, data exchange and information between air traffic controllers and pilots, those who practice are the most important human factor in the management structure of They are subjected to physical and mental stress at any time during their activity, which could endanger the safety of air traffic (Prasad & Tata, 2003). In air traffic management, the human factor consists of several categories of personnel: driving, navigating, technical -engineering and flight insurance, forming a team. They undertake activities for the optimal use of airspace by all categories of users, avoiding the permanent segregation of airspace.

The current state of the subject presented in the current context

Since the Wright Brothers' 1903 achievement of the first flight heavier than air, aviation has been involved in accident prevention. The International Civil Aviation Organization (ICAO) has released accident rates involving fatalities of passengers every year since 1945. for use in transportation businesses. Since then, data has demonstrated that aircraft is the safest mode of transportation. Basically, there is a flight disaster every 5 million (Cunha & Alves, 2014).

This represented a 46% improvement over 2011, when there were 0.37 accidents per million flights, or one accident for every 2.7 million flights. Sadly, as Figure 1 demonstrates, there are large regional differences in the accident rates for flight operations (2012a).

Figure 1. The rate of plane crashes reported to 10 milion flights in different regions of the world

In Europe, 2010 was the first year in which no accidents occurred. In 2011, there was only one fatal accident in which 6 people were injured (Sukhikh et al., 2012). Maintaining a high level of civil aviation safety can determine the outcome of factors to control and minimize aviation safety hazards.

Effectiveness of commercial aviation security management systems

Effectiveness is determined by the repetition factor of future causes, the more accurately the causes and recommendations are identified, the better their quality so that methods can be implemented to improve safety.

The main objective of the flight accident investigation is to find out the facts, conditions and circumstances related to the accident, in order to determine the likelihood of causing it and to take appropriate measures to prevent the recurrence of the accident and the factors contributing to it (Cunha & Alves, 2014).

ICAO recommendations are based on the transition of operators to the safety management system with proactive methods based on the identification of identified hazards and threats by monitoring activities. It aims at routine monitoring by pooling data for flight risk analysis, synthesis and management. The objective of the safety management system is to determine the causes of accidents and to take relevant actions to prevent them.

Prevention as a concept in the approached field. Methods of prevention

Although significant progress has been made in increasing aviation security, the process of improving aviation security is never ending and must be shaped by new trends and innovations in aviation and the global industry. Risk analysis is essential to improve the current security system. There is also a need for close cooperation and coordination between agencies and governments (airports, airlines, government authorities) dealing with in-flight security (Hussin et al., 2012).

Types of threats:

- Bomb attacks: Like many other threats, bomb protection is the responsibility of airport security. An effective and relatively inexpensive way to protect passengers and aircraft from bombs hidden in luggage is critical. Only multi-stage monitoring and scanning of passengers and cargo, including a ban on all transport of dangerous, suspicious and unaccompanied goods, could reduce the risk of such events (Cunha & Alves, 2014). Counterintelligence is also one of the key factors in finding doubt. Solutions so far include bomb detection systems, explosive detection systems, the use of specially trained dogs in detecting explosives and special personnel trained in analyzing suspicious behavior among passengers. An explosion-proof or explosion-proof device may be an option to protect the aircraft (Prasad & Tata, 2003). A number of successful tests have been carried out in this court, confirming that an explosion during the flight of a bomb in a piece of luggage will not have a negative impact on passengers or the aircraft. The only questions remain the cost of such a container and the desire and interest of airlines towards such a container.

Figure 2. Cargo bag

- MANPADS: Although the biggest threat is perceived to be from aircraft bombings, illicit suicides and attacks using aircraft as weapons against ground targets, terrorists may resort to a new type of threat, Man Portable Air Defense Systems (MANPADS), portable rocket launchers (Dmitriev et al, 2020). They are lightweight, easy to carry and can quickly launch anti-aircraft missiles. They can be ordered by 3 methods: infrared, CLOS (Command line of site) and laser. More than 1 million portable rocket launchers have been manufactured since the 1970s.

Figure 3. Portable rocket launcher

Although the threat to shoot down civilian aircraft has historically been limited to air operations in war-torn areas, there is growing concern among some aviation security and counterterrorism experts about a possible threat to civilian aircraft (Sukhikh et al., 2012). Civil aircraft remain quite vulnerable to attacks from MANPADS because during take-offs and approaches for landing they fly a short distance from the ground, a range within range of portable missile launchers. Commercial aircraft, unlike military aircraft, are not equipped with any measures of protection against missile attacks. It is also worth noting that large commercial aircraft are not agile or maneuverable enough to escape a missile attack.

There is no general solution to effectively eliminate the threat of this type of weapon on aircraft, weapons that are available to terrorist groups (Hussin et al., 2012). Only a risk-based multi-step approach that includes preventing the purchase of these weapons by terrorists, stopping terrorist activities in the planning and preparation stage of an attack, and reducing such attacks by improving airport and operational security measures can lead to a reducing the risk posed by portable rocket launchers.

- Cyber-attacks: Aviation is much more than airplanes. It is supported by ground equipment and systems as well as a large network of computers. The virtual attack on the computer network consists of operations to use the network to interrupt, reject, degrade, or destroy information in or even on computers and networks (Kovrigin & Vasiliev, 2020). Private companies working in the virtual security industry report a rising level of hacks targeting key industries and the aviation industry is undoubtedly one of them. Many hackers or terrorist groups may view cyberattacks as an easy, inexpensive, and highly effective means of demonstrating their strength. Any radar, any ATC/ATM system, any link, and any telephone line can be a possible target. Cyber-attacks have become a global epidemic and no system is immune. Hackers can, for example, remove all the protections of a TCAS, which can lead to a collision in the air (Dmitriev et al, 2020). A breakdown in an ATC system and misuse of sensitive data is a problem that needs to be considered. At best, it would interfere with the ability of controllers to do their job, leading to massive delays and air traffic restrictions. At worst, especially with radio frequency blocking, the consequences can be fatal. Also, the economic disaster of the collapse of an ATC system would be huge, leading to total chaos in air transport. In combination with cyber-attacks, radio frequency blockages and pulsed electromagnetic attacks should also be mentioned as serious threats to air transport. Cyberspace is a critical, rapidly developing area of competition between state and non-state actors such as terrorist groups. with their community of hackers and because of this many analysts are pessimistic about the future (Hu & Zhang, 2018) Ensuring an effective defense against cyber-attacks is very difficult, expensive and endless work because attackers are always one step ahead.
- Drones: Although no incidents involving a drone for terrorist purposes have been reported so far, they are a growing concern for civil aviation security. Terrorist attacks using drones can have a strong psychological effect on fear and uncertainty (Zhang & Hu, 2018). Unfortunately, the misuse

of drones brings some substantial advantages to terrorists: flexibility and secrecy in taking off, easy assembly, increasing the number of drones worldwide, relatively cheap technology, cost-effectiveness compared to the damage that can be caused, high accuracy, the possibility of transporting biological and chemical weapons. The poor efficiency of defense systems against such low targets in combination with insufficient radar coverage at low altitudes makes drones virtually "invisible" objects (Zhang & Hu, 2018). A low-flying, low-speed drone is processed in current data processing algorithms like a bird, a small cloud, or a false reflection. Existing GBADs and QRAs are unnecessary in the face of such a threat. At present, it is virtually impossible to defend against small drones. Even defending the perimeter of the airport would be extremely complicated, both technically and economically. Therefore, the main focus in the fight against this threat must be placed in measures to prevent attacks from the time of preparation.

Figure 4. Drone

Terrorist attacks can take place anytime, anywhere and are irregular and therefore difficult to predict. Their main characteristics are the uncertainty, the violence and the fear they arouse. The fight against terrorist organizations is an extremely difficult endeavor, as most terrorist organizations are very well organized. Difficulties in identifying sources of terrorist financing are a major problem in the fight against terrorism.

4. CONCLUSION

In conclusion, this paper analyzes the risks and improve the performance of aircraft in terms of aerospace safety management.
Safety is the basis of fast and reliable air services, and international cooperation in aviation safety by governments and industry groups, through ICAO, has helped turn commercial aircraft into the safest way to travel.
The 193 ICAO nations are now pursuing a number of initiatives and targets pertinent to current important areas while also aiming to increase their regulatory capability in order to attain their 2030 global safety target of zero fatalities. of risk mitigation, worldwide aviation safety planning, and surveillance.
Although safety has been a primary focus for the aviation industry for the past 100 years, we still feel that accidents do happen and that there have been remarkable advancements in technology, training, and risk management.
When it comes to long-distance fatalities, we can say that flying is thought to be the safest mode of transportation. According to the Civil Aviation Authority, there are 0.003 fatalities per billion air kilometers compared to 0.27 for rail and 2.57 for automobiles.
Even though the invention of the jet engine in the 1950s is acknowledged as a significant development, increasing aviation safety can only be accomplished by combining a number of other elements. Compared to earlier piston engines, jet engines provide a level of safety and dependability

that is unsurpassed. Today, engine manufacturers are considered to have all but eliminated the possibility of engine failure. Achievements in enhancing security include the invention of electronics, the most noteworthy of which was the introduction of digital instruments known as the "glass booth" in the 1970s, and the development of fly-by-wire technology in the 1980s. A significant part has also been played by advancements in air traffic control technology, such as anti-collision control systems, navigational aids, and sensor technologies.

Crew or cockpit resource management and data monitoring, which tries to lower the risk of human error, is another significant security advancement in recent years. For instance, in-cabin data monitoring systems, which include digital audio and visual recording equipment, are now frequently utilized to both look for accident causes and detect safety trends that may be addressed through training.

Human error is the primary factor in recent aviation mishaps, according to the research of their causes. Today, the proportions are inverted from fifty years ago, when around 80% of accidents were attributable to subpar design or technological issues and only 20% to human error.

We think that increasing safety is a reflection of the aerospace industry's top-notch risk management and the expanding capacity to recognize issues before they become serious ones. As manufacturing technology advances and quality control processes improve, aviation accident investigations and aircraft safety inspections are becoming more efficient.

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