

Factors affecting Safety Management of Aviation: A study of Pilot experience and Leadership style on safety Management of Aviation

Raeed Ahmad Khan, Ahmad shah Durrani, Ali Sher Babar, Ayaz Siddiqui

Student, Aviation Management, Superior University, Punjab, Pakistan

Department of Aviation Management

Abstract

The study was performed to understand the nature and purpose of factors affecting the safety and security of the aviation industry and how strategic management systems affect the safety of airports and their importance in the current Aviation industry. In the research, high significance is given to safety policies and the role which they play in keeping the airports and airlines safe by providing safety barriers. In this study, for the research philosophy, we have incorporated Positivism in our research. To understand the variables of the research as much as possible and to complete the research objectives, a quantitative method was used in this research. As for the data collecting tool, the research used survey-type close-ended questionnaires. A total of 150 questionnaires were distributed to the aviation sector people in Pakistan. Through the questionnaires, the study represents the impact of pilot experience and leadership style adopted by organizations on the safety management of Aviation. The research describes how significant is the pilot experience in relation to the chances of accidents occurring and how leadership style and better management decisions how a great impact on the performance and safety of the Aviation industry. In the research, the analysis finding suggests that it is true that Pilot experience is a necessary element to prevent accidents and the chances of an error occurring are less. Likewise, the leadership style

adopted by the organization is also quite important as the safety policies and environment have a great impact on safety management in Aviation.

Keywords: Safety management, Pilot experience, Leadership styles, safety model

Introduction

The purpose of this research is determining the relationship between safety policies and other factors affecting the safety in aviation. Forecasting also plays a significant role in the success of aviation industry. by imposing different policies, procedures and models, we can ensure better safety in aviation. Aviation has been developing from the early on and now has become one of the most significant fields of the world as it has grown rapidly and the most important mode of transfer, as it is fast and safe. According to research, it has been noticed that, the daily flights number have been increasing each year. People are using the Air route for transport, as it has become very important for both passenger traffic and the import and export of cargo goods in the air as well. Traveling by air is said to be safest mode of transport, for people and goods, as it is safe and comfortable, but there have been many cases of incidents which have damaged the reputation of aviation industry (Guzanek, Borucka, & Defense, 2021).

For that, Safety management of aviation is basically providing a safe environment for the airports and airlines to function properly. It can be said that safety management are a set of principles, processes and the measures taken to prevent from any kind of accident, incidents, injuries and other harmful scenarios from happening, it includes a set of rules and regulations, which are set in a systematic manner. These exists to help the managers, give their responsibilities in such a way that if it is implemented, all kinds of security problems could be solved because it helps to predict

any problems in the system so that errors could be prevented, likewise security breaches do not happen and safety is insured in the system in a tactful manner.

The factors affecting safety management of aviation is hot talk in the aviation industry, because the motto of our aviation is safe and efficient flights for all who may use the aviation services. So, if we are not safe in our operations, our aviation department can't progress further. Now, as we talk about the factors, there are many types in the deep history of aviation, because many threats have presented themselves to us, whether they are human factors or operational and equipment error, all of them effect the safety management of aviation.(Guzanek et al., 2021)

The main significance of identifying these factors of safety management, or the main role of these factors, is that it encourages the formation of improved management system, which is made by through study of these factors. These are then used to manage safety risks that may occur in the work environment. It creates a culture safe working environment, which consists of safety policies and procedures, to be followed by everyone. This results in the employees working on their duties and act with complete safety in mind.

For the aviation industry, using the knowledge of these factors, every operator in the airport and all the service providers can manage risk in such a systematic manner by using risk index and classifying the hazards into different groups. These are further used to manage risks and problems. All this knowledge and preparation, can further also be applied in various aviation sectors, allowing air traffic controllers and airport managers to include all the details in their operations, so that the system can work with any harm. Because of this, identifying threats is made possible and the operator's role has become easier for prevention of the accidents. This safety management system also provides a structured and systematic process of safety risk management, which helps

greatly in good decision making and, the number and chances, of bad decisions are reduced, thus safety is served. This also serves as to increase the confidence in risk controls, which greatly helps the safety staff do their duties with less stress and pressure in this safety assurance processes (Santos & Melicio, 2019). Almost all the organizations within the aviation industry are greatly investing time and resources in this matter because without safety, their industry can't work and grow and they cannot earn revenue with a damaged reputation. Hence knowing about these factors is a must, which greatly signifies the importance of safety management and the aviation have started to increasingly dependent on safety management systems, as they are positively influencing the safety culture in the way employees perform their duties.

These factors affecting safety management have greatly benefited the aviation industry by preventing many major accidents from happening all around the world, safety and security policies and procedures are becoming more and more secure each day, which greatly benefits all, the airports, airlines, cargo industries, passengers and the business which are either directly or indirectly related to aviation, because with such tight security procedures and efficient system, the chances of threats and harms are greatly reduced and acts like terrorism, hijacking, sabotage, smuggling etc. are greatly reduced and most of the aviation is protected from such threats.

Following all the safety policies and procedures, all flights can operate without any risk related to security and safety, which keeps the capacity and delay factor in check and aviation industry can serve their customers and provide them with comfort, luxury, and safety.

The problem statement of safety management (which greatly reduces all chances of threats and harms from ever happening) is that, the barriers which have been set by safety management in aviation can be breached because there is not always 100 percent guarantee of safety, there is

always a chance of some error taking place. The offender that wants to commit the crime can wait for any kind of loophole for striking, which they can use against the safety management of aviation and cause harm to it. As human life is fragile and weak, it can be bypassed with more opposition.

Likewise cyber-attacks can also be used to damage the highly secure networking of information and technology of aviation. This issue needs great investment to be solved and large amount of barriers should be placed in this regard. Different types of firewalls and encryptions can be used to prevent these types of attacks.

Using of outdated security equipment can also result in the formation of loopholes and errors that may lead to many problems. Also, the checking and maintenance of equipment should be done regularly, to prevent from any kind of harm from happening.

The most common cause of the errors in any field is human error, these can be intentional and unintentional. Around 70 percent of all the errors in aviation are caused by human factor and other 30 percent includes equipment malfunction, software errors etc. We can mitigate most of the human errors by providing them with proper instructions and trainings, which should repeat after a certain time period. These trainings, if performed properly can prepare us for facing different situations, hence minimizing the human errors and improving our overall performance. We can also implement different policies in our HRM. Background checks should be done more thoroughly.

Our research is aim to answer what are factors affecting safety management of aviation? What are the main elements effecting security? How can safety management be implemented in the airport system? How can threats me managed and prevented? How can we make aviation industry safe

and secure? In this research, we try to bring light to these questions and implement their solutions in aviation industry.

Our research mainly focuses on different factors which affect the safety management in aviation in Pakistan. There are some factors especially happen in Pakistan, as Pakistan does not follow international trends. As the airports of Pakistan are mostly very boring because Pakistani people are not ready to handle exclusive looking airports as they will stand and watch something if it is even a little bit amusing/unique. This is one of the reason Pakistani airports looks somewhat like hospitals, to appear unattractive so only those people who are concerned should enter and use the services of the airport. This in return reduce the traffic entering the vicinity, hence making it easier to handle and monitor the people in the vicinity.

Our research aims towards providing a general insight into theoretical principles in flight safety within civil aviation for examining further issues in this area. To achieve this purpose, we need to define the changes which have been achieved with the help of safety policies in civil aviation. The study of the research has pointed out that the modern global and national definition of flight safety area in aviation, is the state that regulates the area where it is working, the effective system of safety management can be influenced by exercising administrative legal power in all the elements of that particular part. Having analyzed all basic notions of flight safety area and having compared it with the working of flight safety, we may state flight safety has a broader sense than the latter, and generally constitutes the system of social relations, which are mainly for ensuring flight safety within civil aviation and are working on the principle of laws and regulations. Through research we have come to know that, one of the effective measures to ensure effectively handling of safety challenges arising to flight safety within civil aviation is to apply legal administrated power in this area, which means that the legal system protect social relations in civil flight safety area.



In figure 1, shows the framework of safety management processes, about how they start, their processing and the final result.

Literature review:

According to research, absence of tools is one of the main reasons that any kind of accidents occur and incidents in aviation. These are caused due to different loopholes in the systems. One of the models for the prevention of accidents and incidents is Swiss cheese model (Xue & Fu, 2018), according to this model, which tells the researchers that any kind of accidents does not occur due to 1 problem, but multiple failures lead to an accident. These failures are mostly minor failures which are overlooked or ignored. This model is also known as Swiss cheese model in the aviation industry. In this particular model of aviation, there are 5 categories, which are also divided again

into 45 sub categories, which are basic and safety culture (Xue & Fu, 2018). Which is in accordance with normal practices. That's why it is difficult to associate it with organization factor of the part of CAA (Xue & Fu, 2018).

The model revealed more causes of accidents by human and organizational causes than through accident reports. The major cause of occurrence of accidents and incidents are human and organizational factors. Which are mostly caused due to large number of facilities and to reduce economic losses. Human Factors Analysis and Classification System (HFACS) determines that amount of accidents in aviation my using the model of swiss cheese (Xue & Fu, 2018). Statistical have shown that almost 70 percentage of accidents are mainly due to the reason of human error. According to, 41 aviation were mainly the result of some kind of human error. Some of other factors inadequate super vision and poor resource management. Also, in India organization factors were also the main element causing accidents in 48 incidents. So theses above examples show that human error and decision making have big impact on accidents. (Xue & Fu, 2018).

The model of general aviation produced results are more helpful for civil aviation as they are quite similar aviation. The model recognize the harmful hazards and they should be removed accordingly (Xue & Fu, 2018). It is very important and significant to measure the effects of human and leadership affects so that safety is maintained and accidents don't occur (Xue & Fu, 2018).

Some studies done in the US by implementing safety policies have greatly impacted upon the risk that comes from training operation and the safety environment is highly secured due to it (Adjekum & Management, 2014) the system of safety have good impact on environment and the strategies that prevent the accidents are implemented for safety culture (Adjekum & Management, 2014). This allows the one to use this model to understand the flight hazards of safety and report them

through the system developed to for reporting of these procedures. In this way, the managers can safety understand the safety requirement and implement for safety system. In this way, safety threats can be decrease as low as the model can. The SMS system is according to the model divided into 4 parts which are further divided into 12 more parts. The safety system can only be operated effectively if it's all operation are in accordance with safety policy (Stolzer, Halford, & Goglia, 2011). If the model of SMS is to succeed then it is only possible if the organization with its all group and people follow the policy of the safety model (Cooper, 2000; ICAO, 2009).

ICAO has its own view point on safety and it has its own management tool framework of safety rules and regulations, this is described in the document #9858 safety management manual (SMM). Since than it is a requirement by ICAO for its members, to implement safety management system. Safety management manual, is done by the ICAO to issue the safety protocol all around the world. It mostly has all related information on safety. Its main goal is to form good safety reforms (ICAO, 2009). It consists of the entire system of procedures that means of whole system of safety and environment principles. (Steven Leib and Chien-tsung Lu, 2017).

Currently, if we want to improve the SMS system in Pakistan there are three major questions: “What are different types of SMS?”, “Why does it fail?”, and “How can we improve it?”. These questions can be answered by paying attention to the basic theoretical research on SMS. When building SMS many organizations will often choose proper international, national, organizational, or cooperate safety management system as the base for their establishment. It is very complex decision to choose the suitable safety management system. It is rather complex for leaders and employees in companies to understand the safety management system, which hinders in them participating effectively (Chenggong Guo, Feng Jiang, Tao Chen and Ying Li, 2022).

There is a need of safety document storage system (safety database) which are mostly not available, especially based on information technology to ensure the strong, archiving, protecting and withdrawing the right data of all documents related with SMS activity (Wildan Nugraha, 2019).

Some of the variables that we are going to discuss in this research, that affect the safety management of aviation are as follows;

Pilot Experience with age with relation with safety management

Pilot experience, of course comes with age as it focuses on the continuing nature of socialization and recognizes the fact that ongoing life experiences act to transform and condition the attitudes, beliefs, working values as well as behavior which is developed by working for a long period of time. All of these features come in a pilot life as he experiences different situations, solves various problems, undergoing many activities and training, all of these does not happen immediately or in a blink of an eye as the pilot experience has to process all of this throughout his/her career. As the times passes by, the pilot gains valuable experience, which comes with age as at the very start, the pilot viewpoint on various aspects was completely different. If compared the same pilot views in its senior years with the one in its early stages of career, the former shall have more diversity of knowledge and his/her viewpoint should have changed, as the pilot has understood many useful stuffs as well as erased much useless knowledge from the brain dictionary. All the remaining principles, values, beliefs and knowledge, which have remained behind are the perfected systems, if followed, all the work activities should be completed without errors. But throughout the career life of pilot, many unknowing situation and incidents are taking place that can't be solved even with the pilot's great experience, as the pilot career life can't take in all which is in the aviation industry has to offer, so of course many errors and bad decisions were made, which would later

teach the pilots, that might come after them, many valuable lessons (Bell, Robertson, Wagner, & Research, 1995).

As (Gewirtz et al, 1956) points out, if a group experience resembles each member within the group, then it provides reinforcement to many pre-established behavioral patterns. Accordingly, behavior patterns which reviews a previously learned expectation (e.g., safety behavior) should help in fixing or adding correct dimensions in an individual's behavior. Likewise, all pilots know that following the safety patterns or procedures is the correct way of handling and managing safe and secure flights, as it keeps the chances of errors from occurring, all this is learned by the pilot with the time spend in the career, by training, learning from seniors, learning for the workplace, organization and safety culture established in the organization. Basically, the factors that mainly indicate how much a pilot has experience is the amount of flight hours he/she may have flown, how much knowledge of flight classification and the number of past accidents or incident or events. In some event, a study was performed, in which all the pilot were requested to provide their total flight hours in all aircraft, the number of ratings in relation to the fleet classifications, the duration of their pilot certificates. And all the accidents or aircraft failures experienced in their aviation careers. All of these indicate the overall pilot experience that comes with age. Pilot's experiences and aircraft safety/flight safety have a dependent variable and independent variable relationship and this research is to calculate how much they affect each other.

For the above purposes, as aviation safety is considered an important role in eliminating human errors and safe keeping the aviation industry. From an operational standpoint, a pilot plays a very important role in safety management in aviation as all the flight operations that are taking place, are done in the command and supervision of pilot, and if even a tiny bit of error were to take place, huge amount of damage could happen. For this purpose, if to calculate the risk index or the chances

of errors or hazards, we first relate it with the pilot experience in safety with five safety-related behaviors associated with preflight preparation. These behaviors included firstly, checking the performance of a thorough walk-around inspection to identify if there are any problems, secondly, checking the metrological condition of the weather prior to flight, incase if condition not reliable and chances of any hazard of occurring are more, then to cancel or delay the flight. Thirdly, checking the amount of fuel requirements with regard to appropriate reserves needed for the flight to take place. Fourth, doing a thorough study of takeoff and landing distance as well as runway lengths at all airports, that the fleet or aircraft that the pilot has to command, can be functional at the runway of the airport or not. And lastly, the use of a checklist to further confirm that all these things are checked and aircraft is ready for flight. Also, the interior and exterior inspections of the aircraft is also necessary and also following the commands of Air traffic controller, at the aerodrome and during flight is highly important.

All the above are necessary for the safety management of aviation. For the safe and secure flight for the aircraft as well as the passengers in the aircraft and all the crew members present in the aircraft. For all this to happen perfectly without any error, professional training of pilots is necessary, understanding the safety protocol and following all the preflight inspections as well as inflight working. All of these does not happen immediately, as already mentioned above, a pilot of course takes time and power to understand all the concepts with some margin of error and mistakes taking place throughout the process. It takes time and experience for the pilot to optimize the performance and work without any error. That's why safety management or flight safety depends largely on the experience and age of pilot.

Leadership styles in relation with safety management

All different researchers have given their own viewpoint on leadership with according to their perspective and knowledge (Bastola, 2020). Leadership should give rise to trustworthiness, and that trust should motivate the people to work more effectively (Yukl, 2010). If there is no amount of motivation for the employees to follow, then the people of organization don't follow the procedure of the said organization and accidents occur. The main reason of such reasons is due to bad environment of safety climate and bad decisions of management (Hofmann & Stetzer, 1996).

The people present in any organization are different from each other (Kelly et al., 2015). Safety climate, and safety culture, are very important and could be greatly improved by executing programs that focus on trust between workers, fair superior trust (that the supervisor is fair in treatment with each employee), and job satisfaction (Simard & Marchand, 1994). There is also the concept of luck culture (Bastola, 2020).

It has been observed that safety climate of any organization mostly in aviation have direct relation with the leadership decisions. According to research, if leadership becomes good then the level of safety in organization also increases.

In aviation safety, all the efforts of crew and employees are linked together. This mainly states that leadership is a must for aviation to improve if it wants to increase security.

Research Methodology

This is the part of research that is the methodology in which the data collection and survey questionnaires are performed and sampling techniques are used to determine the relationship of safety management system with the variables such as the pilot experience and leadership styles of organization. For this purpose, the Research Philosophy which is adopted is of Positivism, which is used as it is a tool which uses already existing theories to develop a hypothesis which is then

tested during the research process. Likewise, in our research, we use it as positivism use a highly structured process so the people researching on the same topic could benefit from their research. We are using positivism as it tends to provide more accurate and concrete results which can aid the future researchers.

As we know that safety management is very important at an airport in order to conduct a safe and efficient flight, which will benefit Passengers, Airline as well as the Airport. If the safety of an airport is ensured it means that the flight will face no consequences, i.e., there will be a safe flight with no delays due to safety reasons the positivism research will help us identify these loopholes and hazards, which can be exploited to compromise safety.

The research approach is deductive as in the deductive method, we basically used to avoid risk in our industry. In this study, we use it to test our variables, that if they correspond with our safety management policy and also to, we test the validity theory of the research, then we get positive result from it. And lastly, quantitative approach is used as it described the objective of the research in quantitative data, which is further used for the analysis. In this way, the research is justified and can be performed accordingly.

Instrument

The instrument or the data collection tool is the most important and significant part of our research. The main tool was the survey questionnaire which was divided into various segments such as age of the respondent, gender as well as the amount of time being in the organization, which are the demographic segment of the survey. Then the second segment or section describes about the safety management system of aviation in which forecasting, safety barriers, Traffic levels, passenger opinions and safety policy and environment are discussed in the survey. The next section is the

safety model of the data tool which is the Swiss cheese model, how it calculates the chances of accidents of aviation and which policies could be used to prevent damage from the etc. Furthermore section explains about the pilot experience with age, which tell us how flight accidents occur, how trained pilots differ from untrained ones and how much impact it has on Aviation and safety. And lastly the last section is about the leadership styles, which comprises about how good leadership effect the organization and how good decision have impact on Aviation safety. The questionnaire is of close ended question so that unbiased answer could be obtained. The questionnaire is like a five-point scale that goes from strongly disagree to the last strongly agree. According the one is the least and five is the highest. A total of 150 respondents' data was collected and further analysis was obtained.

Sampling

For our research, the population and sampling, we have collected data in the forms of survey (close ended questions) by making online survey form questionnaire and distributing them towards the people of aviation that are doing internships or working in airports such as Allama Iqbal international airport and the staff of airlines, as well as the students of aviation management and those who have degree of aviation, which means the students of aviation or any person with direct relation with any aviation field. The data was mainly collected form Allama Iqbal international airports people and students of aviation. The data was then further incorporated in the format of excel file format, in which all the collected respondents answer were observed and then the research used the software Smart PLS 3 to run our analysis and check the credibility of our data.

1.1. Analysis

After doing the analysis and processing in the Smart PLS 3, we have got the result form the data that the research had collected form the questionnaire and send in the form of excel. As the table that is shown below shows the reliability and validity of the data. This tables are used for the trustworthiness of the research. If the values are between 0.70 and 0.95 then the research is trustworthy. The highest value in the Cronbach's Alpha is 0.877 and the lowest is 0.705.

Construct Reliability and Validity

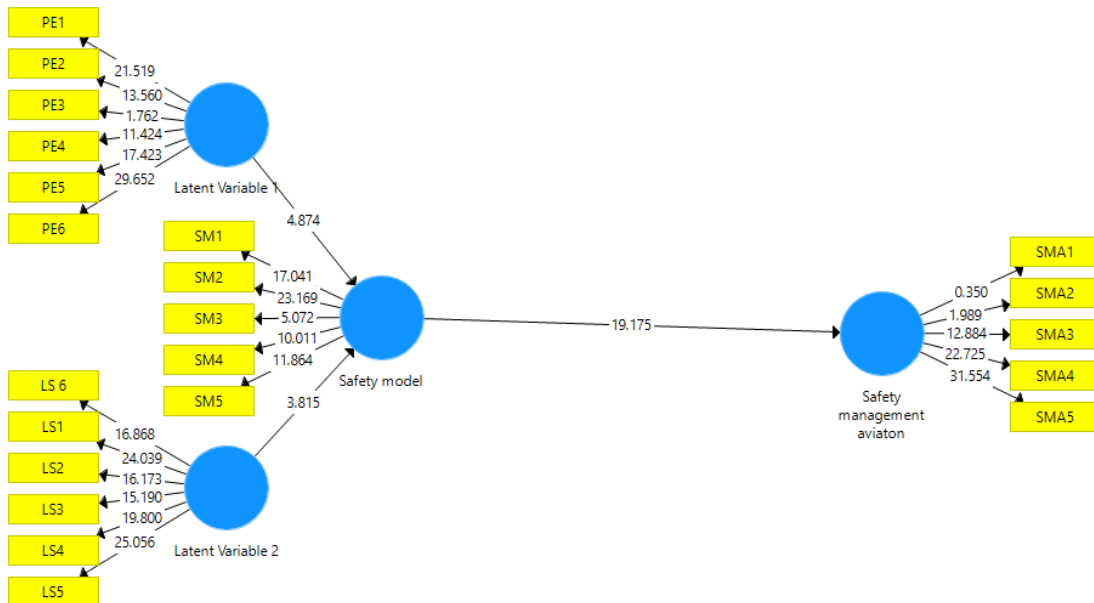
	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Leadership Style	0.803	0.855	0.864	0.534
Pilot Experience	0.877	0.878	0.907	0.620
Safety management aviation	0.705	0.768	0.813	0.615
Safety model	0.764	0.784	0.841	0.517

The table below is of factor load or known as outer loading. All the value of the item in the below table should be equal or above the value of 0.50. After the analysis on the factors considered in the study there is no value smaller than 0.50 which implies that all the factors are directly related to each other.

Outer Loading

	Leadership Style	Pilot Experience	Safety management aviation	Safety model
LS 6		0.749		
LS1		0.842		
LS2		0.782		
LS3		0.761		

LS4	0.788	
LS5	0.799	
PE1	0.795	
PE2	0.766	
PE3	0.747	
PE4	0.753	
PE5	0.793	
PE6	0.853	
SM1		0.752
SM2		0.823
SM3		0.786
SM4		0.783
SM5		0.728
SMA1	0.747	
SMA2	0.815	
SMA3	0.770	
SMA4	0.847	
SMA5	0.846	



As you can see in the table below that all the p-values are supposed to be less than 0.05 in order to accept a hypothesis and all of the p-values are less than 0.05 so all of our hypothesis

are accepted. Which implies that leadership style, pilot experience and safety model of aviation greatly effects the level of safety in aviation.

Mean, STDEV, T-Values, P-Values					
	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P-Values
-> Leadership Style	0.479	0.487	0.098	4.874	0.000
-> Pilot experience	0.387	0.384	0.102	3.815	0.000
Safety model -> Safety management aviation	0.781	0.787	0.041	19.175	0.000

Discussion

We are conducting research, which was to find the impact of leadership style, pilot experience and safety model on the safety of aviation. In the past there are very few analyses done on this topic and our study concludes that there is a huge impact on safety in aviation caused due to lack of pilot experience in different scenarios and their leadership style vastly affects the level of safety in aviation and also the organization's own safety policy also can determine the level of safety in aviation. Therefor it concludes that these factors are very important for the safety in aviation, that's why they are must to include in strategical management system.

Conclusion

In the research, after all the processes and procedures, and after the data collection and analysis of research, it has been proved that a relationship between the variable pilot experience and safety management of aviation as stated above and also the leadership styles

and safety model also greatly affect the functioning of the safety management of aviation. So, all these points of importance should be greatly observed and if any chance of error show it and it should be corrected because the safety of aviation industry greatly depends upon them. The strategic management system would be incomplete if they are not added in its system and checked thoroughly. Other airports should also give importance on these issues if they want their safety to be fully protected.

References

- Adjekum, D. K. J. P. J. o. B. A., & Management. (2014). Safety management systems in aviation operations in the United States: Is the return on investment worth the cost. 4(4), 1442-1450.
- Bastola, D. P. J. J. o. A. T. S. (2020). The relationship between leadership styles and aviation safety: a study of aviation industry. 11(1), 71-102.
- Bell, B. D., Robertson, C. L., Wagner, G. S. J. J. o. A. A. E., & Research. (1995). Aviation Safety as a Function of Pilot Experience: Rationale or Rationalization? , 5(3), 2.
- Guzanek, P., Borucka, A. J. S., & Defense. (2021). An Analysis of Factors Affecting the Number of Safety Incidents in Civil Aviation. 7(2), 105-118.
- Santos, L., & Melicio, R. (2019). Stress, pressure and fatigue on aircraft maintenance personal.
- Stolzer, A. J., Halford, C. D., & Goglia, J. J. (2011). Implementing safety management systems in aviation: Ashgate Publishing, Ltd.
- Xue, Y., & Fu, G. J. J. o. s. r. (2018). A modified accident analysis and investigation model for the general aviation industry: Emphasizing on human and organizational factors. 67, 1-15.