



Link between human factors and aviation accident and incidents

Zaryab Khan^{1*}, Roha Siddique¹, Maryam farrukh¹

¹Superior university , Lahore, aviation and management department.

Bamm-f19-118@superior.edu.pk

Bamm-f19-073@superior.edu.pk

Bamm-f19-067@superior.edu.pk

* correspondence: Bamm-f19-118@superior.edu.pk

Abstract:

This research has been conducted for aviation accidents and incidents and their impacts on aviation industry. Also there is a detailed discussion on link between the human factors and aviation accidents and incidents. The human factors like fatigue and etc. are directly involved in aviation accidents and incidents. Most accidents and incidents are caused by human factors. Human factors can be lessened by applying different training of CRM in the organization. And train the employees accordingly. Aviation accidents and incidents benchmark the bad impact of the airline on its passenger satisfaction. Passenger satisfaction and confidence plays a vital role in the organization betterment and also it helps in improving the revenue. Accidents and incidents also effect the airline economically. As economy is directed with the customer satisfaction and accidents lower the satisfactory level of the passengers. Different human factors

affect an airline differently. And some of the them can lead a flight into a disastrous and deadliest accident. There are many of the accidents in which we see human error was reason and human factors were behind that error. Therefore we must take care of the human factors and train the staff that has to lead a flight in accordance with the human factors. This is what we are going to discuss in detail in this research article. We have made surveys and collect the data and bring the analysis in the research to the readers.

KEYWORDS: human factors, aviation accidents, fatigue, aviation incidents, passenger satisfaction.

Background:

In order to prevent the accidents and incidents in the aviation industry , the human factors is one of the Barrier that act as a safety. In civil and military aviation, there are 70% to 80% occupational accidents and incident are caused by human factors. As human make mistakes by their nature. Than any other single factor , the factors that add more accidents and incidents in the aviation industry are the human factors . The data get from the National transportation safety board and Federal aviation administration shows that the aircrew, organizational factor, and the environmental factors are associated with the 1020 commercial aviation accidents. The aviation accidents and incident due to human factor is 80%. The human factors include violation of rules , improper training of pilots , lack of essential awareness , ignoring meteorological Condition , flight operation performed while pilot is drunk , workload , fatigue , lack of communication , stress and etc . In past, 2013 the Asiana flight 214 was crashed . The reason behind of aircraft accident is that pilot was in fatigue According to the national transportation safety board. The pilot was rely on autopilot more and he didn't have the ability to fly properly. The aviation accidents and incident that cause by failure of machine is 20%.

Some of the accidents and incident in aviation industry are also due to the aircraft maintenance . The general aviation accidents and incident that cause by maintenance is 7.1 % . In 2019 on October 17 the Penair flight 3296 that was a domestic flight. That was crashed. That aircraft was 24 years old . All the system and technology that used on that aircraft was also old. The national transportation safety board released report in 2021 on 2 November . The maintenance of aircraft was the reason of crash. The accident caused by the incorrect wiring of landing gear manufacturers. The accidents and incident that caused by the aircraft maintenance is because of that aviation industry place profit above the safety of lives .

On may 2020, PIA airlines aircraft pk 8303 was crashed in model colony karachi. About the initial reports the cause of this accident was a human error. The pilot make the approach for landing twice. At first of his attempt pilot was unable to deploy the landing gears and the aircraft got damaged by hitting the surface of runway and both the engines got damaged just before he again takeoff for a go around on his second landing approach he lost his engines and ATC was failed to tell him about the conditions and damage he has got. They knew the situation when it was too late and when ATC advised the pilot to increase the height of the aircraft, the pilot replied that he will manage it. There was an over confidence of the pilot and lack of information

service between both pilot and ATC lead the precious life's to the death. Only two of the passengers survived hardly. Some of the reports also acknowledged that both the pilots got distracted while they were talking about coronavirus disease. All this raise us towards the human error that leads the lost of many precious lives.

In 2003 on 8 January flight 5481 was crashed due to the aircraft maintenance . Because of the incorrect maintenance of the elevator control system the aircraft nose was not in control the nose of the aircraft was going up and this was not in the hand of pilot to bring the nose of aircraft down back. Mechanical failures are also the cause of accidents and incident in aviation industry in such a way that any failed or faulty parts are not check out and if any mistake occur while doing maintainancee of aircraft , the aircraft mechanic go to hide because of fear to lose his repute in the organization so it may prove very dangerous and this type of mistakes cause accident and costs lives . The reason behind avation accidents and incident that cause by mechanical failures are also the lack of knowledge . We should not think and be sure from the certified and licenced based aircraft mechanic that he must be knowledge based too.

Among all the modes of transport aircraft is the most safest. The aviation accidents and incident still cannot be eradicate completely from the industry and cannot be avoided with the even use of advanced aeronautical technology and weather forecasting. Due to human errors that maybe pilot error and maintenance error the dispersal and the loss of control occur. So we still hear the news about the aircraft crash. It always cause huge concern and responses of public because most of the accidents and incident in avation industry gives fatalities.

At the end of Second World War, the idea of human factors in avation industry appear by the United States and North America. In the 1940s, the term of human factors start to use in the literature in Air investigation reports of British Air force.

After all In 1957 it is officially used for the very first time. The human errors are the main source of accidents and incident in avation industry. So the human error is no unique in the aviation industry. Human errors has been defined as when the actions of human reaches beyond the limit and causes accidents so it get out of the patience box. from 1992 to 2001, human error in avation industry play a essential role as 70% to 80% avation accidents and incidents were concerned with the flight crew . So the human errors impact significantly more in avation industry . For example In 2006, the 79% of targic loss of lives were due to the pilot error in the United states. Aviation industry is the most safe . The humans factors in avation industry also impact on the safety. Furthermore to the safety problems , Due to the human errors A great loss can also be

face by Airline industry in sense of financial loss , or when the tools are damaged or destroyed , and change can be occur in the flight schedule for example the flight get delay and there can also enhancement in fuel cost.

The collision between the ground vehicle that are standing on the airport and the aircraft is 92% all these were due to the human error in this taxiway is not included . So cost the airline industry annually about 10 billon US Dollars. The roles of human errors that reduce the human performance in aviation industry is very important to understand .

PROBLEM STATEMENT

- We focus only that what type of accidents and incident is happened , instead of focusing why accidnets and incident are happen?
- Why human factors than any other factor are more the cause of fatal accidents and incidents in avaition industry .

RESEARCH GAPS

In our research we have seen that every one is just talking about life loss but the gap is that no one is talking about financial loss of aviation industry and airline industry.

RESEARCH AIMS

Goals/objective :

- To provide awareness about the typical human factors in training session .
- To increase the safety by preventing pilots mistake
- To reduce the human errors that caused aviation accidents and incidents.

Outcomes

- tragic loss of life can be prevent
- humans can safely and efficiently integrated with the technology
- the development of ability to make decision in emergency situation .

Significance:

The term human factors is important in aviation industry because human error costs lives . It is important to search and optimize the factor that causes accident and lower the human performance . It has been realized that aviation accidents and incident are more caused by human factor rather than any other factor that is mechanical failure . The 70% of commercial airplane accidents and incident are due to the human factors so the term human factors are the primary contributor. The term human factor is also concern with the air traffic management , and maintenance practices. In order to improve the efficiency and safety of the flight operation and to reduce the accidents and incidents in aviation industry the professionals in human factors work with the engineer , pilot and the air traffic controller as well to give information about the interaction of human factors and aviation accidents and incident. The maintenance resource management and the crew resource management is imagined as the synonymous of the human factors.

To provide the safe, effective, comfortable and prevent the tragic loss of life the human factors include information about the characteristics , abilities and the limitations about the human that purpose is to apply on the system , jobs and task in order to prevent the aviation accidents and incident. The polices , training and the procedures helps in reduce the human error and increase the human performance . If there is gain in technology , the humans are answerable for the safety and success of the aviation industry by preventing human errors .

RESEARCH QUESTION

- Research question are stated below
- how human factors influence in the aviation accident and incident ?
- In training session which element is more need to be focus ?
- Is human factor differ on gender that cause aviation accidents and incidents ?
- what human factors are common that cause accidents and incident in aviation industry ?

HYPOTHESIS

Human factors are directly influence in aviation accidents and incident . It differs according to the experience of flight and the type of the organization .

RESEARCH FRAMEWORK

Independent variables : Human factors (fatigue , stress , workload, lack of knowledge , lack of communication)

Dependent variables : Aircraft , Airline industry , economy , Air travelers.

Literature review:

The aviation market may be a highly competitive environment. The delivery of high-quality service to airline passengers is vital for the airline's survival, competitiveness, profitability and sustained growth (Suki, 2014). Albeit fatal aviation accidents are extremely rare, the rapid growth in aviation industries has caused increasing exposure to risk. Airlines got to understand what passengers expect so as to raised serve their demands and achieve the highest level of satisfaction. Liao (2014) acknowledged that airlines especially don't want to arouse any fears or unpleasant feelings in their passengers because excellent service quality can increase levels of customer satisfaction, and retain consumers (Hu et al., 2009).

Considering passengers' safety perception toward the airline together of the service quality would offer a perspective for airlines, enabling them to spot passengers' behaviors and expectation for better market segmentation. The results will bring a big importance to airline strategic management to enhance its airline service quality, customer satisfaction and safety management efficiently. Humans, by their very nature, make mistakes; therefore, it should come as no surprise that human error has been implicated during a sort of occupational accidents, including 70% to 80% of these in civil and military aviation (O'Hare, Wiggins, Batt, & Morrison, 1994; Wiegmann and Shappell, 1999; Yacavone, 1993). In fact, while the amount of aviation accidents attributable solely to mechanical failure has decreased markedly over the past 40 years, those attributable a minimum of partially to human error have declined at a way slower rate (Shappell & Wiegmann, 1996). Given such findings, it would appear that interventions aimed toward reducing the occurrence or consequences of human error haven't been as effective as those directed at mechanical failures. Clearly, if accidents are to be reduced further, more emphasis must be placed on the genesis of human error because it relates to accident causation. Human factor is one among the security barriers which is employed in order to stop accidents or incidents of aircraft. Therefore, the question is to which extent the error caused by human factor is included into the share of errors that are made during aircraft maintenance. within the EASA

approved aircraft maintenance organization, which incorporates in its working system the human factor also, the tendency is to use the approach by continuous monitoring and analysis of errors in aircraft maintenance. Such approach achieves advance prevention or reduction of the occurrence of harmful events, such as accidents, incidents, injuries and during a wider sense damages associated with aircraft operation and maintenance. The research presented during this paper may be results of gathering and systematization of errors caused by human factors over the last five years in one organization for aircraft maintenance certified consistent with the ECU standards. The study encompasses an analysis of 28 (twenty-eight) investigations of individual cases and provides insight into the most factors of errors. The results of analyses on the explanation for occurrence of human error show similar results just like the Boeing study which was administered for the planet fleet. Even with the advancements in aeronautical technology and meteorology, aviation accidents still can't be avoided. We still hear news about aircraft crashes, loss of control and disappearance thanks to human errors (e.g. pilot and maintenance error), inclemency, mechanical failure or sabotage. Consistent with Aviation Safety Network (ASN), a Netherlands-based online aviation database, the seriousness of aviation accidents are often classified into accident, hijack, incident, other occurrence, unfiled occurrence, write-off and hull-loss. Most aviation accidents are fatal, and involve other political problems, so it always causes huge public responses and concerns.

However, aircraft is proven to be the safest among all transport modes, but why do they always cause an enormous social panic and have an influence on economic performances? Even though they're also rare, crash events are nearly always catastrophic. Besides, the media tends to misrepresent the accident causes and typically lacks accurate safety knowledge, giving rise to negative spillover effects not only to air transportation users but also to the society. Individual safety perception toward airlines may be a key to selecting which airline to use. Objective safety might not be an adequate measure for passengers because they can't correctly know it, so perceived (subjective) safety could also be more relevant to them. The origin of safety perception toward airline companies may come from accident history, tangible elements and operation performances of airline service, airfare and media also as rumor influences. Human factors are defined by the International Civil Aviation Organization (ICAO) as “about people in their living and dealing situations; about their relationship with machines, with procedures and with the environment about them; and about their relationships with people (at work)”. Human factors contribute to approximately 75% of aircraft accidents and incidents. (Husam Kharoufah, John Murray, Glenn Baxter, Graham Wild, 2018) intrinsically, understanding their influence is

important to improve safety within the aviation industry. This study examined the various human factors causations during a random sample of over 200 commercial air transportation accidents and incidents from 2000 to 2016. The most objective of this study was to spot the principal human factor contributions to aviation accidents and incidents. An exploratory research design was utilized. The qualitative data were recorded during a database, and were coded into categories about the flights (including date, manufacturer, carrier, state of occurrence, etc). These categories were then analyzed using Chi-Squared tests to work out which was statistically significant in terms of getting an influence on the accidents/incidents. The foremost significant human factor was found to be situational awareness followed by non-adherence to procedures. Additionally, charter operations proved to possess a significantly higher rate of human factor related occurrence as compared to other sort of operations. A big finding was that Africa features a high rate of accidents/incidents relative to the quantity of traffic and aircraft movements. These findings reflect a number of the more noteworthy incidents that have received significant media attention, including Air Asia 8501 on the 28th of December 2014, TransAsia Airways 235 on the 4th of February 2015, and Air France 447 on the first of June 2009; these accidents resulted during a significant loss of lives where situational awareness and non-adherence to procedures were significant contributing factors.

According to for several years, the first focus of flight crew selection was on the identification of people with superior flying skills and skills. However, explains that, in recent years the aviation community has become increasingly aware that for a flight crew to complete their flight or mission, the flying skills and therefore the ability to figure well during a crew situation during the various phases of the flight are necessary. Crew resource management (CRM's) skill tests are designed to live problem solving, deciding, and knowledge of how individuals perform struggling with crew members within the cabin. The authors' findings illustrated that CRM has proved to be more effective than traditional methods supported research from scientists which stated that the majority aviation accidents are thanks to miscommunication between crew members within the cockpit. Another study about flight crew selection presented by reference; focused on testing the individual skills of flight crew additionally to conducting structured interviews to enable human resources to pick the best flight crew to fly their aircrafts. Conclusions were supported substantial research that was completed to seek out the simplest method to pick pilots. The results illustrated that individuals' tests and structured interviews is that the best method, with the authors discovering a positive relationship between good interview scores and continued employment in addition to, a relationship between poor interview scores

and flight crew being terminated by the corporate. Advancement within the aviation sector has led to the invention of innovative methods, like profiling. Discusses profiling of flight crew supported their personalities and psychological state . The profiling process consists of two methods; select-in and select-out. The select-in method helps in estimating the extent of data, skills, and other capabilities the candidate has for a given job and consists of psychological testing and measuring the private traits executed from the analysis of the job task. While the select-out method, includes medical techniques and an assessment of psychopathology to watch psychiatric fitness. Another study about pilot selection authored by Ref. focused on the importance of situational awareness of flight crew within the process of flight crew selection. The authors demonstrated the importance of situational awareness for flight crew to execute the right action during a short period which will be but a millisecond which may be very decisive for the security of the aircraft and passengers. The authors state that the method of choosing flight crew and grouping them as per their level of situational awareness consists of 5 vital individual skills which are: Spatial, attention, memory, perception, and cognitive functions. The 5 skills were defined as:

Spatial: the potential of a private to interact with the aircraft systems through mental visualization and manipulating objects spatially which are significant for navigational purposes.

Attention: is that the specialize in significant details during a demanding environment. The distribution of attention across several, competing sources of information and tasks are often an important challenge for flight crew during the different flight phases.

Memory: Memory consists of memory and LTM stores. Comprehension and projection of future events that require high levels of situational awareness must occur in memory as people attempt to integrate information from several sources, compare the information obtained to the goals and objectives forecasted, and then project future scenarios from known dynamics. While long-term memory stores, can reduce the load on memory. According to the authors, a deft pilot is differentiated by his ability to understand the significance of the small print during the flight to understand whether the information should be stored within the LTM or not.

Perception: is that the ability of a private to perceive information during a short period and to remain conscious of infrequent signals to require decisive actions.

Cognitive functions: is that the capability of a private to affect workload and circumvent issues struggling and extreme environment during the flight.

These five individual skills should be examined separately within the process of flight crew selection to make sure pilots can withstand the demanding and extreme environment during the flight. Therefore, flight crew should be consistently monitored, trained, and developed to make sure their readiness to face all kind of challenges to diminish aircraft accidents in the aviation industry.

Trends in aviation human factors research

The term “human factors” has become increasingly popular within the commercial aviation industry as human error has been recognized rather than technical failure to underlie most aviation accidents and incidents. HFs may be a very extensive topic in both its knowledge domain and scope. HFs involve the gathering of data about human abilities, limitations, and other characteristics and implementing it to equipment, machine, jobs, tasks, systems, and environments to get a secure, comfortable, and effective usage by a person's. In aviation, the knowledge of how a human and technology interact during a safe and effective is a component of HFs. This knowledge can then be implemented into various areas like design, training, policies, or procedures to reinforce human performance. Much research has been undertaken on the various HFs causes in aviation accidents and incidents like fatigue, situation awareness, and distraction in cockpit, and lots of other causes. The subsequent sections discussed the foremost significant HFs in aviation accidents and incidents such as fatigue, situational awareness, and communication.

Fatigue

Fatigue is taken into account one among the foremost critical factors that has an impact on the choice making of flight crew members. As an example, presented a study of major accidents in domestic schedule carriers from 1978 to 1990 produced by the National Transportation Safety Board (NTSB), the study estimated that fatigue contributed to between 4 and seven of civil aviation mishaps, and data from the United States Army Safety Centre suggests fatigue is involved in 4% of Army accidents. Additionally, statistics from the Air Safety Centre blame fatigue for 7.8% of Air Force Class-A mishaps.

The most significant issue which will be obtained from these data is that the financial cost of those accidents, together major civil aviation accident can exceed \$500 million in total financial losses.

The failure of communication and cooperation between flight crew members during flights has been identified as a main explanation for many of the accidents and incidents in commercial air transportation; presented a study on focus groups of crew members of airlines during which different vital themes were identified. One among the foremost important themes identified from this study were the barriers to industry during a flight in which 6 barriers were identified, which were:

The protocols of interphone and therefore the locked landing deck door. The study has indicated that 81% of cabin crew agreed before discussion and then an extra 17% agreed after the discussion that a locked cockpit door can be a physical and psychological barrier between crew members. The study has indicated

also the texture of hesitation from the cabin crew to use the interphone as they were unmindful of things in terms of workload within the cockpit. recommended the installation of video cameras by the landing deck door to realize safety within the cockpit and effective communication among crew members.

Research methodology:

In this research we are discussing about how human factors affecting the entire aviation industry. As we discussed earlier that different human factors effect d'aviation industry Differently. We have seen number of incidents and accidents in aviation industry just because of human factor. although we know that we can't make a human perfect. The thing which we can do is just Identifying the factors that causes human error in the industry and after identifying it the next phase is to mitigate these errors.By mitigating and reducing human errors that are caused by different human factors can save many precious lives. The basic purpose of this research is just to know that at which extent the human factors effect the aviation industry.

For this research the philosophy we have chosen is positivism. In this type of research philosophy that data collection over which the research will based on should be quantitative and over research contains quantitative type of data that's why we are utilizing positivism in our research. The approach that we are using in our research is deductive. Both positivism and deductive approach has relationships. where there is the use of positivism philosophy there must be the use of Deductive approach in that research. In deductive approach which test this research whether it is true or not. Is the research is according to the ground realities and does it Workable on ground realities.

The collection of data must be quantitative in this race in this type of research. In our research we kept the data quantitative. Sampling the data we are using probability approach of sampling and also simple random because we have chosen 10 employees Of aviation industry of our country. The method that is used in our data collection is questionnaire. In that questionnaire there will be different closed ended questions. These questions will be given to those employees which we have sampled for our research this is how we are collecting the data and analyzing it and providing a detailed research.

Construct reliability and validity:

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Human factors	0.158	0.312	0.566	0.304
Passenger satisfaction	0.174	0.260	0.297	0.279

Human factors and passenger satisfaction has a deep integration with each other. As shown in the above given table the value of reliability is 0.566 and passenger satisfaction value is 0.297. and if we talk about AVE. of human factor the value is 0.304 and value of passenger satisfaction is 0.279.

DISCRIMINANT VALIDITY

	Human factors	Passenger satisfaction
Human factors	0.551	
Passenger satisfaction	0.328	0.528

The value for the validation are shown in the above given table which are 0.551 for the HF vs HF. PS vs HF has the validity of 0.328. PS vs PS has the validity 0.528. validity is the point where we see how much is the value is valid in regards to the research we are making for the now knowledge.

OUTER LOADINGS

	Human factors	Passenger satisfaction
HF 1	0.420	
HF 2	0.596	
HF 3	0.066	
HF 4	0.824	
PS 1		0.882
PS 2		0.532
PS 3		-0.221
PS 4		-0.088

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Human factor-> passenger satisfaction	0.328	0.358	0.087	3.771	0.000

The above given table reflects the values of original sample, STDEV, T-values and P-values. The P-value is 0.000 this means the sample and all the calculations are according to the research requirements.

Conclusion:

While concluding the whole research we see that the passenger satisfaction and human factors that are directly related to the aviation accidents and incidents have a deep integration. When an airline gets the accident or catch up an incident the passengers got scared of and they seems not to travel with the same airline. This will down the passenger satisfaction and will let the

organization down in market and as well as their revenue will go down and ultimately the organization will create bad impact among the passengers. If an airline is not able to satisfy their passengers they are going to shut their business soon in the future. The passenger satisfaction is the asset that is the most important among all the other assets that an airline owns.

RESEARCH LIMITATIONS AND FUTURE DIRECTIONS

This study, like every research, has flaws that could lead to further research. First, because the research was conducted from frequent flyer participants alone, the findings' generalizability is limited. As a result, future research should include basic categories of airline travel customers in their sample. Second, our study only looked at WOM as a conceivable moderating effect on the relationship among both service quality and trust, as well as customer satisfaction and brand image; but even so, there may be some significant observations as a moderator between perceived quality and brand image, as well as repurchase intentions. Finally, this research can be expanded by include a comparative examination of domestic and foreign airlines in the very same framework, demonstrating how customers' views of modelled variables differ across two demographic groups. This is especially essential in the context of airline image, since customers perceive multinational airlines to have unique identities. Future research should explore the influence on multiple operational levels including such high, middle, and operating levels, to determine the magnitude of the effect at each stage.

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