

Fatigue Effects On Aviation Industry and On Its Performance As Well: Measuring Its Effects on Industry Through PLS-Smart

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ABSTRACT

This study is all about effects of fatigue on aviation industry. Fatigue is important factor that reduces human ability and it leads to accidents and incidents and threatens the safety of human lives working there. The nature of the study was quantitative research and positivism philosophy. In which probability sampling is used. As we selected 100 respondents belong to aviation in Lahore. Positivism uses numerical data and probability sampling is not biased. Through which we get to know that how much aviation industry effected by fatigue and it has major effects on its performance. The study suggests taking measures related to fatigue is very important to reduce its effects on performance of each employee working in this industry.

Keywords: fatigue effects, performance, aviation industry, problems due to fatigue, fatigue management, sleep

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1. INTRODUCTION:

In a variety of real world settings, fatigue emerges from long duty hours, insufficient sleep, stress, over workload which results in poor performance of pilots, crew members, air traffic controllers and disturbs all aviation operations. In aviation related field, sleepiness is very dangerous because fatigue related errors in aviation industry leads to accidents and major incidents. Description given by Charles Lindbergh in 1953 of his historic solo transoceanic flight of 33.5h in 1927 illustrates the destructive effects of fatigue in aviation. He was not the first to identify fatigue as a risk factor for aviation accidents. However, throughout the years, fatigue remained an important factor that is the main cause of accidents and incidents both in civil and military aviation. "Fatigue threatens aviation safety because it increases the risk of pilot error that could lead to an accident."

Recent events have highlighted the importance of fatigue in aviation operations. Because of demanding flight schedules, crew members often suffer disrupted sleep and desynchronized circadian rhythms, the combination of which effects performance. Unfortunately, market requirements for transcontinental and transoceanic routes, as well as for nighttime departures and early-morning arrivals, continue to pose challenges to human vigilance in flight. However, regulatory attention to the physiological causes of fatigue, new techniques for schedule optimization, advanced sleep-monitoring technology, and behavioral strategies to counter fatigue will go a long way toward managing fatigue-related risks in operational contexts. As fatigue increases, accuracy and timing degrade, lower standards of performance are accepted, the ability to integrate information from individual flight instruments into a meaningful overall pattern declines, and attention narrows. Important aspects of flight tasks are forgotten or ignored. In addition, fatigued pilots tend to decrease their physical activity, withdraw from social interactions, and lose the ability to effectively time-share mental resources. Severely fatigued pilots face many problems due to lack of sleep and fatigue. As sleepiness increases, performance becomes less consistent, especially at night. Task-related details are missed and response failures occur because of an increase in unpredictable and involuntary lapses into sleep. Overall, fatigue impairs the aviator's ability to pay attention to flight instruments, radio communications, crew coordination, and navigational tasks. Recent events have highlighted fatigue-related safety issues in civil aviation. In 2004, Corporate Airlines Flight 5966 crashed on approach to Kirksville Regional Airport after its fatigued pilots, who were on their sixth flight of the day, had been on duty for 14 hours. Because they were tired, these pilots ignored published procedures, failed to respond

to alerts that the aircraft was too close to the ground, and crashed into trees after losing awareness of the location of their aircraft with respect to the approaching airport location and its surroundings. In February 2008, the Honolulu-based pilots of Go! Airline Flight 1002 overshot their destination by more than 30 miles because they fell asleep on the flight deck during a trip that was only 50 minutes long. In October 2009, a similar event occurred when the pilots of Northwest Airlines Flight 188 remained unresponsive to communications from air traffic control for almost 90 minutes and overflew their destination by 150 miles because they evidently had dozed off at the controls. So fatigue is a major factor to discuss in aviation industry because of this many incidents and accidents can happen easily. A very illustrating example of fatigue and its effect on the safe piloting of an aircraft is provided by the, 2010 crash of Air India Express Flight 812, which crashed on landing in Mangalore, costing the life of 158 of the 166 persons aboard.(Front. Physiol., 06 September 2021). Fatigue is a major stressor in aviation operations and there is need to understand its interaction with mental workload. This study provides overall discussion about fatigue effects on aviation and its performance as we know that fatigue is a major risk factor in aviation industry because it can cause severe effects on pilots, staff, crew members and air traffic controllers that can further lead to accidents and incidents. Like stress, fatigue is cumulative and it could be either acute (short-term) or chronic (long-term). Acute fatigue is easily recognized by not flying and sufficient rest since it stems mainly from lack of sleep, workload, crew scheduling, a long duty period. On the other hand chronic fatigue is more insidious and subjective which pilot cannot bear to tolerate more than the other before chronic fatigue emerges. Heavy workload and financial problems, mental and health illness are major factors that cause fatigue. In this literature review we study how to overcome these issues, problems related to health and mental stress to avoid accidents that can easily happen due to lack of sleep , stress , fatigue and any kind of issue related to fatigue.

Problem Statement:

Due to over workload and stress in aviation industry which leads to fatigue and furthermore fatigue is the major cause of accidents in aviation industry. Similar reductions in performance have been observed in fatigued pilots and other crew members and ATCs. So, the problem is over workload and also stress on pilots and other workers in aviation industry which is the main cause of fatigue and it has major effects on aviation industry. And it is an important topic to discuss because of this problem and how to overcome this issue. Fatigue may cause long term health effects. Although these effects may have a limited influence on the performance of a fatigued pilot, they may lead to long-term reductions in performance. The aviation industry should take steps on this situation as workload causes fatigue and fatigue eventually causes accidents or incidents and it increases the risk of any type of accidents and incidents. The workload of the staff, crew members and pilots should be reduced their working hours should be reduced so the risk can be easily mitigated.

Research Aims:

The study for this research is very significant and it highlights the problems and issues caused in aviation due to lack of sleep, workload and fatigue. And it shows how the fatigue and workload of the employees should be reduced so the chances of any risk can be mitigated as much as possible.

Significance:

The significance of this research is very important to discuss as it has major effects on aviation industry and its operations. There is concern in the aviation community that pilot schedules can lead to fatigue and increased chance of an aviation accident. Fatigue is the major risk factor in aviation industry as it effects pilots performance and we know that pilots has the responsibility of many people and one mistake of pilots or air traffic controllers can lead to aircraft crash. There is highly chance of accidents and incidents if no proper solutions provided to this major risk factor. So, this is very important research on this major risk factor to avoid any kind of accidents and incidents in aviation industry.

2. LITERATURE REVIEW:

This literature review examines safety concerns and study about fatigue and its effects on performance due to which accidents can happen easily. The relationship between stress, fatigue and performance, crashes and accidents. Fatigue is the major factor that has effects on performance so it is important to discuss the relationship between fatigue and accidents and important research on safety measures as well providing solutions to overcome this issue in aviation industry.

(1991 Dinges and Kribbs) stated that performance is critically effected by fatigue and this is the main reason behind accidents and crashes. Further, they talk about that performance changes are linked with fatigue and lack

of sleep from laboratory studies with field studies where performance decrements are potentially more readily observable than infrequent adverse safety outcomes. Thus, the review includes performance effects as well as overt safety outcomes of fatigue. This review is all about fatigue and its effects on aviation industry so far. Safety in aviation industry is very important because it has responsibility of many people for example if pilot is facing workload and fatigue problem he couldn't concentrate on his work and it can lead to accident. So fatigue is the major issue and aviation industry is facing this issue due to workload and long working hours. It has effect on performance as well so there are some methods that can mitigate fatigue in aviation industry and can reduce stress level of employees.

There are some methods to mitigate fatigue factor in aviation industry.

Cockpit lighting:

This is mitigation method regarding lights in the cockpit at night. So this is mitigation method and light effects on person's performance which leads to fatigue. Short wavelength light pulses (especially 420 nm) has been found to be good on alertness and performance, measured with 9-point VAS scale.

Napping:

This is important method that mitigates this risk factor. In this study, conducted by Petrie et al. (2011) with 253 pilots operating international flights showed that daytime napping prior to overnight duties revealed significantly lower fatigue levels, based on short-form health survey (SF-36) use. Hartzler (2014) reported that the strategic naps are important. These types of naps have been advocated for pilots in particular, as opportunities to sleep either in the designated rest facilities or on the flight deck may be beneficial in reducing both the performance and alertness associated with fatigue.

EXERCISE:

Exercise helps to change in the phase of sleep-wake cycles via delaying in the sleep-wake cycle resulting in alertness. Barger et al (2004) reported that daily exercise of 18-fit males with strictly controlled very dim lights helps to reduce fatigue.

3. MATERIAL AND METHODOLOGY:

In this article, the literature located in PUBMED and Google Scholar relating aviation, fatigue, surveys, subjective and objective measurements and countermeasures were reviewed and tools used in these studies, in which we study fatigue and the performance and safety concerns related to fatigue which is major risk factor.

INDEPENDENT VARIABLE:

As we know independent variable is the one which effects dependent variable. Independent factor depends on dependent variable as it effects other variables.

In this article fatigue is independent variable which effects aviation industry to extreme level. So fatigue, workload, long working hours, sleep deprivation are the major independent variables that effects aviation operations and it is very important to discuss because in aviation there is no chance of any mistake as it can lead to serious accidents.

DEPENDENT VARIABLE:

Dependent variable effected by independent variable. So, in these articles pilots, crew members, aviation, performance are dependent variables that are effected by independent variables like fatigue and workload etc. which has major effects on dependent variables like aviation and its performance.

In this study, we need to understand the relationship between fatigue and performance. The effects of fatigue on each individual in aviation industry. And to overcome this problem solutions are needed that are explained in our article we study that how we manage this issue by providing solutions that helps in reducing this major risk factor. Accidents and incidents happens due to this fatigue problem and workload on pilots and ATCs so proper research and solution are required to overcome this issue.

4. RESEARCH METHADODOLOGY:

This research contains the methodology, data collection tool and sampling techniques to study the relationship between fatigue and its performance on aviation industry. This study uses quantitative research and positivism philosophy and deductive approach. In this research probability sampling is used. For this study a sample of population is taken. We select 100 people belong to aviation in Lahore that how fatigue has major effects on aviation industry. POSITIVISM APPROACH uses numerical data and probability sampling is not biased that's why we are using quantitative research for our research. As we took 70 respondents from aviation population measurements are done in numeric form in which researcher finds relationship between two or more variables. Positivism philosophy is used here as it does not incorporate feelings and emotions. It gives almost accurate information and tells how

We are using positivism approach as it is more reliable as compare to other approaches, we will do our research through questionnaire to discuss the major effects of fatigue on aviation industry and its people. Fatigue is major problem which not only effects aviation industry but it has also major effects on other industries as well. Many incidents occur due to fatigue problem. We will survey the people about fatigue effects on aviation industry and what is their point of view about this issue which effects not only this industry but also other organizations in the world and its people for this purpose we use positivism research.

Through this approach social norms can be explained better by people. Things are explained subjectively and objectively in this approach. This article is based on fatigue and it's effects on aviation industry and how it effects the performance of pilots and ATCs. We will ask people what they think why fatigue and stress lower the performance of pilots and ATCs. Fatigue and stress can often lead to an aircraft accidents or incidents. Some pilots have to fly for several hours in a day and they have back to back flights because of which they become very sleepy and tired.

Questionnaire:

This study uses quantitative research and positivism philosophy and deductive approach. In this research probability sampling is used. For this study a sample of population is taken. We select 80 people belong to aviation in Lahore that how fatigue has major effects on aviation industry. POSITIVISM APPROACH uses numerical data and probability sampling is not biased that's why we are using quantitative research for our research. As we took 100 respondents from aviation population measurements are done in numeric form in which researcher finds relationship between two or more variables. Positivism philosophy is used here as it does not incorporate feelings and emotions. It gives almost accurate information and tells how We are using positivism approach as it is more reliable as compare to other approaches, we will do our research through questionnaire to discuss the major effects of fatigue on aviation industry and its people. Fatigue is major problem which not only effects aviation industry but it has also major effects on other industries as well. Many incidents occur due to fatigue problem. We will survey the people about fatigue effects on aviation industry and what is their point of view about this issue which effects not only this industry but also other organizations in the world and its people for this purpose we use positivism research. Through this approach social norms can be explained better by people. Things are explained subjectively and objectively in this approach. This article is based on fatigue and it's effects on aviation industry and how it effects the performance of pilots and ATCs. We will ask people what they think why fatigue and stress lower the performance of pilots and ATCs. Fatigue and stress can often lead to an aircraft accidents or incidents. Some pilots have to fly for several hours in a day and they have back to back flights because of which they become very sleepy and tired.

Analysis

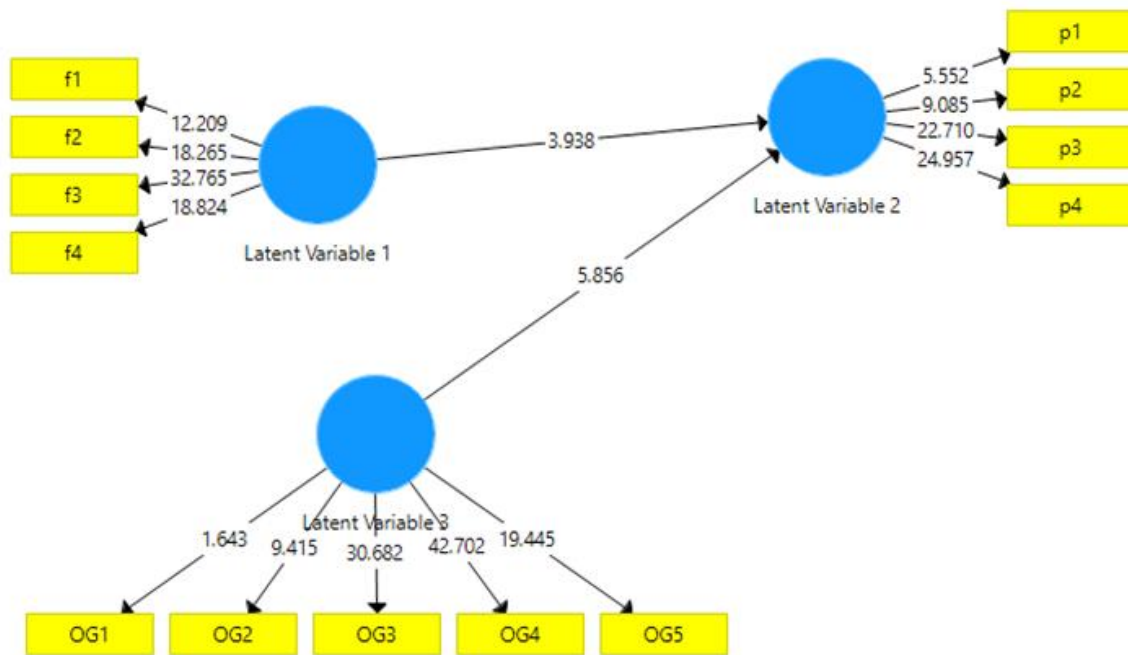


Table 1:

Path Coefficients			
	Fatigue	Performance	Quality
Fatigue		0.640	0.265
Performance_			0.484
Quality			

Table 2:

Construct Reliability and Validity				
	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Fatigue	0.742	0.857	0.895	0.630
Performance	0.856	0.862	0.904	0.702
Quality	0.775	0.793	0.849	0.534

Table 3:

Discriminant Validity			
	Fatigue	Performance_	Passenger Satisfaction
Fatigue	0.794		
Performance	0.740	0.838	
Quality	0.725	0.751	0.731

Table 4:

R Square		
	R Square	R Square Adjusted
Performance	0.548	0.544
Passenger Satisfaction	0.627	0.622

Table 5:

f Square			
	Fatigue	Organization Growth	Passenger Satisfaction
Fatigue		1.211	0.170
Performance			0.273
Passenger Satisfaction			

5. Conclusion:

As we know fatigue remains an important safety risk factor in both civil and military aviation. Sleep and circadian factors are the primary factors of human fatigue, and aviation schedules influence both these factors powerfully. Fatigue is the major cause of accidents in aviation industry so it is very important factor to discuss and provide solutions that how to mitigate these factors that has major effects on pilots and every single individual working in aviation industry. Overload like long hours working and stress leads to fatigue and it has major effects on aviation operations so there is need to overcome these issues by providing proper solutions. We took 100 people based on work experience and some employees who face this problem due to workload at workplace. We used positivism philosophy and quantitative research. Through which we get to know that about 80% of employees and aviation industry suffers due to fatigue problem. To major concern is to solve this issue as soon as possible by reducing long working hours and provide suitable schedule for flights so pilots and other crew members couldn't face this issue and aviation industry overcome this issue due to which many accidents may occur. So 80% of respondents were agree that fatigue is the major problem not only in aviation industry but also it has major impact on other industries as well. So our research proved that fatigue is major cause of poor performance in aviation industry. Fatigue is the major problem that every person is facing in the aviation industry so far and it's very important and necessary to take steps towards this issue to resolve fatigue issue because it has major effects on each and every individual working in airports, airline's as well in the organization. Pilots and ATCs face this issue and this issue can also lead to major accidents and incidents such as crash and loss of many people lives. So our research was all about fatigue in aviation industry and the people we took as respondents were agree that fatigue has major effects on them as well on the whole aviation industry.

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