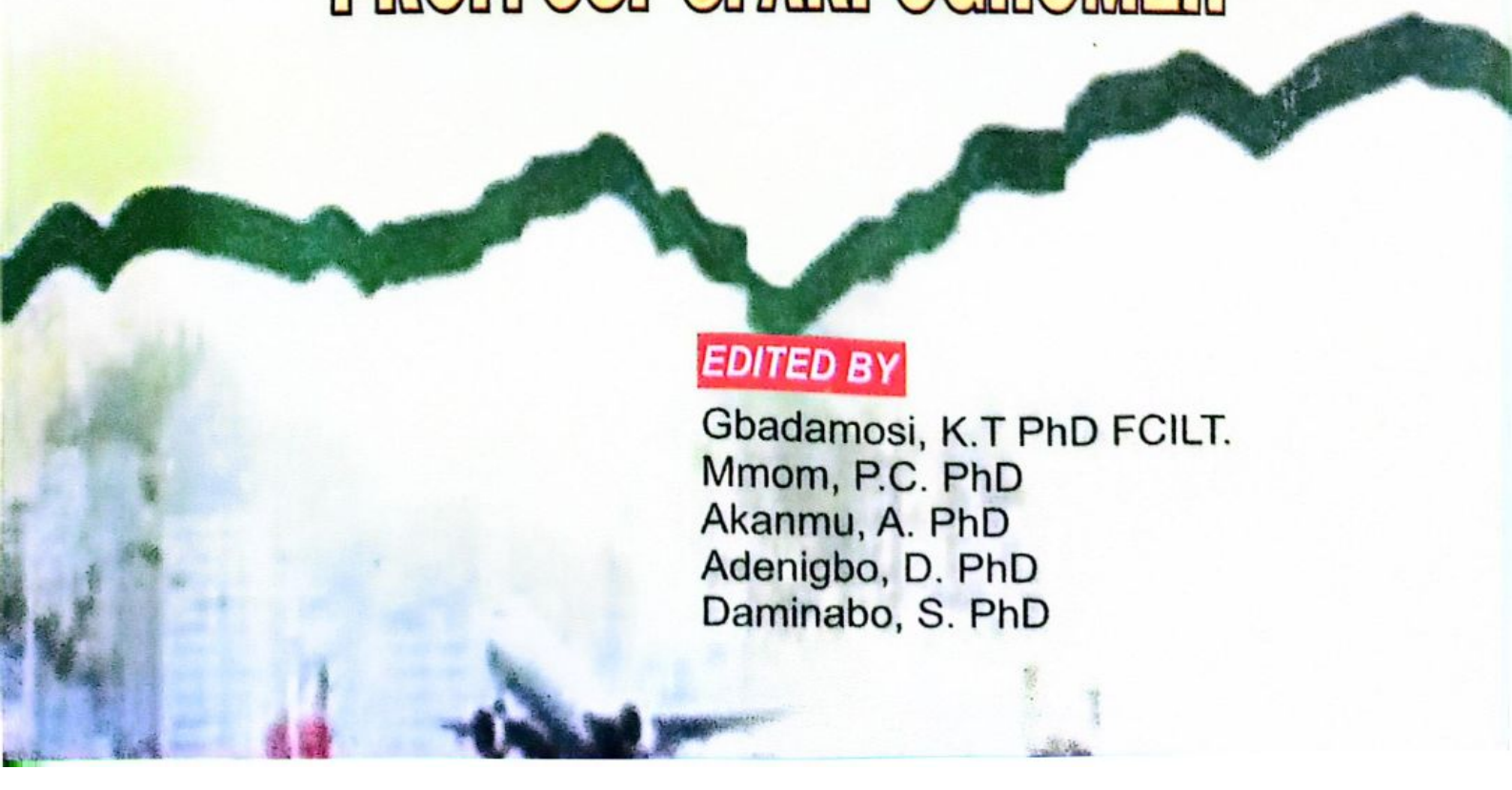
PERSPECTIVES ON

TRANSPORT DEVELOPMENT IN NIGERIA-

CONTEMPORARY DISCOURSE

Festschrift In Honour Of

PROF. OSI S. AKPOGHOMEH



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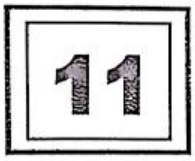

ASSESSMENT OF AVIATION PERSONNEL PERCEPTION ON THE CAUSES OF COMMERCIAL AIRCRAFT DISASTERS, MEASURES AND CHALLENGES PREVENTING SAFETY MANAGEMENT IMPLEMENTATION IN NIGERIA

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Abstract

Nigeria has experienced some devastating commercial aircraft disasters in the time past which occurred due to human and natural events and have resulted in the loss of passengers, crew and damages to cargoes. This study is built on event system theory and focuses on determining the causes of commercial aircraft disasters and the effectiveness of the measures put in place to reduce aircraft disasters. This study utilized purposive sampling to pick the three major airports in Nigeria out of 30 airports for the study. A total of 150 questionnaires were distributed randomly to the aviation personnel to determine the simple causes and measures put in place for aviation disasters. The data collected were analysed using frequency, percentages, and mean index score. While the study hypothesis was tested with Chi-square. The study result showed that the causes of aircraft disasters in Nigeria among others were sabotaged due to bird strikes (M= 4.190), pilot errors (M= 4.391), engine failure (M= 4.692) and Corruption (M= 4.140). Similarly, the study result also showed that monitoring of airline operations (M= 3.172), compliance checklist for ramp investigation (M= 4.272) and Runway lightning to secure aircraft touch down (M= 4.172) were effective in reducing Aircraft disasters. The study therefore concluded that there is a statistical significance to the effectiveness of Runway lightning in securing aircraft touch and compliance checklist for ramp investigation to reduce aircraft disasters in Nigeria. The study recommended among others that corruption among the aviation staff should be eradicated by coming up with stricter policies to abolish it.

Keywords: *Aircraft; Aviation; Commercial; Disaster, Nigeria; Perception*

11.1. Introduction

Air transport has facilitated the movement of people and cargo from one point to another. The development of supersonic aircraft has made travel easier as people and cargo are delivered to the right location within the shortest period. Despite the numerous advantages of air transport one of the demerits of air transport is aircraft disasters. According to World Health Organization (WHO, 2020) described a disaster as a major crisis that occurs over a short or long period and results in widespread human, material, economic, or environmental loss that surpasses the affected community's or society's ability to deal using its resources. In the Aviation industry, the major disasters are plane hijacking, aircraft crashes, and the presence of foreign substances in aircraft. The causes of aircraft disasters are numerous and it is difficult to determine the specific cause of aircraft disasters. According to Pilot Institute (PI, 2020) posited that human error, mechanical faults, weather problems, air traffic controller/other ground staff error, and other causes are the five causes of aviation disaster.

Aviation disasters increase with an increase in air service demand. The number of planes involved in accidents is increasing as a result of the ongoing annual expansion in global air traffic passenger demand. Despite being one of the 20 countries with the best air infrastructure, the United States has the highest number of civil airliner disasters in the world (Statista Research Department, 2023). Efforts by the International Civil Aviation Organization to provide recommended practices and standards for safety management in civil aviation are yet to yield the required result as aircraft disasters are still common problems for both developed and developing countries.

Nigeria being a developing country has faced serious disasters in civil aviation due to the ineffectiveness of the measures put in place to manage aviation disasters. It is, therefore, against this background the study seeks to assess aviation personnel's perception of the causes of aircraft disasters, measures and challenges preventing safety management system implementation in Nigeria. The study proposed one hypothesis which is stated as follows; there is no statistical significance to the 2-key effectiveness of the measures put in place to reduce aircraft disasters in Nigeria.

11.2 Literature Review

11.2.1 Concept of Aircraft Catastrophic

According to the International Federation of Red Cross and Red Crescent Societies (IFRC, 2022) conceptualized disasters a serious disruptions to the functioning of a community that exceed its capacity to cope using its resources. Disasters can be caused by natural, man-made and technological hazards, as well as various factors that influence the exposure and vulnerability of a community. Similarly, *disaster* refers to an event or situation that is of greater magnitude than an emergency; disrupts essential services such as housing, transportation, communications, sanitation, water, and health care; and requires the response of people outside the community affected (Gebbie & Qureshi 2002).

United Nations Office for Disasters Risk Reduction (UNDRR, 2015) conceptualised disasters as a serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts. In the context of aviation, disaster refers to man or natural event which may disrupt aviation activities. A disaster in the airport may occur due to aircraft accidents or any other event which prevents flight from taking place. This study therefore conceptualised that the demand for airline services is a function of disaster which is shown in Figure 1.

Figure 1 indicates the conceptual relationship between dependent and independent variables. The dependent variable is the passenger demand for airline service and it is perceived by the study that an increase in aircraft disasters results in to decrease in passenger demand. The independent variables are the causes of aircraft disasters and the effectiveness of the measures put in place to curb aircraft disasters. Thus, the independent variables used are discussed as follows;

11.2.2 Causes of Commercial Aircraft Disasters

These are factors resulting in aircraft accidents. This includes Aircraft sabotage due to bird strikes, pilot errors, inadequate technological know-how, engine failure, poor runway and taxing maintenance, corruption, bad weather conditions, poor aircraft maintenance, error from air traffic controllers, and poor culture in carrying out all safety measures before flight.

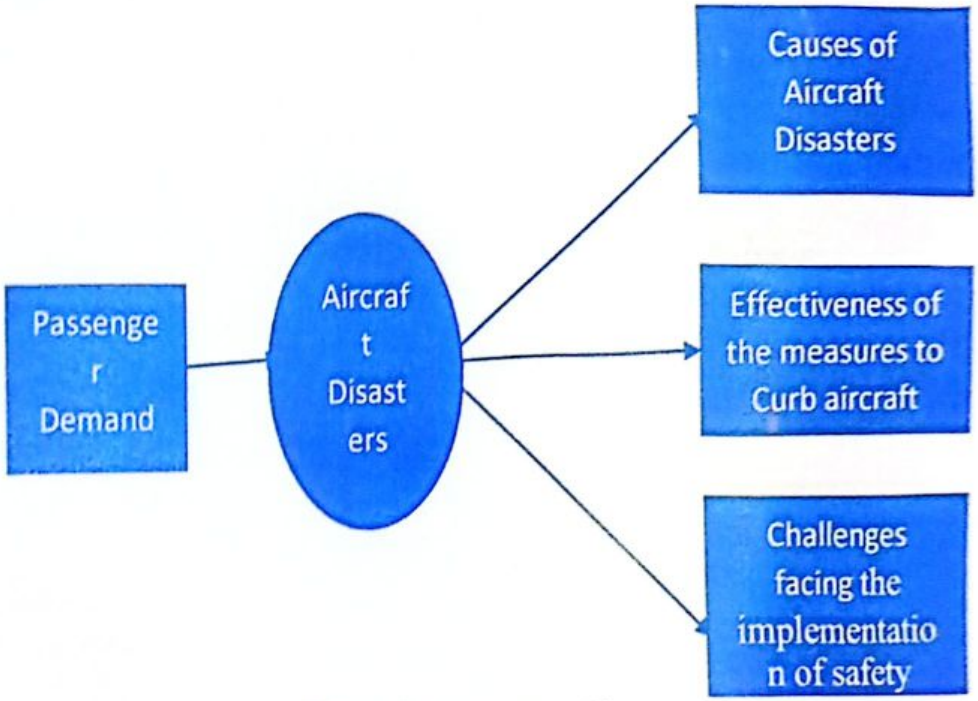

Figure 11.1: conceptual framework
Source: Authors' survey (2023)

11.2.2. Effectiveness of measures put in place to curb aircraft disasters

This includes the effectiveness of anti-bird strike system, monitoring of airline operation, compliance checklist for ramp investigation, the effectiveness of the process of certifying aircraft maintenance, maintenance of runway and taxiway, runway lightening to securing aircraft touch down, airport search and rescue team.

11.2.3. Challenges facing the implementation of safety management in the airport

This include lack of flexibility, information and procedures overload, safety management system demand for more energy from aviation personnel, and difficulties in changing working habits, Rules and procedures can be a source of tension for the personnel

11.3 Event System Theory

An event is anything that happens, an occurrence. The idea of an event began to take on a philosophical life of its own in the twentieth century, due to a reawakening of interest in the concept of change, to which the concept of an event seems inextricably tied, and to the growing use of the concept of an event in scientific and meta-scientific writing (Broad, 1933; Horgan, 1978). Event system theory provides a needed shift in focus for organizational theory and research by developing specific propositions articulating the interplay among event strength and the spatial and temporal processes through which events come to influence organizations (Morgeson et al., 2015). Therefore, this study is built on event system theory. Disaster as an event may hurt aircraft operation and if an airline is known to be associated with disaster it may result in decreased service demanded for the airline services.

11.4 Review of existing work on Commercial Aircraft Disaster

Simon (2015) posited that the causes of aircraft disasters are categorised into five (5) major causes, including pilot error, mechanical failures, weather, sabotage and other forms of human error. The majority of aircraft disasters are caused by human error, accounting for about 50% of accidents, mechanical failure still accounts for around 20% of aircraft accidents, errors due to traffic controllers account for 10% and the rest percentages are attributed to other causes of aircraft disasters (Pilot Institute, 2020).

Previews work by Stephens and Ukpere (2014) on causes of air crashes from a transport management perspective. The authors analysed the causes of accidents between the period of 1920-2014. The major causes of aircraft accidents studied were lightning, design flaws, sabotage / explosive devices, fuel starvation, cargo hold/cabin fire,

hijacking, pilot incapacitation, air traffic control errors bird strikes and unknown. The result showed that certain regions were recorded to have similar causes of accidents and some others were prone to certain causes of accidents. In addition to the study result, North America had more cases of air crashes than other regions but when compared with the volume of traffic in this region one will understand why they had many more crashes than others.

Li et al. (2015) investigated the effects of aviation accidents on the public perception of an airline in Taiwan. The purpose of this research is to clarify the degree to which accidents bring about consequences such as public perception change and social influences. The study results show that respondents who participated in the survey before and after the GE235 Accident, are significantly different because the latter witnessed an accident again, and their image, safety perception, trust and willingness to use are strongly affected. The study concluded by recommending that Airlines may also make more efforts to implement safety management to prevent accidents from happening.

In another study by Sumathi et al. (2018) studied airport accidents and prevention. The study's purpose was to provide comprehensive knowledge of the diverse accidents that occur in airports; discuss their causes and propose feasible preventive measures and or solutions to reduce the damage caused by some unavoidable disasters. The study classified the type of accidents in the airport into the key locations where they occur. For instance, runway accidents include Improper Maintenance of Aircraft, improper Runway Supervision, Environmental Influence, Foreign Object Damages, Misread Communication Faulty equipment and so on. while accidents in the airport are mainly fire accidents, building collapses, Atmospheric Effects and Faulty Equipment. The other types of causes of accidents are human factors and security breaches in the airport.

Shahriari and Aydin (2018) analysed aviation accidents using the case of a Scandinavian Airlines System plane that departed from Stockholm on a route to Copenhagen, Denmark. The study results indicate that the cause of this accident is a combination of several

factors. Accident can occur due to ambiguously written procedures, inadequate training, unexpected operational situations or individual judgments. Situational awareness, environmental and crew coordination factors, as well as shortcomings in pilot technical knowledge, skills and experience, also can cause incidents. The study concluded that unsafe pre-conditions which had been created by the SAS organization in terms of training, instruction, operational procedures etc. were blamed for pilot and technicians' errors and mistakes which led to the crash.

Lai & Lu (2005) studied the impact analysis of September 11 on air travel demand in the USA. The aim was to determine the impact of the September 9/11 attack on both domestic and international flight services. The results indicate that both domestic and international air traffic was significantly impacted for 1 and 2 months, respectively. Akyildirim et al (2020) studied the financial market effects of international aviation disasters. The effects of airline disasters on aviation stocks, while considering contagion effects, information flows and the sources of price discovery within the broad sector. Results indicate substantially elevated levels of share price volatility in the aftermath of aviation disasters, while cumulative abnormal returns present sharp underperformance of the analysed companies relative to international exchanges.

Alcaide et. al. (2022) utilised mathematical modelling of the financial impact of air crashes on airlines and involved manufacturers. Their research was to determine the financial impact of air crashes by distinguishing between fatal and non-fatal events and their effect on the market stock price of the involved companies of airlines and manufacturers. The study results reveal that the companies harmed when an air crash occurs include the involved airline, regardless of the causes of the crash if it was a fatal event. However, with non-fatal events, the impact on airlines differs depending on the event's outcome.

Therefore, the foregoing study on the impact of aircraft disasters on air transport demand focused on filling the gap in the literature in the area of Aircraft sabotage due to bird strikes, pilot errors, inadequate technological know-how, engine failure and so on. The effectiveness (i.e., anti-bird strike system, monitoring of airline operation,

compliance checklist for ramp investigation, etc.) and the challenges faced by airmen to implement safety management systems were also investigated.

11.5 Methodology

11.5.1 Population and Sampling Size

The study population consist of aviation personnel such as the Nigeria Civil Aviation Authority, Air traffic controllers, Engineers, the Federal Airport Authority, and the Nigeria Metrological Agency (NiMet). The purposive sampling method was utilized to pick the three major hub airports in Nigeria where the questionnaires were administered to the aviation personnel using simple random sampling. 150 questionnaires were conveniently distributed among the chosen respondents at the airports (Nnamdi Azikiwe International Airport (NAIA), Murtala Muhammed International Airport (MMIA) and Aminu Kano International Airport (AKIA) in a proportional method. The air disasters focused mainly on commercial aircraft which are mostly catastrophic and deadly.

11.5.2 Instrument for Data Collection

The instrument used for the data collection was a questionnaire. The questionnaires used were divided into four sections (i.e., I, II, III, & IV) to capture information on socioeconomic attributes of aviation personnel, causes of aircraft disasters, the effectiveness of the measures put to curb aircraft disasters and the challenges faced by the aviation personnel to implement the safety management respectively. Sections II and IV of the questionnaires were designed in a way that allows aviation personnel to rate their option on a 5-point Likert scale where 1-represent strongly disagree and 5-represent strongly disagree. Section III allows the aviation personnel to rate on a 5-point Likert scale as well where 1-represent not effective and 5-represent very effective.

11.5.3 Method of Data Analysis

The foregoing study analysed the gathered data using frequency, percentages and mean index score. While the hypothesis was tested using Chi-square statistics. The study utilized a 0.05 confidence level, this means that if the P-value is less than 0.05 then the study accepts an alternative hypothesis and if it exceeds the confidence level then the study accepts the null hypothesis

11.5.4 Overview of Aircraft Disasters in Nigeria Civil Aviation

Disasters in Nigeria's civil aviation industry are majorly associated with aircraft disasters. The aircraft disasters range from aircraft accidents to aircraft hijacking and technology issues which may cause damage to aircraft and loss of lives. Historically, aircraft disasters in Nigeria can be traced back to the British Oversea Airway Cooperation (BOAC) which crashed into a tree as the Canadair C-4 Argonaut departed from Mallam Aminu Kano International Airport in Kano to Libya in 1956 with a total of 32 people on board which were killed (Civil Aviation Authority, 1974). According to the Civil Aviation Authority (CAA) report it was raining when the aircraft reached 250ft before the aircraft started losing control.

After Nigeria got her independence, the Nigeria Airway was formed. In 1969, the Nigeria Airway Flight 825 crashed while approaching Murtala Muhammed International Airport in Lagos killing 87 people onboard. The causes of the disasters were unknown but rumour has it that the disaster was due to a fight between a prisoner and two guards onboard (First Vickard 10 Accident, 1969). In 1993, there was a Kano air disaster when a chartered Boeing 707 passenger flight crashed as it attempted to land at Mallam Aminu Kano International Airport. It is the deadliest air crash in Nigeria which resulted in the death of 176 passengers. In 1994, there was Nigeria Airway flight 9805 crashed as they moved from King Abdulaziz Airport in Jeddah, Saudi Arabia to Mallam Aminu Kano International Airport in Kano the disaster was caused as a result of heat emanating from the cargo holds which eventually resulted in an explosion of the aircraft leading to the damage of the cargoes transported (Ministry of Aviation, 1994). Furthermore, there was a disaster involving Nigeria Airway Flight 357 from Yola Airport to MMIAL at Kaduna International Airport on

November 13, 1995, when the aircraft caught fire as a result of an overrun runway. Flight 357 disaster occurred due to the pilot error and stubbornness of the captain to heed to directive of the Air Traffic Control (ATC) leading to the death of eleven people with 66 minor injuries and 14 passengers were seriously injured (Aviation Safety Network, ASN, 1995). In 1996, ADC airline flight 086 was scheduled from Port Harcourt to Lagos in November. The crew pilot lost control of the aircraft resulting in crashing into Lagos Lagoon, and all the 144 passengers and crew members on board died (ASN, 1996).

The Sosoliso airline flight 1145 is a domestic passenger flight which was scheduled from Abuja to Port Harcourt which crashed in December 2005 resulting in the death of 110 people onboard. The reason for the disaster was a result of the crew's decision to control the approach beyond the decision attitude without having runway insight (Accident Investigation Bureau, AIB, 2006; Daniel, 2007). Similarly, the EAS Airline flight 4226 was a scheduled domestic passenger flight from Kano to Lagos in May 2002 which crashed into Gwamaja quarters and burst into flames. The disaster resulted in the death of 103 people (Edomaruse and Okechukwu, 2002).

In addition, in 2006 flight 053 which was scheduled for a flight from Abuja to Sokoto crashed into a cornfield after taking off from Abuja International Airport resulting in the death of 96 people (ASN, 2006). The causes of the crashes were attributed to the pilot's decision to take off during the bad weather conditions (Accident Investigation Bureau, AIB, 2006). In 2012, Dana Air flight 0992 which was a domestic flight was scheduled for flight from Abuja to Lagos and crashed into a building. The aircraft disaster remains the deadliest commercial passenger airline crash in the history of Nigeria's civil aviation after the Kano air disaster in 1973. The causes of disaster was a result of engine failure which resulted in a crash in a densely populated area in the Iju-Ishaga neighbourhood near the airport causing the death of 159 people on board (AIB, 2016). In 2013, Associated Aviation Airline scheduled a domestic charter flight 361 from Lagos to Akure. The disaster resulted in the death of 16 persons and the cause of

the disaster was attributed to improper configuration of the flaps for take-off (Accident Investigation Bureau Nigeria, 2012; Simon, 2013).

11.6 Discussion of Results

11.6.1 Socioeconomic Features of the Respondents

The analysis of the gender of the aviation staff can be seen in Table 1, from the analysis, it was observed that about 58.6% of the aviation staff were males and only 41.4% of them were female. The marital status of the aviation staff can be observed that about 50.8% of the staff were married, and only 21.9% of them were divorced.

The analysis of the age of the aviation staff indicates that 35.2% of the aviation staff were between the age of 32-42 years, 25.7% of the aviation staff were between the age of 43-53 years, and 19.5% of them were between the age of 21-31 years. Similarly, table 1 reveals that 15.7% of the staff were above 54 years and only 3.9% of them were less than 20 years of age. The analysis of the education status of the aviation staff can be seen in Table 11.1, from the analysis about 35.9% ofthe aviation staff possessed postgraduate certificates, 25% of them hadBachelor's degree certificates, 22.7% of them had NCE certificates, andonly 16.4% of them possess polytechnic results. In addition, Table 11.1 indicates the monthly income earned by the aviation staff. From the analysis about 30.5% of the aviation staff earned between ₦ 151,000- 200,000 per month, 24.2% of them earned between ₦ 101,000- 150,000, and 16.4 % of them earned ₦ 51,000-100,000 monthly.Moreover, 21.1% of the aviation staff earned above ₦ 201,000 and 7.8% of them earned less than ₦ 50,000 monthly.

Table 11.1: Analysis of socioeconomic characteristics of the respondents

Socioeconomic dimensions	Frequency	Percentage
Sex of the Aviation Staff		
Male	75	58.6
Female	53	41.4
Total	128	100.0
Marital status	Frequency	Percentages
Married	65	50.8

Single	35	27.3
Divorced	28	21.9
Total	128	100.0

Age of the aviation staff	Frequency	Percentages
Below 20 years	5	3.9
21-31 years	25	19.5
32-42 years	45	35.2
43-53 years	33	25.7
Above 54years	20	15.7
Total	128	100.0

Educational Qualification	Frequency	Percentage
Polytechnic	21	16.4
Bachelor's Degree	32	25.0
NCE	29	22.7
Postgraduate	46	35.9
Total	128	100.0

Monthly Income Earn	Frequency	Percentage
below ₦ 50,000	10	7.8
₦ 51,000-100,000	21	16.4
₦ 101,000-150,000	31	24.2
₦ 151,000-200,000	39	30.5
Above ₦ 201,000	27	21.1
Total	128	100.0

Source: Authors' survey (2023)

11.7 Analysis of the Causes of Aircraft Disaster in Nigeria

Table 11.2: Staff Responses Distribution on Causes of Aircraft Disasters

S/n	*Causes of Aircraft Disasters*	*Mean (M)*	*Standard Deviation*
1	Aircraft sabotages due to bird strikes	4.190	0.802
2	Pilot errors	4.391	0.684
3	Inadequate technological know-how	3.279	0.180
4	Engine failure	4.692	0.789
5	Poor runway and taxing maintenance	2.581	0.367

6	Corruption	4.140	0.342
7	Bad weather condition	4.378	0.241
8	Poor aircraft maintenance	3.111	0.752
9	Error from air traffic controller	3.100	0.635
10	Poor culture to carry out all safety measures before flight	2.918	0.456

Source: Authors' Survey (2023)

The analysis of causes of Aircraft disasters in Table 11.2 above showed that aircraft sabotage due to bird strikes (M= 4.190), pilot errors (M= 4.391), engine failure (M= 4.692), corruption (M= 4.140), bad condition (M= 4.378), inadequate technological know-how (M= 3.279), Poor aircraft maintenance (M= 3.111) and error from air traffic controller (M= 3.100) were agreed by the aviation staff as the factors responsible for causing aircraft disasters. Poor runway and taxing maintenance (M= 2.581) and poor culture to carry out all safety measures before flight (M 2.918) were moderately agreed as factors responsible for causing Aircraft disasters.

11.8 Analysis of the Challenges of Implementing Safety Management System

Table 11.3 indicates that the challenges facing the implementation of SMS are lack of flexibility (M= 4.010), information and procedures overload (M= 3.996), Safety management system demand for more energy from aviation personnel (M= 4.279), Difficulty in changing working habits (M= 3.443) and Rules and procedures can be a source of tension for the personnel (M= 3.346).

Table 11.3: Distribution of Aviation staff responses on the Challenges of Implementing Safety Management system

s/n	*SMS Challenges*	*Mean (M)*	*Standard Dev.*
1	lack of flexibility	4.010	0.725
2	information and procedures overload	3.996	0.346
3	Safety management systems demand more energy from aviation personnel	4.279	0.671

4	Difficulties in changing working habits	3.443	0.143
5	Rules and procedures can be a source of tension for the personnel	3.346	0.407

Source: Authors' Survey (2023)

11.9 Analysis of the Effectiveness of measures put in place to curb aircraft disasters

Table 11.4: Distribution of Aviation staff responses on the measures put in place to curb aircraft disasters

s/n	Effectiveness of the measures put in place	Mean (M)	Standard Dev
1	Effectiveness of anti-bird strike system	2.188	0.687
2	Monitoring of airline operations,	3.172	0.255
3	Compliance checklist for ramp investigation	4.272	0.887
4	Effectiveness of the process of certifying aircraft maintenance	2.381	0.638
5	Maintenance of runway and taxiway	3.877	0.528
6	Runway lightening to securing aircraft touch down	4.172	0.352
7	Airport search and rescue team	3.152	0.521

Source: Authors' Survey (2023)

The analysis in Table 11.4 showed that monitoring of airline operations (M= 3.172), compliance checklist for ramp investigation (M= 4.272), Runway lightening to securing aircraft touch down (M= 4.172), Airport search and rescue team (M= 3.152), and maintenance of runway and taxiway (M= 3.877) were effective in reducing aircraft disasters. Similarly, the effectiveness of the anti-bird strike system (M= 2.188) and the effectiveness of the process of certifying aircraft maintenance (M= 2.381) were perceived as ineffective in reducing aircraft disasters in Nigerian civil aviation.

11.12 Test of hypothesis

The analysis in Table 11.5 shows the hypothesis result. From the analysis,it was noticed that Runway lightning to securing aircraft touch down (P-value = 0.000) and compliance checklist for ramp investigation (P-value = 0.000) were less than the significant level of 0.05. which indicates that there is a statistical significance to the effectiveness of Runway lightning in securing aircraft touch and compliance checklist for ramp investigation to reduce aircraft disasters in Nigeria.

Table 11.5: Showing the Chi-Square Result

	Runway lightening to securing aircraft touch down	compliance checklist for ramp investigation
Chi-Square	14.483[a]	16.657[b]
Df	5	5
Asymp. Sig.	.000	.000

Source: Authors' Survey (2023)

11.13. Conclusion

This study on aviation personnel's perception of the causes of aircraft disasters, measures and challenges preventing safety management implementation in Nigeria focused on determining the causes of aircraft disasters and the effectiveness of the measures put in place to reduce aircraft disasters in Nigeria. From the analysis, the study concluded that were sabotages due to bird strikes (M= 4.190), pilot errors (M= 4.391), engine failure (M= 4.692), Corruption (M= 4.140),bad weather conditions (M= 4.378), inadequate technological know- how (M= 3.279), Poor aircraft maintenance (M= 3.111) and error fromair traffic controller (M= 3.100).

The study also concluded that there is statistical significance to the effectiveness of Runway lightning in securing aircraft touch and compliance checklist for ramp investigation to reduce aircraft disasters in Nigeria. It was recommended that stricter enforcement and attention should be put to managing aircraft operations in Nigeria. The study also, recommended that corruption among the aviation staff should be eradicated by coming up with stricter policies to abolish corruption.

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