Innovations

A Biannual Apprasial of Airline Safety Challenges in Nigeria Aviation Industry (2023-2024)

Babalolab Obasanjo James (Ph.D)[1],Afolayan Isaac Olayinka (Ph.D)[2] & Abdul-Rahaman Olalekan Badmus[3]
Department of Transport Management, LadokeAkintola University of Technology, Ogbomoso, Nigeria

ORCID ID: 0009-0002-8749-2863[1], 0009-006-8289-2429[2]

Abstract
Aircraft safety is an important part of the global aviation industry. It sometimes entails complicated tasks to be carried out by Aircraft Safety Agencies (ASA) often with considerable time constraints. The direct consequences or effects on Nigerians and other nationals are emotional trauma faced by victims, their families and sympathizers, loss of confidence in an airline or in flying generally and the cost of rescue operations .The study investigated the safety issues of aviation industry in Nigeria. The study was carried out at the MMIA which is Nigeria's premier international air gateway. A total of 126 airlines were sampled. Descriptive and inferential statistics techniques were used to describe safety events in the study area. The study therefore looked into four aviation safety approaches, technical, human factors, organizational and total system. The study identified both domestic and international flight safety issues among certain airlines that landed in MMIA, Lagos, and the data collected was subjected to a multiple regression analysis model to ascertain the facts. The findings revealed that technical issue, radio frequency, aborted takeoff, bird strike, fire accident, unruly passenger behavior and air pressure problem are all significant at both +ve or –ve level. It was revealed that aviation safety is paramount to the sustainability of the industry. The study therefore, recommends that, the industry be given further attention in safety regards.

Keyword: *Aviation, Safety, Accident, Sustainability*

I. Study Background

The aviation industry offers a multitude of social and economic advantages and is essential in promoting economic growth and development.The operations that directly involve moving people and products by air, such as general aviation

services, airports, and airlines, are included in the air transport (aviation) business (Chukwuka&Amahi, 2024).A significant portion of aviation's economic influence stems from its capacity to create jobs, wealth, and efficient support for international trade, tourism, and business. It also gives nations, particularly developing ones, the chance to facilitate trade and establish connections within the global supply chain (Aneke&Okwu-Delunzu, 2023).A significant aspect of the international aviation sector is aircraft safety. There are situations where Aircraft Safety Agencies (ASA) must complete difficult jobs, frequently under tight deadlines. Rapid technological advancements in the aviation sector in recent years, including highly automated and interconnected systems, have increased the workload for ASAs in maintaining both new and old fleets. In addition, ASAs must always increase their knowledge base in comparison to earlier ASAs (Nechesa, 2023). Because it is not always possible to evaluate the system safety of novel and complicated designs with hindsight, technological improvements have the potential to bring about new kinds of maintenance faults.

The workload associated with maintenance and inspections has, however, decreased in recent decades due to a number of other innovations, including improved hardware, fail-safe systems, and the use of health monitoring technologies on engines, systems, and even structures (Habib&Turkoglu, 2020).According to the Nigerian Civil Aviation Regulations (Nig. CARs) NCA, (2020), general aviation and commercial air transport are respectively defined as "an aircraft operation other than an aerial work operation or a commercial air transport operation" and "an aircraft operation involving the public transportation of passengers, cargo, or mail for remuneration or hire." The general understanding of safety management is the application of a collection of guidelines, procedures, and controls to avoid mishaps, injuries, and other unfavorable outcomes when utilizing a service or product.Professionally speaking, it is an organizational role that guarantees all safety risks have been identified, evaluated, and effectively reduced.In the aviation sector, preventing harm to people or loss of life as well as environmental damage is the main goal of safety management.A plane crash is defined as an event related to the operation of an aircraft that occurs between the time someone boards it with the intention of taking off and the time they disembark. This includes situations in which someone is fatally or seriously injured, the aircraft sustains damage or structural failure, or the aircraft disappears or is rendered completely unusable. The emotional trauma suffered by victims, their families, and sympathizers, loss of confidence in an airline or in flying in general, and the cost of rescue operations—such as recovering bodies, retrieving aircraft wreckage, and investigation—which frequently amounts to millions of Naira—are the direct consequences or effects of the accident on Nigerians (Adediran, 2023) and other nationals.

Every country hopes that an airline catastrophe won't happen on its soil because aviation accidents are such a tragedy (Chukwuka&Amahi, 2024).The worst part is that lives are lost, but it also damages the country's, the airline's, and the aviation industry's reputations.Plane crashes can occur for a variety of reasons, such as malfunctioning aircraft, sabotage, poor design, errors made by air traffic controllers, pilot error, or inclement weather.Between the time passengers board and exit, plane crashes occur, and they typically result in fatalities or significant injuries to the occupants (Adediran, 2023).It also causes the country's hazard level to increase, which drives up the cost of airplane insurance.Thus, in order to guarantee that a country keeps a positive reputation for safety, the civil aviation authorities, carriers, airport managers, and others regularly make targeted efforts.The Nigerian Air Force's (NAF) Beechcraft King Air B3501 was engaged in the country's most recent aviation mishap, which occurred in 2021.On February 21, 2021, while en route from Minna to Abuja, Federal Capital Territory, an engine malfunction claimed the lives of the entire crew of this military aircraft, including seven men of the Nigerian Air Force.In 2021, the Nigerian Air Force (NAF) lost one of its Beechcraft King Air A3501 aircraft as well.On May 21, 2021, while traveling from NnamdiAzikiwe International Airport in Abuja to Kaduna International Airport in Kaduna State, the NAF Beechcraft King Air crashed.The eleven individuals on board consisted of seven guests, including Gen. Ibrahim Attahiru, the commander of army staff at the time of the ceremony, and four crew members.Nobody made it out alive.This was the second of the NAF force's six Beeachcraft King Air 3501s to go down.Another fixed-wing aircraft crash occurred in October 2013 (Nuhu 2021).Representatives from the sector recently met in Lagos to talk about preserving and improving Nigeria's excellent aviation safety record.Between 2005 and 2023, Nigeria saw an astounding 78 accidents and 4 major occurrences (Nigeria Safety Investigation Bureau, NSIB, 2024).Nigeria's aviation statistics indicate that it is the finest in Africa, with only two fatal accidents recorded in the last ten (10) years, 260 safety recommendations made by the NSIB between 2005 and 2023, and incidents totaling 272 safety recommendations in the safety bulletin.Therefore the study investigated the safety issues of aviation industry in Nigeria between 2023-2024.

II. Literature

General Safety Concept

Risk and loss are always present while discussing safety, even if it is a multi-inspective category.Ability to prevent loss is a sign of safety in a system, be it a technical object, process, or scenario involving decision-making.Loss can refer to a number of unfavorable occurrences, including interruption, incident, accident, and disaster.Error, imperfection, failure, and damage are terms related to the idea of loss in the context of technical dependability.Hazard is linked to concepts of threat

and a feeling of threat that are connected to how risk is perceived. The types of losses taken into consideration account for the discrepancies in interpretations of the facility's safety.Since safety is a risk-averse concept, a thing is safer when there is less chance that it will be lost.The capacity of an HF-T-E system to carry out its intended function (job) without endangering human life or health is what makes it safe.This term is restricted to situations in which regulations are followed when operating the system.It is inappropriate in situations where rules, guidelines, and directions are disregarded or disobeyed in genuine systems (transportation).An emergent characteristic of a system is safety, which is defined as its capacity to: - preserve vital system attributes like integrity, stability, self-stability, and competitiveness; - offer vital behaviors like adaptation, homeostasis, growth, learning, equifinality, and intentionality.The events that comprise the accident chain are another set of concepts related to the idea of safety. Heinrich (1941), developed the domino theory of accident causation, which holds that accidents cause injuries, in Industrial Accident Prevention, which is now considered a classic.Unsafe behaviors and environments are what lead to accidents. Human error is the root cause of unsafe behaviors and environments (Umar, 2023).A safety model is a set of assumptions or beliefs—often implicit—about the characteristics and circumstances that enhance a system's safety.A set of assumptions about how incidents and accidents happen in a system and the underlying causes that enable them is known as an accident model.The term "aviation safety" has multiple meanings for different individuals."The condition of being safe from undergoing or causing hurt, injury, or loss" is how a school of taught safety.Regarding this definition, the concern is if safety can be achieved.Stated differently, is it possible to totally prevent getting hurt or injured?The response appears more in the negative, from whichever angle observed.The idea of safety is frequently associated with preventing accidents.That is why "safety" might be understood to mean "as few accidents as possible" or, more practically, "no (avoidable) accidents."This definition is useful from an operational standpoint since it addresses a significant portion of safety concerns, which are related to preventing accidents.Operational flight safety is one aspect of aviation safety, but it is not the only one.It includes deeper political, strategic, and legal aspects in addition to accident prevention.It consists of corrective, punitive, and preventive actions.Thus, in general, "risk management" is stated to be synonymous with safety.There could be less or more risk.The extent of its management can range from the regular suspension of an unqualified pilot's license to the temporary grounding of all civil aircraft in an emergency, depending on the risk involved.Thus, a multidisciplinary approach is necessary for aviation safety.18"The state in which the risk of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and risk management," is how the International Committee of the Red Cross defines

safety.The elegance of this concept resides in its recognition that the activity's risk is not eliminated entirely but rather is decreased to a manageable level. Most significantly, the concept acknowledges that risk management and hazard identification are two processes that go into maintaining safety.Safety therefore means "continuous measurement, evaluation, and feedback into the system," according to experts in the field.Thus, "the state of freedom from unacceptable risk of injury to person or damage to aircraft and property" could be used to characterize aviation safety.The term "unacceptable risk" in this definition suggests that there might also be "acceptable risk."Therefore, total harm prevention does not equate to aircraft safety.

Aviation Security

Aircraftsecurity can be characterized as a"assemblage of human and material resources and countermeasures meant to prevent unlawful interference with aviation."According to popular belief, security is concerned with outside forces that want to compromise the aircraft's safety, risk the lives of its occupants—passengers, crew, other individuals, and property—or damage air navigation infrastructure when the aircraft is in the air or on the ground.From the preceding, it may be inferred that aviation security aims to safeguard national security and counterterrorism policies while also preventing damage to aircraft, crew, and passengers.

Aviation Safety and Security Provisions under the Civil Aviation Act2006

The Civil Aeronautics and Space Administration (CAA) Act of 2006 incorporates essential guidelines for aviation security and safety, adhering to global guidelines and best practices found in the Chicago Convention annexes.The important international conventions in the area of aviation security and safety have been adopted by the CAA in 2006.These conventions are known as the Tokyo Convention (1963) on Offenses and Certain Other Acts Committed on Board Aircraft.The conventions for the suppression of unlawful acts against the safety of civil aviation, the protocol for the suppression of unlawful acts of violence at airports serving international civil aviation, and the convention for the suppression of unlawful seizure of aircraft were all established in 1970 at The Hague.In addition to domesticating these Conventions, the Act has made some amendments and fulfilled with certain requirements placed on contracting states by the Conventions.For example, the CAA, 2006 stipulates that anyone found guilty of hijacking faces a life sentence in jail and a minimum fine of N10,000,000.This clause is obviously meant to serve as a deterrent, presumably to discourage hijacking as an offense.It is, however, maintained that the provision is simply superficially pragmatic as it lacks the underlying efficacy to control the danger of hijacking.The use of cutting-edge technology, bomb-sniffing dogs, law enforcement, biological/chemical detectors,

closed-circuit televisions, and security checkpoints that include passenger observation techniques, boarding pass and identity checks, metal detectors, trace portals/puffers, carry-on baggage screening, checked baggage screening, and secondary screening, are therefore all necessary. The National Executive Safety Committee (NESC) was established by Mr. Festus Keyamo, Minister of Aviation and Aerospace Development, with the goal of improving aviation safety in Nigeria.A statement on the Nigeria Civil Aviation Authority's official X account stated that the Committee was formed in compliance with the safety guidelines established by the International Civil Aviation Organization (ICAO) in Annex 19. (NCAA, 2024).In compliance with the safety guidelines established in Annex 19 by the International Civil Aviation Organization (ICAO), the Committee was established on April 23, 2024.The Committee's responsibilities include managing safety regulations, carrying out risk analyses, and offering strategic guidance to improve safety performance in Nigeria's aviation sector.According to the statement, the Nigerian Executive Safety Committee comprises the following members: the Nigerian Airspace Management Agency (NAMA), the Nigerian Federal Airport Authority (FAAN), the Nigerian Safety Investigation Bureau (NSIB) Chief Executive Officers, the Nigeria College of Aviation Technology (NCAT), the Nigerian Meteorological Agency (NIMET), and the Nigerian Air Force (NAF).National Executive Safety CommitteeAdditionally, the Committee's responsibilities encompass monitoring safety performance, identifying strategic risks, and ensuring effective safety management processes.The NSEC will also be responsible for prioritizing safety improvements by effectively and efficiently allocating resources based on risk assessments and strategically guiding the Safety Improvement Advisory Committee (SIAC).Other responsibilities of the Committee include overseeing the development of State Safety Programmes (SSP), reviewing safety policies, monitoring performance against objectives, identifying emerging safety risks, ensuring effective safety oversight, approving policy changes, and handling escalated SIAC issues.The Committee will also approve the SIAC's Terms of Reference for safety projects and demand periodic safety progress reports.

III. **Procedure**

The study was carried out atthe MMIA which is Nigeria's premier international air gateway. The airport's history dated back to pre-colonial times, around the time of the Second World War. The current international airport terminal was built and commissioned over 40 years ago, in 1978.The terminal opened officially March, 15, 1979. The airport had been known simply as the Lagos International Airport. It was however, re-named after the late Nigerian Head of State, General MurtalaMuhammed, who died in 1976.The airport terminal has been renovated several times since the 1970s but its most radical make over began in 2013, following the launch of the Federal government's multi-billion naira Remodeling/

Rehabilitation Programme for its airports nationwide. Under the re-modeling work by late 2014, the MMlA lounge area had been expanded to four times its previous size and new passenger handling conveyor systems installed which can handle over 1,000 passengers per hour. Code: LOS, Elevation: 41 m. Hub for, Aero Contractors, Arik Air, Azman Air, Med-View Airline, Air Peace, Dana Air, Ibom Air and others. Secondary data was used in the study which was gotten from 'AZ' agency of Federal Airport Authority of Nigeria. The study identified both local and international flight safety issues among some airlines that landed in Lagos. A total of 130 airlines were sampled. Descriptive and inferential statistics techniques were used to describe safety events in the study area. This study therefore looked into four aviation safety approaches, technical, human factors, organizational and total system.

IV. Results and Discussion

The results presented in Table 1.1 show that, of the 130 airlines that was surveyed, a greater percentage of the selected airlines valued at 20.8% believe that the majority of the difficulties encountered during flight operation were caused by the aircraft's unstable approach and the pilot's poor visibility. Proximity to preceding landing, which accounts for 18.5% of the sampled size, this has the potential to significantly alter an aircraft's headwind or tailwind, causing it to suddenly deviate from its intended flight path. Furthermore, 14.6% of the collected data revealed that an aircraft wind shear was the challenge it suffered. Missed approach because of too high upon arrival amounted to 11.5% from the observed data. It means the moment where the airplane can no longer maintain its height due to the intersection of the high-speed buffet and low-speed stall. Lastly, the localizer, which transmits VHF signals to provide aircraft with lateral guidance so that pilots can make sure the aircraft is properly aligned with the center of the runway during the approach and landing of flight, had the smallest value (10.8%) from the collected data.

Table 1.1: Distribution of Safety Challenges by Missed Approach

		Frequency	Percent	
	Localizer	14	10.8	
	Wind shear	19	14.6	
	Unstable Approach	27	20.8	
	Proximity to preceding landing	28	21.6	
	Poor visibility	27	20.8	
	Too high on approach	15	11.5	

	Total	130	96.9	

Source: Field Survey, (2024).

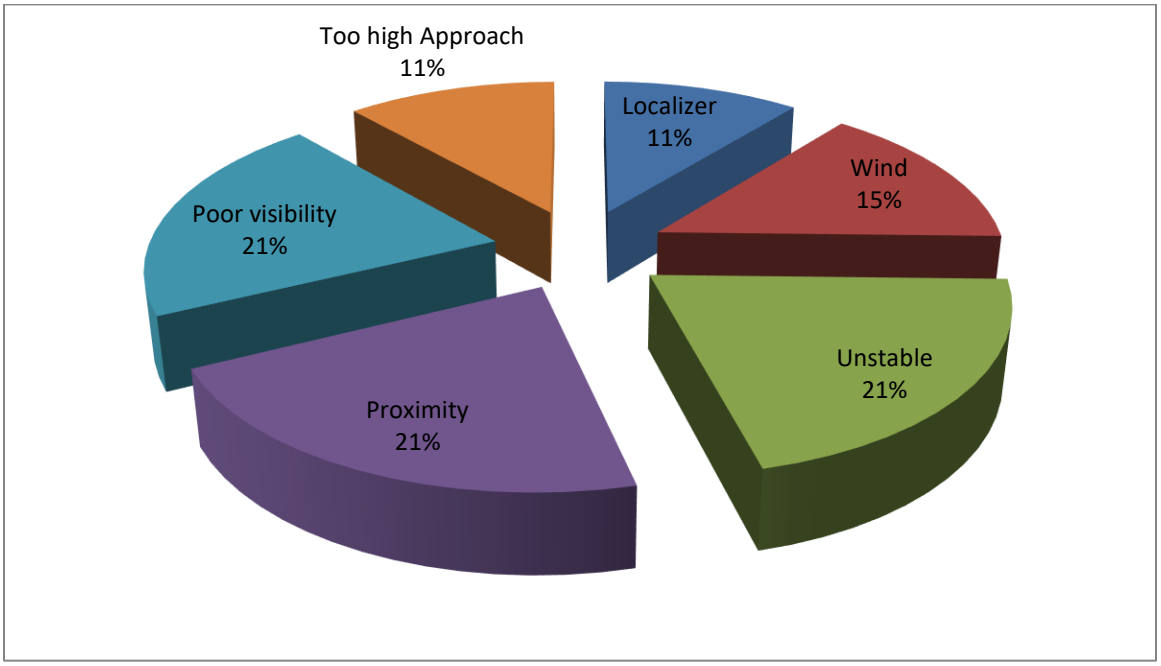

Fig 1.1: Representing Distribution by Missed Approach

Furthermore, regression analysis was performed to appraise the effects of safety challenges on flight operations at MuritalaMuhammed International Airport in Lagos. The results are displayed in tables 1.2, 1.3, and 1.4. The safety challenge on flight operation in MM1, Lagos State, was explained by the multiple regression models of 69.8% of the variation. The statistical significance was verified by an F-value of 33.847, with a significance level of P=.05, as shown in table 1.3.The adjusted R-square was 0.678, while the correlation coefficient R was 0.836 (83.6%). This shows how the independent variables affect the dependent variable as well as the fitness of data in the model. Furthermore, it was revealed that five (5) of the seven (7) variables; technical issues, radio frequency, aborted takeoff, bird strike, and fire accident were statistically significant. Table 1.4 showed the dependent variable showed the greatest significant contribution from the bird strike, at 0.926 (92.6%), followed by the air pressure problem at 0.810 (81%), radio frequency at 0.655 (65.5%), and air pressure problem at 0.810 (81%). Technicalissues, the dependent variable received minimal effects from unruly passengers, while fire accidents and aborted takeoff contributed 0.269, 0.168, and 0.60 respectively. Furthermore, Unruly Passenger has a t-value of 0.149 at the 0.882 level of

significance, and Bird Strike has a positive and maximum t-value of 5.611 at the 0.000 significance level. This implies that all the variables under study are statistically relevant to flights safety in aviation industry.

Table 1.2: Model Summary of Safety challenges on Flight operation

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.836[a]	.698	.678	.72525

Source: Field Survey, (2024).

Table 1.3: ANOVAof Safety challenges on Flight operation

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	142.427	8	17.803	33.847	.000[b]
	Residual	61.541	117	.526		
	Total	203.968	125			

Source: Field Survey, (2024).

Table 1.4: Coefficients of Safety challenges on Flight operation

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
	(Constant)	.884	.255		3.460	.001
	Technical Issues	-.244	.076	.269	3.215	.002
	Radio Frequency	-.833	.164	.655	5.066	.000
	Aborted take off	-.072	.221	.060	.327	.744
	Bird strike	.835	.149	.926	5.611	.000
	Fire accident	-.198	.190	.168	1.040	.300
	Unruly passenger	-.019	.130	.020	.149	.882
	Air pressure problem	.692	.130	.810	5.345	.000

Source: Field Survey, (2024).

V. Conclusion

Base on the findings which revealed that technical issue, radio frequency, aborted takeoff, bird strike, fire accident, unruly passenger behavior and air pressure problem are all significant at both +ve or –ve level. The study did not gave inferential attention to missed approach which could be as a result of the following, (localizer, wind shear, unstable approach, proximity to preceding landing, poor visibility and too high on approach).From results of the findings, it was revealed that

aviation safety is paramount to the sustainability of the industry. Despite the fact that significant commercial aviation accidents have not occurred in the sector recently. Yet, the safety issues should not be taking for granted as it has a lot of implications on passenger's psychology and financial hazard on airline operators. The findingalso showed the relationship between safety and aviation industry sustainability. The study therefore, recommends that, the industry be given further attention in safety regards.

References

1. *Adediran, A. O. (2023). Regional Collaboration for Aircraft Accident Investigation as Impetus for Aviation Safety in Africa. South African Yearbook of International Law, 48(1), 1-22.*
2. *Ernest Jebolise Chukwuka and Fidelis U. Amahi (2023). Effect of Air Safety Operations on Performance of Air transport Business in Nigeria. Innovations, Number 75 December 2023.*
3. *Khadijah Abdullahi Habib and Cengiz Turkoglu, (2020).Analysis of Aircraft Maintenance Related Accidents and Serious Incidents in Nigeria . MDPI*
4. *Nigeria Civil Aviation Regulations Part 18 (Nig. CARs). Available online: ncaa.gov.ng (accessed on 20 May 2020).*
5. *OgunjimiOluwatoyin, (2014).Safety Management and Aviation Industry in Nigeria, 1969-2009. Paper uploaded to academia.*
6. *Aneke, I. O., &Okwu-Delunzu, V. (2023). Role of The Aviation Industry In The Economic Development Of Nigeria. Irish J. Env. E. Sci, 7(04).*
7. *Nechesa, R. O. (2023). Preventing of conflict situations in free route airspace on flight planning phase (Doctoral dissertation, National Aviation University).*
8. *Habib, K. A., &Turkoglu, C. (2020). Analysis of aircraft maintenance related accidents and serious incidents in Nigeria. Aerospace, 7(12), 178.*
9. *Chukwuka, E. J., &Amahi, F. U. (2024).Effect of air safety operations on performance of air transport business in Nigeria. International Journal of Aviation Safety, 34(3).*
10. *Adediran, A. O. (2023). Regional Collaboration for Aircraft Accident Investigation as Impetus for Aviation Safety in Africa. South African Yearbook of International Law, 48(1), 1-22.*
11. *Chukwuka, E. J., &Amahi, F. U. (2024).Effect of air safety operations on performance of air transport business in Nigeria. International Journal of Aviation Safety, 34(3).*
12. *Umar, G. (2023). Adequacy And Utilization Of Safety Facilities In Building Construction Sites In Federal Capital Territory Abuja And Niger State, Nigeria (Doctoral dissertation).*