

TREND AND CHARACTERISTICS OF AIRCRAFT ACCIDENTS AND INCIDENTS IN NIGERIA, 1936-2024.

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Abstract

Aviation safety remains a major concern in Nigeria's air transport sector. The rapid increase in aircraft incidents and accidents in Nigeria despite its little contribution to the global aviation traffic has led to serious consequences within the aviation industry. Between 1960 and early 2000s, the country experienced a series of high- fatality air crashes involving both public and private carriers, often attributed to poor maintenance practices, weak regulatory oversight, inadequate infrastructure and insufficient training. The objectives of this study is to; examine the historical trend of aircraft accidents and incidents and project future occurrences and secondly, to identify and categorize the characteristics of these occurrences based on factors such as flight phase, carrier, operation and the cause. Data were collected from official aircraft accidents and incidents investigation reports; Aviation Safety Network (ASN) database, Nigerian Safety and Investigation Bureau (NSIB) database, descriptive statistics- data distribution, category frequencies and also correlation analysis were performed, excel was used for tabulation and graphical representations. The results showed that between 1966 and 1975 aviation industry in Nigeria recorded the highest rate with 32 occurrences of accident and incident due to the Nigerian civil war. However, the last two decades 2006 to 2015 and 2016 to 2024 witnessed drastic drop in accident and incident cases. Landing phase emerges as the most hazardous; with 66 accident and 8 incident rates. Commercial aviation emerges as the predominant category, accounting for 34.8% of total accidents and incidents with 48 occurrences. The study concluded that commercial aviation contributed more in terms of aircraft accidents and incidents compared to general and military aviation. Therefore, Nigerian Safety and Investigation Bureau (NSIB) should promote the importance of establishing and actively participating in safety information-sharing programs within the Nigerian aviation industry

Keywords: Aviation Safety, Aircraft Accidents, Aircraft Incidents, trend analysis, Characteristics

1.0 Introduction

Aviation safety remains a major concern in Nigeria's air transport sector. Since the first recorded air crash in 1936, several aircraft

accidents and incidents have occurred, reflecting changing patterns in operations, technology and regulation. Aviation in Nigeria dates back to 1925, with more

structured commercial operations beginning in the 1930s and expanding significantly after independence in 1960. Over the decades Nigeria has developed one of the busiest aviation sectors in Sub-Saharan Africa, with multiple domestic and international carriers and major airports like Murtala Muhammed International Airport in Lagos and Nnamdi Azikwe International Airport in Abuja.

However, Nigeria's aviation sector has faced persistent safety challenges. Between 1960 and early 2000s, the country experienced a series of high-fatality air crashes involving both public and private carriers, often attributed to poor maintenance practices, weak regulatory oversight, inadequate infrastructure and insufficient training; this statement can be supported by the study of Abdullahi and Turkoglu (2020), the researchers analyzed aircraft maintenance related accidents and serious incidents in Nigeria and the result of the research study revealed that the most common maintenance-related accidents and incidents in the last decade are "collision with terrain" and "landing gear events".

The most frequent failures at systems level resulting in accidents are the "engines" and air-frame structure". The highest occurring maintenance-related incidents and accidents were attributed to "removal/installation,"

working practices such as "accumulation of dirt and contamination", inspection/testing", "inadequate oversight from operator and regulator". The tragic crashes of the ADC Flight 053 (1996), EAS Airlines Flight 4226 (2002), and Bellview Airlines Flight 210 (2005), among others, highlighted the systemic safety deficiencies. (Eriksson, 2011)

Aviation accidents as defined by the International Civil Aviation Organization (ICAO) in Annex 13 to the convention on International Civil Aviation (Aircraft Accident and Incident Investigation) "as an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which:

- A person is fatally or seriously injured.
- The aircraft sustains damage or structural failure which adversely affects its structural strength, performance or flight characteristics, and would normally require major repair or replacement of the affected components, or
- The aircraft is missing or is completely inaccessible."

Aviation incidents as defined by the International Civil Aviation Organization (ICAO) in Annex 13 to the convention on International Civil Aviation (Aircraft Accident and Incident Investigation) “as an occurrence, other than an accident, associated with the operation of an aircraft that affects or could affect the safety of operations” (Airsafe.com, 2012).

Despite notable safety improvements, there is limited comprehensive analysis covering this period (1936 to 2024). This research paper examined the historical trend and categorize these characteristics based on factors such as flight phase, carrier frequency, types of flight operations, causes of aircraft accident occurrences and also forecast for the future occurrences were carried out.

2.0 The Need for the research

The rapid increase in aircraft incidents and accidents in Nigeria despite its little contribution to the global aviation traffic has led to serious consequences within the aviation industry, when aircraft accident occurs the first step taken by the Nigerian Civil Aviation Authority (NCAA) is to suspend the affected airline from flying within the Nigerian airspace. For example, In January, 2025 NCAA suspended all the Boeing 737 aircraft belonging to Max Air,

following the multiple serious safety incidents: landing gear collapse, tyre burst, fuel contamination in May and July 2023. (Ch-aviation, 2023).

A study by Rodrigue (2021), revealed that aviation safety and accident prevention are only achieved through an examination of historical accident data, which allows for a comprehensive understanding of statistical data characteristics and the extraction of concealed knowledge.

3.0 Reviewed Literature

Several studies have explored aviation safety within Nigeria and globally. A study by Yafei (2019), studied the importance of safety management systems in minimizing risks, the research study showed a number of civil aviation accidents fluctuates generally in the world, also the number of global civil aviation casualties from 1942 to 2016 showed a parabola trend of increasing first and then decreasing.

In Nigeria, a study by Oluwakoya *et al.* (2020), studied the Saptio-Temporal Patterns of Air Crashes in Nigeria between 1960 and 2012 and result showed that the classification of causal air crashes in Nigeria as human, mechanical, environmental and mixed themes, it also reveals that the pattern of air crashes in Nigeria follows a cyclic pattern of

occurrences over the years. Passarella *et al.* (2023), analyzed accidents trends in Africa and highlighted the role of infrastructure and human factors, the study stated that the increase in fatalities despite the drop in accident numbers, attributable to the introduction of larger aircrafts designs carrying more passengers per flight. Few studies have conducted a comprehensive historical assessment covering Nigeria from 1936 to 2024.

The objectives of this research are to examine the historical trend of aircraft accident and incident occurrences. Secondly, to identify and categorize the characteristics of these occurrences based on factors such flight phase, carrier, operation and the cause. A forecast for the future occurrences was carried out.

4.0 Study Area and Methodology

4.1 Study Area

Nigeria is located within the Longitudes 2°30'E and 14° 30'E and Latitudes 4° 30'N and 14° 30'N of the equator. Nigeria lies in West Africa and experiences a diverse climate that ranges from arid in the north to tropical in the majority of the country. Thunderstorms and Convective Weather: Seasonal thunderstorms are common during the rainy season (April to October). These

storms can cause severe turbulence, micro bursts, and wind shear, all of which are dangerous during takeoff and landing. This statement can be supported by the research study conducted by Anthony and Derek, (2018), evaluated the effect of turbulence on aircraft during landing and take-off phases, the result revealed low level wind shear and turbulence present a serious safety risk to aircraft during the approach, landing and take-off phases and also identified as one of the primary factors for aircraft go-a rounds and aborted landings (See appendix II)

4.2 Methodology

Data were collected from official aircraft accidents and incidents investigation reports; Aviation Safety Network (ASN) database, Nigerian Safety and Investigation Bureau (NSIB) database, which provides comprehensive records of aircraft accidents and incidents worldwide. The study adopted a descriptive statistic- data distribution, category frequencies of the causes of aircraft accident and incident, phases of the flight during the accident, number of accidents per year and the carrier involved in aircraft incidents and accidents occurrences, excel was used for tabulation and graphical representation. Also, correlation analysis was used to identify variable relationship between

the number of passengers and rate of injuries and fatalities.

5.0 Results and Discussion

5.1: Table 1 below presents the distribution of aircraft accidents and incidents decade by decade, number of passengers, fatalities and injuries within the Nigerian airspace.

Table 1: Aircraft Accidents and Incidents Occurrences in Nigeria by Decade (1936–2024)

S/No	Years	Accidents	Incidents	No. of Passengers	No. of Fatalities	No. of Injuries
1	1936-1945	8	0	17	3	0
2	1946-1955	4	0	41	36	0
3	1956-1965	2	0	52	33	0
4	1966-1975	32	1	555	375	36
5	1976-1985	8	0	143	100	21
6	1986-1995	23	2	1187	203	426
7	1996-2005	25	7	1129	487	423
8	2006-2015	13	3	468	135	256
9	2016-2024	5	8	354	18	183
Total		120	21	3946	1390	1345
Average		24	4.2	789.2	278	269

Source: Author's Analysis, based on Aviation Safety Network Database (2024).

Table 1 above shows 120 aircraft accidents occurrences and 21 aircraft incidents occurrences, with 3946 passengers, 1390 fatalities and 1345 injuries within the period under review. Between 1966 and 1975 aviation industry in Nigeria recorded the

highest rate with 32 occurrences due to the Nigerian civil war. However, the last two decades 2006 to 2015 and 2016 to 2024 witnessed drastic drop in accidents and incidents cases.

The researcher subsequently conducts a yearly trend analysis over the span of 89 years, employing the additive model through the Ordinary Least Squares (OLS) method of Time Series Analysis, and presents the results as follows: Trend Analysis for Aircraft Accident: The fitted trend equation is as follows: factor causing aircraft accidents = $0.905 + 0.0103 X t$, in this equation, 0.905 represents the intercept, indicating the baseline level of aircraft accidents when the time variable t is zero. This intercept serves as a reference point for understanding the historical context of aircraft accidents at the beginning of the analysed period.

The term 0.01030 signifies the slope of the trend line, which indicates the average increase in the number of aircraft accidents per year. This positive coefficient suggests a gradual upward trend in accidents over time, implying that as the years progress, there has been a consistent rise in the frequency of aircraft accidents. The variable t typically represents the time in years since the start of the analysis, allowing the model to capture the impact of time on accident occurrences. Thus, for each additional year, the number of aircraft accidents is expected to increase by approximately 0.01030, reflecting the ongoing challenges and complexities in aviation safety.

Table 2: Aircraft Incident Forecasts for 2024–2033

Year	Forecast	Approximate Forecast
2024	0.57915	1
2025	0.58757	1
2026	0.59599	1
2027	0.60441	1
2028	0.61283	1
2029	0.62124	1
2030	0.62966	1
2031	0.63808	1
2032	0.64650	1
2033	0.64650	1

Total	6.16194	10
Average	0.61619	1

Source: Author's Analysis, based on Aviation Safety Network Database (2024).

Table 2 above provides projections of expected aircraft incident occurrences over the next decade, the researcher utilized the model above to generate specific predictions for each year by replacing t with values from 89 to 98, corresponding to the years within that range presents the forecasts for aircraft incidents from 2024 to 2033, illustrating a trend that suggests a gradual increase in

occurrences over the specified period. The data indicates that the forecast values for each year remain close to one incident, with an average forecast of approximately 0.616 per year. This steady projection implies a relatively stable trend in aircraft incidents, consistent with the historical data analyzed previously.

Table 3: Aircraft Accident Forecasts for 2024–2033

Year	Forecast	Approximate Forecast
2024	1.82210	2
2025	1.83240	2
2026	1.84271	2
2027	1.85301	2
2028	1.86331	2
2029	1.87361	2
2030	1.88392	2
2031	1.89422	2
2032	1.90452	2
2033	1.91482	2
Total	18.68462	20
Average	1.86846	2

Source: Author's Analysis, based on Aviation Safety Network Database (2024)

Table 3: Aircraft Accident forecasts for 2024–2033 provides a comprehensive

projection of expected aircraft accident occurrences over the next decade. The

forecast values, which show a gradual increase from 1.82210 in 2024 to 1.91482 in 2033, indicate a slight upward trend in anticipated accidents. Each year reflects an incremental increase, suggesting that while the overall risk remains relatively low, there is a consistent expectation for minor fluctuations in accident and incidents rates. The approximate forecast consistently rounds

these values to 2, highlighting a practical approach to predicting accidents and incidents where slight variances may not significantly impact safety measures

5.2 Characteristics of aircraft accident and incident occurrences based on factors such as causal factors, type of aircraft operation, flight phase and carrier.

5.2.1 Causal factor of aircraft accidents and incidents (1936-2024)

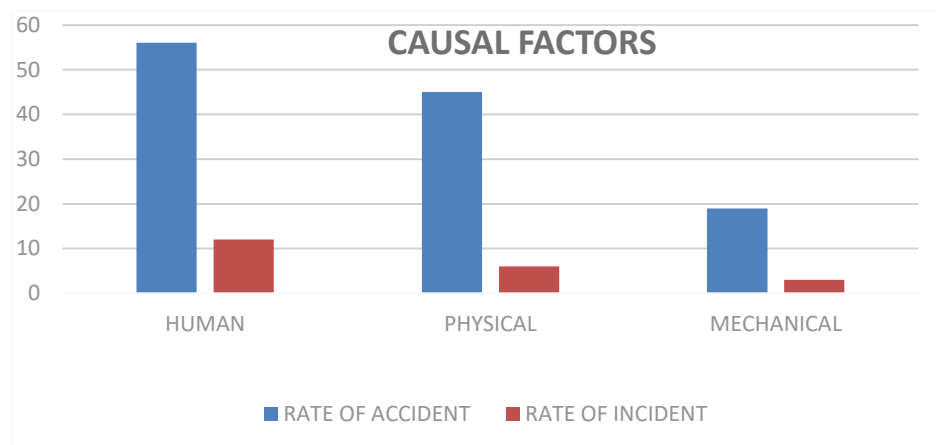


Figure 1 : Causal factor of aircraft accidents and incidents (1936-2024)

Source: Author's Analysis, based on Aviation Safety Network Database (2024)

Figure 1 above indicates the causes of aircraft accidents and incidents within the Nigerian Airspace. Human factor accounts for 56 and 12 for accident and incident occurrences respectively out of 141 occurrences which

translate s to 48%, highlighting the critical role of pilot error, misjudgment, and inadequate decision-making in these occurrences.

5.2.2 Accidents and Incidents during flight phase

Table 4 : Accidents and Incidents rate during flight phase (1936-2024)

Flight Phase	Rate of Aircraft Accident	Rate of Aircraft Incident
Landing	66	8
Takeoff	9	1
Approach	18	3
Enroute	9	0
Initial Climb	3	6
Standing	14	1
Taxiing	1	2
TOTAL	120	21

Source: Author's Analysis, based on Aviation Safety Network Database (2024).

Table 4 above provides a detailed breakdown of the rate of accident and incident occurrences across various flight phases, illustrating the relative risks associated with

each phase of flight. Notably, landing emerges as the most hazardous phase, with 66 accident and 8 incident rates.

5.2.3 Aircraft operations associated with incident and accident rates

The figure below indicates the occurrences of aircraft accidents and incidents in relation to aircraft operations.

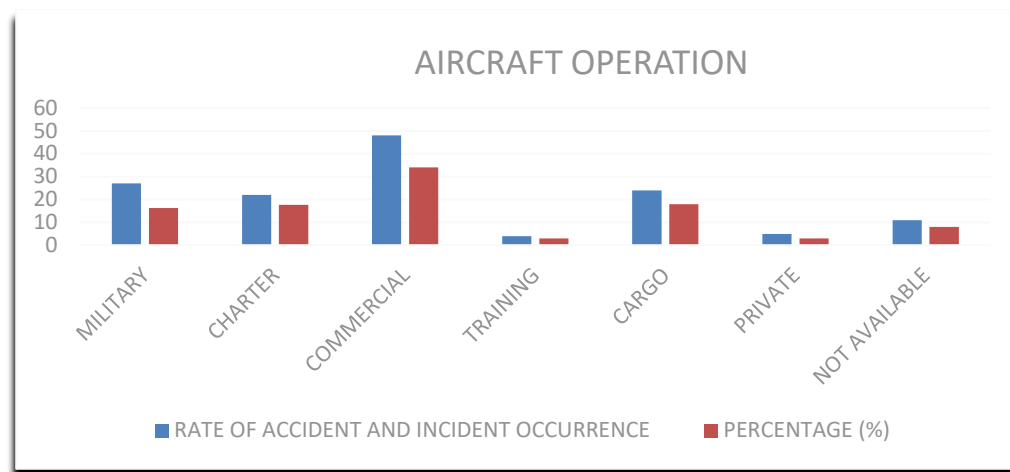


Figure 2: Aircraft operations associated incident and accident rates (1936-2024) .

Source: Author's Analysis, based on Aviation Safety Network Database (2024).

The examination of aircraft operations in relation to incident and accident rates, as presented in Figure 2, above reveals considerable disparities across different operational categories. Commercial aviation

emerges as the predominant category, accounting for 34.8% of total accidents and incidents with 48 occurrences. Military operations follow with 25 accidents and incidents, constituting 18.1%.

5.2.4 Frequency aircraft accidents and incidents by carrier

Table 5: Frequency of aircraft accidents and incidents by carrier

Carrier	Freq	Carrier	Freq	Carrier	Freq.	Carrier	Freq
South African A/Force	1	Gas Air Nigeria	1	Eagle Aviation	2	Kabo Air	3
Joint Church Aid	1	Sosoliso irlines	1	British Overseas Airways	2	Bristow Helicopters	3
MaxAir 1	1	Hold Trade Air	1	Royal Airforce	2	Bristow Helicopters	3
Chrome Air	1	DHL Aviation	1	Air France	2	Bristow Helicopters	3
J. Ray Mcdermott	1	Sabena	1	West African Airways Corp.	2	Aerocontractors	3

Albarka Air	1	Das Air Cargo	1		2	Dana Air	3
Benin Government	1	Capital irlines	1	Okada Air	2	Pan African	3
Savanah A/Lnes	1	Harka Air Services	1	Wings Aviation	2	ADC A/L	3
Imani & Sons	1	Namco	1	Int'l Red Cross	2	Skypower Express	3
EAS Airline	1	Taraba State		Pan African Airlines	2	Chanchangi	
Sky Executive	1	Aeroflot	1	Nordchurchaid	2	Biafran A/f	4
Angola Air Charter	1	Saudi Airlines	1	Associated Av.	2	USA Army Air Force	5
Hydro Cargo	1	Swat Tech	1	Mk Air Lines	2	Nigerian Airforce	14
Continentale Deutsche	1	Flughjalp	1	Overland	2	Nigerian Airways	14
Millenium Air	1	Nest Oil	1	Canairlief Air	2		
Concord Airlines	1	Swedish Red Cross	1	United Nigeria	2		
Ashaka Cement	1	Affretair	1				
IRS Airline	1	Europ. Air	1				
Ghana Airways	1	Jafe Group	1				
MK Air Cargo	1	Skyline	1				
Bellview A/L	1	Affretair	1				
Aeronaut. Ind.	1						
Private	1						
Biafran Govt	2						
						Grand Total	
						141	

Source: Author's Analysis, based on Aviation Safety Network Database (2024).

Table 5 above provides a comprehensive summary of aircraft incidents and accidents attributed to various carriers, highlighting the diverse range of operators involved in aviation within Nigerian airspace. The Nigerian air force and Nigerian Airways with 14 accidents and incidents occurrences respectively, stands out as the carriers with the highest frequencies. This underscores the operational challenges faced by military aviation in the country, potentially linked to the nature of military missions, equipment maintenance, or other risk factors.

The findings in this study is in agreement with the study by Yafei, (2019). The researcher studied the analysis and forecast of global civil aviation accidents for the period 1942-2016. Global civil aviation casualties from 1942 to 2016 showed a parabola trend of increasing first and then decreasing. The highest number of casualties appeared in 1972, which was 2373 on different flight stages.

6.0 Conclusion and Recommendations

6.1 Conclusion

A total number of 141 accident and incident reports were analyzed for the period under

review, there were 120 accidents and 21 incidents recorded, with 1390 fatalities and 1345 injuries. Landing phase was discovered to have the highest accidents and incidents rate during flight phase, followed by approach and take off. Commercial aviation contributed more in terms of accidents and incidents compared to general and military aviation. The Nigerian air force with 14 accidents and incidents stands out as the carrier/airline with the highest frequency of occurrences.

6.2 Recommendations

Based on the findings of this study, the following recommendations proffered:

- i. Improve safety oversight and enforcement: The regulatory authorities should intensify enforcement of safety regulations, especially for aging aircraft, pilot licensing, maintenance standards, and operator safety compliance.
- ii. Promote the importance of establishing and actively participating in safety information-sharing programs within the Nigerian aviation industry, e.g Federal Aviation Administration (FAA)-Aviation Safety Information Analysis and Sharing (ASIAS)

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