ASSESSMENT OF HUMAN ERRORS AMONG PILOTS AND AIRCRAFT ENGINEERS AS CAUSAL FACTORS IN AVIATION INCIDENTS AND ACCIDENTS IN NIGERIA'S AVIATION

A. E. Ubogu, [1] I. I. Akaaba,[2] and J. A. Adenigbo,[3]
[1]Department of Geography & Regional Planning
The Federal UniversityDutsinma, Nigeria
[2] Nigerian College of Aviation Technology
Zaria, Nigeria
[3]Department of Transport Management
The Federal University of Technology Akure, Nigeria

Abstract

This study examines the differences of operational errors among pilots and aircraft engineers' actions and inactions in the discharge of their duties. A questionnaire survey was conducted on a purposively selected sample of pilots and aircraft engineers at the four major international airports in Nigeria. The study employed Principal Component Analysis (PCA) to analyse the data collected for the study. The results of the study show that apprehension/panic, interpersonal tension, overconfidence and delay are the most significant contributory factors to aviation incident and or accident among pilots. Similarly, the results for the aircraft engineers found unfavourable environment, personal problems and lack of confidence as the most critical human errors that contribute to aviation accidents in Nigeria. The implications of these results portend grave concern for air safety in Nigeria's aviation industry. The paper therefore recommends that all professions involved in the overall air transport industry in the country should put in place strategies that will ensure zero per cent chance for errors in the industry.

Keywords: Pilots, Aircraft Engineers, Aviation, incident, accident, errors

Introduction

Air transport being the fastest growing mode of transport has witnessed dramatic developments in the areas of technology, engineering, management and operations. The introduction of larger and faster aircraft with advanced information management has modernised the aviation industry, technically, administratively and even technologically (Stephens & Ukpere, 2014). The risk of aviation accidents may increase with the increased traffic volume arising from increasing demand for air transportation, and in Nigeria, the occurrence of aviation accidents in a country reflects the safety level of air transportation of the country. As a result of this, aviation safety experts are constantly working towards providing an incident- or accident-free flying environment (Houston, Walton and Conway, 2012). Consequently, the industry has made significant improvements to reduce the rate of aviation incidents and accidents, although there is still much to be done to further advance safety in the aviation community (Wood & Sweginnis, 2007). The World Bank (2009) reported that in Africa, Sub Saharan African carriers have the world's worst accident record. This unenviable record is largely attributable to poor pilot capabilities and weak safety administration.

According to International Civil Aviation Organization (ICAO) Annex 13 of 2011 which deals with aircraft accident investigation, an accident is defined as an occurrence associated with the operation of an aircraft which takes place between the times any person boards the aircraft with the intention of flight until such a time when such persons have disembarked. The annexure identified three different categories of accidents. The first involves injury to persons, such as a person becoming seriously injured consequent upon being in the aircraft, or having direct contact with any part of the aircraft or being directly exposed to jet blast. The second category is when the aircraft sustains damage or structural failure that adversely affects the structural strength, performance or flight characteristics of the aircraft and would normally require major repair or replacement. The third category is a situation when the aircraft is missing or is completely inaccessible. The ICAO document also defines an incident as an occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation.

Extensive studies on aviation accidents had been conducted by researchers. Stephens and Ukpere (2014) carried out an empirical analysis of the causes of air crashes from a management perspective by examining the causes of air crashes from all over the world based on continental locations of accidents. The study found that certain continental regions have similar causes of air accidents, and concluded that other continents have safer air transport than Asia and Africa. In another stu dy, Fadugba, Oluwajana, Busari and Oyedepo (2015) evaluated air transport safety after the 1960 independence in Nigeria. The study showed that air traffic accidents in Nigeria increased per decade with 2 incidents only between 1960 and 1969, with an increasing trend in the subsequent decades until it culminated at 27 incidents between 2000 and 2009. The study of Weli and Ifediba (2014) was more specific as it looked at the implications of poor weather conditions on flight operations for hazard management in Nigeria.

The contribution of human errors to aviation accidents has been found to be substantial in the overall rates of aircraft accidents all over the world. Errors arise as a result of a wrong interpretation of the problem or a choice of the wrong course of action after an accurate picture of the situation has been established. Generally, the concept of Human Factors Analysis and Classification System (HFACS) which was originally developed for military aviation has been applied to analyse various accident data across the world. In Australia, Inglis, Sutton and McRandle (2007) worked on human factor analysis of Australian aviation and compared it with that of the United States using HFACS. In a study commissioned by the United States Department of Transportation Federal Aviation Administration, Wiegmann's report, titled *A human error analysis of commercial aviation accidents using Human Factor Analysis and Classification System (HFACS)* (Wiegmann, 2001), established that HFACS can serve as a viable tool for analysing commercial aviation accidents. Similarly, Wiegmann et al. (2005) applied HFACS to general aviation accidents for the United States in a report submitted to the Federal Aviation Administration, Atlantic City International Airport in New Jersey. Similarly, in Brazil, Fajer (2011) also applied HFACS to compare the results of aviation accident analyses performed by the Centre for Investigation and Prevention of Aviation Accidents (CENIPA) with methods of HFACS and concluded that CENIPA reports did not contemplate the organisational factors associated with aviation accidents.

Reason (1990) asserted that mistakes made by different actors in the aviation industry created the conditions that promoted errors prevalent in the industry. Human error can be defined as inappropriate human behaviour that lowers level of system effectiveness or safety, which may or may not result in accident or injury (Wickens, Gordon and Liu, 1998).

A study by Lee (2009) showed that mistakes cannot be eliminated; nevertheless, human errors and their negative consequences can be reduced in three ways: through system design, personnel selection and personnel training. The author then concluded that although personnel selection and training are extremely important factors, it is generally accepted that even the best-trained pilot and aircraft maintenance engineers, like all humans, are susceptible to mistakes. Indeed, a study by Moon, Kwang-Eui and Youn-Chul (2011) using data obtained from Boeing Company for ten (10) years showed that of all commercial aircraft accidents within the period studied, 55% were caused by pilot errors, 17% by aircraft defects, 13% by adverse weather conditions, 5% by airport and air traffic control, 3% by maintenance personnel and 7% by miscellaneous matters. They therefore concluded that many of the causal factors that contribute to accidents can be viewed as different types of human errors

This study examines the human errors among pilots and aircraft maintenance engineers in Nigeria using Principal Component Analysis (PCA). The focus is to examine the most significant factors responsible for aviation accident as a result of the attitudinal response of pilots and aircraft engineers. The aim is to group the various individual attitudes into components in order to explain the weight of the variables contributing to aviation-related errors among aviation personnel and its implication for aviation accidents in Nigeria.

Methodology

The study relied on primary source of data collection involving the survey of pilots and aircraft engineers through questionnaire administration at the four major international airports in Nigeria. These airports are located in Lagos, Abuja, Kano and Port Harcourt. The study took a total sample of 150 pilots and engineers out of a population of 1053 pilots and 937 aircraft engineers licenced and registered in Nigeria as at the time of the survey. The sample size can be said to be adequate based on the suggestion of Hair et al (1995) referred to in Williams, Brown and Onsman (2010) that a sample population of this nature should have a sample size of 100 or more. The distribution of the responses from the questionnaires administration is presented in Table 1.

Table 1: Distribution of Questionnaire

Airport	**Respondents**	**Pilots**	**Engineers**
Lagos	55	30	25
Abuja	32	17	15
Kano	33	21	12
Port-Harcourt	30	13	17
	150	81	69

Source: Authors Survey, 2016

The study employed purposive sampling technique to collect data with the aid of research assistants. The sampling technique was to ensure that only pilots and aircraft engineers were surveyed at the four major international airports. Information in the questionnaire was presented such that the respondents had to indicate the weight they attached to a multiple of factors capable of contributing to aviation-related errors in Nigeria.

The instrument was designed on a multiple-item measurement scale fashioned on the 5-point Likert scale to allow for a wide measurement of the degree of the pilots' and engineers' consideration of each factor presented in the questionnaire. The items included faulty planning, haste (hurried departure), operating environment, boredom, inattention and distraction. Other variables were personal problems, overconfidence, lack of confidence, apprehension/panic, violation of flight discipline (risk taking), error in judgement, delay, complacency, lack of motivation and interpersonal tension. The variables were tabulated for the respondents to rank them in order of significance from 1 – the most critical to 5 – the least critical in their contribution to aviation-related errors in Nigeria.

Principal Component Analysis (PCA) was employed as technique for data analysis. This is in the light of the need to reduce the variables to a few orthogonal variables that could be used to explain the major factors that accounted for aviation errors in Nigeria from the operational stand point of pilots and aircraft maintenance engineers. The PCA was to highlight the most significant components contributing to aviation accidents as a result of actions or inactions of pilots and aircraft engineers. The main purpose of PCA is to determine the number of component factors needed that can adequately describe the correlations between the observed variables, and estimating how each component is related to each observed variable by estimating the factor loading (Oyesiku, 2000). This study adopted the notation for PCA presented by Laudau and Everitt (2004) as a model for mathematical specification;

$$Y_1 = a_{11}x_1 + a_{12}x_2 ... + a_{1q}x_q$$

$$Y_2 = a_{21}x_1 + a_{22}x_2 ... + a_{2q}x_q$$

.
.
.

$$Yq = a_{q1}x_1 + a_{q1}x_2 ... + a_{qq}x_k \quad (1)$$

Where the coefficient a_{ij} ($i = 1, \ldots, q$, $j = 1, \ldots, q$) are chosen so that the required maximal variance and uncorrelated conditions hold.

The study area is Nigeria that occupies a landmass of 923, 768 km2 with a projected population of 174, 507, 539 people as at 2015. The latitudinal and longitudinal extent of the country is 4^o to 14^oN and 2^o to 15^oE. Nigeria has four major international airports located in the cities of Lagos, Abuja, Kano and Port Harcourt respectively (see Fig. 1). The country is regarded as the largest economy in Africa considering its size, population threshold and the obvious abundance of resources.

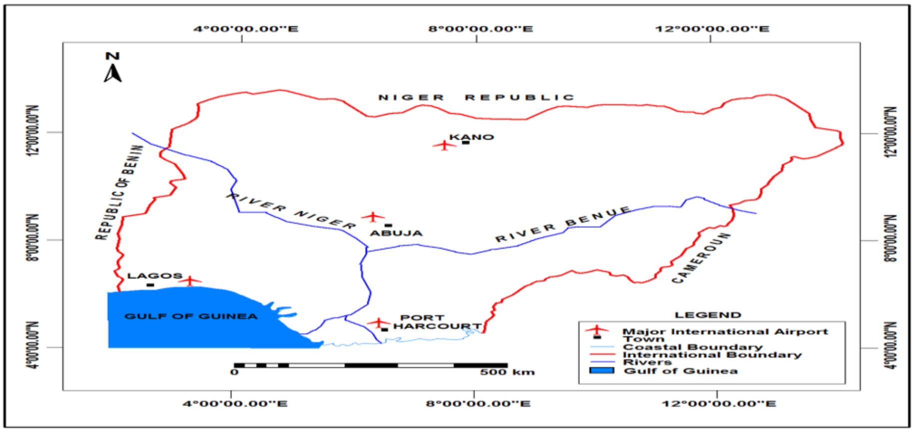

FIG. 1 :LOCATION OF MAJOR INTERNATIONAL AIRPORTS IN NIGERIA
Source :Adapted and modified from Airport map of Nigeria

Results and Discussion

The alarming aviation accident records in Nigeria underscore the need to examine the causes of aviation incidents and accidents as well as the role errors play in aggravating the problem. This study is assesses the errors of pilots and aircraft engineers leading to aviation accidents in Nigeria.

Accidents in the aviation industry of Nigeria have been a major concern to stakeholders in the industry. It is imperative to note that a data set to be used in statistics of this nature should undergo a test of suitability and adequacy. Thus, to assess the suitability of the data, internal consistency checks were conducted using Kaiser-Meyer-Olkin (KMO) measure of sample adequacy and the Bartlett test of sphericity (See Table 2). These tests were employed based on the requirement of data reduction technique prior to component extraction as suggested by Williams et al. (2010). The importance of the tests is to verify whether the samples were adequate to meet the assumptions of the use of principal component analysis.

Table 2: KMO and Bartlett's Test for Pilots and Aircraft Engineers

KMO and Bartlett's Test for Aircraft Engineers		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.657
Bartlett's Test of Sphericity	Approx. Chi-Square	485.914
	Df	91
	Sig.	.000

KMO and Bartlett's Test for Pilots		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.622
Bartlett's Test of Sphericity	Approx. Chi-Square	859.848
	Df	91
	Sig.	.000

Source: Authors' Computation

The result in Table 1 shows a sampling adequacy value of .657 and .622 for aircraft engineers and pilots respectively, $p<0.0$. This indicates that the data obtained is adequate and suitable for the analysis. Therefore, with values of this threshold, the data can be considered to be reliable for use in principal component analysis.

The factors contributing to aviation accidents as a result of human errors on the part of pilots and aircraft engineers are naturally dependent on one another by a level of relationship. The correlation matrix (Table 3 & 4) of the variables under investigation reveals the nature of the relationship between and amongst the variables. It is observed that the correlation between the variables shows both positive and negative relationships. This implies that any effect on one factor will produce a corresponding measure of effect on the other. For ease of presentation, the variables are represented by X_1 to X_{14}, where X_1 denotes faulty planning; X_2 represents haste (hurried departure); X_3 (unfavourable operating environment); X_4 (boredom, inattention, distraction); X_5 (personal problems); X_6 (over confidence); X_7 (lack of confidence) and X_8 (apprehension/panic). Other variables are X_9 (violation of flight discipline, which implies risk taking); X_{10} (error in judgement); X_{11} (delay); X_{12} (complacency); X_{13} (lack of motivation) and X_{14} (interpersonal tension).

Table 3: Correlation Matrix of Pilots Survey

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}
X_1	1.000													
X_2	-.053	1.000												
X_3	-.008	.207	1.000											
X_4	.170	.083	.325	1.000										
X_5	-.017	.136	.280	.051	1.000									
X_6	.111	-.134	-.102	.306	.060	1.000								
X_7	.065	.054	.171	.247	.171	.145	1.000							
X_8	-.114	.020	-.111	-.256	.115	.055	.154	1.000						
X_9	.045	-.021	-.125	-.356	.321	.065	.176	.653	1.000					
X_{10}	.076	-.032	-.155	-.452	.234	-.002	.054	.618	.806	1.000				
X_{11}	.103	.010	-.006	-.101	.116	-.049	.076	-.179	-.139	.049	1.000			
X_{12}	.011	-.195	-.320	-.629	-.169	-.181	-.027	.394	.335	.377	.119	1.000		
X_{13}	-.049	.251	.191	.227	.316	.026	.224	.415	.328	.330	-.029	-.134	1.000	
X_{14}	-.147	.276	.262	.231	.464	.081	.299	.416	.341	.204	.080	-.189	.789	1.000

Source: Authors' Computation

The result presented in Table 3 indicates that the strongest correlated pair of variables are violation of flight discipline (risk taking) and error in judgement; ($r = 0.806$). This is obvious in that pilots attitude to risk taking often results in errors that are capable of causing aircraft accidents. Conversely, high level of judgemental errors usually results in pilots violate flight discipline with its attendant implications for aviation incidents and accidents.

Lack of motivation were found to be strongly correlated with interpersonal tension ($r = .789$). Indeed, interpersonal tension between air crew members especially between the subordinates and the team leader has the tendency to negatively affect the motivation of the subordinates to carry out any assigned duty. On the other hand, tension between staff will tend to make superior officers to use bias in posting and assigning of duties to the subordinate officers. Increased tendency for aircraft accidents exist when there is tension between pilots and employers and/or other employees.

Similarly, apprehension/panic showed a strong correlation with violation of flight discipline with an r value of 0.653. In fact, this result perhaps implies that pilots' violation of flight discipline is a function of apprehension and/or panic. It is to be noted that pilots are bound to violate flight rules whenever they are panic-stricken. Another variable that is strongly correlated with apprehension/panic is error in judgement with r value of 0.618. Also, this invariably indicates that pilots tend to commit errors capable of causing aircraft accident when they are panic-stricken.

An examination of Table 3 also shows that there is a weak positive and negative relationship between the variables. The strongest positive correlation between the variables under investigation for aircraft engineers (Table 3) is between faulty planning and personal problems (*r* = .474). Indeed, there is the tendency for engineers to commit errors that may prove to be fatal if such aircraft maintenance engineers have some personal problems that disturb their wellbeing. Similarly, a relationship exist between variables "haste" (hurried operation) and "operating in an unfavourable environment" (*r* = 0.450). Furthermore, "faulty planning" and "error in judgement" showed a positive correlation with r = 0.428. An overview of the results in Table 4 perhaps indicates that the variables under consideration are somehow related among themselves. This gives us an indication of the association between the behavioural errors. For instance, the more the aircraft maintenance operates in an unfavourable environment, the greater the probability of an engineer that will work in haste. As faulty planning increases, the tendency for engineers to commit errors in judgement also increases.

Table 4: Correlation Matrix of Aircraft Engineers

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}
X_1	1.000													
X_2	.292	1.000												
X_3	.273	.450	1.000											
X_4	.332	.299	.292	1.000										
X_5	.474	.063	-.036	-.034	1.000									
X_6	-.127	-.042	-.141	-.253	-.008	1.000								
X_7	-.261	-.215	-.311	-.032	-.179	.110	1.000							
X_8	-.129	-.115	.065	.072	-.141	-.028	.381	1.000						
X_9	.357	.055	.075	.358	.043	.030	.198	.058	1.000					
X_{10}	.428	.238	.160	.131	.342	-.090	-.060	-.122	.228	1.000				
X_{11}	.173	-.010	-.101	-.099	.284	.091	-.092	-.208	-.037	.193	1.000			
X_{12}	.102	-.160	-.188	.226	.073	-.118	.290	.051	.284	.106	.180	1.000		
X_{13}	-.263	-.268	-.467	-.370	.076	.118	.073	-.058	-.304	-.234	.350	.158	1.000	
X_{14}	-.038	-.234	-.081	-.027	-.003	.060	.150	-.058	.022	-.110	.251	.304	.273	1.000

Source: Authors' Computation

Furthermore, the total variance of the operational errors for pilots explained is presented in Table 5. The result indicates that the percentage of the total variance accounted for by the principal component analysis shows four components with eigenvalues greater than 1. The percentage of total variance explained indicates that component one has an eigenvalue of 3.354 accounting for 23.96% of the total variance explained by the analysis. Similarly, component two reveals an eigenvalue of 3.798 thereby accounting for 19.99%. Component 3 and 4 with eigenvalues of 1.411 and 1.233 accounted for 10.08% and 8.81% respectively. The significance of these component loadings provides a clear indication of the underlining relationship of the human errors committed by pilots to aviation incidents/accidents in Nigeria.

Table 5: Total Variance of Pilots' Errors Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.354	23.958	23.958	3.354	23.958	23.958	3.182	22.729	22.729
2	2.798	19.986	43.944	2.798	19.986	43.944	2.843	20.305	43.035
3	1.411	10.082	54.026	1.411	10.082	54.026	1.520	10.860	53.895
4	1.233	8.811	62.837	1.233	8.811	62.837	1.252	8.942	62.837
5	.938	6.698	69.534						
6	.892	6.374	75.908						
7	.856	6.116	82.024						
8	.711	5.078	87.103						
9	.551	3.937	91.040						
10	.432	3.087	94.127						
11	.294	2.103	96.229						
12	.234	1.674	97.904						
13	.204	1.456	99.360						
14	.090	.640	100.000						
Extraction Method: Principal Component Analysis.									

Source: Authors' Computation

In all, they have been reduced to four major components with eigenvalues greater than 1.00. These are the dominant loadings for each component. These eigenvalues are the proportion of the total variation in the data set that is explained or at best summarized by a component. The cumulative percentage of the variance revealed that the four principal components alone account for 62.8% of the human errors.

The total variance explained by engineers' data set is shown in Table 6. Unlike the total variance for pilots' data set, the total variance explained by engineers' errors indicates that five principal components with eigenvalues greater than 1 were extracted. Cumulatively, this accounts for 64.9%. Component 1 shows an eigenvalue of 2.932 that accounts for 20.94%.

Table 6: Total Variance of Engineers Errors Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.932	20.940	20.940	2.932	20.940	20.940	2.414	17.244	17.244
2	2.090	14.925	35.865	2.090	14.925	35.865	2.067	14.765	32.010
3	1.900	13.573	49.439	1.900	13.573	49.439	1.790	12.783	44.793
4	1.148	8.203	57.641	1.148	8.203	57.641	1.657	11.834	56.627
5	1.014	7.240	64.882	1.014	7.240	64.882	1.156	8.255	64.882
6	.886	6.329	71.211						
7	.773	5.522	76.733						
8	.696	4.969	81.702						
9	.568	4.058	85.760						
10	.488	3.489	89.249						
11	.462	3.301	92.551						
12	.408	2.914	95.465						
13	.343	2.448	97.913						
14	.292	2.087	100.000						
Extraction Method: Principal Component Analysis.									

Source: Authors' Computation

Component 2 has an eigenvalue of 2.090 accounting for 14.925%. Similarly, the eigenvalues of component 3 (1.900), component 4 (1.148) and component 5 (1.014) accounted for 13.573%, 8.203% and 7.240% respectively.

According to Laudau and Everitt (2004), an attempt must be made to identify the variables that can be used to explain the underlining dimensions of the issue under consideration. However, in order to identify the major components that explain the contributory factors of human errors to aviation incidents/accidents in Nigeria, a method of rotation (Varimax) is employed. The purpose is to maximize the variance of the squared loadings to produce orthogonal components with a view to interpreting the principal component analysis. In practice, an arbitrary threshold value of 0.4 is equated as high loadings (Laudau and Everitt 2004).

Table 7 shows the rotated component matrix of the explanatory variables for the pilots' data set. A careful examination of Table 6 shows the variables with highest loading value for each of the extracted components. For instance, error in judgement (0.864) and violation of flight discipline which implies risk taking (0.853) loads highly on component 1. Similarly, apprehension/panic loads with 0.778 on Component 1. For component 2, the most significant variables are interpersonal tension (0.855), lack of motivation (0.768) and personal problems (0.617). Component 3 has overconfidence with loadings of 0.773 as the most critical variable that contributes to human errors.

Table 7: Rotated Component Matrix[a] of Pilot Errors

	Component			
	1	2	3	4
Faulty planning			.496	.471
Haste (hurried departure)		.499		
Operating in an unfavourable environment		.554		
Boredom, inattention, distraction			.521	
Personal problems		.617		
Overconfidence			.773	
Lack of confidence			.409	
Apprehension/panic	.778			
Violation of flight discipline (risk taking)	.853			
Error in judgement	.864			
Delay				.836
Complacency	.657			
Lack of motivation		.768		
Interpersonal tension		.855		
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.				
a. Rotation converged in 9 iterations.				

Source: Authors' Computation

For component 4, the most critical variable with high loading is delay (0.836). These are found to be the most important contributors of errors to pilots' operation in the aviation industry in Nigeria.

Table 8 shows the rotated component matrix of aircraft engineers' variables as they contribute to errors in Nigeria's aviation industry. The table shows the five extracted components of the variables under investigation. As can be seen, component 1 loads highly on operating in an unfavourable environment (0.754) as well as boredom, inattention and or distraction (0.663). The most significant variables that load on component 2 are personal problems (0.781), error in judgement (0.730) and faulty planning (0.714). Indeed, the most critical variables that load on component 3, 4 and 5 are lack of confidence (0.768), interpersonal tension (0.796) and overconfidence (0.933) respectively.

Table 8: Rotated Component Matrix[a] for Engineers

	Component				
	1	2	3	4	5
Faulty planning	.402	.714			
Haste (hurried departure)	.621				
Operating in an unfavourable environment	.754				
Boredom, inattention, distraction	.663				
Personal problems		.781			
Overconfidence					.933
Lack of confidence			.768		
Apprehension/panic			.610		
Violation of flight discipline (risk taking)	.419		.533		
Error in judgement		.730			
Delay				.506	
Complacency				.652	
Lack of motivation					
Interpersonal tension				.796	
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.					
a. Rotation converged in 6 iterations.					

Source: Authors' Computation

It is imperative to note that the variables which contribute to operational errors among pilots and aircraft maintenance engineers vary to a certain degree. For instance, while the most significant variable on component 1 that contributes to errors among pilots is error in judgement, the most significant for engineers is operating in an unfavourable environment. However, it can be noted that two (2) common variables are common to pilots and aircraft engineers as major significant contributory factors to aviation accidents in the overall aviation industry of Nigeria. These variables are interpersonal tension and overconfidence. This implies the need for effective lines of communication in the aviation industry.

Conclusion

This study has examined the various contributors to aviation errors and its implications for incidents/accidents. This has been carried out from the perspective of pilots and aircraft engineers in Nigeria. The study subjected 14 causative factors of aviation errors to analysis separately for pilots and aircraft engineers. It found apprehension/panic, interpersonal tension, overconfidence and delay as the most significant causative factors contributing to pilot errors which may lead to aviation accident while unfavourable environment, personal problem, lack of confidence, interpersonal tension and overconfidence were found to be significant causes of aviation errors. These have implications for the safety of our airspace.

Policy Implications

The aviation industry of Nigeria has been perceived to be unsafe as a result of increasing accident rates over the years. Investigations of the causes of accidents cases in Nigeria tend to be complex because of various specialised roles different professionals play to ensure safe operations of aircraft in our airspace. If air transport in Nigeria is to be made safer, all professions involved in the industry in the country should minimise error by instilling a high sense of discipline capable of controlling the attitudes of professionals in the industry. This hopefully will eliminate attitude and practices capable of causing errors among aviation personnel. Aviation operators and management must be compelled to adhere strictly to routine actions such as repairs. Also, the aviation industry must be encouraged towards providing a friendly and favourable working environment for its personnel (especially aircraft engineers) to work.

Furthermore, violation of flight discipline especially associated with unnecessary risk taking should be discouraged among pilots. This will go a long way in minimising avoidable incidents/accidents that are traceable to errors. Similarly, aviation operators should as a matter of policy avoids faulty planning. For instance, pilot's flying schedules should be adhered to strictly while scheduled routine maintenance should be observed and enforced strictly by aircraft engineers. Again, personal problems of aviation personnel may have direct and indirect influence in the efficiency and effectiveness of both pilots and engineers. The air industry being a sensitive and safety conscious industry requires that all its personnel must be in the right frame of mind both physically and psychologically. Therefore, apart from routine medical fitness tests, other relevant psycho-social tests should be conducted on aviation personnel. This is to ascertain their overall fitness for the industry.

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