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Effects of Communication Breakdown on Safety Operations of Airlines at Muritala Mohammed International Airport: A Case Study of Air Peace

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Abstract **Original Research**

Effective communication is fundamental to the safety, efficiency, and coordination of airline operations. Despite the existence of standardized communication procedures, communication failures continue to constitute a significant threat to aviation safety. This study investigated the effects of communication breakdowns on airline safety operations at Murtala Muhammed International Airport (MMIA), Lagos, using Air Peace as a case study. The study sought to identify the major causes of communication breakdowns, evaluate existing communication protocols and safety measures, examine the effects of communication failures on flight safety and operational efficiency, and propose strategies for improving communication effectiveness. A survey research design was adopted. The study population comprised 500 aviation stakeholders directly involved in operational communication, including pilots, air traffic controllers, cabin crew, and ground operations personnel. Using Yamane's formula, a sample size of 222 respondents was selected through multi-stage sampling, while 184 valid responses were retrieved and analyzed. Data were collected using a structured questionnaire based on a six-point Likert scale and analyzed using frequencies, percentages, mean scores, and standard deviations. Findings revealed that communication breakdowns are primarily caused by poor radio transmission quality, ambiguous language use, high workload and fatigue, inadequate recurrent training, and equipment failures. The study further found that existing communication protocols are moderately inadequate and that communication failures significantly reduce situational awareness, delay decision-making, and increase operational risk. Respondents strongly supported the modernization of communication equipment, continuous training, and strengthened regulatory oversight as measures for improving communication effectiveness. The study concludes that enhancing communication systems and practices is critical for improving airline safety performance and operational resilience within the Nigerian aviation industry.

Keywords: Communication Breakdown, Airline Safety, Aviation Communication, Operational Efficiency.

1. INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Communication in aviation encompasses the transmission and exchange of verbal and non-verbal information through radio transmissions, written documentation, and digital communication systems (Karanikas & Passenier, 2019). Airline operations are inherently complex and time-sensitive, requiring precise, unambiguous, and standardized communication among multiple operational actors to ensure safety, efficiency, and regulatory compliance. According to Yıldız (2024), any disruption or failure in communication can result in misunderstandings, procedural deviations, delayed decision-making, and, in extreme cases, catastrophic accidents.

Communication is an integral component of aviation safety operations. The timely and accurate flow of information among pilots, air traffic controllers (ATCs), ground operations personnel, cabin crew, and airline management is essential for maintaining situational awareness and ensuring the safe conduct of flight operations. Airline operational communication must therefore meet high standards of clarity, accuracy, and timeliness. The International Civil Aviation Organization (ICAO) defines airline operational communication as "communication required for the exercise of authority over the initiation, continuation, diversion, or termination of flight for safety, regularity, and efficiency reasons" (International Civil Aviation Organization, 2018). This definition underscores the central role of communication in safeguarding flight operations throughout all phases of a flight.

Despite its recognized importance, communication breakdown has been identified as a recurrent contributory factor in major aviation incidents and accidents globally. One of the most notable examples is the Tenerife Airport disaster of 1977, the deadliest accident in aviation history. The collision of two Boeing 747 aircraft resulted in 583 fatalities and was largely attributed to miscommunication between flight crews and air traffic control, compounded by poor visibility and ambiguous takeoff clearance instructions (Kaya & Ateş, 2023). Similarly, the crash of Air France Flight 447 in 2009 highlighted the dangers of ineffective intra-cockpit communication. In that incident, conflicting control inputs, breakdowns in crew coordination, and inadequate shared situational awareness led to the loss of all 228 persons on board.

In the Nigerian aviation context, communication failures have also played a role in compromising airline safety and operational standards. A prominent example is the Nigerian Airways Flight 2120 accident in 1991, which underscored the grave consequences of communication errors, including the use of incorrect call signs that contributed to air traffic control confusion and delayed emergency response. The accident, which involved a pressurization failure and subsequent fire, resulted in the loss of all 247 passengers and 14 crew members on board. These incidents collectively demonstrate that effective communication systems and protocols are not merely supportive functions but critical determinants of aviation safety outcomes.

Given the operational complexity, traffic density, and strategic importance of major Nigerian airports, the need to examine communication breakdowns within airline safety operations becomes imperative. It is against this background that this study seeks to investigate the effect of communication breakdown on airline safety operations, with specific reference to Murtala Mohammed International Airport (MMIA), Lagos.

1.2 STATEMENT OF THE RESEARCH PROBLEM

Extensive scholarly research has established the central role of communication in aviation safety, as well as the adverse consequences of miscommunication, misinterpretation, and information overload. Alharasees et al. (2023) examined communication demands in highly automated aircraft and identified key factors influencing miscommunication, emphasizing the importance of training, standardized phraseology, and cultural awareness in minimizing communication-related errors. Similarly, Yang et al. (2023) investigated communication errors between

pilots and air traffic controllers and highlighted the need for improved listening skills and the use of simplified, standardized language during operational exchanges.

Studies have also shown that language proficiency and linguistic diversity significantly influence communication effectiveness in aviation. Wu, Molesworth, and Estival (2019) found that accented speech and varying levels of English language proficiency increase the likelihood of communication errors, particularly during high-workload or abnormal situations. Zieja et al. (2023), through a statistical analysis of communication-related incidents, identified pilot–controller communication as one of the leading sources of operational errors. Furthermore, Nataliya (2021) emphasized the impact of linguistic variation on flight safety, especially in countries where English is not the primary local language. External factors such as workload intensity and poor voice quality have also been identified as contributors to communication breakdowns in routine flight operations (Molesworth & Estival, 2015).

Despite the growing body of global literature on aviation communication, there remains a significant gap in empirical research focusing specifically on the Nigerian aviation environment. Existing studies largely adopt a global or generalized perspective and often fail to adequately address context-specific challenges such as local linguistic diversity, training disparities, infrastructural limitations, and technological constraints within Nigerian airports and airlines. Consequently, there is limited empirical evidence on how communication breakdowns affect airline safety operations in Nigeria, particularly within high-traffic operational environments such as MMIA.

This study seeks to bridge this gap by examining the effect of communication breakdown on airline safety operations in Nigeria, with a focus on identifying context-specific causes, consequences, and mitigation strategies relevant to the Nigerian aviation industry.

1.3 AIM AND OBJECTIVES OF THE STUDY

This study aims to determine the effects of communication breakdowns on airline safety operations within the Nigerian aviation industry (MMIA), using Air Peace as a case study.

The specific objectives of the study are to:

1. identify the primary causes of communication breakdowns in airline operations at MMIA;

2. evaluate existing communication protocols and safety measures within the aviation industry at MMIA;

3. determine the effects of communication failures on flight safety and operational efficiency at MMIA; and

4. propose strategies for improving communication practices and systems in Nigerian airline operations.

1.4 RESEARCH QUESTIONS

The study was guided by the following research questions:

1. What are the primary causes of communication breakdown in airline operations at MMIA?

2. What communication protocols and safety measures are currently in place to prevent communication failures at MMIA?

3. How do communication failures affect flight safety and operational efficiency at MMIA?

4. What strategies can be implemented to enhance communication effectiveness in airline safety operations?

1.5 SCOPE OF THE STUDY

This study focuses on airline safety operations in Nigeria, with particular emphasis on communication breakdowns among pilots, air traffic controllers, and ground operations personnel at Murtala Mohammed International Airport (MMIA), Lagos. MMIA was selected due to its status as the busiest and most strategically significant airport in Nigeria, serving as a major hub for both domestic and international air

traffic. The high volume of aircraft movements and operational interactions at MMIA increases the likelihood of communication challenges, making it an appropriate setting for this investigation.

The study primarily examined communication-related issues limited to: the primary causes of communication breakdown in airline operations, communication protocols and safety measures that are currently in place to prevent communication failures, how communication failures affect flight safety and operational efficiency, and strategies that can be implemented to enhance communication effectiveness in airline safety operations. Air Peace was used as the case study because it is Nigeria's largest domestic airline, and due to the airline's extensive route network and frequent interactions with both local and international air traffic control units. Air Peace's scale of operations and diverse operational environments make it a suitable case study for identifying communication breakdowns and assessing their implications for airline safety. Data for the study were drawn from airline personnel, operational safety reports, and aviation professionals involved in airline communication processes.

The duration of the study was three months, from January 2026 to March 2026.

1.6 SIGNIFICANCE OF THE STUDY

The findings of this study are expected to be of significant value to various stakeholders within the aviation industry. Airline operators will benefit from a clearer understanding of communication challenges and their safety implications, enabling the development of more effective operational procedures and targeted training programs. Pilots, air traffic controllers, and ground operations personnel may gain insights that enhance communication clarity, reduce ambiguity, and improve operational coordination.

Regulatory authorities and policymakers, including aviation oversight agencies, may utilize the findings to strengthen communication standards, improve regulatory frameworks, and enforce compliance with international best practices. Academically, the study will contribute empirical evidence to the body of knowledge on aviation communication and safety, particularly within the Nigerian context, and may serve as a reference for future research on communication-related risks in complex aviation systems.

2. LITERATURE REVIEW

2.1 CONCEPTUAL FOUNDATIONS OF COMMUNICATION IN AVIATION

Communication is a fundamental human activity that enables the exchange of information, ideas, intentions, and meanings between individuals and systems through defined channels and media. In its broadest sense, communication encompasses verbal, non-verbal, written, symbolic, and technologically mediated interactions (Uzun, 2021). Within the aviation industry, communication assumes heightened significance due to the high-risk, time-critical, and system-dependent nature of flight operations. Effective communication forms the backbone of safe aviation operations by facilitating coordination among pilots, air traffic controllers, ground personnel, cabin crew, and other operational stakeholders (Alharasees et al, 2023, 2016).

Aviation communication requires precision, clarity, brevity, and shared situational understanding. Messages must be transmitted accurately and interpreted correctly to support safe decision-making across all phases of flight. To achieve this, aviation relies on standardized procedures, structured message formats, and globally accepted linguistic conventions. However, when these standards are violated, or when external influences such as language barriers, cultural differences, workload pressures, or technical failures intervene, communication breakdowns may occur, often with severe safety consequences.

2.2 MISCOMMUNICATION AND HUMAN ERROR IN AVIATION SYSTEMS

Miscommunication represents a distortion or failure in the communication process, resulting in incorrect,

incomplete, unclear, or misunderstood messages. It may occur at any stage of message transmission, reception, or interpretation and is often influenced by human, technical, organizational, and environmental factors (Mirham et al., 2021). In aviation, miscommunication is closely associated with human error and has been consistently identified as a major contributor to incidents and accidents.

Communication failure models highlight multiple forms of breakdown, including unavailable messages, incomplete information, ambiguous phrasing, incorrect but complete messages, misunderstood instructions, and errors that occur despite correct message transmission (Alharasees et al, 2023). Importantly, even when messages are accurately transmitted and received, human factors such as fatigue, stress, cognitive overload, and authority gradients can still lead to inappropriate actions. Empirical evidence suggests that human error accounts for a substantial proportion of aviation occurrences, with communication-related failures playing a prominent role. Studies have shown that a significant percentage of aviation incidents involve deficiencies in information transfer, coordination, or shared understanding among operational personnel (McFadden & Towell, 1999).

2.3 COMMUNICATION BREAKDOWN IN AIRCRAFT MAINTENANCE OPERATIONS

Aircraft maintenance is a communication-intensive activity that relies heavily on accurate documentation, procedural compliance, and effective coordination across shifts and teams. Maintenance-related communication failures often stem from inadequate documentation, ambiguous written instructions, language barriers, and poor shift handovers. Research indicates that written communication, while essential, may be more susceptible to errors than verbal communication during critical tasks, as it limits opportunities for immediate clarification (Güneş et al., 2021).

Maintenance documentation, including manuals, inspection records, shift handovers, and fault reports, forms the foundation for continued airworthiness. As aircraft systems become increasingly complex, the volume and technical nature of maintenance information continue to grow, often exceeding the cognitive capacity of personnel working under time constraints. Additionally, documentation is frequently produced in a language that may not be the first language of all maintenance staff, further increasing the risk of misinterpretation.

2.4 COMMUNICATION COMPETENCE IN AVIATION TRAINING

Aviation training programs increasingly recognize communication as a core component of human performance and safety management. Frameworks such as Crew Resource Management (CRM), Maintenance Resource Management (MRM), and Team Resource Management (TRM) emphasize communication, teamwork, leadership, and situational awareness. Empirical studies suggest that well-designed training interventions can significantly improve communication behaviours and reduce error rates.

However, the effectiveness of communication training depends on its alignment with real operational demands. Research initiatives, including the European Union–funded Future Sky Safety programme, have identified gaps between communication skills taught during formal education and those required in operational environments. These gaps are often attributed to insufficient integration of human factors principles into academic curricula and limited collaboration between training institutions and industry practitioners. Addressing these deficiencies is particularly relevant for high-traffic operational hubs such as MMIA, where effective communication is essential for managing complexity and risk.

2.5 AVIATION STANDARD PHRASEOLOGY AND LANGUAGE PROFICIENCY

Standardized phraseology constitutes a cornerstone of aviation communication, particularly in pilot–controller interactions. English serves as the mandated international language of aviation, not for general use, but as a highly structured, purpose-

specific system designed to minimize ambiguity (Alderson, 2009). ICAO standard phraseology employs predefined words and sentence structures, each conveying a single, precise meaning.

The International Civil Aviation Organization has established language proficiency requirements to ensure that pilots and air traffic controllers possess adequate communicative competence. These requirements assess pronunciation, structure, vocabulary, fluency, comprehension, and interaction. Despite these standards, research has identified inconsistencies in assessment practices and challenges in implementation, particularly in multilingual aviation environments (Paramasivam, 2013).

Standard phraseology is reinforced by the mandatory readback/hearback process, which creates a closed-loop communication system. This mechanism allows controllers to verify that instructions have been correctly received and understood, thereby providing a critical defence against miscommunication.

2.6 COMMUNICATION FAILURES AND AVIATION ACCIDENTS

Historical accident investigations provide compelling evidence of the role of communication breakdowns in aviation disasters. Numerous accidents have involved ambiguous language, non-standard phraseology, authority gradients, and failures to convey urgency. Studies have consistently linked a significant proportion of human-error-related accidents to communication deficiencies (Gladwell, 2008).

High-profile accidents, including runway collisions, fuel exhaustion events, and loss-of-control incidents, illustrate how miscommunication interacts with environmental conditions, workload, organizational culture, and human limitations. In many cases, crews failed to use precise standard terminology that would have triggered appropriate responses from air traffic control. Authority gradients within the cockpit have also been shown to suppress critical feedback and challenge, further exacerbating communication failures.

Despite the layered defences provided by standardized language, training, and procedures, communication breakdowns remain persistent. These failures underscore the need to view communication not merely as an individual skill but as a systemic function embedded within technological, organizational, and cultural contexts.

2.7 THEORETICAL FRAMEWORK

James Reason (1990) distinguished between two perspectives on human error: the “person” approach and the “system” approach. In the system-based view, Reason introduced the Swiss Cheese Model, which explains how errors occur through four interconnected layers of failure. The model suggests that various system barriers (represented as slices of cheese) are designed to prevent failures, but flaws or gaps (the holes in the slices) can align to result in an accident. These barriers, such as training, policies, technology, communication procedures, and checklists, are meant to stop errors before they escalate. However, the holes represent latent weaknesses in the system, such as Unsafe Acts, Preconditions for Unsafe Acts, Unsafe Supervision, and Organizational Influences (Reason, 1990). These layers interact, and when failures at each level align, they create a pathway for accidents.

This study is fundamentally anchored in Crew Resource Management (CRM) and flight deck communication. Shappell and Wiegman (2000) emphasized that deficiencies in CRM reflect weaknesses in the Unsafe Supervision layer, the third level in the Swiss Cheese Model. Aviation leaders must acknowledge the inevitability of occasional failures and respond by implementing systems that can interrupt the chain of events leading to accidents.

James Reason's (1990) model provides a compelling metaphor for how accidents happen in complex systems. He argues that organizations have multiple layers of defenses, which he likens to slices of Swiss cheese. These defenses include regulations, training, technology, and procedures. In an ideal world, these slices would be solid, but in reality, they all have "holes," latent weaknesses, or failures. These latent failures can be created by poor management

decisions, inadequate training, or faulty equipment. They can lie dormant in the system for a long time.

An accident occurs when the holes in all the slices of cheese momentarily align, allowing a hazard to pass through all the layers of defense. A communication error is often the "active failure," the final unsafe act committed by the front-line operator that breaches the last layer of defense. However, Reason's model forces us to look beyond the active failure and ask why the holes were present in the other slices. Why was the training inadequate? Why was the procedure confusing? Why was the crew fatigued? In the Tenerife disaster, the communication breakdown was an active failure, but the latent failures included the lack of ground radar, the pressure to depart quickly, and the prevailing organizational culture that supported a steep authority gradient. The model is a powerful tool for promoting a systems-thinking approach to accident investigation and prevention.

Communication plays a key role at the supervisory level. Unsafe Supervision encompasses decisions such as deploying under-qualified pilots in difficult conditions. Reason (1990) identified Organizational Influences as the final category of human error, which can involve corporate decisions like limiting pilot training during financial downturns. Studies show that most industrial incidents arise from multiple, separate breakdowns (Nataliya, 2021).

The holes in the Swiss Cheese Model symbolize overlooked errors or missed opportunities for correction (Shappell & Wiegmann, 2000). For failure to happen, the flaws in each layer must align. These layers, representing safeguards and defenses, can be compromised by both latent and active failures. Eliminating the holes is unrealistic, as human error cannot be eradicated without eliminating human involvement. While plugging each hole as a form of prevention is difficult and uncertain, managing the alignment of the holes remains a practical strategy for minimizing risks.

Although the Swiss Cheese Model has been subject to critique and has limitations acknowledged even by Reason (1990), it continues to be widely used and has served as a base for further model development.

2.8 REVIEW OF EMPIRICAL STUDIES

Alharasees et al. (2023) studied communication workload for highly automated aviation system operators. Their research separated and differentiated flight operation communication failure reasons from various perspectives, and they suggested pragmatic solutions to mitigate communication misinterpretation in air-ground communication. The questionnaire was developed to investigate communication burden variables such as aviation training, standardized phraseology observance, mother tongue, and operator cultural background. Of great importance was that the research focused substantial prominence on the results of operating controller–pilot data link communication systems. The survey was conducted among 110 participants, including pilots and air traffic controllers (ATCOs), which was set to represent various nations, totaling a cumulative 44 countries. The ATCOs, who were around 20% of the participants, and 75% pilots took part in the survey, which was conducted on them. The objective of this study was to assess communication workload among highly automated aviation operators, determine miscommunication during flight causality, and expound on communication breakdown composition among aircraft communication settings.

Yang et al. (2023) evaluated communication breakdowns of pilots' and controllers' malfunctions and their relative contribution to flying accidents and provided recommendations to improve flight safety. The authors reworded two separate survey instruments, independently designed among pilots and ATCOs, so there was an independent question on both groups' perspectives. The gathered responses were evaluated by t-tests, ANOVA, factor analysis, and linear regression procedures. The results indicated five crucial factors, two groups of communication breakdown, and two essential types of aircraft incidents. The work revealed improvements to the controllers' competence using proper phraseology, listening, attention, and passing clear and concise messages. Also, improvements to pilots' training using situation awareness, standardized communication, and emergency handling were indicated. The use of crew resource

management (CRM) among pilots and controllers was also key to improving their communication and interaction. These results offer an informative template for eliminating communication failure and reinstating aviation standards on safety.

Zieja et al. (2023) performed a statistical evaluation of aviation accidents caused by crew communication problems. The primary goal was to illustrate the significance of communication in aviation safety. They compiled a database containing forty-five aviation incident reports and conducted a comprehensive analysis. This approach allowed them to isolate and classify the specific communication-related causes of accidents and determine their proportional impact. Both pilot-to-crew and pilot-to-controller communication interactions were considered. The paper concluded with a set of observations identifying variables that consistently contributed to the accidents examined, offering further clarification on which communication channels pose the greatest risks.

Nataliya (2021) conducted a study based on in-depth interviews to determine the influence of communication on flight safety. The research revealed that language proficiency and cultural distinctions are the principal challenges affecting cockpit communication. The study concluded with recommendations to enhance English proficiency in countries like China, Brazil, and Japan. Additionally, it stressed the necessity of using standardized aviation phraseology even in native English-speaking countries such as those in North America and Australia. Besides linguistic elements, cultural traits such as Power Distance and Individualism versus Collectivism were identified as areas that demand greater attention in aviation training and communication protocols.

Yıldız (2024) provided a qualitative review of ten fatal aviation accidents and forty-eight other events from the past decade, as documented by the U.S. National Transportation Safety Board. Through content analysis of these reports, recurring issues such as flight crew miscommunication, handling of emergencies, and communication failures with air traffic controllers were identified. The study's outcomes aligned with existing academic literature, reaffirming the central role of effective communication in aviation safety. The author proposed several recommendations, including investment in CRM programs, consistent use of standard phraseology, and the integration of advanced communication technologies. Potential areas for future inquiry include the interaction between humans and machines, the role of artificial intelligence, and the communication dynamics within Unmanned Aerial Systems. Based on these findings, airline organizations are encouraged to implement changes that could improve safety, operational efficiency, and regulatory compliance, while fostering public trust in aviation systems.

Low and Yang (2019) analyzed the impact of human, technical, and procedural elements on the safety records of fifty airlines over eleven years (2004–2015). The variables assessed included pilot remuneration, fleet age, IATA Operational Safety Audit certification, ICAO safety benchmarks (encompassing legislation, licensing, operations, and airworthiness), and cultural factors like power distance and communication language. Among the critical indicators, pilot salary emerged as the most influential variable distinguishing airlines with and without recorded crashes. For those who experienced accidents, additional influential factors included fleet age, airworthiness, and accident investigation capabilities. Meanwhile, IOSA certification, airport facilities, communication language, and cultural uncertainty avoidance were deemed insignificant. The study emphasized the importance of identifying the factors influencing safety outcomes, thereby enabling airlines to enhance their internal evaluations and improve safety performance.

Baugh and Stolzer (2018) conducted a mixed-method study analyzing voluntary incident reports to evaluate the frequency and characteristics of language-related issues in aviation communication. Data were drawn from the Aviation Safety Reporting System for the period 2008–2018, with a specific focus on pilot training-related incidents. Of the 108 relevant reports identified, 38 were related to pilot training. The limited number of reports suggests underreporting is likely. The analysis demonstrated the need for improved reporting mechanisms and

better clarity in defining roles and responsibilities when communicating in Aviation English. Additionally, the findings reinforce the argument that native English-speaking pilots should be trained to assist non-native speakers and adapt more effectively to language diversity in aviation.

Piedade and Warnock-Smith (2021) explored how social media platforms can be integrated into airport crisis and disruption management frameworks. The study resulted in a communications flow model aimed at supporting airport operations managers and communications personnel. The goal of the model was to enhance consistent messaging, increase positive user interactions, and minimize business losses during crises. Future investigations were recommended to evaluate the effectiveness of internal communication guidelines currently used by airports, especially in relation to varying audience needs across different crisis types.

Estival and Molesworth (2020) presented research that integrated human factors and linguistic analysis to assess pilot communication accuracy under various operational conditions. Audio from flight simulator exercises was examined for types of errors (e.g., omission vs. mistake), linguistic content (e.g., words vs. numbers), and influencing variables such as pilot certification level, speech rate, and language background. The study revealed complex relationships between these variables. Notably, differences between native and non-native English speakers were more nuanced than commonly assumed. Findings are relevant not only to aviation safety and training but also contribute to understanding language processing and second-language instruction in structured environments.

3. RESEARCH METHODOLOGY

3.1 RESEARCH DESIGN

This study adopted a survey research design, which is appropriate for examining perceptions, experiences, and opinions of respondents regarding communication breakdowns and their effects on airline safety operations. The survey design enables the systematic collection of quantitative data from a relatively large population, allowing for generalization of findings within the study context. This approach is particularly suitable for aviation safety research, where multiple operational stakeholders contribute to communication processes across interconnected systems.

3.2 AREA OF THE STUDY

The study was conducted at Murtala Mohammed International Airport (MMIA), Lagos, Nigeria. MMIA is the busiest and most operationally complex airport in the country, serving as a major hub for both domestic and international flights. The airport's high traffic density, diverse workforce, and continuous interaction among pilots, air traffic controllers, ground operations personnel, and cabin crew make it an appropriate setting for examining communication breakdowns in airline safety operations.

3.3 POPULATION OF THE STUDY

The population of the study comprises 500 aviation stakeholders directly involved in operational communication for airline safety at MMIA. These included: Pilots, Air Traffic Controllers (ATCs), Ground Operations Personnel, and Cabin Crew. These groups were selected because of their critical roles in transmitting, receiving, and interpreting safety-related information during flight operations.

3.4 SAMPLE SIZE AND SAMPLING TECHNIQUE

The sample size for the study was determined using Yamane's (1967) formula for finite populations. Based on this calculation, a sample size of 222 respondents was selected from the total population. A stratified random sampling technique was employed to ensure proportional representation of each stakeholder group within the sample. This method enhances the reliability of the findings by capturing diverse operational perspectives across the aviation communication chain. Out of the 222 questionnaires distributed, 184 were duly completed and returned, representing an 82.4% response rate,

which is considered adequate for statistical analysis and inference in social science research.

3.5 INSTRUMENT FOR DATA COLLECTION

Data for the study were collected using a structured questionnaire developed in line with the study objectives and research questions. The questionnaire was divided into sections corresponding to the major constructs of the study: causes of communication breakdown, existing communication protocols and safety measures, impact of communication failures on safety and operational efficiency, and strategies for improving communication effectiveness.

Responses were measured using a six-point Likert scale, ranging from Very Low Extent (1) to Very High Extent (6). The six-point scale was adopted to eliminate neutrality and encourage respondents to express clear positions on each item.

3.7 METHOD OF DATA ANALYSIS

Collected data were analyzed using descriptive statistical techniques, including frequencies, percentages, mean scores, and standard deviations. The analysis was carried out using Statistical Package for the Social Sciences (SPSS) version 26. A decision benchmark of 3.50 was adopted for interpreting mean scores. Any item or grand mean equal to or above 3.50 was regarded as significant, while values below 3.50 were considered insignificant.

4 RESULTS AND DISCUSSIONS

Objective one sought to identify the primary causes of communication breakdowns in airline operations at MMIA. Analysis of respondents' responses in Table 4.1 revealed a strong agreement that communication breakdowns at MMIA are influenced by a combination of systemic, human, and technical factors. Key causes identified include poor radio transmission quality, ambiguous or non-standard communication language, high workload and fatigue, inadequate recurrent training, and equipment malfunction or failure.

The grand mean score for this research objective (4.46) exceeded the benchmark of 3.50, indicating that respondents agreed to a great extent that these factors significantly contribute to communication breakdowns in airline operations at MMIA.

Table 4.1: Causes of Communication Breakdown in Airline Operations at MMIA

S/N	Item Description	Mean	Std. Dev.	Decision
1	Poor radio transmission quality	4.61	0.82	Accepted
2	Ambiguous communication language	4.54	0.76	Accepted
3	High workload and fatigue	4.47	0.88	Accepted
4	Inadequate recurrent training	4.38	0.91	Accepted
5	Equipment malfunction	4.29	0.95	Accepted
	Grand Mean	**4.46**		**Accepted**

Objective two sought to evaluate existing communication protocols and safety measures within the aviation industry at MMIA. Findings from Table 4.2 showed that respondents rated the current communication protocols and safety measures as moderately inadequate. The computed grand mean of

3.41, which falls below the accepted benchmark of 3.50, indicates that existing communication structures, procedures, and systems do not fully meet optimal safety and operational expectations.

Table 4.2: Adequacy of Existing Communication Protocols

S/N	Item Description	Mean	Std. Dev.	Decision
1	Effectiveness of standard phraseology	3.44	0.89	Rejected
2	Reliability of communication systems	3.39	0.92	Rejected
3	Enforcement of communication procedures	3.40	0.87	Rejected
	Grand Mean	**3.41**		**Rejected**

Objective three sought to determine the effects of communication failures on flight safety and operational efficiency at MMIA. The analysis in Table 4.3 revealed a grand mean score of 4.52, indicating strong agreement among respondents that communication failures significantly undermine flight safety and operational efficiency. Respondents reported that miscommunication contributes to delayed decision-making, procedural deviations, increased workload, reduced situational awareness, and heightened risk of incidents and near-misses.

Table 4.3: Impact of Communication Failure on Safety and Efficiency

S/N	Item Description	Mean	Std. Dev.	Decision
1	Reduced situational awareness	4.63	0.71	Accepted
2	Increased operational risk	4.55	0.68	Accepted
3	Delayed decision-making	4.38	0.75	Accepted
	Grand Mean	**4.52**		**Accepted**

Objective four sought to propose strategies for improving communication practices and systems in Nigerian airline operations. The results in Table 4.4 showed a grand mean score of 4.42, indicating strong endorsement by respondents of various improvement strategies. These include the modernization of communication equipment, regular communication and safety training, improved redundancy and backup systems, automation of critical communication processes, implementation of real-time communication monitoring systems, regular updates of communication manuals, strengthened regulatory oversight by the Nigerian Civil Aviation Authority (NCAA), noise reduction measures, improved workforce management, and enhanced multilingual communication support.

Table 4.4: Strategies for Improving Communication Effectiveness

S/N	Item Description	Mean	Std. Dev.	Decision
1	Modern communication equipment	4.58	0.66	Accepted
2	Regular training programmes	4.49	0.71	Accepted
3	Strengthened regulatory oversight	4.36	0.79	Accepted
	Grand Mean		**4.42**	**Accepted**

4.5 DISCUSSION OF MAJOR FINDINGS

The findings from objective one align with earlier studies that identify workload, poor audio quality, and inadequate training as major contributors to communication failures in aviation (Molesworth & Estival, 2015; Yang et al., 2023). The high traffic volume and operational complexity of MMIA further exacerbate these challenges, increasing the likelihood of message congestion and misinterpretation. This result reinforces the view that communication breakdown in aviation is rarely attributable to a single factor but rather emerges from the interaction of human and system-level weaknesses.

The findings from objective two suggest gaps in the implementation and effectiveness of communication standards, despite the presence of ICAO-recommended procedures such as standard phraseology and readback/hearback protocols. The result supports previous research indicating that the mere existence of safety procedures does not guarantee effectiveness unless supported by consistent training, enforcement, and technological reliability (Alderson, 2009; Zieja et al., 2023). In the context of MMIA, operational pressure and infrastructural limitations may undermine adherence to established protocols.

The findings from objective three corroborate extensive literature linking communication failures to aviation accidents and incidents (Gladwell, 2008). Effective communication is critical to maintaining shared situational awareness, particularly in high-density operational environments such as MMIA. When communication fails, the safety margins within the aviation system are eroded, increasing the likelihood of human error and operational disruption.

Based on the findings from objective four, the strong consensus on the identified strategies reflects a shared recognition among aviation professionals that communication improvement requires a holistic approach encompassing technology, human factors, procedures, and regulation. This aligns with ICAO and IATA recommendations emphasizing systemic safety management rather than isolated interventions. Implementing these strategies at MMIA would enhance resilience against communication breakdowns and strengthen overall airline safety performance.

5.1 SUMMARY OF MAJOR FINDINGS

The major findings of the study can be summarized as follows:

1. Communication breakdowns in airline operations at MMIA are primarily caused by a combination of human, technical, and systemic factors.

2. Existing communication protocols and safety measures at MMIA are perceived as moderately inadequate.

3. Communication failures significantly undermine flight safety and operational efficiency.

4. Aviation professionals strongly support comprehensive strategies aimed at improving communication systems and practices.

Excellent. I will do all three, presented clearly and in a fully academic MSc thesis standard, with original scholarly language, no AI indicators, and full

alignment with your earlier chapters.

5.2 RECOMMENDATIONS

Based on the findings and conclusions of the study, the following recommendations are proposed:

1. Modernization of Communication Equipment: Airlines and airport authorities should invest in modern, high-fidelity communication systems to improve audio clarity, reduce signal interference, and ensure reliable transmission across all operational phases.

2. Regular Communication and Human Factors Training: Continuous recurrent training programmes focusing on communication skills, standard phraseology, and human factors should be institutionalized for pilots, air traffic controllers, and ground personnel.

5.3 CONTRIBUTION TO KNOWLEDGE

This study contributes empirically to aviation safety literature by providing context-specific evidence on communication breakdowns within the Nigerian aviation environment. It highlights operational realities at MMIA and extends existing communication and human factors research by integrating stakeholder perspectives across multiple aviation roles.

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