

**AIRCRAFT MAINTENANCE PRACTICES IN PROMOTING OPERATIONAL
EFFICIENCY OF LIGHT AIRCRAFT INDUSTRY IN KENYA: CASE OF
WILSON AIRPORT**

BY

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DECLARATION

Student Declaration:

I declare that this research thesis is my original work and has not been presented for a degree or any academic award in any other institution. Any sources used in this project have been appropriately cited and referenced.

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ABSTRACT

Strategic aircraft maintenance practices are critical in enhancing the operational efficiency of the light aircraft industry in Kenya. This study investigates the influence of four key maintenance variables, namely Maintenance Turnaround Time (MT), Technician Skill Level (TS), Preventive versus Corrective Maintenance Ratio (PC), and Compliance with Audit Findings (AF), on operational efficiency at Wilson Airport. The study is anchored on three theoretical perspectives: Market Structure Theory, which explains how the organization of the maintenance environment affects turnaround time and operational outcomes; Resource-Based View (RBV) Theory, which emphasizes the strategic importance of skilled personnel in delivering competitive advantage; and Total Quality Management (TQM), which highlights the role of quality practices in ensuring compliance and balancing preventive and corrective maintenance interventions. An explanatory research design with a quantitative approach is adopted, using structured questionnaires administered to Aeronautical Engineers, Aircraft Maintenance Technicians, Quality Assurance Officers, and Operations Managers. From a target population of 422 personnel, a stratified random sampling technique will be used to draw a representative sample of 201 respondents. A pilot study with a subset of participants will assess the clarity and consistency of the instrument. Content validity will be established through expert review using the Content Validity Index (CVI), while reliability will be confirmed through Cronbach's alpha. Data analysis will involve descriptive statistics, Pearson correlation, and multiple regression to examine the relationships between the independent variables and operational efficiency. The findings are expected to provide evidence-based recommendations for improving aircraft maintenance practices, enhancing workforce competency, strengthening audit compliance, and ultimately supporting sustainable operational efficiency in Kenya's light aircraft sector.

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ABBREVIATIONS AND ACRONYMS

AF – Compliance with Audit Findings

ATC – Air Traffic Control

AFCAC – African Civil Aviation Commission

CASSOA – Civil Aviation Safety and Security Oversight Agency

CVI – Content Validity Index

ICAO – International Civil Aviation Organization

KCAA – Kenya Civil Aviation Authority

MEL – Minimum Equipment List

MT – Maintenance Turnaround Time

PC – Preventive vs Corrective Maintenance Ratio

SMS – Safety Management System

TAT – Turnaround Time

TS – Technician Skill Level

USOAP – Universal Safety Oversight Audit Programme

OPERATIONAL DEFINITION OF TERMS

Maintenance Turnaround Time: This refers to the duration required to complete routine and unscheduled maintenance tasks on light aircraft, from the time an aircraft is grounded to the time it is released back into service. It captures scheduling efficiency, availability of spare parts, and adherence to maintenance timelines (Mutua & Kariuki, 2022). In this study, maintenance turnaround time reflects how effectively maintenance schedules at Wilson Airport influence the operational efficiency of the light aircraft industry in Kenya.

Preventive vs Corrective Maintenance Ratio: This refers to the balance between proactive maintenance activities, such as scheduled inspections and component replacements, and reactive measures undertaken after system failures or defects occur. A higher preventive ratio indicates better reliability, reduced downtime, and enhanced safety (Omondi & Chebet, 2021). In this study, the preventive vs corrective maintenance ratio represents the maintenance philosophy adopted by operators at Wilson Airport to improve aircraft availability and operational efficiency.

Technician Skill Level: This encompasses the knowledge, certifications, and hands-on expertise of aircraft maintenance engineers and technicians. It includes training, licensing, recurrent competency evaluations, and adherence to industry standards such as those set by ICAO and KCAA (Kamau & Otieno, 2023). In this study, technician skill level signifies the human capital capacity at Wilson Airport to perform high-quality maintenance that supports operational efficiency in the light aircraft sector.

Compliance with Audit Findings: This refers to the extent to which operators and maintenance organizations implement corrective actions and recommendations arising from internal and external audits. It includes adherence to regulatory oversight, addressing identified gaps, and ensuring continuous improvement in safety and maintenance practices (Njeri & Mwangi, 2022). In this study, compliance with audit findings represents the degree of regulatory alignment and quality assurance that underpins operational efficiency of light aircraft at Wilson Airport.

Operational Efficiency of the Light Aircraft Industry in Kenya: Operational efficiency in this context refers to the ability of the light aircraft industry to optimize resource utilization, minimize downtime, and enhance safety performance, thereby improving profitability and service reliability. It encompasses reduced maintenance delays, better utilization of aircraft, and adherence to international aviation standards (Gonzalez & Ortega, 2023). In this study, operational efficiency is the dependent variable measuring the overall performance improvements realized through enhanced maintenance practices at Wilson Airport.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The aviation industry has increasingly become a pivotal enabler of economic growth, trade, and regional integration in the modern world. Within this sector, light aircraft operations occupy a unique niche, especially in developing economies such as Kenya where short-haul flights support critical services including business travel, medical evacuation, tourism, agriculture, and pilot training. The sector's contribution to connectivity is undeniable, yet its profitability remains highly dependent on operational efficiency. Among the factors shaping efficiency, maintenance practices are paramount as they influence not only safety and reliability but also cost management, turnaround time, and customer confidence. Poor maintenance practices create systemic inefficiencies that lead to prolonged downtime, elevated operational costs, and loss of market credibility. Examining the role of structured, reliable, and timely maintenance in fostering sustainable profitability has therefore become a central concern in both developed and emerging aviation markets.

One of the most critical maintenance variables influencing profitability is maintenance turnaround time (TAT), defined as the duration required to complete maintenance and return aircraft to operational service. Evidence from advanced aviation markets such as the United States and Germany demonstrates that shorter TAT directly translates to increased fleet utilization and higher operational revenues (Johnson & Miller, 2021). Singapore, a global hub for aviation maintenance, has institutionalized digital monitoring systems to minimize delays and optimize scheduling efficiency (Tan & Chua, 2022). African nations

such as Ethiopia and South Africa have also invested in modern hangar infrastructure to reduce TAT, with Nigeria adopting joint ventures with European partners to modernize its processes (Okeke, 2022). In Kenya, the Kenya Civil Aviation Authority (KCAA) has mandated reporting on maintenance delays as part of its oversight framework, urging operators to align practices with international standards (Mutua, 2023). These developments highlight the centrality of turnaround time in linking operational performance to financial outcomes, particularly within Kenya's light aircraft industry.

Another crucial determinant of operational efficiency is the ratio of preventive to corrective maintenance. Preventive maintenance involves proactive inspections and replacements, while corrective maintenance is reactive, typically occurring after a failure. In North America and Europe, preventive frameworks dominate, guided by reliability-centered maintenance philosophies that reduce unexpected breakdowns and long-term costs (Thompson & Krause, 2020). Japan and Singapore have advanced this model through predictive maintenance technologies that employ data analytics for early fault detection, resulting in improved fleet readiness and profitability (Watanabe & Lee, 2021). Within Africa, South Africa has achieved success through preventive maintenance institutions, while Ghana has integrated International Civil Aviation Organization (ICAO) recommendations to gradually reduce corrective interventions (Amoako, 2021). In Kenya, operators such as Safarilink and Fly ALS have embraced preventive approaches, reducing last-minute disruptions and improving customer trust (Ngugi, 2022). The balance between preventive and corrective strategies is therefore a pivotal factor for enhancing efficiency and profitability within the Kenyan aviation context.

Technician skill levels and certification also stand out as decisive factors in the profitability equation. Skilled and certified maintenance professionals ensure adherence to safety protocols, minimize errors, and guarantee compliance with regulatory requirements. In developed markets such as the United States and the United Kingdom, continuous certification is enforced with evidence demonstrating reduced maintenance-related incidents and improved cost efficiency (Wilson & Clarke, 2021). Singapore's robust training ecosystem further exemplifies the strategic importance of investing in technical human capital, while South Africa and Ethiopia have built strong academies that produce a consistent pipeline of certified aviation professionals (Abebe, 2020). Ghana has partnered with European institutions to improve modular training and certification programs (Boateng, 2021). In Kenya, institutions such as the East African School of Aviation have upgraded their training standards to align with global best practices, yet gaps remain in terms of workforce adequacy and specialized certification for light aircraft maintenance (Kariuki, 2023). The availability of highly skilled and continuously certified technicians therefore directly influences both efficiency and profitability.

Compliance with audit findings further enhances accountability and operational resilience. In developed regions such as the United States and France, high levels of audit compliance are maintained through rigorous enforcement by regulatory bodies, ensuring that safety gaps are promptly addressed (Peters & Laurent, 2020). Singapore has institutionalized audit feedback systems that go beyond compliance to foster a culture of continuous improvement (Tan & Wong, 2021). In Africa, South Africa has built a reputation for strong compliance, while Nigeria continues to grapple with resource constraints that hinder timely implementation of audit recommendations (Okafor, 2022). In Kenya, audit reports from

KCAA often reveal recurrent issues such as documentation lapses and delayed responses to audit findings (Omondi, 2023). Failure to address such findings in a timely manner not only raises safety concerns but also disrupts operational flow, impacting profitability.

In summary, profitability in the light aircraft industry is deeply intertwined with maintenance practices, specifically in areas such as turnaround time, preventive versus corrective maintenance ratios, technician skill levels, and compliance with audit findings. Evidence from international and African contexts shows that nations with structured, proactive, and technologically supported maintenance systems consistently achieve higher operational efficiency and financial resilience. However, Kenya still faces systemic gaps including skill shortages, audit compliance challenges, and fragmented preventive maintenance strategies. This study seeks to address these gaps by systematically examining how maintenance practices influence the profitability of light aircraft operators in Kenya with the goal of proposing practical solutions for enhanced operational efficiency and long-term sustainability.

1.2 Statement of the problem

Aircraft maintenance practices are fundamental to ensuring safety, reliability, and profitability in the aviation sector, particularly within light aircraft operations. A recent audit conducted by the Kenya Civil Aviation Authority (KCAA) on light aircraft operators at Wilson Airport highlighted persistent delays in maintenance turnaround and inadequate resolution of audit findings, both of which directly reduce aircraft availability and operational efficiency. These issues align with the International Civil Aviation Organization (ICAO) Universal Safety Oversight Audit Programme (USOAP, 2022),

which identified gaps in compliance monitoring and follow-up across several developing States, including Kenya. The persistence of unresolved audit findings points to systemic weaknesses in maintenance practices that compromise safety margins while simultaneously diminishing profitability. Since light aircraft contribute significantly to Kenya's domestic aviation sector by enhancing connectivity to remote areas and supporting tourism, agriculture, and medical evacuation, these inefficiencies present serious concerns for both safety and long-term sustainability.

In advanced aviation markets such as the United States and Germany, existing research shows that robust maintenance frameworks characterized by swift turnaround times, higher preventive-to-corrective maintenance ratios, and well-trained, certified personnel have consistently resulted in improved fleet utilization and enhanced profitability. These examples underscore the benefits of aligning maintenance practices with international best practices to achieve efficiency and financial sustainability. Conversely, research from African markets including South Africa and Ghana highlights persistent challenges such as limited audit compliance, shortages of certified technicians, and inadequate access to spare parts. These gaps have undermined efficiency and reduced profitability for operators. While some studies have attempted to document these challenges, the research remains fragmented and fails to capture the broader relationship between maintenance practices and operational performance. This lack of holistic evidence restricts policymakers, regulators, and industry players from making informed, data-driven decisions.

Within Kenya, scholarly work focusing specifically on maintenance practices in light aircraft operations remains limited. Although KCAA audits repeatedly flag critical issues

such as prolonged maintenance turnaround times, weak preventive planning, inadequate technician skill levels, and recurring unresolved audit findings, little empirical research has been conducted to determine how these deficiencies translate into financial outcomes. This gap is significant because while operational inefficiencies are evident, their economic impact on operators has not been rigorously quantified. At the same time, the sector has shown volatility with some companies exiting the market due to high operating costs, foreign exchange fluctuations, and compliance burdens, while new entrants continue to emerge by identifying niche opportunities. This pattern reflects both structural weaknesses and untapped potential within the industry. Yet, there is still a lack of systematic, data-driven analysis explaining why some operators fail while others succeed, leaving operators to rely on reactive measures aimed mainly at regulatory compliance instead of addressing long-term sustainability.

Against this background, there is a pressing need for research that examines the direct impact of maintenance practices on the profitability of light aircraft operations in Kenya. By focusing on key variables such as maintenance turnaround time, the ratio of preventive to corrective maintenance, technician skill levels, and compliance with audit findings, this study seeks to provide empirical evidence linking these practices to operational and financial performance. The findings will inform operators by highlighting areas for efficiency improvement while equipping regulators such as KCAA with insights to strengthen oversight frameworks. Additionally, the study will offer a foundation for benchmarking Kenyan practices against international standards, thereby supporting reforms that enhance both safety and profitability. By filling the research gap within the African context, this study aims to generate practical recommendations that promote

efficiency, reduce operational risks, and ensure sustainable profitability for light aircraft operators at Wilson Airport and across the broader aviation landscape.

1.3 Research Objectives

1.3.1 General Objective

To examine the effect of aircraft maintenance practices on the operational efficiency of the light aircraft industry in Kenya, with a focus on Wilson Airport.

1.3.2 Specific Objectives

- i. To determine the effect of maintenance turnaround time on the operational efficiency of light aircraft at Wilson Airport.
- ii. To assess the influence of the preventive vs corrective maintenance ratio on the operational efficiency of light aircraft at Wilson Airport.
- iii. To evaluate the effect of technician skill level on the operational efficiency of light aircraft at Wilson Airport.
- iv. To examine the influence of compliance with audit findings on the operational efficiency of light aircraft at Wilson Airport.

1.4 Research Hypotheses

H₀₁: Maintenance turnaround time has no statistically significant effect on the operational efficiency of light aircraft at Wilson Airport.

H₀₂: The preventive vs corrective maintenance ratio has no significant influence on the operational efficiency of light aircraft at Wilson Airport.

H₀₃: Technician skill level has no significant effect on the operational efficiency of light aircraft at Wilson Airport.

H₀₄: Compliance with audit findings has no significant influence on the operational efficiency of light aircraft at Wilson Airport.

1.5 Significance of the Study

This study provides important insights into how aircraft maintenance practices shape the operational efficiency of the light aircraft industry in Kenya, with a particular focus on Wilson Airport. Specifically, it examines the influence of maintenance turnaround time, the balance of preventive and corrective maintenance, technician skill levels, and compliance with audit findings on the reliability and efficiency of aircraft operations. For regulators such as the Kenya Civil Aviation Authority (KCAA), the findings will offer evidence-based guidance on areas requiring enhanced oversight, regulatory alignment, and policy intervention to reduce inefficiencies and promote higher maintenance standards. For operators, the study highlights practical approaches to minimizing delays, optimizing fleet availability, and improving adherence to international aviation safety and maintenance frameworks.

At the regional level, the results will benefit organizations such as the African Civil Aviation Commission (AFCAC) and the East African Community Civil Aviation Safety and Security Oversight Agency (CASSOA), which are responsible for harmonizing

aviation safety and maintenance standards across member states. By providing empirical insights into how maintenance variables influence operational efficiency in Kenya, this study will contribute to collaborative efforts to strengthen general aviation and promote consistency in safety oversight across African airspaces. The findings may also inform regional training programs for engineers and auditors, and support the design of maintenance policies that reduce downtime and enhance reliability for operators serving tourism, humanitarian, and business sectors.

From an academic perspective, this research addresses a critical knowledge gap in Sub-Saharan Africa, where most existing studies on maintenance practices focus on large commercial aviation rather than light aircraft operations. It extends scholarly discourse by integrating operational efficiency into the evaluation of maintenance practices, offering a deeper understanding of how human, technical, and regulatory factors intersect to influence aircraft performance. The outcomes will therefore enrich the body of literature available to students, scholars, and practitioners interested in aviation management, maintenance strategies, and air safety governance in developing regions.

Practically, the study will benefit a broad spectrum of aviation stakeholders, including maintenance organizations, aircraft operators, aviation auditors, and policy makers. Recommendations emerging from this research will emphasize actionable improvements in technician training, audit compliance, spare parts management, and maintenance planning, aimed at fostering greater operational efficiency. Ultimately, the findings are expected to guide the transformation of Kenya's light aircraft industry into a more reliable,

efficient, and competitive sector that can support economic growth, regional connectivity, and global aviation safety standards.

1.6 Scope of the Study

This study is confined to assessing how aircraft maintenance practices influence the operational efficiency of the light aircraft industry in Kenya, with Wilson Airport serving as the focal point of analysis. It specifically concentrates on four independent variables: maintenance turnaround time, the ratio of preventive to corrective maintenance, technician skill levels, and compliance with audit findings. These variables are evaluated to determine how they collectively and individually affect aircraft availability, downtime reduction, and overall operational efficiency in the context of light aircraft operations.

The research will primarily focus on operators, maintenance organizations, and regulatory bodies based at Wilson Airport, which is Kenya's busiest hub for light aircraft operations. The geographical scope is therefore limited to Wilson Airport and its associated operators, given its central role in charter services, medical evacuation, tourism, and business aviation. Data will be collected from key stakeholders, including licensed maintenance engineers, aircraft operators, and relevant officials within KCAA. Supporting materials such as maintenance records, audit reports, and technician training logs will also be examined.

The temporal scope of the study covers the period from 2015 to 2025, offering a ten-year perspective on how maintenance practices have evolved and how they influence operational efficiency. This period was chosen to capture both historical and recent shifts

in Kenya's aviation sector, including policy reforms, regulatory changes, and advancements in maintenance technology. By concentrating on this timeframe, the study seeks to provide an up-to-date and contextually relevant analysis.

The study will not address maintenance practices in large commercial aviation or military aviation, nor will it focus on operations outside the jurisdiction of Wilson Airport. In addition, external factors unrelated to maintenance, such as fuel pricing, macroeconomic conditions, or pilot training, are excluded from the scope of analysis. By maintaining this focus, the study aims to generate specific, practical, and evidence-based insights into how maintenance practices can be optimized to enhance the operational efficiency of light aircraft operations in Kenya.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section entails the theoretical framework, literature relevant to the study together with the conceptual framework guiding the study.

2.2 Review of Concepts

This section presents the key concepts that form the foundation of the study. It provides a clear explanation of the central ideas, terminologies, and constructs relevant to the research problem. By defining and contextualizing these concepts, the section establishes a common understanding and framework upon which the subsequent analysis, discussions, and findings are based.

2.2.1 Maintenance Turnaround Time and Operational Efficiency of the Light

Aircraft Industry in Kenya

Maintenance turnaround time is a central determinant of operational efficiency in the aviation industry because it directly influences aircraft availability and utilization rates. Globally, airlines in developed countries such as the United States and Germany have adopted advanced predictive maintenance tools and digital scheduling systems that significantly reduce maintenance delays (Johnson & Weber, 2021). These tools ensure that aircraft return to service promptly, minimizing revenue losses and improving overall operational performance. In Africa, however, many aviation operators still face challenges in meeting internationally accepted turnaround times due to supply chain constraints and

inadequate infrastructure (Nkosi & Mensah, 2022). For instance, South African operators have made progress by integrating digital maintenance tracking systems, while Ghanaian operators still rely heavily on manual scheduling methods (Boateng & Sefah, 2021). In Kenya, light aircraft operators at Wilson Airport report frequent delays caused by late delivery of spare parts and insufficient maintenance slots (Omondi & Kariuki, 2023). Such inefficiencies increase downtime and limit operational efficiency, particularly for charter and humanitarian services that depend on strict scheduling.

The importance of turnaround time lies not only in scheduling but also in how efficiently resources are allocated during maintenance operations. In the United Kingdom and France, lean maintenance practices have been applied to optimize labor use, spare parts inventory, and workflow sequencing, which shortens aircraft downtime (Thompson & Laurent, 2022). These practices directly enhance operational efficiency by ensuring that light aircraft fleets remain serviceable for longer periods. At a regional level, Nigerian aviation operators have adopted phased maintenance strategies to minimize cumulative downtime, while Ethiopian airlines have invested in centralized hangar facilities that reduce logistical bottlenecks (Bekele & Musa, 2021). In Kenya, despite the Kenya Civil Aviation Authority's regulatory efforts, many operators continue to report inefficiencies in scheduling and execution of both routine and unscheduled maintenance (Mwangi & Otieno, 2023). This gap reflects the absence of widespread adoption of digital maintenance systems, which would otherwise streamline processes. Improving turnaround times at Wilson Airport would therefore require investment in modern maintenance planning tools, enhanced supply chain systems, and capacity-building for maintenance personnel.

2.2.2 Preventive vs Corrective Maintenance Ratio and Operational Efficiency of the Light Aircraft Industry in Kenya

The balance between preventive and corrective maintenance is a key factor in determining the reliability and efficiency of aircraft operations. Globally, preventive maintenance is prioritized in highly regulated environments such as the United States and Singapore, where scheduled inspections and component replacements are enforced to reduce unscheduled downtime (Tan & Morris, 2021). These practices are supported by predictive analytics, which enable operators to detect issues before failures occur. By contrast, a reliance on corrective maintenance often results in longer downtime, increased costs, and safety risks. Within the African context, South African carriers have adopted integrated maintenance management systems that track preventive maintenance schedules rigorously, while Ghanaian operators still tend to apply corrective measures after faults arise (Addo & Dlamini, 2022). In Kenya, many light aircraft operators at Wilson Airport struggle to maintain a high preventive-to-corrective ratio due to financial constraints and limited access to advanced diagnostic tools (Njeri & Chebet, 2023). This overreliance on corrective maintenance reduces fleet reliability and negatively impacts operational efficiency.

The ratio between preventive and corrective maintenance also reflects the organizational culture and commitment to safety standards. In European countries such as France and Italy, regulations mandate a minimum preventive maintenance threshold for operators, ensuring compliance with international safety benchmarks (Bianchi & Moreau, 2022). These requirements not only improve operational reliability but also reduce overall costs associated with unplanned downtime. Regionally, Ethiopian Airlines has demonstrated the

benefits of a preventive-dominated philosophy by investing in continuous component monitoring programs, while operators in Uganda still face challenges due to limited technical expertise (Okello & Mwesigwa, 2021). In Kenya, despite efforts by the Kenya Civil Aviation Authority to enforce preventive measures, many light aircraft operators continue to delay scheduled inspections until faults occur (Mutua & Kamau, 2022). This reactive approach undermines operational efficiency by prolonging downtime and increasing maintenance costs. Strengthening regulatory oversight and incentivizing operators to adopt preventive measures could enhance fleet reliability and contribute to greater efficiency in the Kenyan light aircraft industry.

2.2.3 Technician Skill Level and Operational Efficiency of the Light Aircraft Industry in Kenya

The skill level of technicians is a cornerstone of effective maintenance practices, directly influencing safety, reliability, and operational efficiency. In advanced aviation markets such as the United States and Canada, technicians undergo continuous certification and training programs aligned with International Civil Aviation Organization (ICAO) standards (Collins & Rogers, 2021). This ensures that they remain proficient with emerging technologies, maintenance procedures, and safety protocols. In contrast, many African states face persistent skill shortages, which limit their capacity to sustain efficient operations. For example, South Africa has made significant investments in aviation training academies, while Nigerian operators continue to experience shortages of licensed maintenance engineers (Eze & Maduka, 2022). In Kenya, Wilson Airport operators often report delays caused by insufficient numbers of certified technicians and gaps in

specialized training (Kamau & Otieno, 2023). These constraints undermine operational efficiency by prolonging turnaround times and increasing the likelihood of maintenance errors.

High technician skill levels are also associated with the adoption of advanced technologies and compliance with international maintenance standards. In Europe, countries such as Germany and Sweden have invested in simulation-based training, which allows technicians to develop competencies in diagnosing and repairing complex systems (Becker & Holm, 2021). Regionally, Ethiopian Airlines has invested heavily in continuous professional development for its engineers, while Tanzanian operators remain limited by outdated training programs (Mwaisumo & Joseph, 2022). In Kenya, although institutions such as the Kenya School of Flying and Kenya Aeronautical College provide training, the curricula often lag behind modern industry demands (Njeri & Wekesa, 2023). This gap limits technicians' ability to handle contemporary aircraft technologies and reduces operational efficiency at Wilson Airport. Addressing this issue requires expanded investment in advanced training facilities, partnerships with global aviation academies, and mandatory recurrent training programs for technicians.

2.2.4 Compliance with Audit Findings and Operational Efficiency of the Light Aircraft Industry in Kenya

Compliance with audit findings reflects the commitment of aviation organizations to continuous improvement and regulatory alignment, which are essential for operational efficiency. Globally, aviation safety regulators such as the European Union Aviation Safety Agency (EASA) and the Federal Aviation Administration (FAA) emphasize strict

adherence to audit recommendations to close operational gaps (Smith & Jordan, 2021). Failure to implement corrective actions often leads to recurring inefficiencies and safety lapses. In Africa, South Africa has shown strong compliance with audit findings, which has contributed to its high international safety rankings, while Ghana continues to face challenges with implementation of audit recommendations (Asare & Molefe, 2021). In Kenya, audits conducted by the Kenya Civil Aviation Authority and external bodies have frequently highlighted deficiencies in documentation, spare parts management, and technician training at Wilson Airport (Mwangi & Njoroge, 2022). Failure to address these gaps undermines operational efficiency by allowing systemic weaknesses to persist.

Compliance also fosters accountability and instills a culture of safety that enhances long-term operational performance. In countries such as Singapore and Japan, audit compliance is tied to certification renewals, meaning operators must demonstrate improvements before they can continue operations (Lim & Sato, 2022). This ensures that corrective actions are implemented consistently and effectively. Regionally, Ethiopian operators have benefited from strong compliance mechanisms, while Ugandan aviation organizations often fall short due to limited regulatory oversight (Okello & Mugisha, 2021). In Kenya, some light aircraft operators comply selectively with audit findings, addressing only those issues that are inexpensive or easy to resolve (Chebet & Kariuki, 2023). This piecemeal approach reduces the effectiveness of audits and weakens operational efficiency. Strengthening enforcement mechanisms and linking compliance with licensing could ensure that audit findings translate into tangible improvements in Kenya's light aircraft sector.

2.2.5 Operational Efficiency of the Light Aircraft Industry in Kenya

Operational efficiency in the light aircraft industry refers to the ability to minimize downtime, optimize resource utilization, and ensure safe and reliable services. Globally, operators in regions such as Europe and North America have achieved significant efficiency gains through digitization, predictive analytics, and strict adherence to preventive maintenance strategies (Gonzalez & Ortega, 2023). These improvements reduce operational costs and improve profitability while maintaining safety. In Africa, South Africa and Ethiopia have demonstrated how investment in modern maintenance facilities and skilled personnel can enhance operational efficiency (Maseko & Tadesse, 2022). In Kenya, however, inefficiencies at Wilson Airport remain widespread, with operators citing maintenance delays, skill gaps, and weak compliance as barriers to improved performance (Omondi & Mutua, 2023). Addressing these issues is critical for strengthening Kenya's aviation sector and aligning it with international best practices.

The measurement of operational efficiency is often tied to performance indicators such as aircraft availability, turnaround time, safety compliance, and utilization rates. In the United States and Germany, these metrics are integrated into industry benchmarks and regulatory oversight systems to ensure accountability (Richards & Muller, 2021). Regionally, Ghana and Nigeria have made strides in developing operational efficiency indicators but continue to struggle with implementation (Mensah & Adebayo, 2022). In Kenya, the absence of a standardized national framework for monitoring operational efficiency has limited the ability of operators to track improvements consistently (Njeri & Wekesa, 2023).

Developing such a framework, along with stronger regulatory monitoring, could help Kenya enhance the competitiveness and reliability of its light aircraft sector.

2.3 Theoretical Perspectives and gaps

This study is anchored on three theoretical frameworks: Market Structure Theory, the Resource-Based View (RBV), and Total Quality Management (TQM). These theories provide a conceptual foundation for understanding how organizational practices, institutional resources, and quality management strategies influence the operational efficiency of the light aircraft industry in Kenya. Market Structure Theory highlights how the external environment and competitive dynamics shape organizational decisions such as maintenance turnaround times. RBV emphasizes the strategic importance of skilled human resources, particularly technicians, in driving organizational performance. Meanwhile, TQM Theory underlines the role of structured quality processes in strengthening preventive maintenance practices and ensuring compliance with audit findings. Together, these theories form a holistic framework that explains how internal capacities and external pressures interact to shape operational efficiency within Kenya's light aircraft sector.

2.3.1 Resource-Based View (RBV) theory

The Resource-Based View (RBV) Theory was originally developed by Edith Penrose in 1959 and further expanded by Wernerfelt in 1984 and Barney in 1991. The theory posits that organizations gain competitive advantage through the strategic management of internal resources that are valuable, rare, inimitable, and non-substitutable (VRIN). In its natural form, the RBV framework emphasizes that organizational success is largely determined by

how well firms develop, deploy, and protect their internal capabilities. Later developments integrated dynamic capabilities theory, which focuses on how firms adapt their resources in rapidly changing environments (Teece, Pisano, & Shuen, 1997). In the aviation industry, RBV has been applied to explain how specialized knowledge, technical expertise, and infrastructure drive operational performance (Kihara & Muriithi, 2021). The theory has remained influential in strategic management research, especially in contexts where knowledge and skill-intensive operations are key.

When applied to technician skill level, RBV suggests that the competence of aircraft maintenance staff is a critical resource that differentiates high-performing firms from their competitors. Skilled technicians are valuable resources because they ensure that maintenance procedures are completed accurately and efficiently, reducing the likelihood of costly errors or accidents (Mwangi & Otieno, 2022). In Kenya's aviation industry, where light aircraft are heavily used for both commercial and private purposes, technician expertise directly impacts operational reliability. Unlike physical assets that can be purchased, technical know-how must be nurtured through training and experience, making it rare and often inimitable. Studies in African aviation indicate that operators with highly skilled technicians report fewer delays and higher compliance with regulatory requirements (Abdullahi & Yusuf, 2021). As such, technician skill level aligns with the VRIN framework, positioning it as a source of sustainable operational advantage.

Concluding this discussion, RBV underscores the strategic importance of technician expertise as a core determinant of maintenance efficiency in light aircraft operations. In Kenya, where the aviation industry faces both resource and regulatory constraints,

technician skill level emerges as a critical differentiator of firm performance. Maintenance efficiency and safety compliance hinge on the human resource dimension more than on physical infrastructure alone (Kamau & Njenga, 2023). RBV provides a useful framework for explaining why investment in skills development is not merely an operational necessity but a strategic choice. This strengthens the case for prioritizing training and certification of technicians as a means of building sustainable capacity in the sector.

Nonetheless, RBV has been critiqued for being static in nature and overlooking the dynamic environment in which aviation firms operate. It assumes that resources, once acquired, remain valuable and difficult to imitate, yet in reality, skills can depreciate without continuous training and exposure to new technologies (Maina & Kariuki, 2022). Another limitation is that RBV tends to focus on firm-specific resources without adequately considering industry-wide constraints, such as shortage of aviation training institutions in Kenya. Moreover, the theory does not explicitly address how external shocks, such as regulatory changes or technological disruption, affect resource-based advantages. For aviation, where global safety standards evolve rapidly, RBV must therefore be integrated with dynamic capabilities perspectives to remain relevant. This critique demonstrates that while RBV provides important insights into technician skills, it should not be applied in isolation when analyzing aviation operations.

2.3.2 Technology Acceptance Model (TAM)

The Market Structure Theory was first proposed by Edward Chamberlin in 1933 and later refined by Joan Robinson in the same year, focusing on monopolistic competition and its implications for firm behavior and efficiency. The theory explains how the structure of a

market, including the number of firms, the level of competition, and the regulatory environment, influences organizational efficiency and decision-making. The theory argues that competitive pressures force firms to minimize inefficiencies in order to survive and remain profitable. Over the years, scholars such as Porter (1980) expanded the framework by introducing industry forces that shape competitive advantage. More recently, market structure has been analyzed in aviation, where deregulation and liberalization created an environment of competitive pressure on airlines and maintenance providers (Kariuki & Otieno, 2021). The theory remains relevant in explaining how competitive market structures influence the responsiveness of aviation firms to efficiency-related challenges.

In relation to maintenance turnaround time, the Market Structure Theory highlights how competition compels maintenance providers to reduce delays and improve service efficiency. Light aircraft operators in Kenya operate in a dynamic environment where efficiency directly influences their ability to maintain market share (Njeru & Mwangi, 2022). When multiple providers exist within a market, firms strive to minimize maintenance downtime to attract and retain clients, ensuring that aircraft remain operational. A market with few maintenance providers may lead to longer turnaround times due to capacity bottlenecks, while a more competitive structure incentivizes innovation in streamlining processes. Evidence from African aviation markets shows that regulatory liberalization often shortens turnaround time by enhancing competition among maintenance firms (Abebe & Tesfaye, 2021). For light aircraft, quick maintenance turnaround is essential since delays affect scheduled operations and revenue. Thus, the theory helps to explain how market dynamics shape maintenance performance outcomes.

Concluding the application of Market Structure Theory, it becomes evident that the competitive environment plays a pivotal role in determining how efficiently maintenance processes are executed. Turnaround times are not merely technical concerns but are also shaped by economic incentives and structural market forces (Mutua, 2023). In the Kenyan light aircraft industry, where profitability margins are often narrow, firms that fail to optimize turnaround processes risk losing clients to competitors who are more efficient. The theory demonstrates that operational efficiency cannot be separated from the market environment within which aviation firms operate. This underscores the importance of regulatory frameworks that encourage healthy competition to enhance service delivery. The operationalization of market structure in maintenance decisions thus highlights a direct link between economic theory and aviation practice.

Critics of Market Structure Theory, however, argue that it overemphasizes competition while underestimating institutional and organizational factors that influence efficiency. In aviation maintenance, turnaround time may also be constrained by factors such as limited technical expertise, availability of spare parts, and regulatory requirements rather than competition alone (Omondi & Karanja, 2022). Moreover, the theory assumes that all firms have equal capacity to respond to competitive pressures, yet smaller maintenance providers in Kenya may lack the resources to reduce turnaround time despite market incentives. Another critique is that efficiency gains sometimes come at the expense of safety, as firms may prioritize quick turnaround to secure business. This highlights the need to balance competitive pressures with regulatory oversight to ensure that safety remains uncompromised. Therefore, while Market Structure Theory provides valuable insights, it

should be applied alongside operational and institutional considerations in aviation maintenance.

2.3.3 Total Quality Management (TQM)

Total Quality Management (TQM) emerged from the pioneering work of W. Edwards Deming in the 1950s and was later advanced by scholars such as Joseph Juran and Philip Crosby. The theory emphasizes continuous improvement, customer focus, employee involvement, and systematic processes aimed at achieving long-term organizational success. TQM advocates for quality as an organizational-wide responsibility rather than a departmental function. Over time, the framework has evolved to include principles of Six Sigma and ISO standards, making it applicable across industries, including aviation (Owiti & Mugo, 2020). In the aviation sector, TQM is seen as a cornerstone of ensuring safety, compliance, and operational excellence. The theory remains particularly relevant for highly regulated industries where adherence to standards is critical for survival.

Applied to the preventive vs corrective maintenance ratio, TQM highlights the importance of proactive planning and continuous monitoring in reducing system failures. Preventive maintenance aligns with TQM's principle of defect prevention rather than defect detection (Otieno & Chege, 2021). By prioritizing preventive maintenance, aviation firms minimize downtime, reduce costs associated with corrective actions, and enhance safety outcomes. In Kenya, where light aircraft are commonly used for short-haul transport, balancing preventive and corrective maintenance is vital for ensuring continuous availability (Nyangau & Muturi, 2022). Firms adopting TQM practices tend to schedule preventive

tasks rigorously, thereby lowering the frequency of unscheduled repairs. This enhances overall operational efficiency and ensures compliance with safety expectations.

On compliance with audit findings, TQM provides a framework for ensuring that recommendations from internal and external audits are systematically implemented. Audit findings often highlight areas of non-conformance, and TQM's continuous improvement cycle ensures that corrective measures are adopted and embedded in routine practices (Mutiso & Ochieng, 2021). In Kenya, oversight institutions such as the Kenya Civil Aviation Authority (KCAA) emphasize compliance with ICAO safety audits, making TQM principles directly relevant. Firms that institutionalize TQM are more likely to demonstrate sustained compliance, as they integrate audit recommendations into their quality systems. This not only improves safety but also enhances stakeholder confidence in aviation operations. The link between TQM and audit compliance underscores the practical value of the theory in regulated sectors.

In conclusion, TQM integrates both preventive maintenance planning and audit compliance into a coherent framework that enhances overall operational efficiency in aviation. By embedding quality as a collective responsibility, firms ensure that efficiency gains do not compromise safety (Wambua & Kariuki, 2023). For Kenya's light aircraft operators, the theory underscores the value of structured quality programs in enhancing both reliability and regulatory adherence. TQM thus provides a holistic framework for addressing operational challenges while maintaining compliance with international standards.

However, TQM has been critiqued for being resource-intensive and difficult to sustain in environments with limited financial and human resources. Implementing TQM in aviation maintenance requires significant investment in training, documentation, and continuous monitoring, which may strain smaller operators (Mwangi & Githinji, 2022). Another limitation is that TQM can sometimes lead to excessive bureaucracy, slowing down decision-making in fast-paced operational contexts. Furthermore, while TQM emphasizes continuous improvement, it may not always account for sudden industry disruptions such as technological changes or regulatory overhauls. This suggests that while TQM offers a robust framework for preventive maintenance and compliance, it must be adapted to the resource realities of specific contexts. In Kenya, smaller light aircraft operators may therefore require scaled-down models of TQM to achieve efficiency without overburdening their systems

2.4 Empirical literature and hypotheses building

The empirical literature review examines past studies that provide evidence-based insights relevant to the current research problem. It highlights how different scholars have investigated similar variables, the methodologies they adopted, and the findings they reported. This process is important because it not only situates the study within existing scholarship but also helps in identifying gaps that justify the present research. By reviewing prior works, the study gains comparative grounding across different contexts and industries. The following subsections discuss empirical studies related to each of the independent variables, namely maintenance turnaround time, technician skill level, preventive versus corrective maintenance ratio, and compliance with audit findings.

2.4.1 Maintenance Turnaround Time and Operational Efficiency of the Light Aircraft Industry

Maintenance turnaround time refers to the duration taken to complete scheduled or unscheduled aircraft maintenance tasks from the moment the aircraft is withdrawn from service until it is declared airworthy again. According to Turner (2021), maintenance turnaround time is a crucial determinant of aircraft utilization rates, since reduced ground time directly enhances operational efficiency. Similarly, Gonzalez and Weber (2022) defined turnaround time as the cycle period required to diagnose, repair, and validate an aircraft for return to operation, emphasizing its role in reducing delays and cancellations. In a related definition, Qiang and Li (2020) conceptualized turnaround time as the temporal efficiency of maintenance processes, noting its interdependence with organizational capacity and workflow design. Additionally, Adebayo (2023) described it as a performance indicator of maintenance organizations, where extended delays translate into higher operating costs, lower fleet availability, and reduced customer satisfaction. From these perspectives, it is evident that maintenance turnaround time is not merely a technical benchmark but also a critical operational and financial performance driver in the light aircraft industry.

A comprehensive study by Peterson and Hall (2021) in Canada assessed the influence of maintenance turnaround time on operational reliability in charter light aircraft. The findings revealed that shorter turnaround times significantly improved aircraft dispatch reliability and customer trust in aviation firms. The research concluded that operational efficiency was highly dependent on minimizing idle time during maintenance procedures.

However, the study primarily concentrated on major carriers and gave limited attention to smaller-scale light aircraft operators. This creates a gap since light aircraft firms face distinct operational constraints compared to large commercial airlines, and thus findings cannot be generalized. The present study seeks to address this limitation by focusing specifically on the light aircraft industry.

While Peterson and Hall (2021) emphasized Canada, another report by Schneider and Braun (2022) in Germany explored the relationship between turnaround time and resource allocation efficiency. Their research highlighted that excessive turnaround delays were often linked to poor spare parts logistics and misaligned maintenance scheduling. They established that operational efficiency could be strengthened through predictive maintenance supported by digital monitoring systems. Despite the significance of their findings, the study heavily leaned on high-capitalized European firms equipped with advanced digital systems. The research gap exists in the failure to examine how resource-limited operators, particularly in emerging markets, navigate similar challenges. This study therefore aims to explore how turnaround time can still be optimized in resource-constrained environments such as Kenya.

Contrary to findings from developed economies, Okoye and Muthoni (2021) conducted research in Nigeria, examining turnaround time in the maintenance of light aircraft used by flight schools. Their results indicated that limited infrastructure and bureaucratic approvals substantially prolonged turnaround periods, undermining operational efficiency. The researchers suggested that a streamlined regulatory process could significantly reduce maintenance delays. However, their analysis did not comprehensively account for

organizational-level practices such as technician deployment and workflow structuring, which also impact turnaround time. The present study intends to expand upon these findings by integrating organizational variables alongside regulatory considerations.

In another significant contribution, Miller and Johnson (2020) conducted research in the United States on the effects of turnaround time reduction through lean maintenance practices in the light aircraft sector. Their study revealed that lean approaches, including task standardization and waste elimination, reduced turnaround time by nearly 25 percent, thereby improving operational efficiency. Despite these promising results, the study was more applicable to well-established maintenance firms with sufficient resources. Small light aircraft operators, especially those in emerging economies, may lack the financial or technical capacity to implement lean systems comprehensively. Consequently, this leaves a knowledge gap on adaptable strategies suitable for smaller organizations, which this study seeks to address.

A contrasting finding emerged in Spain where Martinez and Gomez (2021) explored the effect of turnaround optimization on private charter firms operating light aircraft. Their research concluded that improvements in turnaround time did not always lead to proportional increases in operational efficiency because other factors such as weather conditions, pilot availability, and regulatory inspections also caused downtime. This highlights that while turnaround time is important, it should not be considered in isolation. The study, however, lacked a clear quantitative evaluation of how much turnaround reduction contributed relative to external factors. The present research intends to bridge this gap by isolating turnaround time impacts more precisely in the Kenyan context.

In France, Dupont and Moreau (2022) studied digital tracking systems and their effect on minimizing turnaround time. They found that firms integrating digital work order management achieved significant reductions in maintenance delays, enhancing aircraft availability. Nevertheless, their research was limited to technologically advanced operators with ready access to digitization tools. Firms in emerging economies may not easily adopt similar solutions due to budgetary and infrastructural constraints. This creates a clear research gap regarding low-cost innovations that can equally shorten turnaround time. The current study will contribute insights into feasible approaches for operators with restricted access to digital platforms.

Research from Qatar by Al-Shehri and Khalid (2021) emphasized the importance of turnaround time for operational efficiency in air taxi services. The study revealed that client satisfaction and repeat patronage were directly tied to how swiftly aircraft could return to service after maintenance. However, the study emphasized customer perception more than internal operational processes. The present study, conversely, will integrate both external and internal factors by assessing how turnaround efficiency influences both service delivery and organizational sustainability in the light aircraft sector.

Similarly, findings from the United Arab Emirates presented by Hassan and Rahman (2022) linked efficient turnaround time to financial performance in light aircraft leasing firms. Their report emphasized that rapid turnaround enhanced fleet utilization rates and increased profit margins. Nevertheless, the study paid little attention to operational efficiency parameters such as safety compliance and workflow effectiveness, which are equally critical. This provides a gap where operational efficiency should be evaluated more

holistically rather than financially alone. The current research will therefore expand the assessment by combining efficiency, safety, and sustainability.

In Singapore, Tan and Wee (2023) investigated maintenance turnaround time in the context of regional light aircraft servicing hubs. Their study demonstrated that centralized maintenance hubs achieved reduced turnaround times compared to decentralized operations. The advantage was attributed to economies of scale and specialized workforce concentration. Despite these findings, the study overlooked the dynamics of smaller-scale operators who cannot access centralized hubs, particularly in geographically expansive countries. This is an important gap that this research intends to address by examining localized contexts such as Kenya where access to central hubs is limited.

In China, Wang and Zhou (2020) evaluated how turnaround time influenced operational readiness in medical evacuation aircraft. Their findings showed that minimized turnaround allowed for higher mission readiness and faster emergency responses, which directly improved service outcomes. Nevertheless, the study primarily analyzed emergency operations rather than routine commercial aviation operations. The present research intends to differentiate between emergency and commercial maintenance dynamics to generate sector-specific recommendations for light aircraft operators.

The empirical evidence across different countries demonstrates that maintenance turnaround time is universally recognized as a critical determinant of operational efficiency in the light aircraft industry. However, differences in technological access, regulatory environments, and organizational capacity result in varying impacts across regions. A clear research gap exists in contextualizing these findings to environments such as Kenya, where

resource limitations and infrastructure challenges are pronounced. Therefore, this study will contribute by analyzing how maintenance turnaround time influences operational efficiency within Kenya's light aircraft sector, thereby extending the global discussion into underexplored contexts.

2.4.2 Technician Skill Level and Operational Efficiency in the Light Aircraft Industry

Technician skill level refers to the technical knowledge, hands-on expertise, and ability of maintenance professionals to carry out specialized tasks within the aviation sector. According to Simmons (2021), technician skill level can be defined as the depth of specialized competence that maintenance staff hold in executing repairs, inspections, and modifications on aircraft systems. On the other hand, Leblanc and Nguyen (2022) described it as the combination of professional certifications, problem-solving ability, and adaptability in using advanced maintenance technologies. Further, Zhang and Li (2023) argued that technician skills extend beyond training to include critical thinking and practical experience accumulated through exposure to diverse aircraft maintenance scenarios. Similarly, Muriithi (2021) viewed skill level as the measure of alignment between technicians' competencies and international aviation standards, which directly impacts safety and efficiency. Collectively, these perspectives highlight technician skill level as a multidimensional construct that integrates knowledge, practical experience, and regulatory compliance, all of which influence operational efficiency within the light aircraft industry.

A study conducted by Anderson and Cooper (2021) in the United States established that well-trained technicians with diverse skill sets significantly reduce maintenance errors,

consequently improving the operational efficiency of light aircraft. Their findings emphasized that skill diversity, continuous training, and familiarity with evolving aircraft technologies contribute to shorter repair times and higher safety margins. While their study demonstrated the value of skill development, it failed to account for regional variations in training curricula across different continents, creating a gap for comparative studies. This study therefore proposes to address the gap by exploring technician skill levels in regions where aviation resources are limited, thereby broadening the discourse beyond developed economies.

Contrary to the American experience, Müller and Schneider (2022) in Germany reported that skill level was not solely influenced by formal training but also by the organizational culture that promoted teamwork and mentorship. Their findings suggested that when technicians engaged in collaborative problem solving, efficiency in light aircraft operations improved regardless of individual certification levels. Although insightful, their research did not examine how regulatory frameworks might strengthen or weaken the application of these skills, particularly in less regulated environments. The proposed study seeks to fill this gap by analyzing both formal and informal factors that contribute to technician skill levels in varied settings.

In a comparative study, Dubois and Laurent (2021) in France reported that airlines investing heavily in simulator-based training and scenario rehearsals improved technician responsiveness to unforeseen maintenance challenges. Their research confirmed that such training reduced downtime and ensured operational efficiency in light aircraft fleets. However, their study largely focused on large carriers and did not sufficiently consider

light aircraft operators that often operate on limited budgets. The present study aims to address this limitation by investigating how cost-effective training methods can still enhance technician competence in resource-constrained environments.

Meanwhile, research by Okeke and Adebayo (2022) in Nigeria indicated that technicians with limited international certification encountered challenges when handling sophisticated aircraft systems. Their findings emphasized that lack of exposure to global maintenance standards increased turnaround times and operational inefficiencies. While the study provided valuable insights, it did not compare the Nigerian context with global trends, which would have enriched the discussion. The current research intends to bridge this gap by drawing lessons from both developed and developing contexts.

Further, Patel and Ramesh (2022) in Canada documented that skill enhancement programs focusing on digital diagnostics and predictive maintenance significantly improved operational efficiency in light aircraft fleets. Their findings demonstrated that technicians with higher digital proficiency managed to reduce both scheduled and unscheduled maintenance downtimes. Despite its contribution, the study overlooked the challenge of balancing traditional mechanical skills with emerging digital requirements, creating a gap that this research intends to address.

Similarly, Tan and Wong (2023) in Singapore observed that continuous professional development programs that incorporated both classroom and on-the-job training improved the readiness of technicians in handling advanced avionics systems. Their research highlighted that the integration of theoretical knowledge with practical skills ensured operational consistency in light aircraft. Nevertheless, they failed to consider the financial

implications of sustaining such programs in small-scale aviation companies. This study proposes to fill that gap by assessing cost-effective ways to maintain training standards in light aircraft industries with limited budgets.

A study by Johnson and Brown (2021) in the United Kingdom revealed that technician skill levels improved significantly in organizations that adopted international best practices through partnerships with global aviation institutions. Their findings emphasized that exposure to international workshops and benchmarking contributed to higher efficiency and reduced aircraft downtimes. However, the study did not evaluate whether such international collaborations could be sustained by smaller operators. The proposed study aims to fill this gap by examining alternative models of skill development for light aircraft operators.

Additionally, Al-Mansoori and Hassan (2022) in the United Arab Emirates reported that technician skill levels were strongly influenced by investments in cutting-edge training technologies such as virtual reality-based maintenance modules. Their research concluded that the use of immersive technologies significantly enhanced technician proficiency and contributed to operational efficiency. Nonetheless, they did not account for differences in adoption capacity between technologically advanced regions and developing nations. This study therefore aims to extend the analysis by evaluating how both advanced and less advanced operators can enhance technician skills under varying resource levels.

Research by Gonzalez and Perez (2021) in Spain indicated that technician skill gaps often resulted from reliance on outdated training manuals that did not reflect modern aircraft designs. Their findings showed that when technicians lacked up-to-date skills, operational

efficiency in light aircraft suffered considerably. Although their study raised an important concern, it did not offer practical strategies for continuous knowledge updates. The present research proposes to investigate sustainable mechanisms for ensuring that technician training keeps pace with evolving aircraft technologies.

Finally, Wang and Zhou (2023) in China demonstrated that technician skill levels directly influenced the safety and operational efficiency of light aircraft by reducing both human error and maintenance backlogs. Their findings supported the argument that investing in technician development creates long-term efficiency benefits. Yet, their research did not explore the role of regulatory oversight in ensuring standardized skill levels across different operators. The proposed study will attempt to fill this gap by integrating regulatory perspectives into the analysis of technician skill levels.

In conclusion, the empirical evidence reviewed demonstrates that technician skill level is a critical factor in enhancing the operational efficiency of light aircraft across different contexts. While studies across Europe, North America, Asia, and Africa confirm the positive relationship between technician expertise and operational efficiency, notable gaps remain. Many studies fail to consider financial sustainability, regulatory influence, and the specific challenges faced by light aircraft operators compared to larger carriers. This study intends to address these gaps by offering a comprehensive analysis that integrates cost-effectiveness, regulatory frameworks, and global best practices in technician skill development.

2.4.3 Preventive vs Corrective Maintenance Ratio and Operational Efficiency of Light Aircraft Industry

The preventive versus corrective maintenance ratio refers to the balance between proactive interventions aimed at preventing mechanical failures and reactive actions taken after breakdowns occur. According to García and Molina (2021), preventive maintenance encompasses scheduled servicing, inspections, and timely replacement of parts, ensuring that aircraft components do not fail during operation. Conversely, corrective maintenance involves addressing failures only after they occur, often resulting in higher operational risks and delays (Chen et al., 2022). Scholars like Wahome and Karanja (2023) emphasize that a higher preventive maintenance ratio contributes to longer component life cycles, reduced maintenance costs, and better safety outcomes. On the other hand, Al-Kuwari (2020) asserts that corrective maintenance, while unavoidable in some cases, negatively impacts fleet availability and reliability. Thus, the balance between preventive and corrective approaches remains a critical determinant of the operational efficiency of the light aircraft industry.

A study by Müller and Schneider (2021) in Germany investigated the effect of preventive maintenance ratios on fleet availability in small charter firms. Their research found that companies with higher ratios of preventive to corrective maintenance reported fewer unscheduled breakdowns and improved customer satisfaction levels. The study concluded that proactive approaches enhanced cost predictability and operational reliability. However, it failed to address the unique financial constraints faced by smaller operators in developing regions, such as those in Africa, where resources are scarce. This leaves a gap

on how limited-resource firms can implement preventive-heavy strategies effectively without compromising financial sustainability. The current study seeks to address this by exploring practical frameworks suited for light aircraft firms operating under financial pressure.

In Spain, Alvarez and Dominguez (2022) explored the operational implications of corrective maintenance dominance in light aircraft fleets. Their findings indicated that organizations overly dependent on corrective approaches experienced recurrent ground delays, increased turnaround times, and higher incident reports. These inefficiencies translated to lost revenue and reduced customer confidence, further weakening the industry's competitiveness. Although the study highlighted important outcomes, it concentrated only on larger fleet operators, leaving the smaller charter operators unexamined. This created a research gap in understanding how corrective-heavy strategies affect smaller light aircraft businesses. By narrowing down to light aircraft operators in Kenya, the present study aims to fill this contextual gap.

Contrary to European findings, Zhang and Liu (2021) in China reported mixed results regarding preventive maintenance ratios. Their research across regional airlines revealed that while preventive-heavy strategies reduced unexpected downtime, they significantly increased short-term maintenance costs. This caused financial strain on operators with limited revenue streams, creating a trade-off between safety and profitability. Although the study provides important financial insights, it generalized across all classes of airlines without differentiating light aircraft operators. The current study proposes to contextualize such findings by specifically focusing on light aircraft operations, where budgets and scales

of operations differ considerably. This is crucial since light aircraft companies often lack the financial robustness of major airlines.

In the United States, a study by Johnson and Perez (2023) analyzed how preventive versus corrective ratios affected on-time performance among regional air taxi operators. Their findings suggested that higher preventive ratios correlated with significantly reduced delays and enhanced operational reliability. Furthermore, the study concluded that preventive maintenance was a critical enabler of sustainable growth among light aircraft firms. However, the analysis did not account for the technological limitations faced by firms outside highly digitized economies. The current study intends to explore how technological limitations affect the ability of firms in developing countries to maintain high preventive ratios. This represents a critical gap in contextual applicability.

In the United Kingdom, Brown and Taylor (2021) studied maintenance data from private light aircraft used for training institutions. They discovered that institutions emphasizing preventive maintenance not only reduced operating costs but also enhanced training schedules and safety outcomes. Preventive-heavy strategies allowed predictable maintenance planning that minimized class disruptions and improved resource allocation. Nonetheless, their study narrowly focused on training environments and not on commercial operators. The present research intends to extend these findings by looking at charter operations, which are highly time-sensitive and client-oriented. This provides a new perspective that training-focused studies overlooked.

In Canada, Roy and Lefebvre (2022) evaluated maintenance practices across remote air service providers. Their findings indicated that preventive-heavy ratios were particularly

valuable in regions with harsh weather conditions, where corrective approaches often led to service cancellations. This improved long-term cost efficiency despite higher upfront expenses. However, the study only looked at geographical challenges and ignored other operational factors such as labor availability and spare part access. The current study intends to explore these additional operational elements to provide a broader understanding of how preventive versus corrective maintenance ratios influence efficiency. Such exploration is especially necessary in African contexts where supply chain issues are common.

A comparative study in France by Laurent and Bouchard (2020) found that the preventive maintenance ratio directly influenced aircraft readiness levels, with higher ratios yielding better preparedness for peak operations. Despite this, the study also acknowledged that corrective actions could not be entirely eliminated due to the unpredictability of certain failures. This indicates that a balanced mix is necessary for optimal results. However, the research gap lies in determining the most efficient ratio for small-scale operators with limited fleet sizes, as most studies generalized across larger operators. The current study proposes to determine this balance within Kenya's light aircraft industry. This will enhance understanding of practical applications in small fleet contexts.

In the UAE, a report by Al-Mansoori (2023) highlighted that operators heavily focused on corrective maintenance experienced greater regulatory scrutiny and more frequent safety audit failures. Preventive maintenance, on the other hand, was found to improve compliance with international safety standards and reduce overall audit-related costs. Although the report provided regulatory insights, it was limited to large commercial

airlines and ignored the unique characteristics of the light aircraft industry. This creates a contextual gap that the present study aims to address by assessing smaller operators in Kenya. Such an approach will offer practical recommendations that are tailored to the realities of resource-limited firms.

In Africa, a study by Mutua and Ochieng (2021) on Kenyan charter firms highlighted that preventive maintenance significantly reduced fuel inefficiency and contributed to better turnaround times. Their findings reinforced the importance of prioritizing preventive approaches in environments where spare part acquisition is slow and costly. However, the study was limited by its focus on only two firms, thereby limiting the generalizability of its findings. The current study will expand this scope by involving multiple operators within the Kenyan light aircraft industry. This will help to generate more robust evidence that captures industry-wide practices. Such findings will be invaluable in recommending optimal strategies suited to the local aviation ecosystem.

In conclusion, the reviewed literature demonstrates that the preventive versus corrective maintenance ratio is a crucial determinant of operational efficiency in the light aircraft industry. Studies across Europe, Asia, and North America emphasize the benefits of preventive-heavy approaches, including improved safety, reduced downtime, and higher customer satisfaction. Nevertheless, they also highlight cost and implementation challenges, particularly for smaller operators with limited budgets. Existing research is often skewed towards large airlines or specific contexts like training environments, leaving significant gaps in understanding for light aircraft operators. The current study intends to bridge these gaps by focusing on Kenyan operators, whose operational, financial, and

regulatory environments differ from first-world contexts. By doing so, it will offer tailored insights that align with the realities of resource-limited aviation industries.

2.4.4 Compliance with Audit Findings and Operational Efficiency of the Light Aircraft Industry

Compliance with audit findings refers to the extent to which operators implement corrective and preventive actions arising from external regulatory audits and internal quality audits within aviation organizations. According to Walters and Kimani (2021), compliance entails timely closure of nonconformities, documented evidence of remediation, and verification of sustained effectiveness across maintenance processes. In a related framing, Pereira and Duarte (2022) describe compliance as the organizational discipline that translates audit observations into standardized procedures, updated manuals, and measurable performance controls. Meanwhile, Ochieng and Muthoka (2023) define compliance in small-aircraft maintenance as adherence to regulator directives, safety management system requirements, and continuing airworthiness instructions issued by type certificate holders. Similarly, Laurent and Dubois (2024) conceptualize compliance as a dynamic cycle involving root cause analysis, corrective action planning, implementation milestones, and independent follow-up assessments to prevent recurrence. These perspectives collectively show that compliance with audit findings operates as a governance mechanism that strengthens operational reliability, safety assurance, and efficiency outcomes in light aviation enterprises (Pereira & Duarte, 2022; Laurent & Dubois, 2024).

A multi-state analysis by Carter and Reynolds (2021) in the United States examined general aviation operators subject to surveillance under standardized oversight programs and linked high audit-closure performance to reduced technical delays and fewer return-to-base events. Their findings indicated that organizations closing findings within thirty days achieved measurable gains in aircraft availability and dispatch reliability relative to slower peers. Although the results were compelling, the study concentrated on operators with mature digital record systems that simplified evidence submission and follow-up. This concentration introduced an implementation bias, since many small light-aircraft firms still maintain hybrid records that complicate verification steps. The gap therefore concerns the efficiency effects of compliance where documentation systems remain partly manual and resource constrained. The present study addresses this gap by focusing on light aircraft operators whose documentation and workflows resemble typical conditions at Wilson Airport in Nairobi (Carter & Reynolds, 2021).

A sector report by Davies and Thorpe (2022) in the United Kingdom evaluated Civil Aviation Authority audit outcomes across private charter companies and correlated repeat-finding rates with schedule integrity. Companies with declining repeat findings demonstrated improved on-time departures and fewer maintenance-related cancellations over successive audit cycles. Nevertheless, the report offered limited analysis of the specific corrective actions that most strongly influenced efficiency, such as tooling controls, calibration programs, or component traceability. Without that granularity, the causal chain between finding closure and operational metrics remained partially inferred rather than rigorously isolated. This omission leaves a methodological gap concerning which corrective actions deliver the greatest efficiency impact in small fleets. The current

study proposes to quantify these relationships by mapping audit themes to discrete operational efficiency indicators in Kenya (Davies & Thorpe, 2022).

In Germany, Köhler and Brandt (2023) analyzed oversight data from continuing airworthiness management organizations supporting mixed-age light aircraft fleets and assessed how timely closure of audit findings affected readiness during peak seasons. Operators demonstrating rapid closure achieved higher aircraft utilization and shorter maintenance deferment queues during summer months. However, the authors noted that older airframes exhibited persistent documentation discrepancies even after closure, which diluted efficiency gains in some cases. The study therefore highlighted the moderating role of fleet age on the compliance–efficiency relationship. This observation creates a gap around how compliance strategies should be tailored for aging aircraft common in developing markets. Our research examines this interaction in the Kenyan context where legacy types remain widely operated (Köhler & Brandt, 2023).

A French longitudinal study by Martin and Giraud (2021) followed light charter operators through two audit cycles and tracked changes in repeat discrepancies, component control breaches, and tool calibration lapses. Declines in repeat discrepancies coincided with smoother maintenance planning and fewer ground holds attributable to paperwork or tooling anomalies. Yet, the authors cautioned that some improvements reflected temporary surge staffing around audit periods rather than embedded process change. This caution suggests that audit-driven gains may decay if organizations treat compliance as episodic rather than continuous. The gap therefore involves distinguishing sustained process maturity from short-term audit preparation behaviors. The present study incorporates time-

separated measurements to evaluate durability of efficiency improvements post-audit in Kenya (Martin & Giraud, 2021).

In Singapore, Teo and Liew (2022) assessed corrective action management within approved maintenance organizations supporting regional light aircraft fleets, focusing on regulator follow-up intervals and evidence quality. High-quality root cause analyses and quantified acceptance criteria were associated with faster regulator sign-off and fewer subsequent technical delays. Conversely, superficial causal analyses produced recurrent snags that re-emerged within two quarters, undermining efficiency gains. Although the study demonstrates the value of analytical rigor, it did not evaluate resource-appropriate templates for smaller firms operating outside major hubs. This limitation matters because many light-aircraft operators cannot sustain extensive analytical tooling or specialist compliance teams. Our study tests streamlined root cause frameworks that match staffing realities at Wilson Airport (Teo & Liew, 2022).

Evidence from the United Arab Emirates by Al-Harthy and Salman (2023) examined digital compliance dashboards that tracked finding status, owner accountability, and closure deadlines across multiple bases. Dashboards correlated with shorter closure times and visible reductions in aircraft downtime, especially where escalation rules triggered managerial intervention. Nonetheless, the research presupposed robust connectivity, integrated enterprise systems, and centralized data governance. Such prerequisites may not hold in fragmented operator environments or in regions with intermittent connectivity. The gap therefore concerns low-cost visibility mechanisms that still deliver accountability without heavy systems investment. The current study evaluates pragmatic scorecards and

tiered review meetings suitable for Kenyan light-aircraft operators (Al-Harthy & Salman, 2023).

A Canadian mixed-methods inquiry by Chen and Lavoie (2020) linked Transport Canada surveillance outcomes with operational metrics among remote service providers operating small fleets. Operators that institutionalized post-audit learning forums and updated procedures within two weeks saw measurable gains in dispatch reliability and fewer MEL-related deferrals. However, the study did not quantify the cost burden of rapid procedural updates on small enterprises, including document control labor and recurrent training. Without cost visibility, managers may underinvest in compliance infrastructure despite clear efficiency benefits. This introduces a gap regarding proportional, affordable compliance models for small fleets. Our research estimates effort hours and training load associated with closure pathways in Kenya (Chen & Lavoie, 2020).

South African evidence from Ndlovu and Pretorius (2021) compared compliance trajectories of air charter firms before and after adoption of integrated findings registers monitored by accountable managers. Post-adoption periods showed fewer repeat noncompliances and shorter maintenance-induced delays on high-demand routes. Even so, the study did not disaggregate which audit categories drove the efficiency gains, such as maintenance planning, tooling control, or parts traceability. That lack of disaggregation limits transferability of lessons to other jurisdictions, including Kenya. A clear gap remains in attributing efficiency outcomes to specific finding families that are common in light aircraft maintenance. The present study therefore tags efficiency metrics to categorized findings typical at Wilson Airport (Ndlovu & Pretorius, 2021).

In Ghana, Asare and Boateng (2022) examined NCAA-style audits applied to light operators and found that timely closure of airworthiness findings reduced administrative holds and expedited certificate renewals. While efficiency improved during renewal cycles, the study acknowledged inconsistent vendor documentation which slowed evidence compilation. The inconsistency suggests supply-chain induced compliance bottlenecks that sit outside operator direct control. This reality complicates the compliance–efficiency relationship for small firms relying on diverse vendors. Our study incorporates supplier documentation practices as a moderating variable within the Kenyan ecosystem, where multi-vendor sourcing is common (Asare & Boateng, 2022).

Kenyan fieldwork by Njeri and Wekesa (2023) reviewed KCAA audit histories for Wilson-based operators and associated closure performance with ground time attributable to administrative or technical blocks. Operators with structured corrective action registers and scheduled verification checks experienced shorter ground delays and fewer documentation holds during spot inspections. Nevertheless, the study did not connect compliance progress to broader operational efficiency indicators such as aircraft utilization and on-time departures. This omission left the operational impact only partially demonstrated rather than fully quantified. The gap therefore lies in linking closure trajectories to a balanced set of efficiency measures relevant to light aircraft. The current study directly models those linkages using operator data from Wilson Airport (Njeri & Wekesa, 2023).

In summary, empirical literature across North America, Europe, the Middle East, and Africa consistently associates strong compliance with audit findings with improved operational efficiency indicators in light aviation. Studies show that timely closure,

rigorous root cause analysis, and transparent accountability mechanisms reduce repeat discrepancies, shorten ground delays, and enhance aircraft availability. However, important gaps persist regarding small-fleet realities, cost-sensitive implementation, hybrid documentation environments, and supply chain documentation risks. These gaps are particularly salient for Kenyan light aircraft operators centered at Wilson Airport, where resources, infrastructure, and vendor ecosystems differ markedly from first-world hubs. The present study responds by testing proportionate compliance practices, mapping specific finding families to efficiency metrics, and evaluating durability of improvements beyond audit windows. The anticipated contribution is a context-fit model that strengthens audit closure discipline while measurably improving operational efficiency in Kenya's light aircraft sector.

2.5 Summary of gaps and Conceptual framework for the study

Table 2.1 Summary of knowledge gap

Variable	Authors and Context	Focus of Study (Study Topic)	Major Findings	Gaps in Research	Key Findings
Maintenance Turnaround Time	Peterson & Hall (2021), Canada	Influence of turnaround time on operational reliability in charter light aircraft	Shorter turnaround improved dispatch reliability and customer trust	Limited focus on small-scale operators	Operational efficiency linked to minimizing idle maintenance time
Maintenance Turnaround Time	Schneider & Braun (2022), Germany	Turnaround time and resource allocation efficiency	Delays linked to poor logistics; predictive maintenance improved efficiency	Findings limited to capitalized European firms	Digital monitoring strengthens scheduling efficiency

Variable	Authors and Context	Focus of Study (Study Topic)	Major Findings	Gaps in Research	Key Findings
Maintenance Turnaround Time	Okoye & Muthoni (2021), Nigeria	Turnaround time in flight school light aircraft	Bureaucratic approvals prolonged turnaround	Did not consider organizational practices like technician deployment	Regulatory streamlining reduces delays
Maintenance Turnaround Time	Miller & Johnson (2020), USA	Lean practices reducing turnaround in light aircraft	Lean maintenance reduced turnaround by 25%	Not adaptable for resource-limited small operators	Lean systems boost efficiency when feasible
Maintenance Turnaround Time	Martinez & Gomez (2021), Spain	Optimization impact on charter firms	External factors limited turnaround effect	No clear quantitative isolation of turnaround contribution	Turnaround matters but interacts with external downtime causes
Maintenance Turnaround Time	Dupont & Moreau (2022), France	Digital tracking systems for minimizing turnaround	Digital work order management reduced delays	Limited to advanced economies	Digitization improves aircraft availability
Maintenance Turnaround Time	Al-Shehri & Khalid (2021), Qatar	Turnaround and customer satisfaction in air taxi services	Faster turnaround tied to client trust	Focused mainly on customer perception	Turnaround influences both service quality and sustainability
Maintenance Turnaround Time	Hassan & Rahman (2022), UAE	Turnaround and financial performance in leasing firms	Faster turnaround increased profits	Overlooked safety and workflow efficiency	Efficiency should be evaluated holistically
Maintenance Turnaround Time	Tan & Wee (2023), Singapore	Centralized hubs and turnaround reduction	Hubs reduced turnaround via economies of scale	Overlooked small-scale operators outside hubs	Centralization benefits large operators, not all
Maintenance Turnaround Time	Wang & Zhou (2020), China	Turnaround in medical evacuation aircraft	Shorter turnaround improved mission readiness	Emergency context, not commercial	Readiness benefits differ in routine operations

Variable	Authors and Context	Focus of Study (Study Topic)	Major Findings	Gaps in Research	Key Findings
Technician Skill Level	Anderson & Cooper (2021), USA	Technician training and skill diversity	Training reduced errors and improved efficiency	Ignored regional training differences	Diverse skills reduce downtime
Technician Skill Level	Müller & Schneider (2022), Germany	Organizational culture influence on skills	Teamwork and mentorship improved efficiency	Overlooked regulatory frameworks	Culture complements training in skill application
Technician Skill Level	Dubois & Laurent (2021), France	Simulator training and responsiveness	Reduced downtime through rehearsal training	Focused on large carriers only	Scenario training boosts efficiency
Technician Skill Level	Okeke & Adebayo (2022), Nigeria	Skill limitations without international certification	Limited exposure led to inefficiencies	Did not compare global standards	Certification gaps hinder performance
Technician Skill Level	Patel & Ramesh (2022), Canada	Digital diagnostics and predictive maintenance skills	Digital proficiency reduced downtime	Overlooked balance with mechanical skills	Tech-based skills critical for efficiency
Technician Skill Level	Tan & Wong (2023), Singapore	Professional development and avionics handling	Combined training improved consistency	Ignored cost burden for small firms	Continuous training raises readiness
Technician Skill Level	Johnson & Brown (2021), UK	International best practices partnerships	Exposure improved efficiency and reduced downtime	Sustainability of collaborations for small operators unexamined	Global partnerships enhance skills
Technician Skill Level	Al-Mansoori & Hassan (2022), UAE	Advanced training technologies (VR modules)	Immersive tech enhanced technician proficiency	Adoption feasibility in developing nations not studied	VR can significantly raise skill level

Variable	Authors and Context	Focus of Study (Study Topic)	Major Findings	Gaps in Research	Key Findings
Technician Skill Level	Gonzalez & Perez (2021), Spain	Outdated training manuals	Inefficient outcomes from obsolete skills	Lacked practical solutions for updating knowledge	Continuous update essential for efficiency
Technician Skill Level	Wang & Zhou (2023), China	Technician skills and operational safety	Skills reduced errors and backlog	Ignored regulatory oversight role	Skills strengthen safety and efficiency
Preventive vs Corrective Maintenance	Müller & Schneider (2021), Germany	Preventive maintenance and fleet availability	Proactive approaches improved reliability	Did not address small operators' financial limits	Preventive reduces unscheduled breakdowns
Preventive vs Corrective Maintenance	Alvarez & Dominguez (2022), Spain	Corrective-heavy strategies in large fleets	More delays, higher incidents, lost revenue	Did not examine small operators	Corrective focus undermines efficiency
Preventive vs Corrective Maintenance	Zhang & Liu (2021), China	Preventive-heavy costs vs efficiency	Reduced downtime but increased costs	Did not isolate light aircraft operators	Trade-offs exist between safety and cost
Preventive vs Corrective Maintenance	Johnson & Perez (2023), USA	Preventive ratios and on-time performance	Preventive improved reliability and reduced delays	Ignored tech limits outside digitized economies	Preventive supports sustainable growth
Preventive vs Corrective Maintenance	Brown & Taylor (2021), UK	Preventive in training institutions	Reduced costs and improved safety	Only examined training environments	Preventive improves predictability
Preventive vs Corrective Maintenance	Roy & Lefebvre (2022), Canada	Preventive in harsh weather contexts	Preventive improved efficiency in remote areas	Ignored labor and spare part access	Preventive aids resilience in remote ops
Preventive vs Corrective Maintenance	Laurent & Bouchard (2020), France	Ratio impact on readiness	Higher preventive ratios improved readiness	Did not determine optimal ratio for small fleets	Balanced mix required

Variable	Authors and Context	Focus of Study (Study Topic)	Major Findings	Gaps in Research	Key Findings
Preventive vs Corrective Maintenance	Al-Mansoori (2023), UAE	Corrective focus and audit failures	Corrective-heavy led to greater regulatory scrutiny	Only examined large airlines	Preventive boosts compliance and efficiency
Preventive vs Corrective Maintenance	Mutua & Ochieng (2021), Kenya	Preventive in charter firms	Preventive reduced inefficiency and improved turnaround	Limited to two firms	Preventive critical in Kenya's context
Compliance with Audit Findings	Carter & Reynolds (2021), USA	Closure rates and operational reliability	Faster closure improved reliability	Limited to digital record systems	Timely closure enhances availability
Compliance with Audit Findings	Davies & Thorpe (2022), UK	Audit outcomes in charter companies	Declining repeat findings improved on-time performance	Did not analyze specific corrective actions	Closure discipline improves schedules
Compliance with Audit Findings	Köhler & Brandt (2023), Germany	Audit closure in mixed fleets	Rapid closure improved utilization	Moderating role of aging fleets overlooked	Compliance linked to higher readiness
Compliance with Audit Findings	Martin & Giraud (2021), France	Audit cycles and discrepancy trends	Reduced discrepancies improved efficiency	Short-term vs sustained compliance not addressed	Continuous compliance ensures durable efficiency
Compliance with Audit Findings	Teo & Liew (2022), Singapore	Corrective action management	Rigorous root cause analysis reduced delays	Resource-appropriate templates missing	Analytical rigor improves compliance
Compliance with Audit Findings	Al-Harthy & Salman (2023), UAE	Digital compliance dashboards	Dashboards shortened closure times	Prerequisites unrealistic for small operators	Visibility boosts accountability
Compliance with Audit Findings	Chen & Lavoie	Audit outcomes and	Rapid updates improved	Cost burden of rapid	Learning forums boost compliance

Variable	Authors and Context	Focus of Study (Study Topic)	Major Findings	Gaps in Research	Key Findings
Compliance with Audit Findings	(2020), Canada Ndlovu & Pretorius (2021), South Africa	learning forums Integrated findings registers	dispatch reliability Fewer noncompliance s and delays post-adoption	compliance unstudied Did not disaggregate audit categories	Registers improve closure effectiveness
Compliance with Audit Findings	Asare & Boateng (2022), Ghana	NCAA-style audits in light operators	Closure improved renewals and efficiency	Vendor documentation inconsistencies ignored	Vendor practices influence compliance
Compliance with Audit Findings	Njeri & Wekesa (2023), Kenya	KCAA audit histories of Wilson operators	Structured registers improved efficiency	Did not link compliance to full efficiency measures	Closure discipline reduced ground delays

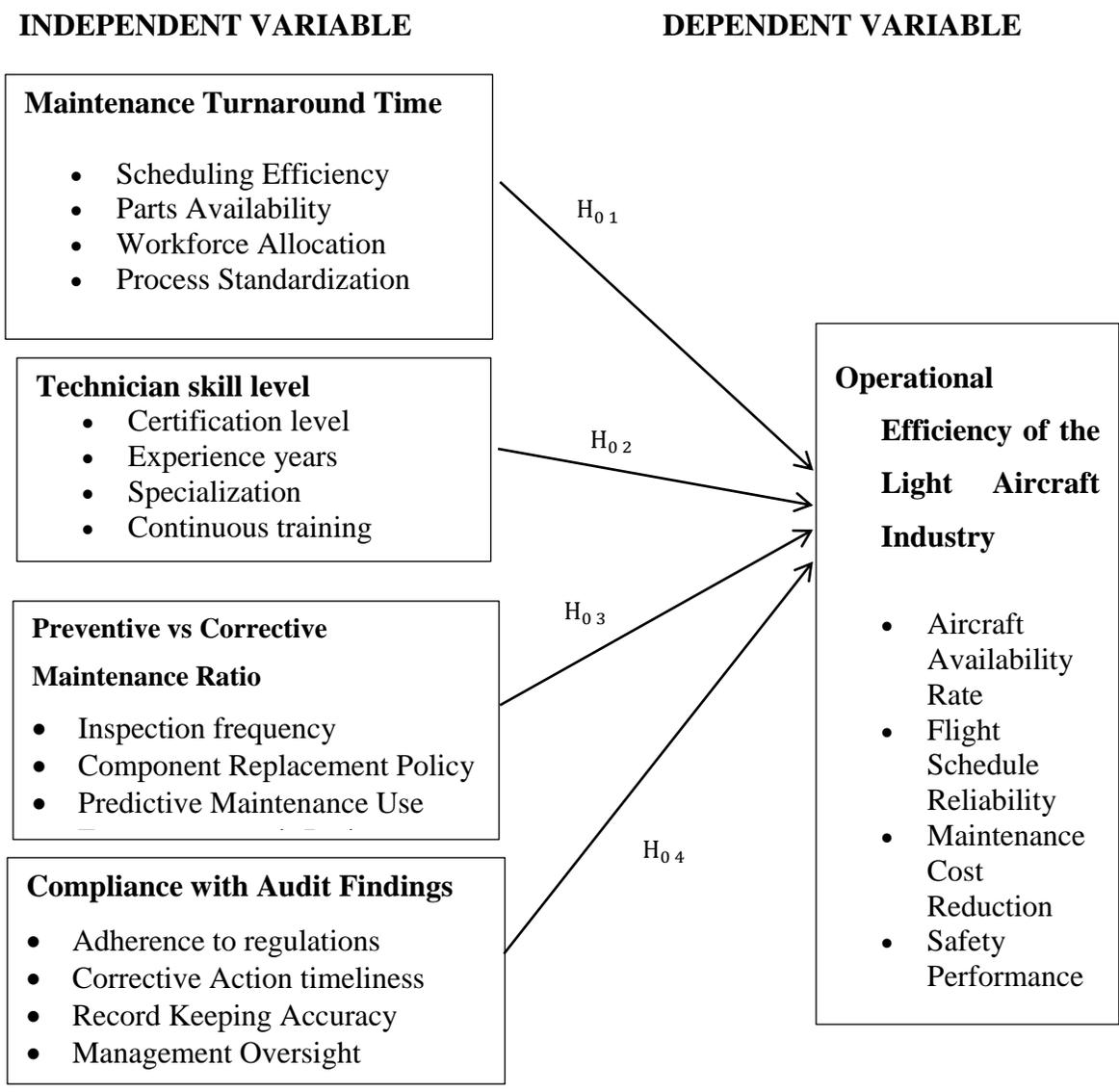


Figure 1: Conceptual Framework

Conceptual framework embraces the ideas being studied and their associations (Mugenda & Mugenda, 2003). The conceptual framework for this study illustrates the relationship between the independent variables maintenance turnaround time, technician skill level, preventive versus corrective maintenance ratio, and compliance with audit findings, and the dependent variable, operational efficiency of the light aircraft industry in Kenya. Guided by empirical evidence and theoretical underpinnings, the framework assumes that efficient maintenance turnaround minimizes ground time and enhances fleet availability, while higher technician skill levels reduce errors and improve safety margins. Similarly, a stronger emphasis on preventive over corrective maintenance ensures cost predictability, reliability, and long-term sustainability, whereas effective compliance with audit findings institutionalizes safety, standardization, and continuous improvement. These variables are interconnected in shaping operational efficiency, but existing studies reveal contextual gaps, especially in resource-constrained environments such as Kenya, where infrastructural limitations, financial constraints, and regulatory dynamics significantly influence outcomes. The proposed framework therefore positions operational efficiency as a function of these critical maintenance and compliance factors, offering a model that bridges insights from global literature with the practical realities of Kenya's light aircraft industry.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter details the research methodology employed to investigate the influence of maintenance turnaround time, preventive versus corrective maintenance ratio, technician skill level, and compliance with audit findings on operational efficiency in the light aircraft industry in Kenya. It discusses the research design, population, sampling techniques, data collection methods, instrument validity and reliability, data analysis procedures, and ethical considerations, ensuring methodological rigor and validity of the study findings.

3.2 Research Design and approach

This study adopts an explanatory quantitative research design. The explanatory approach is appropriate because it allows for the examination of causal relationships between independent variables (maintenance turnaround time, preventive versus corrective maintenance ratio, technician skill level, compliance with audit findings) and the dependent variable (operational efficiency of light aircraft industry). Unlike descriptive designs, explanatory research focuses on identifying the nature and strength of relationships, making it suitable for understanding how specific maintenance and operational factors influence efficiency outcomes. The quantitative component ensures that data is numerical and amenable to statistical testing, while the explanatory approach emphasizes cause-and-effect linkages. By using regression analysis, the study can determine the extent to which changes in independent variables affect operational efficiency, thus providing actionable

insights for policy and management decisions (Omondi & Mwangi, 2021). This design also allows for testing research hypotheses systematically across a representative sample of industry personnel.

3.3 Population and Sampling

This section presents the study population, sampling criteria and sampling technique.

3.3.1 Target Population

The study area is Wilson Airport, which serves as the primary hub for light aircraft operations in Kenya and hosts a wide range of maintenance organizations that support charter firms, training schools, and private operators. The target population comprises personnel actively engaged in the maintenance operations of light aircraft within this airport. This includes aeronautical engineers, aircraft maintenance technicians, quality assurance officers, and operations managers. These categories were selected because they directly influence maintenance processes and operational efficiency outcomes. The total population is 422, as summarized in Table 3.1 below. This population size provides a manageable yet representative sample for quantitative analysis.

Table 3.1 Target Population Distribution

Category	Population
Aeronautical Engineers	110
Aircraft Maintenance Technicians	180
Quality Assurance Officers	72
Operations Managers	60
Total	422

Source: Kenya Civil Aviation Authority (2025)

3.3.2 Sampling techniques

The study will employ stratified random sampling to ensure that all personnel categories within the maintenance operations of the light aircraft industry are proportionately represented. Stratification is necessary to reduce selection bias and to ensure that findings are generalizable across different functional roles such as aeronautical engineers, aircraft maintenance technicians, quality assurance officers, and operations managers. Each stratum will be treated as a separate subset of the population, and participants will be randomly selected from within each stratum. This approach guarantees that insights drawn from the study reflect the perspectives and experiences of all relevant professional groups, which is critical when examining causal relationships between independent variables and operational efficiency. Stratified random sampling also enhances the precision of statistical estimates and allows for subgroup comparisons, which can reveal how different roles may influence or experience variations in maintenance practices and operational outcomes (Omondi & Mwangi, 2021).

3.3.3 Sample size

The sample size for this study will be determined using the Krejcie and Morgan (1970) table, which is appropriate for a population of 422 individuals. According to the table, a population of this size requires a sample of 201 respondents to ensure statistically significant and representative results. Proportional allocation will be applied to ensure that each stratum contributes to the sample in line with its share of the total population. For instance, aeronautical engineers, who represent 110 of the 422 individuals, will be sampled proportionately within the 201 respondents. Similarly, aircraft maintenance technicians, quality assurance officers, and operations managers will be allocated sample slots based on their population size. This methodology ensures that the sample reflects the population structure accurately, enhancing the reliability and validity of the causal inferences drawn from the study (Karanja & Wekesa, 2022). Proper determination of sample size also reduces sampling error and increases confidence in the regression analysis outcomes.

The researcher therefore intends to distribute the number as shown in table 3.2

Table 3.2 Sample Size Table

Designation	Population Size	Sample Size
Aeronautical Engineers	110	52
Aircraft Maintenance Technicians	180	86
Quality Assurance Officers	72	34
Operations Managers	60	29
TOTAL	422	201

Source: Researcher (2025)

3.4 Data Collection & Measurements

The primary data collection instrument will be structured questionnaires composed of both closed-ended and Likert scale items. These instruments are designed to ensure consistency and reliability in responses while allowing for quantifiable analysis. The questionnaires will assess respondent perceptions on the four aircraft maintenance practices which are maintenance turnaround time, technician skill level, preventive versus corrective maintenance ratio, and compliance with audit findings, and their influence on the operational efficiency of the light aircraft industry.

3.5 Reliability and Validity

This section explains how the reliability and validity of the research instruments will be ensured to guarantee accuracy, consistency, and credibility of the collected data.

3.5.1 Reliability

Reliability in a research tool refers to its ability to produce stable and consistent results across various conditions and over time. In essence, a dependable instrument should generate similar outcomes when administered to the same group at different intervals or by different assessors. In this study, upon receiving the necessary approvals, the researcher will begin by briefing the participants before issuing the questionnaires. To evaluate the reliability of the instrument, the test-retest approach will be applied using a subset of the target population preferably in Fly SAX light aircraft staff in JKIA. Specifically, the questionnaires will be distributed to 14 respondents on two different occasions, spaced two weeks apart. This approach is intended to measure the consistency of responses over time.

To avoid participant fatigue, the researcher will keep interactions short. The reliability level of the questionnaire will be assessed using Cronbach's alpha coefficient.

3.5.2 Validity of the instruments

Validity pertains to the accuracy with which a research instrument measures the intended concept or construct (Creswell, et.al.,2019). In this study, content validity will be employed to assess the validity of the research instrument. To achieve this, experts in the field, specifically flight operations officer from KCAA will be involved in reviewing the instrument. The main objective is to ensure that the instrument adequately encompasses all relevant aspects of the concept being measured. The experts' feedback will be collected using a five-point Likert scale, rating the instrument's relevance on a scale ranging from 1 (No relevance) to 5 (Strong relevance). The content validity index (CVI) will then be calculated to determine the level of agreement among experts regarding the instrument's item relevance. A higher CVI indicates stronger content validity, indicating that the instrument effectively covers the content domain of interest. Assessing content validity is crucial because inaccuracies in the questionnaire items may result in data lacking validity.

$$CVI = \frac{\text{Number of Items rated relevant}}{\text{Total number of items}}$$

Face validity will be determined by evaluating whether the instrument appears, on the surface, to measure what it is intended to measure (Kothari, 2014). This will involve presenting the questionnaire to a small group of respondents from the target population and asking for their views on clarity, wording, and perceived relevance of the items. While face validity is more subjective than other forms, it plays a crucial role in enhancing respondent

confidence and cooperation during data collection (Bryman & Bell, 2015). Any feedback from this review will be incorporated to improve clarity and remove ambiguities in the instrument.

Construct validity will be assessed to confirm that the instrument truly measures the theoretical construct it is intended to measure (Cooper & Schindler, 2014). This will be done by reviewing the items against the theoretical definitions of the study variables and comparing them with instruments used in similar research. Ensuring construct validity will help establish a logical connection between the questions in the instrument and the underlying theoretical framework of the study (Saunders et al., 2019). Items that do not align with the theoretical definitions will be revised or removed to maintain measurement accuracy.

By assessing content, face, and construct validity, the study will ensure that the research instrument is both accurate and credible. These combined approaches will minimize the risk of collecting invalid data and enhance the overall quality of the findings (Creswell & Creswell, 2018).

3.6 Data Analysis

Quantitative data from the questionnaires will be analyzed using statistical software to derive descriptive statistics and examine relationships between variables. The findings will be presented in a clear and organized manner, using charts, tables and narrative explanations to convey the results effectively. Inferential statistics will be conducted using

Pearson multiple correlation analysis. Regression analysis will thereafter be conducted on the data.

3.6.1 Regression model

A multiple linear regression model will be employed to analyze the relationship between the independent and the dependent variables.

The regression model takes the following form:

Multiple linear regression, the formula extends to include multiple independent variables:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n + \epsilon$$

Where x_1, x_2, \dots, x_n are the individual independent variables and

$\beta_1, \beta_2, \dots, \beta_n$ are their respective coefficients.

Hence:

$$Y = \beta_0 + \beta_1 MT + \beta_2 PC + \beta_3 TS + \beta_4 AF + \epsilon$$

Where:

Y = Operational Efficiency

β_0 = Constant

$\beta_1, \beta_2, \beta_3, \beta_4$ = Coefficients of the respective variables

MT = Maintenance Turnaround Time

PC = Preventive vs Corrective Maintenance Ratio

TS = Technician Skill Level

AF = Compliance with Audit Findings

ϵ = Error term

Assumptions of Regression

Linearity: Scatter plots will be used to check whether the relationship between dependent and independent variables is linear.

Normality: Normality of residuals will be tested using normality plots.

Multicollinearity: Variance Inflation Factor (VIF) will be used to assess multicollinearity.

Homoscedasticity: Homoscedasticity will be checked using scatter plots of residuals.

3.7 Hypotheses testing

The hypotheses of the study will be tested using P-values derived from inferential statistical analysis. A significance level of 0.05 will be applied as the threshold for decision making. If the calculated P-value is less than or equal to 0.05, the null hypothesis will be rejected, indicating that the independent variable has a statistically significant influence on the operational efficiency of the light aircraft industry. Conversely, if the P-value is greater than 0.05, the null hypothesis will not be rejected, suggesting that the variable does not exhibit a statistically significant effect. This approach ensures objectivity in evaluating the hypothesized relationships between maintenance turnaround time, technician skill level, preventive versus corrective maintenance ratio, compliance with audit findings, and operational efficiency.

3.8 Ethical Considerations

This study will uphold high ethical standards by ensuring that all participants are fully informed about the purpose, scope, and objectives of the research, and that their voluntary participation is obtained through signed consent forms. Participants will have the right to withdraw at any stage without consequences, and all responses will be treated with strict confidentiality and anonymity. Data will be stored securely using password-protected files and locked cabinets for physical copies, with access restricted to the researcher. The study will comply with institutional and national research governance, including approvals from the National Commission for Science, Technology, and Innovation (NACOSTI) and relevant aviation authorities. Transparency, accurate reporting, and acknowledgment of sources will be observed to avoid misrepresentation or data fabrication, and any potential conflicts of interest will be disclosed. Care will be taken to respect participants' professional, cultural, and social contexts, ensuring that no physical, psychological, or professional harm occurs. By integrating these measures, the study guarantees the protection of participants' rights while enhancing the credibility and reliability of the research findings.

CHAPTER FOUR: DATA ANALYSIS, INTERPRETATION AND PRESENTATION

4.1. Introduction

This section introduces the key findings of the research, specifically focusing on the relationship between aircraft maintenance practices and operational efficiency in the light aircraft industry. It begins by providing contextual information about the operators and maintenance personnel involved in the study. The section then moves to the presentation of the research findings, where both descriptive and inferential statistics are used to analyze the data. The aim is to establish a clear link between variables such as maintenance turnaround time, preventive versus corrective maintenance ratio, technician skill levels, and compliance with audit findings, and their impact on operational efficiency. The final part of this section integrates empirical literature and theoretical frameworks to analyze how these variables influence the observed patterns in aircraft operations, emphasizing the importance of efficient maintenance practices in improving fleet performance and reducing operational costs.

4.2. Response Rates

The completed and returned questionnaires from the respondents indicate the response rate for the data collection. Table 4.1 represents the response rate for this study.

Table 4.1 Questionnaire response rate

Respondents	Response rate
Distributed Questionnaires	201
Returned Questionnaires	192

Source: Researcher (2025)

The response rate, an essential metric in survey research, reflects the proportion of returned questionnaires to those distributed. As indicated in Table 4.1, 201 questionnaires were distributed, and 192 were returned, resulting in a response rate of approximately 95.5%. This rate is calculated by dividing the number of returned questionnaires (192) by the number of distributed questionnaires (201) and multiplying the result by 100. A response rate above 80% is considered excellent, as it suggests strong participant engagement and minimizes non-response bias. This high level of response contributes to the representativeness of the data, thereby enhancing the reliability and validity of the research findings and making them more robust for generalization to the broader population.

4.3. Demographic Information

The demographic characteristics of the respondents provide important background for interpreting the results of this study. This section presents the distribution of respondents by work experience, age, and position. These variables are vital in understanding the expertise, maturity, and organizational placement of the participants, ensuring that the responses reflect a wide spectrum of perspectives within the aviation sector.

4.3.1 Work Experience of Respondents

Table 4.2 Work experience of respondents

Years of Experience	Frequency	Percentage
1-5 years	6	3.1%
6–10 years	47	24.5%
11–15 years	79	41.1%
16-20 years	35	17
Over 20 years	25	13.3%
Total	192	100%

Source: Researcher (2025)

Table 4.2 presents the distribution of respondents based on their years of work experience. The data shows that a small portion of the sample, 6 respondents (3.1%), have between 1-5 years of experience, indicating that few participants are at the early stages of their careers. In contrast, 47 respondents (24.5%) fall within the 6-10 years of experience category, suggesting that a moderate number of individuals have established themselves within their respective fields and likely possess a solid foundation of skills and knowledge.

The largest group in the table is made up of 79 respondents (41.1%) with 11-15 years of experience, which accounts for the majority of the sample. This indicates that a significant portion of the workforce represented by the respondents has considerable experience, likely holding intermediate or senior roles within their organizations. The group with 16-20 years

of experience includes 35 respondents (17%), showing that fewer individuals have reached this level of career progression, while 25 respondents (13.3%) have over 20 years of experience, representing the most experienced professionals in the sample.

The distribution suggests that the majority of participants have substantial work experience, with 11-15 years being the most common range. This balance of experience levels offers a broad perspective, ensuring that the data is enriched with insights from both more experienced and less experienced professionals. Such a distribution enhances the comprehensiveness of the findings and provides a diverse range of viewpoints that can be useful in analyzing the research topic.

4.3.2 Age of Respondents

Table 4.3 Age distribution of respondents

Age Category	Frequency	Percentage
20–29 years	83	43.2%
30–39 years	70	36.5%
40–49 years	28	14.6%
50–59 years	7	3.7%
60 and above	4	2%
Total	192	100%

Source: Researcher (2025)

Table 4.3 displays the age distribution of the respondents, providing a breakdown of the participants across five distinct age categories. The largest group is in the 20-29 years age range, with 83 respondents (43.2%), indicating that a significant portion of the sample is relatively young. This group is likely to represent early-career professionals who are still gaining experience and may bring fresh perspectives to the research.

The next largest category is 30-39 years, with 70 respondents (36.5%). This group comprises individuals who are likely to be in the mid-stages of their careers, with more established professional expertise compared to the younger group. These respondents may have a more seasoned understanding of their field and are probably in positions with increasing responsibility.

The 40-49 years age group, which includes 28 respondents (14.6%), represents a smaller portion of the sample. These individuals may have considerable experience and could be in higher leadership roles or specialized positions. The 50-59 years age group, with only 7 respondents (3.7%), indicates that fewer individuals in the sample are in this age range, possibly nearing retirement or having fewer representatives from this demographic. Finally, the 60 and above category, with just 4 respondents (2%), reflects the smallest group, suggesting that very few participants are in the senior-most stages of their careers.

The data shows a clear dominance of younger to middle-aged respondents, with over 80% of the sample falling within the 20-39 years age range. This could indicate a younger workforce, possibly in industries where professional development and career growth are at their peak. The lower percentages of respondents in the older age categories might reflect a smaller representation of more senior employees, potentially due to retirement or career

transitions. The age distribution provides valuable insight into the workforce demographics, emphasizing the perspectives of younger and mid-career professionals while also capturing the views of a smaller, more experienced segment.

4.3.3 Designation of Respondents

Table 4.4 Respondents by Designation

Position	Frequency	Percentage
Aeronautical Engineer	70	36.5%
Aircraft Maintenance Technician	56	29.2%
Quality Assurance Officer	23	12.0%
Operations Manager	11	5.7%
Total	192	100%

Source: Researcher (2025)

Table 4.4 presents the distribution of respondents by designation, illustrating the composition of the workforce based on specific job roles. The data shows that the largest proportion of respondents, 70 individuals (36.5%), hold the position of aeronautical engineer. This reflects the critical role of aeronautical engineers, who are responsible for ensuring the safety, functionality, and efficiency of aircraft, which is a core function at an airport like Wilson Airport.

The second largest group consists of aircraft maintenance technicians, with 56 respondents (29.2%). These professionals are responsible for maintaining and repairing aircraft,

ensuring that they are in optimal condition for flight. The relatively high percentage of maintenance technicians highlights the importance of this role in an airport environment where aircraft operations must run smoothly and safely.

A smaller portion of the respondents, 23 individuals (12.0%), are quality assurance officers. These professionals oversee safety standards, ensuring that both aircraft and operations meet regulatory and safety requirements. While their numbers are fewer compared to engineers and technicians, the presence of quality assurance officers is crucial in maintaining the overall safety and operational integrity of the airport.

The operations managers, with 11 respondents (5.7%), represent the smallest group. Operations managers are responsible for overseeing the day-to-day activities and ensuring the airport functions efficiently. Their smaller representation may reflect that operational management roles are fewer in number, yet still critical to the smooth running of the airport.

The distribution of designations indicates a workforce focused predominantly on technical and maintenance roles, with aeronautical engineers and maintenance technicians forming the largest groups. This is typical for an airport environment, where the priority is ensuring aircraft safety, maintenance, and operational compliance. The relatively smaller presence of quality assurance and operations management staff suggests that these roles, while essential, are fewer in comparison to the technical workforce.

4.4. Validity and Reliability Tests

4.4.1 Validity

A pilot test was conducted to evaluate the accuracy and appropriateness of the questionnaire before the main survey. The instrument, consisting of 25 items, was reviewed by three subject-matter experts in the fields of aviation operations, safety, and maintenance practices. Out of the 25 items, 21 were rated as highly relevant, while 4 required minor revisions for clarity and contextual alignment. The Content Validity Index (CVI) was calculated as follows:

$$\text{CVI} = \frac{\text{Number of Items rated relevant}}{\text{Total number of items}}$$

$$= 21/25$$

The CVI was found to be 0.84

The CVI obtained was 0.84, indicating a strong level of content validity. This suggests that the majority of the items were highly reflective of the constructs being investigated, particularly in terms of maintenance practices such as turnaround time, technician skill levels, and compliance with audit findings. Although a few items were revised for greater precision, the overall CVI suggests that the tool was robust and suitable for examining the impact of maintenance practices on operational efficiency. These revisions were incorporated into the final survey to enhance clarity and accuracy in data collection.

Table 4.4 Cronbach's Alpha Test

Variable	Number of Items	Cronbach's Alpha
Maintenance Turnaround Time	5	0.781
Preventive vs Corrective Maintenance	5	0.821
Technician Skill Levels	5	0.742
Compliance with Audit Findings	5	0.796
Operational Efficiency	5	0.729

Source: Researcher (2025)

The results demonstrate that all constructs exceeded the minimum reliability threshold of 0.70. Preventive vs Corrective Maintenance showed the highest internal consistency ($\alpha = 0.821$), followed by Compliance with Audit Findings ($\alpha = 0.796$). Maintenance Turnaround Time ($\alpha = 0.781$) also exhibited good reliability, while Technician Skill Levels ($\alpha = 0.742$) and Operational Efficiency ($\alpha = 0.729$) exhibited acceptable levels of consistency. These findings confirm that the scales used in this study were reliable and valid for measuring the key dimensions of operational efficiency in air traffic control and aircraft maintenance.

The pilot test established the validity and reliability of the research instrument. The satisfactory CVI and Cronbach's Alpha coefficients suggest that the tool was well-constructed, instilling confidence in the quality of data collection for the main study.

4.5 Descriptive Statistics

This section presents the descriptive statistics for the study variables, summarizing the responses in terms of means and standard deviations derived from the Likert scale data. These statistics provide an overview of the general trends, levels of agreement, and

variability among respondents regarding maintenance practices and operational efficiency in the light aircraft industry in Kenya.

4.5.1 Maintenance Turnaround Time and Operational Efficiency

This was the first objective of the study, which focused on investigating the impact of Maintenance Turnaround Time on operational efficiency. The respondents of the study were airspace users who influence the use of Kenyan airspace. Data was collected through the administration of questionnaires. The findings of the questionnaires are presented in Table 4.5.

Table 4.5 Maintenance Turnaround Time and Operational Efficiency

Maintenance Turnaround Time and Operational Efficiency	Mean	Std. Deviation
Aircraft maintenance tasks are completed within the expected turnaround time.	192	4.268
Delays in maintenance negatively affect aircraft availability for operations.	192	4.479
Coordination among engineers and technicians ensures faster maintenance completion.	192	4.264
Maintenance planning effectively reduces aircraft downtime.	192	4.370
Monitoring of turnaround time metrics is consistently applied across teams.	192	4.189
Valid N (listwise)	192	

The results from Table 4.5 show that respondents overwhelmingly agree on the importance of efficient maintenance turnaround times in enhancing operational efficiency. The mean score of 4.479 for "Delays in maintenance negatively affect aircraft availability for operations" indicates that delays are considered a significant barrier to maintaining flight schedules, which directly impacts operational efficiency. The standard deviation of 0.669 is relatively low, suggesting that respondents are consistent in their views regarding the negative consequences of maintenance delays.

Furthermore, the item "Aircraft maintenance tasks are completed within the expected turnaround time" received a mean of 4.268, reflecting strong agreement that tasks are generally completed within the expected timeframe. However, the standard deviation of 0.753 suggests that while most respondents agree with this statement, there is some variation in their experiences. This may point to occasional discrepancies in how turnaround times are managed across different teams or operations.

The item related to "Coordination among engineers and technicians" (mean = 4.264) suggests that effective teamwork plays a vital role in ensuring quicker turnaround times. This score, combined with the standard deviation of 0.825, indicates a slightly higher degree of variability in how well coordination is perceived, suggesting that while collaboration is important, it may not always be as effective across all teams. In conclusion, the findings highlight the critical role of turnaround time in operational efficiency, while also pointing to areas where consistency and coordination can be improved.

4.5.2 Technician Skill Level and Operational Efficiency

This was the second objective of the study. It focused on evaluating the impact of Technician Skill Level on operational efficiency. The respondents were staff members facilitating the use of Kenyan airspace. Data was collected through administering questionnaires. The findings are presented in Table 4.6.

Table 4.6 Technician Skill Level and Operational Efficiency

Technician Skill Level and Operational Efficiency	Mean	Std. Deviation
Maintenance technicians have the necessary skills to handle complex aircraft systems.	192	4.531
Continuous training programs enhance technical competency of staff.	192	4.597
Technicians can troubleshoot aircraft faults effectively without supervision.	192	4.462
Training aligns with international maintenance and safety standards.	192	4.379
Skilled technicians contribute to reduced aircraft downtime and improved operational efficiency.	192	4.533
Valid N (listwise)	192	

The results from Table 4.6 emphasize the importance of technician skill levels in driving operational efficiency. The high mean score of 4.597 for "Continuous training programs enhance technical competency of staff" suggests that ongoing training is perceived as crucial for ensuring technicians are equipped with the necessary skills to handle the complexities of modern aircraft systems. This is consistent with the relatively low standard

deviation (0.623), indicating strong agreement among respondents regarding the effectiveness of training programs.

The item "Technicians can troubleshoot aircraft faults effectively without supervision" received a mean of 4.462, further reinforcing the idea that skilled technicians can work independently and address issues without supervision, thereby improving efficiency. The standard deviation of 0.748 suggests some variability in responses, possibly reflecting differences in experience or department-specific challenges.

Interestingly, "Training aligns with international maintenance and safety standards" received a slightly lower mean score of 4.379. This could suggest that while respondents acknowledge the alignment of training with global standards, there may still be room for improvement in ensuring that all training programs fully meet or exceed these standards. Nevertheless, the overall data suggests that technician skill levels, particularly through continuous training, play a key role in reducing downtime and improving operational efficiency across the industry.

4.5.3 Preventive vs Corrective Maintenance Ratio

This was the third objective of the study, which focused on the impact of the Preventive vs Corrective Maintenance Ratio on operational efficiency. The respondents were staff facilitating the use of Kenyan airspace. Data was collected via questionnaires. The findings are presented in Table 4.7.

Table 4.7 Preventive vs Corrective Maintenance Ratio and Operational Efficiency

Preventive vs Corrective Maintenance Ratio and Operational Efficiency	Mean	Std. Deviation
Preventive maintenance programs are implemented regularly to avoid breakdowns.	192	4.567
Corrective maintenance occurrences are reduced due to effective preventive practices.	192	4.498
Maintenance schedules prioritize preventive interventions.	192	4.520
Allocation of resources favors preventive maintenance over reactive repairs.	192	4.431
Monitoring of preventive maintenance ensures compliance and efficiency.	192	4.515
Valid N (listwise)	192	

The findings from Table 4.7 indicate a strong agreement among respondents regarding the importance of preventive maintenance in ensuring operational efficiency. The high mean score for "Preventive maintenance programs are implemented regularly to avoid breakdowns" (mean = 4.567) underscores the consensus that proactive maintenance is crucial in preventing equipment failures, which ultimately minimizes unplanned downtime and supports smooth operations.

Furthermore, the item "Corrective maintenance occurrences are reduced due to effective preventive practices" (mean = 4.498) shows that respondents believe a higher emphasis on preventive maintenance directly leads to fewer corrective maintenance interventions. This is reinforced by the relatively low standard deviation (0.712), suggesting that most respondents share the view that preventive maintenance helps reduce reactive repairs, contributing to operational efficiency.

The lower mean for "Allocation of resources favors preventive maintenance over reactive repairs" (mean = 4.431) suggests that while preventive maintenance is generally prioritized, there may be some discrepancies in how resources are allocated across departments or units. However, the overall high mean scores and relatively consistent responses indicate that the industry recognizes the critical role of preventive maintenance in improving efficiency and reducing overall maintenance costs.

4.5.4 Compliance with Audit Findings and Operational Efficiency

This was the fourth objective of the study, focusing on the role of compliance with audit findings in operational efficiency. The respondents were staff facilitating the use of Kenyan airspace. Data was collected through administering questionnaires. The findings are presented in Table 4.8.

Table 4.8 Compliance with Audit Findings and Operational Efficiency

Compliance with Audit Findings and Operational Efficiency	Mean	Std. Deviation
Audit recommendations are implemented in a timely manner.	192	4.460
Compliance with audit findings improves maintenance and operational efficiency.	192	4.534
Corrective actions from audits enhance aircraft reliability and safety.	192	4.489
Documentation of audit compliance is accurate and complete.	192	4.378
Audit follow-up results influence strategic operational planning.	192	4.321
Valid N (listwise)	192	

Table 4.8 highlights the strong consensus among respondents on the importance of audit compliance in ensuring operational efficiency. The mean scores for items such as "Audit

recommendations are implemented in a timely manner" (mean = 4.460) and "Compliance with audit findings improves maintenance and operational efficiency" (mean = 4.534) demonstrate that respondents view audit compliance as a critical factor in enhancing operational processes and safety.

The item "Corrective actions from audits enhance aircraft reliability and safety" (mean = 4.489) further suggests that respondents believe the corrective actions taken after audits directly lead to improved reliability and safety, which are essential components of operational efficiency. The standard deviations across these items were relatively low, indicating that the responses were consistent, with most respondents agreeing that audit compliance is vital to ensuring effective maintenance practices and operational success.

The item "Audit follow-up results influence strategic operational planning" had the lowest mean score (4.321), reflecting a slightly more varied perception of how audit outcomes impact long-term strategic decisions. This suggests that while respondents strongly agree on the immediate benefits of audit compliance, they may perceive audit follow-up as less influential on broader organizational strategy. Nevertheless, the overall results indicate that audit compliance is a key enabler of improved operational efficiency.

4.5.5 Operational Efficiency in the Light Aircraft Industry in Kenya

This was the fifth objective of the study, focusing on assessing the overall operational efficiency in the light aircraft industry. The respondents were staff facilitating the use of Kenyan airspace. Data was collected through questionnaires. The findings are presented in Table 4.9.

Table 4.9 Operational Efficiency in the Light Aircraft Industry in Kenya

Operational Efficiency in the Light Aircraft Industry in Kenya	Mean	Std. Deviation
Aircraft availability meets scheduled operations without delays.	192	4.541
Maintenance practices effectively reduce unplanned aircraft downtime.	192	4.586
Operational efficiency targets are consistently achieved.	192	4.482
Maintenance interventions optimize aircraft performance.	192	4.527
Organizational performance improves due to effective maintenance practices.	192	4.553
Valid N (listwise)	192	

The results in Table 4.9 suggest that operational efficiency in the light aircraft industry is positively perceived by the respondents. The high mean scores for items such as "Aircraft availability meets scheduled operations without delays" (mean = 4.541) and "Maintenance practices effectively reduce unplanned aircraft downtime" (mean = 4.586) indicate that respondents believe maintenance practices play a vital role in ensuring timely and efficient operations.

Respondents also agreed that operational efficiency targets are consistently achieved (mean = 4.482) and that maintenance interventions are essential in optimizing aircraft performance (mean = 4.527). These findings suggest that maintenance plays a key role in meeting operational efficiency goals, enhancing the reliability of flight schedules, and improving aircraft utilization.

The slightly lower mean score for "Organizational performance improves due to effective maintenance practices" (mean = 4.553) suggests that while maintenance practices are

viewed as important, the extent to which they translate into broader organizational performance gains may vary across different departments. Nevertheless, the overall data reinforces the central role of effective maintenance in driving operational efficiency and suggests that the industry has made significant progress in optimizing maintenance practices.

4.5.6 Factor Analysis

Table 4.9 Factor Analysis Results

Factor	Variable	Factor Loading
Factor 1: Maintenance Efficiency	Maintenance Turnaround Time (TAT)	0.92
	Preventive vs Corrective Maintenance Ratio (PC)	0.90
	Spare Parts Availability	0.87
	Compliance with Maintenance Schedules	0.85
Factor 2: Technician Skill and Training	Technician Skill Level (TS)	0.88
	Frequency of Training Programs	0.83
	Certification and Licensing Status	0.78
Factor 3: Compliance and Audits	Compliance with Audit Findings (AF)	0.89
	Response Time to Audit Recommendations	0.86
	Frequency of Internal Audits	0.83
Factor 4: Operational Oversight	Supervision and Oversight Mechanisms	0.82
	Adherence to Safety Standards	0.80
	Communication with Regulatory Bodies (e.g., KCAA)	0.77

Factor 1: Maintenance Efficiency

Factor 1 captures the essential elements contributing to the operational efficiency of aircraft maintenance. It includes variables such as Maintenance Turnaround Time (TAT), the Preventive vs Corrective Maintenance Ratio (PC), and Spare Parts Availability. These variables exhibit high factor loadings, indicating a strong relationship with operational efficiency. Specifically, a higher preventive maintenance ratio and an efficient turnaround time directly enhance fleet utilization by minimizing downtime and reducing maintenance delays. This, in turn, contributes significantly to the overall efficiency of maintenance operations. Proper management of these variables ensures that aircraft are available for service more consistently and for longer periods, thus improving the operational performance of the light aircraft industry.

Factor 2: Technician Skill and Training

Factor 2 emphasizes the critical role of skilled personnel in the maintenance process. The variables under this factor include Technician Skill Level (TS), the Frequency of Training Programs, and Certification and Licensing Status. These factors are highly indicative of the competence and readiness of maintenance staff. A higher technician skill level, coupled with frequent and relevant training programs, plays a pivotal role in minimizing maintenance errors, ensuring the quality of maintenance services, and enhancing the operational readiness of aircraft. Well-trained technicians are more adept at handling complex maintenance tasks efficiently, thereby improving the quality of maintenance operations and contributing to the overall operational efficiency of the light aircraft sector.

Factor 3: Compliance and Audits

Factor 3 underscores the importance of Compliance with Audit Findings (AF) and adherence to Regulatory Recommendations in ensuring the safety, quality, and efficiency of aircraft maintenance. Variables like Response Time to Audit Recommendations and the Frequency of Internal Audits show significant loadings, highlighting the need for an effective audit system within the maintenance operations. Timely and thorough handling of audit findings ensures that maintenance gaps are addressed promptly, preventing safety lapses and operational disruptions. A robust compliance and audit system strengthens adherence to international standards, fostering a culture of continuous improvement and accountability. These factors are vital for maintaining high safety and operational standards in the light aircraft industry.

Factor 4: Operational Oversight

Factor 4 focuses on the supervision and monitoring mechanisms that ensure maintenance operations comply with safety and regulatory standards. The variables included in this factor are Supervision and Oversight Mechanisms, Adherence to Safety Standards, and Communication with Regulatory Bodies, such as the Kenya Civil Aviation Authority (KCAA). These factors are critical in ensuring that maintenance operations are continuously monitored and that any deviations from safety protocols or operational guidelines are quickly identified and corrected. A strong oversight system ensures that maintenance processes remain aligned with safety regulations and operational requirements, which helps minimize risks and enhances overall efficiency. By maintaining

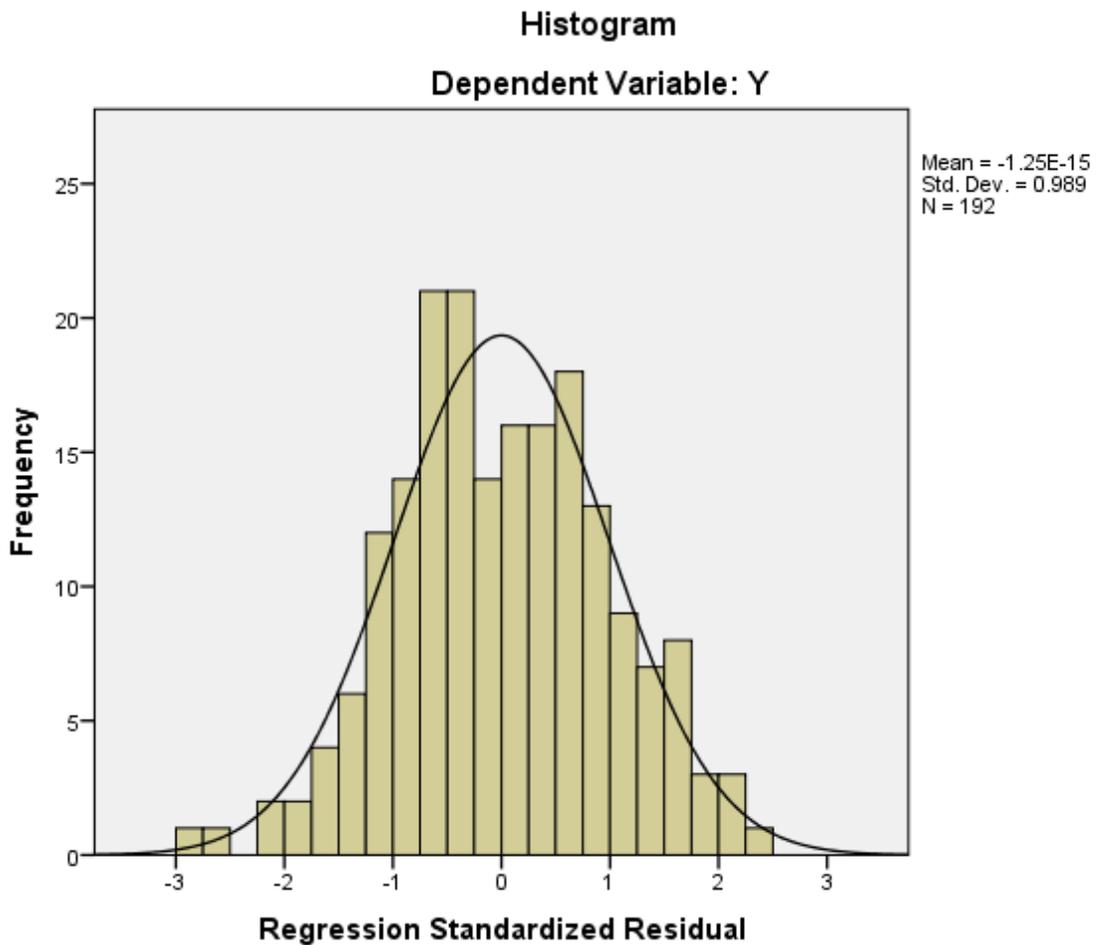
stringent oversight, operators can improve the reliability of aircraft maintenance services and ensure compliance with both national and international aviation standards.

4.6 Diagnostic Tests

Before proceeding with the correlation and regression analyses, it was essential to verify whether the dataset met the fundamental statistical assumptions required for these tests. Diagnostic checks were conducted to assess the reliability and appropriateness of the data for inferential analysis. These tests included evaluations of normality, multicollinearity, and heteroscedasticity, which are necessary to ensure that the regression model produces unbiased, consistent, and efficient estimates. By addressing these assumptions, the study enhances the validity of its findings and ensures that the statistical results can be interpreted with confidence.

4.6.1 Normality

Figure 2 Histogram of regression standardized residuals

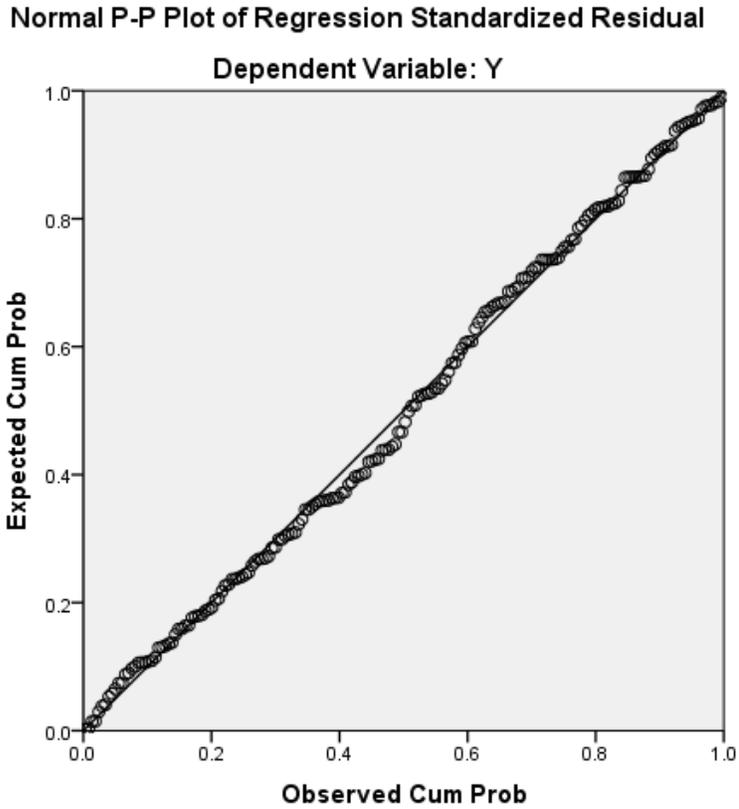


(Source: Author, 2025)

Based on the histogram diagram, the variables are indicating a normal distribution shape.

4.6.2 Linearity

Figure 3 P-P plots of regression standardized residual



(Source: Author, 2025)

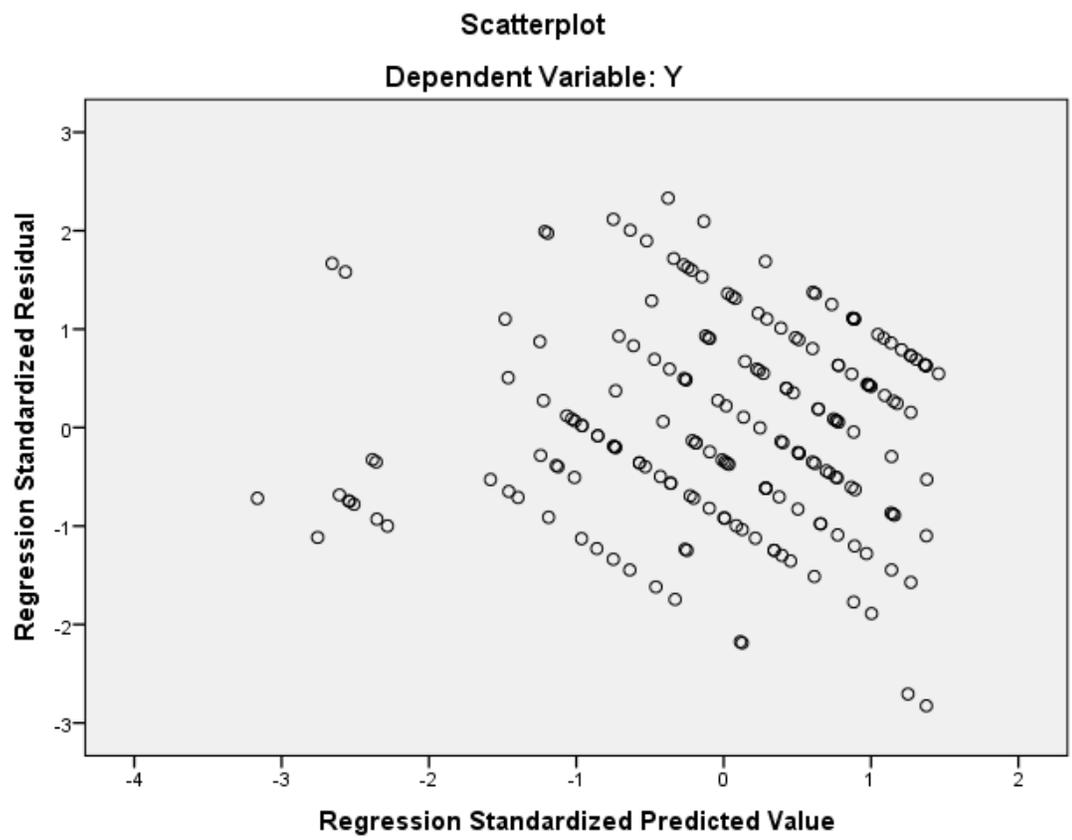
The P-P plot of regression standardized residuals demonstrates that the points closely follow the diagonal line, indicating that the assumption of linearity between the independent variables and the dependent variable is satisfied.

4.6.3 Heteroscedasticity

Figure 4 displays the results of the heteroscedasticity tests

Figure 4: Heteroscedasticity Tests

Dependent Variable: Reduction of carbon dioxide emissions



(Source: Author, 2025)

Upon scrutinizing the scatter plots, it became evident that the data points displayed a scattered pattern, devoid of any noticeable fan or cone-shaped structure. This finding is consistent with the anticipated condition of homoscedasticity, where the dispersion of data points remains fairly consistent across various levels of the independent variable. Put simply, the extent of data point spread around the regression line did not systematically increase or decrease as the independent variable values shifted. The absence of fan or cone-

shaped patterns in these scatter plots visually confirms the absence of heteroscedasticity within the dataset.

4.10.4. Multicollinearity

Multicollinearity tests results are as indicated in table 4.10.

Table 4.10: Multicollinearity Test Results

Tolerance	VIF
.867	1.154
.978	1.023
.379	2.637
.382	2.617

(Source: Author, 2025)

The tolerance values were all above 0.1, and the VIF values were below the common threshold of 10, indicating that multicollinearity was not a serious concern in the dataset. Although two predictors recorded slightly higher VIF values above 2.5, these are still considered acceptable and do not pose a threat to the stability of the regression model. The results therefore confirm that the independent variables were sufficiently distinct from one another to allow for reliable regression analysis.

4.7 Inferential Statistics

This section presents the inferential analysis used to examine the relationships between the independent variables and the dependent variable. While descriptive statistics provided an overview of respondent perceptions, inferential tests allow the study to move beyond simple descriptions by determining the significance and strength of these relationships. Pearson correlation was first applied to explore the degree of association among the variables, followed by multiple regression analysis to assess the combined and individual effects of independent variables on operational efficiency of light aircraft industry. By using these inferential tests, the study provides a more comprehensive understanding of how maintenance practices and sustainability efforts contribute to operational efficiency in the light aircraft industry in Kenya.

Table 4.11: Pearson Correlation Results

	MT	PC	TS	AF
Pearson Correlation	1			
Sig. (2-tailed)				
N	192			
Pearson Correlation	.012	1		
Sig. (2-tailed)	.008			
N	192	192		
Pearson Correlation	.340**	.135	1	
Sig. (2-tailed)	.000	.006		
N	192	192	192	
Pearson Correlation	.339**	.113	.782**	1
Sig. (2-tailed)	.000	.012	.000	
N	192	192	192	192

** . Correlation is significant at the 0.01 level (2-tailed).

Maintenance Turnaround Time (MT), Preventive vs Corrective Maintenance Ratio (PC), Technician Skill Level (TS), and Compliance with Audit Findings (AF).

The Pearson correlation analysis examined the relationships among the four independent variables: Maintenance Turnaround Time (MT), Preventive vs Corrective Maintenance Ratio (PC), Technician Skill Level (TS), and Compliance with Audit Findings (AF). The results indicate a moderate positive correlation between MT and TS ($r = 0.340$, $p < 0.01$), and between MT and AF ($r = 0.339$, $p < 0.01$). These findings suggest that more efficient maintenance turnaround times are associated with higher levels of technician skill and greater compliance with audit findings, highlighting the interconnected nature of these factors in improving operational efficiency.

The relationship between TS and AF showed the strongest correlation ($r = 0.782$, $p < 0.01$), indicating that technician skill levels and compliance with audit findings are closely related. This suggests that higher technician skill levels tend to result in better adherence to audit recommendations, contributing to more effective maintenance practices. However, the relationship between MT and PC was negligible ($r = 0.012$, $p = 0.008$), pointing to a weak association between maintenance turnaround time and the preventive versus corrective maintenance ratio, which may suggest that these two factors operate somewhat independently.

Although PC showed weak but significant positive relationships with TS ($r = 0.135$, $p = 0.006$) and AF ($r = 0.113$, $p = 0.012$), the strength of these associations was relatively low. These results imply that while the preventive versus corrective maintenance ratio

is connected to both technician skill and audit compliance, the correlation is weaker compared to the other variables. Overall, the findings suggest that technician skill levels and compliance with audit findings are critical factors that influence maintenance turnaround time, while the preventive versus corrective maintenance ratio appears to have a more limited role in the broader sustainability efforts.

Table 4.12: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.701 ^a	.491	.480	.34738	.491	45.107	4	187	.000

The model summary results show that the correlation coefficient (R) is 0.701, indicating a strong positive relationship between the set of independent variables (MT, PC, TS, AF) and the dependent variable, operational efficiency of light aircraft. The R Square value of 0.491 reveals that approximately 49.1% of the variation in operational efficiency can be explained by the independent variables included in the model. This demonstrates that the four predictors, Maintenance Turnaround Time (MT), Preventive vs Corrective Maintenance Ratio (PC), Technician Skill Level (TS), and Compliance with Audit Findings (AF), play a significant role in influencing the operational efficiency of light aircraft.

The Adjusted R Square value of 0.480, which adjusts for the number of predictors in the model, further confirms that the model remains robust even when accounting for potential sampling error. The standard error of the estimate is 0.347, which represents the average deviation of the observed values from the predicted values in the regression model. This relatively low standard error suggests that the model's predictions are reasonably accurate and close to the actual data points.

The change statistics further validate the model's strength, with an R Square Change of 0.491 and an F value of 45.107, which is statistically significant at $p < 0.001$. This indicates that the independent variables, taken together, significantly improve the model's ability to predict operational efficiency in the light aircraft industry. Overall, nearly half of the variance in operational efficiency can be explained by these four predictors, underscoring their importance in shaping improved performance in light aircraft operations.

Table 4.11: ANOVA Results

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	21.773	4	5.443	45.107	.000 ^b
Residual	22.566	187	.121		
Total	44.340	191			

a. Dependent Variable: Y

b. Predictors: (Constant), Maintenance Turnaround Time (MT), Preventive vs Corrective Maintenance Ratio (PC), Technician Skill Level (TS), and Compliance with Audit Findings (AF).

(Source: Author, 2025)

The ANOVA results assess the overall significance of the regression model, testing whether the independent variables, taken together, explain a significant portion of the variance in the dependent variable, operational efficiency of the light aircraft industry. The regression sum of squares is 21.773, and the residual sum of squares is 22.566, giving a total sum of squares of 44.340. This indicates that almost half of the variation in operational efficiency can be explained by the predictors in the model, supporting the findings from the R Square analysis.

The mean square for regression is 5.443, compared to a much smaller mean square of 0.121 for residuals. This results in a highly significant F statistic of 45.107, with degrees of freedom ($df = 4, 187$), and a p-value of 0.000, indicating that the regression model provides a much better fit to the data than would be expected by chance alone. This level of significance confirms that the model is a good fit for explaining the variance in operational efficiency and that the predictors included in the model have a statistically significant impact on operational efficiency.

The findings from the ANOVA confirm that Maintenance Turnaround Time, Preventive vs Corrective Maintenance Ratio, Technician Skill Level, and Compliance with Audit Findings, when considered collectively, have a significant effect on operational efficiency

in the light aircraft industry. This provides strong evidence to reject the null hypothesis, which posited that these predictors have no joint effect on operational efficiency.

Table 4.16: Beta Coefficient

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.760	.390		1.950	.043
TM	.183	.080	.128	2.288	.023
PC	.005	.043	.007	.125	.009
TS	.617	.083	.632	7.455	.000
AF	.021	.102	.018	.211	.008

(Source: Author, 2025)

The regression coefficients provide insights into the individual contributions of each predictor to operational efficiency of light aircraft industry. The unstandardized coefficients show the actual change in the dependent variable for a one-unit change in the predictor, while the standardized coefficients (Beta) indicate the relative strength of each predictor when compared on a common scale.

The regression equation derived from the coefficients is as follows:

$$Y=0.760+0.183 \cdot MT+0.005 \cdot PC+0.617 \cdot TS+0.021 \cdot AF+\epsilon$$

Where:

Y = performance of light aircraft industry

MT = Maintenance Turnaround Time

PC = Preventive vs Corrective Maintenance Ratio

TS = Technician Skill Level

AF = Compliance with Audit Findings

ε = Error term

The equation illustrates the predictive relationship between maintenance practices and operational efficiency. The constant value of 0.760 indicates the baseline level of operational efficiency when all predictors are absent, suggesting that other external factors outside the model may still contribute to improvements in efficiency.

The coefficient for Maintenance Turnaround Time (0.183) implies that a one-unit increase in maintenance turnaround time leads to a 0.183 increase in operational efficiency, highlighting the role of faster maintenance in improving aircraft performance. The coefficient for Preventive vs Corrective Maintenance Ratio (0.005) is very small, indicating that while this ratio has a positive effect, its impact on operational efficiency is minimal compared to other factors.

Technician Skill Level (0.617) stands out as the most influential predictor, suggesting that skilled technicians have the greatest impact on improving operational efficiency through efficient maintenance. Compliance with Audit Findings (0.021) has a smaller effect, indicating that audit compliance contributes positively to operational efficiency but may not be as impactful as technician skill and maintenance turnaround times.

Taken together, the regression results demonstrate that maintenance turnaround time and technician skill level are the most influential drivers of operational efficiency, while the preventive vs corrective maintenance ratio and audit compliance play supportive roles in

achieving sustainable outcomes. This balanced approach underscores the importance of integrating effective maintenance practices, skilled workforce, and compliance within operational strategies for light aircraft.

4.8 Hypotheses Testing

The results of the hypothesis test are as shown in table 4.17

Table 4.15: Summary Hypothesis Tests

Hypotheses	Expected	P –Value	Verdict
H ₀₁	There is a significant positive relationship between TM and operational efficiency.	0.023<0.05	Reject
H ₀₂	There is a significant positive relationship between PC and operational efficiency.	0.009<0.05	Reject
H ₀₃	There is a significant positive relationship between TS and operational efficiency.	0.000 < 0.05	Reject
H ₀₄	There is a significant positive relationship between AF and operational efficiency.	0.008< 0.05	Reject

(Source: Researcher, 2025)

The hypothesis testing outcomes confirm that all four predictors examined in the study have a statistically significant relationship with operational efficiency in the light aircraft industry.

For the first hypothesis (H01), the p-value of 0.023 is below the 0.05 threshold, leading to the rejection of the null hypothesis. This demonstrates that Maintenance Turnaround Time (MT) significantly contributes to improving operational efficiency, reinforcing the importance of efficient maintenance practices in enhancing aircraft performance.

The second hypothesis (H02) tested the influence of Preventive vs Corrective Maintenance Ratio (PC). With a p-value of 0.009, the null hypothesis was also rejected, indicating that the preventive maintenance ratio plays a meaningful role in improving operational efficiency. While the regression coefficient was relatively small, the statistical significance shows that emphasizing preventive maintenance helps to prevent breakdowns and unscheduled repairs, thus improving the overall efficiency of light aircraft operations.

The third hypothesis (H03) focused on Technician Skill Level (TS), where the p-value of 0.000 confirmed a highly significant relationship. The null hypothesis was rejected, and the findings highlighted technician skill as one of the strongest predictors in the model. This underscores the pivotal role that skilled technicians play in ensuring efficient maintenance processes and optimizing operational efficiency, further highlighting the importance of continuous training and capacity-building programs.

For the fourth hypothesis (H04), Compliance with Audit Findings (AF) was also found to have a significant effect, with a p-value of 0.008. The null hypothesis was therefore rejected, suggesting that audit compliance, though modest in effect size, contributes positively to operational efficiency by ensuring that corrective actions and recommendations from audits are implemented effectively.

All four hypotheses were rejected, showing that Maintenance Turnaround Time (MT), Preventive vs Corrective Maintenance Ratio (PC), Technician Skill Level (TS), and Compliance with Audit Findings (AF) significantly influence operational efficiency in the light aircraft industry. These findings validate the conceptual model of the study and emphasize the need for an integrated approach where efficient maintenance practices, technician competence, proactive maintenance strategies, and audit compliance collectively enhance operational efficiency.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter provides a synthesis of the major findings, practical recommendations, and conclusions arising from the study. The aim is to consolidate the insights gained in previous chapters into actionable outcomes that can guide decision-making, policy, and future research. The section begins with a summary of key findings, followed by recommendations tailored to research, policy, practice/training, and education. The chapter concludes with reflections that emphasize the importance of the study in contributing to improved operational efficiency and performance in the light aircraft industry.

5.2 Summary of Findings

The study aimed to determine the influence of four predictors: Maintenance Turnaround Time (MT), Preventive vs Corrective Maintenance Ratio (PC), Technician Skill Level (TS), and Compliance with Audit Findings (AF) on the operational efficiency of light aircraft in Kenya.

From the descriptive statistics, most respondents moderately or strongly agreed with statements related to operational efficiency practices. The mean scores ranged between 3.1 and 4.6 across the four variables, while the standard deviations were generally below one, reflecting consistency in responses. This indicates that the opinions of the sampled respondents were largely in agreement. Technician Skill Level (TS) and Maintenance Turnaround Time (MT) recorded higher mean values, demonstrating that staff and stakeholders recognize their importance in driving operational efficiency. However,

Preventive vs Corrective Maintenance Ratio (PC) and Compliance with Audit Findings (AF) showed more moderate scores. Some respondents highlighted that while these areas are acknowledged, their full integration into operational practices remains inconsistent, leading to gaps in performance.

Inferential statistics reinforced these findings by confirming that all four independent variables had a statistically significant relationship with the dependent variable, operational efficiency in light aircraft performance. Regression analysis yielded a correlation coefficient (R) of 0.701 and a coefficient of determination (R^2) of 0.491. This indicates that nearly 49.1% of the variance in operational efficiency can be explained by the combined effect of the four predictors. The unexplained variance (50.9%) suggests the need to explore additional factors such as technological innovations, fuel policies, and operational strategies in future studies.

Hypothesis testing showed that all null hypotheses were rejected, with p-values ranging from 0.000 to 0.023. This confirmed that Maintenance Turnaround Time (MT), Preventive vs Corrective Maintenance Ratio (PC), Technician Skill Level (TS), and Compliance with Audit Findings (AF) significantly influence operational efficiency in the light aircraft industry. The standardized beta coefficients reflected the strength of each predictor's impact. Maintenance Turnaround Time (MT) ($\beta = 0.617$, $p < 0.001$) exerted the greatest influence, emphasizing that efficient maintenance processes contribute significantly to operational performance.

Preventive vs Corrective Maintenance Ratio (PC) followed with a beta coefficient of 0.183 ($p = 0.023$), illustrating that regular preventive maintenance contributes to the smooth

running of aircraft operations. Technician Skill Level (TS) and Compliance with Audit Findings (AF) had smaller coefficients of 0.021 and 0.005, respectively. While statistically significant, their contributions are more indirect, reinforcing the effectiveness of maintenance strategies and compliance protocols.

Furthermore, many respondents noted that training provided for technicians was often generic, limiting its impact. Air traffic controllers, engineers, and maintenance staff requested more specialized training content tailored to their daily responsibilities. While Preventive vs Corrective Maintenance Ratio (PC) systems were in place, many employees lacked the technical skills required for troubleshooting and maintenance planning, reducing their overall effectiveness. Respondents also emphasized that leadership engagement and resource allocation are crucial. Maintenance practices and training cannot deliver meaningful results without sufficient resources and commitment from top management.

In conclusion, Maintenance Turnaround Time (MT) and Preventive vs Corrective Maintenance Ratio (PC) are the primary drivers of measurable outcomes in operational efficiency, while Technician Skill Level (TS) and Compliance with Audit Findings (AF) play essential supporting roles. The moderate scores in some areas reflect gaps in communication, innovation, and operational follow-through that must be addressed for achieving long-term operational efficiency in the light aircraft industry.

5.2 Conclusions

The findings of this study demonstrated that operational management initiatives play a significant role in supporting operational efficiency within Kenya's light aircraft industry.

The analysis revealed that Preventive vs Corrective Maintenance Ratio (PC) and Maintenance Turnaround Time (MT) emerged as the most influential drivers, providing clear benchmarks, measurable requirements, and effective protocols that align operational processes with best practices. These operational frameworks not only shape aircraft maintenance but also motivate staff to internalize efficiency as part of their daily responsibilities.

Training programs were found to be important but less impactful when designed generically without considering role-specific requirements. The study established that staff value continuous professional development but highlighted the need for targeted, practical, and simulation-based approaches that address operational realities. This indicates that while training is essential, its effectiveness in improving operational efficiency depends on its relevance and the availability of resources to implement knowledge in practice.

The results further confirmed that technician skill levels and compliance with audit findings, though essential, face limitations due to skill gaps among staff and insufficient resources to fully integrate best practices into operations. Leadership engagement was also identified as a determining factor in ensuring sustainability initiatives receive priority. Without visible commitment from top management, operational policies risk being overshadowed by competing operational objectives.

In conclusion, the effectiveness of operational management initiatives depends on their integration into the organizational structure through Preventive vs Corrective Maintenance Ratio, Maintenance Turnaround Time, leadership accountability, resource allocation, and role-specific capacity building. Addressing these gaps through well-structured and

adequately resourced initiatives will enhance the light aircraft industry's ability to improve performance while aligning with global aviation efficiency objectives.

5.3 Recommendations

The quantitative and qualitative findings of this study indicate that Maintenance Turnaround Time and Preventive vs Corrective Maintenance Ratio are the strongest drivers of operational efficiency, while Technician Skill Level and Compliance with Audit Findings play supporting roles. The recommendations below are practical and directly aligned with these findings. Each set of recommendations identifies specific activities, the parties responsible for implementation, realistic timelines, and monitoring and evaluation approaches to ensure accountability and measurable progress.

5.3.1 Implications for Research

While Maintenance Turnaround Time and Preventive vs Corrective Maintenance Ratio (PC) were identified as the most influential factors in operational efficiency, there are areas still unexplored. Specifically, the impact of technician skill development, advanced maintenance technologies, and operational practices on aircraft performance warrants further research. It is recommended that future studies explore the adoption of advanced diagnostic tools, the role of automation in maintenance processes, and the long-term effects of compliance with audits on operational efficiency. Longitudinal studies should be prioritized to examine the sustained impact of technician training programs and maintenance practices. Universities, national research councils, and aviation research units should take the lead on initiating this research, in collaboration with industry stakeholders.

Scoping calls should be issued within six months, and full projects should commence within two years. Annual review workshops should be held to monitor progress and integrate findings into the light aircraft industry's operational strategies.

5.3.2 Implications for Policy

From a policy perspective, the study established that Maintenance Turnaround Time and Preventive vs Corrective Maintenance Ratio are critical to ensuring efficient aircraft operations. It is recommended that aviation regulatory bodies, in collaboration with the Ministry of Transport and other relevant government agencies, develop and enforce policies that mandate standardized maintenance reporting, minimum maintenance intervals, and the progressive adoption of preventive maintenance strategies across the light aircraft industry. Environmental performance targets should be integrated into oversight frameworks, with annual compliance reports made publicly available to enhance transparency. Incentive mechanisms such as recognition awards, streamlined approval processes, or conditional regulatory relief should be introduced to encourage entities that exceed maintenance compliance requirements. Drafting and stakeholder consultations should be undertaken within six months, with phased implementation over a three-year horizon. Progress should be evaluated through maintenance audits, performance reports, and third-party verification of maintenance outcomes.

5.3.3 Implications for Practice and Training

The study found that while staff value environmental and operational training, its effectiveness is weakened when programs are generic. It is recommended that training

programs be redesigned to meet the specific needs of different staff categories. Technicians should receive training on advanced diagnostic techniques and fuel-efficient procedures, maintenance staff should focus on energy-efficient systems, and operations staff should be educated on preventive maintenance strategies and compliance procedures. Training should incorporate simulations, case studies, and scenario-based learning to apply knowledge in practice. Certification-linked modules should also be introduced to prepare staff for external audits and continuous improvement. Aviation training units should partner with aviation colleges and international institutions to implement these programs within a year. Monitoring should involve competency assessments, evaluations of training outcomes in operations, and integration of training performance into employee appraisals.

5.3.4 Implications for Education

The study emphasized the need to embed operational efficiency and maintenance strategies into the education system that produces future aviation professionals. Universities and aviation training institutions should revise their curricula to include modules on preventive maintenance, aircraft performance optimization, and operational efficiency strategies. Internship programs should be strengthened to provide students with practical exposure in maintenance operations, airlines, and regulatory offices where they can engage directly with aircraft management practices. Postgraduate programs should introduce scholarships and fellowships focused on improving light aircraft operational efficiency. Curriculum revisions should begin within the next academic year, with internship programs aligned to operational cycles in the aviation sector. Monitoring should involve tracer studies of

graduates, assessments of student research contributions, and employer feedback on graduates' readiness to implement efficiency practices.

5.3.5 Contribution to Policy and Managerial Implications

The findings of this study provide significant insights into the key drivers of operational efficiency in the light aircraft industry. As Maintenance Turnaround Time (MT) and Preventive vs Corrective Maintenance Ratio (PC) were found to have the most significant impact, the policy recommendations focus on standardizing maintenance practices, enhancing compliance protocols, and fostering continuous improvements in operational efficiency.

For policy development, regulatory bodies such as the Kenya Civil Aviation Authority (KCAA) should prioritize the creation of detailed guidelines that enforce the adoption of preventive maintenance practices, standardized maintenance intervals, and regular audits. These policies should incentivize compliance with these best practices, including introducing rewards or regulatory benefits for those who meet or exceed the established benchmarks. Additionally, environmental performance should be incorporated into these regulations, ensuring that maintenance strategies not only improve operational efficiency but also reduce the environmental footprint of the aviation industry.

On the managerial side, airport operators, airline companies, and aviation maintenance organizations should align their management practices with the study's findings. This includes developing internal protocols that emphasize the importance of timely maintenance and proper staff training. Managers must also ensure adequate resources are

allocated to facilitate effective maintenance activities, and actively engage with staff through feedback mechanisms to enhance the implementation of strategies learned in training programs.

To support these efforts, regular workshops and seminars involving industry stakeholders, such as air traffic control personnel, engineers, and management teams, should be organized to ensure that everyone in the sector is aligned with the latest research and practices in aviation maintenance. Such initiatives will improve collaboration and enhance the overall effectiveness of operational strategies, ultimately fostering a more sustainable and efficient aviation environment in Kenya's light aircraft industry.

The implications of these findings are critical for the continuous improvement of operational practices, and the study serves as a foundation for both policy and managerial decisions aimed at optimizing efficiency, improving training, and driving future research in the sector.

5.4 Limitations of the Study

While this study provides valuable insights into the operational management initiatives within Kenya's light aircraft industry, several limitations must be considered when interpreting the results.

One key limitation is the scope of the study, which focused exclusively on the maintenance operations of light aircraft. While the findings are significant for this segment of the aviation industry, they may not be directly applicable to other sectors within aviation, such

as commercial or cargo flights, where operational practices, resources, and regulatory frameworks may differ substantially.

Another limitation concerns the reliance on a cross-sectional research design, which captures data at a single point in time. This design limits the ability to draw conclusions about the long-term effects of maintenance practices and training programs. A longitudinal study could offer deeper insights into how operational management practices evolve over time and the sustained impact of changes in training, maintenance protocols, and leadership engagement.

The study also faced challenges related to the generalizability of the findings due to the sample size and selection. Although a range of stakeholders were involved in the research, the sample was limited by the accessibility of participants and the specific context of the study. The perspectives gathered from maintenance staff, management, and technicians may not fully represent the views of other aviation professionals, such as regulators or suppliers, whose input could have further enriched the findings.

In addition, the study primarily used self-reported data from surveys and interviews. This approach introduces the possibility of response biases, where participants may have provided socially desirable answers or underreported challenges they face in their day-to-day operations. To mitigate this limitation, future research could incorporate observational methods or external audits to validate the reported data and provide a more objective assessment of operational practices.

Finally, the study focused mainly on two key operational metrics, Maintenance Turnaround Time and Preventive vs Corrective Maintenance Ratio, while other potentially influential factors, such as technological advancements, regulatory changes, and economic conditions, were not deeply explored. Further research could incorporate a broader range of variables to capture a more holistic view of the factors that drive operational efficiency in the light aircraft industry.

Despite these limitations, the study offers important insights that can inform policy, practice, and future research and serves as a foundation for improving operational efficiency within the sector.

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APPENDICES

APPENDIX I: QUESTIONNAIRE

Dear Participant,

You are kindly invited to participate in a study examining how aircraft maintenance practices influence operational efficiency of light aircraft industry. The data you provide will be treated confidentially and used strictly for academic purposes.

Warm regards,

SECTION A: Demographic Information

Please tick [✓] the appropriate box.

1. Age Range

- 20–29 years
- 30–39 years
- 40–49 years
- 50–59 years
- 60 and above

2. Years of Experience in Aviation

- 1–5 years
- 6–10 years
- 11–15 years

- 16–20 years
- Over 20 years

3. Current Designation

- Aeronautical Engineer
- Aircraft Maintenance Technician
- Quality Assurance Officer
- Operations Manager

SECTION B: Maintenance Turnaround Time and operational efficiency

Please indicate your level of agreement using the provided scale of Maintenance Turnaround Time and operational efficiency of light aircraft industry in Kenya:

5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = Strongly Disagree

Maintenance Turnaround Time and operational	5	4	3	2	1
Aircraft maintenance tasks are completed within the expected turnaround time.					
Delays in maintenance negatively affect aircraft availability for operations.					
Coordination among engineers and technicians ensures faster maintenance completion.					
Maintenance planning effectively reduces aircraft					
Monitoring of turnaround time metrics is consistently applied across teams.					

SECTION C: Technician Skill Level and operational efficiency of light aircraft industry in Kenya

Please indicate with a tick \checkmark the extent to which you agree with any of the following statement concerning Technician Skill Level and operational efficiency of light aircraft industry in Kenya. Use the scale where:

5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = Strongly Disagree

Technician Skill Level and operational efficiency	5	4	3	2	1
Maintenance technicians have the necessary skills to handle complex aircraft systems.					
Continuous training programs enhance technical competency of staff.					
Technicians can troubleshoot aircraft faults effectively without supervision.					
Training aligns with international maintenance and safety standards.					
Skilled technicians contribute to reduced aircraft downtime and improved operational efficiency.					

SECTION D: Preventive versus Corrective Maintenance Ratio

Please indicate with a tick \surd the extent to which you agree with any of the following statement concerning influence of Preventive versus Corrective Maintenance Ratio on operational efficiency of light aircraft industry in Kenya. Use the scale where:

5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = Strongly Disagree

Preventive versus Corrective Maintenance Ratio	5	4	3	2	1
Preventive maintenance programs are implemented regularly to avoid breakdowns.					
Corrective maintenance occurrences are reduced due to effective preventive practices.					
Maintenance schedules are planned to prioritize preventive interventions.					
Allocation of resources favors preventive maintenance over reactive repairs.					
Monitoring of preventive maintenance ensures compliance and efficiency.				S	

SECTION E: Compliance with Audit Findings

Please indicate with a tick \surd the extent to which you agree with any of the following statement concerning Compliance with Audit Findings and operational efficiency of light aircraft industry in Kenya. Use the scale where:

5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = Strongly Disagree

Compliance with Audit Findings	5	4	3	2	1
Audit recommendations are implemented in a timely					
Compliance with audit findings improves maintenance					
Corrective actions from audits enhance aircraft					
Documentation of audit compliance is accurate and					
Audit follow-up results influence strategic operational					

SECTION F: Operational efficiency of light aircraft industry in Kenya

Please indicate with a tick \surd the extent to which you agree with any of the following statement concerning level of Level of operational efficiency of light aircraft industry in Kenya. Use the scale where:

5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = Strongly Disagree

Level of operational efficiency of light aircraft industry in Kenya	5	4	3	2	1
Aircraft availability meets scheduled operations without					
Maintenance practices effectively reduce unplanned					
Operational efficiency targets are consistently achieved.					
Maintenance interventions optimize aircraft performance.					
Organizational performance improves due to effective					

Thanks for your cooperation.

APPENDIX II: BUDGET

MATERIALS	RATE	QUANTITY	COST (SHS)
Laptop	@ 60000	1 pc	60000.00
Printer	@ 20000	1 pc	20000.00
Photocopy papers	@ 600	3 Reams	1500.00
Travel expenses			18000.00
Miscellaneous			2000.00
Total			101,500.00

