Effect of Aircraft Factors on the Performance of Selected Airlines in Kenya

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Abstract:

Purpose: *The study aimed to determine the effect of aircraft-related factors on the performance of selected airlines in Kenya. The research was guided by the Economies of Density Theory and the Transaction Cost Theory, which explains how operational efficiency and cost structures influence airline performance.*

Methodology: *The target population comprised 355 top management employees, pilots, and engineers drawn from five major airlines in Kenya, Kenya Airways, Safari Link, African Express Airways, AirKenya Express, and Mombasa Air Safari. A stratified random sampling technique was used to select 186 respondents. Data were collected using structured questionnaires designed to capture the study variables. The reliability of the research instrument was tested using Cronbach's Alpha coefficient, while SPSS Version 25 was used for data analysis. Descriptive statistics such as means, frequencies, percentages, and standard deviations were computed. Inferential analysis using multiple linear regression was employed to determine the influence of aircraft factors on airline performance.*

Findings: *The regression analysis revealed that load factors ($\beta = 0.354$, $p = 0.000$) and operational factors ($\beta = 0.262$, $p = 0.009$) had statistically significant positive effects on airline performance, with the model explaining 67.1% of the variation in performance ($R^2 = 0.671$). These findings demonstrate that aircraft-related variables are critical determinants of airline operational success in Kenya.*

Conclusion: *The study concludes that efficient management of aircraft-related factors, particularly load and operational factors, significantly enhances airline performance. Strategic aircraft scheduling, fuel-efficient fleet management, and optimization of load factors are key to improving competitiveness and profitability in the aviation sector.*

Value*: This study contributes to the limited empirical literature on aviation management in emerging markets. It provides actionable insights for airline executives and policymakers, recommending the adoption of real-time aircraft scheduling systems, fuel-efficient technologies, and aviation-specific policy frameworks to promote cost-effective and sustainable operations in Kenya's airline industry.*

Keywords: *Aircraft Factors, Load Factors, Operational Factors, Airline Performance*

Paper Type: *Research Article*

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1. Introduction

The performance of airlines plays a pivotal role in the aviation industry, which serves as a vital enabler of global connectivity, trade, and economic growth. Airlines contribute significantly to national and international economies by facilitating tourism, creating jobs, and enabling efficient movement of goods and services (Nazeer, et al., 2024). However, despite their importance, airlines face numerous challenges that hinder their performance. Globally, the aviation industry has struggled with fluctuating fuel prices, operational inefficiencies, and competition from low-cost carriers (Dong, 2024). These challenges have led to the financial struggles and eventual closure of several prominent airlines, including Thomas Cook Airlines and South African Airways (McLachlan, et al., 2018). Such trends underscore the urgent need to understand the factors influencing airline performance to ensure the sustainability and competitiveness of the sector.

Among the factors influencing airline performance, aircraft factors, though often overlooked, have been identified by scholars as critical determinants (Djojodihardjo, 2023; Barbosa, 2023. Aircraft factors refer to the characteristics and operational aspects of the aircraft that influence efficiency, safety, and profitability (Maia, et al., 2024). Scholars have grouped aircraft factors into categories such as operational factors, load factors, and aerodynamic factors (Hassan, et al., 2023). Operational factors include runway requirements, maintenance needs, and environmental adaptability (Romaniuk, 2024), while load factors pertain to passenger and cargo capacity utilization (Djojodihardjo, 2023). Aerodynamic factors focus on the aircraft's design features that impact fuel efficiency and speed (Barbosa, 2023). These factors collectively influence an airline’s ability to optimize fuel consumption, reduce maintenance costs, and enhance overall profitability. A better understanding of these aircraft factors and their interrelation with airline performance is essential for developing strategies to improve operational efficiency.

Globally, aircraft factors have been widely studied for their influence on the performance of airlines. For instance, in the United States, Doe (2024) found that modern aircraft with enhanced fuel efficiency and advanced aerodynamics, like the Boeing 787 Dreamliner, have been credited with reducing operating costs and enabling airlines to operate on longer routes profitably (Hrytsiuk, 2021). However, challenges such as the high acquisition and maintenance costs of these aircraft often erode the financial performance of airlines, especially those with limited access to capital (Samunderu, 2024). In Europe, Roe (2022) highlighted that underutilization of aircraft due to poor load factor management is a major factor affecting airline performance, particularly for low-cost carriers. Additionally, environmental regulations have forced many airlines in Europe and Asia to retire older, less efficient aircraft prematurely, further increasing operational costs (Lee, et al., 2024). Such findings demonstrate the critical role aircraft factors play in shaping airline performance globally, making it essential for airlines to strategically address these challenges to remain competitive.

In Africa, according to Okonkwo and Moyo (2023), the reliance on aging fleets with low fuel efficiency has been a major contributor to the financial struggles of airlines such as South African Airways and Air Namibia (Mhlanga, 2018). These older aircraft not only incur higher maintenance costs but also face frequent operational downtimes, reducing overall productivity. Furthermore, poor load factor management has been cited as a critical issue for African airlines (Samunderu, 2023)., with Wanjala and Otieno (2024) noting that many carriers operate with load factors below the global average, leading to revenue losses (Mononga & Michael, 2020). Infrastructure challenges, such as inadequate maintenance facilities and incompatible runways for modern aircraft, further limit the ability of airlines in the region to adopt more efficient fleets. Moyo (2023) emphasizes that addressing aircraft factors, such as fleet modernization and improved load management, could enhance the operational and financial performance of African airlines, allowing them to compete more effectively on the global stage.

The airline industry plays a pivotal role in facilitating global connectivity, driving economic growth, and enhancing international trade and tourism. Ideally, airlines are expected to achieve operational efficiency and financial sustainability by optimizing their resources, leveraging advanced technologies, and ensuring high levels of customer satisfaction. Key factors such as aircraft design, maintenance practices, fuel efficiency, load factors, and operational strategies significantly influence airline performance. Globally, airlines that effectively manage these factors have demonstrated improved profitability, competitive advantage, and resilience in a dynamic and highly regulated industry. Advanced maintenance practices, fuel-efficient aircraft, and predictive analytics have enabled leading carriers like Ethiopian Airlines to expand their networks and fleets while maintaining strong financial performance. However, the Kenyan airline industry is characterized by significant operational inefficiencies and financial underperformance. Despite having an experienced workforce and strategic advantages, airlines such as Kenya Airways (KQ) have continued to record persistent financial losses, including a net loss of KSh 22.7 billion in 2023, KSh 38.3 billion in 2022, and KSh 12.15 billion for the first half of 2025, necessitating repeated government bailouts (Kenya Airways, 2024; The Kenya Times, 2025). Other carriers, such as Air Kenya Express, 748 Air Services, and African Express Airlines, have also struggled, while airlines like Fly 540, Jetlink, and Flamingo Airlines have exited the market(The Kenya Times, 2025). The Senate Committee on Kenya Airways identified major issues, including aircraft factors, as key contributors to poor performance. Compared to Ethiopian Airlines, which boasts a fleet of 100 aircraft and 59 on order, Kenya Airways operates a fleet of 40 aircraft with none on order, highlighting gaps in fleet modernization and maintenance strategies. Additionally, challenges in the aircraft maintenance industry, such as the need for extended maintenance intervals and cost pressures, have further compounded these issues, leading to grounded aircraft and decreased business operations.

While studies have explored the relationship between aircraft factors and airline performance, they have often focused on specific aspects such as maintenance practices, fuel efficiency, or operational factors in isolation (Lu & Chung, 2023; Grimme et al., 2021). Moreover, limited research has been conducted on how these factors collectively influence airline performance, particularly in the Kenyan context. This gap in literature necessitates a comprehensive study to investigate aircraft factors such as load factors and operational efficiency and their impact on the performance of airlines operating at Jomo Kenyatta International Airport.

2. Theoretical and Empirical Review

2.1. The Economies of Density Theory

The Economies of Density Theory, advanced by Baumol, Panzar, and Willig (1982), explains that airlines can lower unit costs by increasing load factors, as higher passenger volumes allow fixed costs like crew wages, aircraft leasing, and airport handling fees to be spread across more seats. This improves cost efficiency and competitiveness, particularly for carriers that consistently maintain high passenger loads (Zhou et al., 2020; Foo et al., 2021). Empirical evidence shows that higher load factors enhance financial performance by reducing cost per available seat kilometer (CASK) and increasing revenue per available seat kilometer (RASK), ultimately boosting profitability (Addepalli et al., 2023; Caves et al., 1984). This makes load factor optimization a crucial strategy for both low-cost and full-service carriers seeking efficiency and financial sustainability in today's competitive airline market (Chung & Choi, 2022).

Transaction Cost Theory, pioneered by Coase (1937) and refined by Williamson (1979), argues that firms exist to minimize the costs of conducting economic transactions, including information search, negotiation, and contract enforcement. In aviation, such costs are reflected in fleet management, scheduling, ground handling, and coordination with third parties, which, if poorly managed, can lead to inefficiencies and higher expenses (Williamson, 1981; Ding & Liang, 2022). Airlines that internalize these operations or adopt robust systems to streamline them reduce uncertainty, avoid delays, and improve contractual reliability (Zhang & Round, 2021). Empirical studies highlight how operational strategies like fleet optimization, route planning, and effective crew scheduling lower transaction costs and enhance performance (Gillen & Morrison, 2003; Crozet & Milet, 2023). In the Kenyan context, applying Transaction Cost Theory helps explain how better management of operations can improve punctuality, cost-effectiveness, and customer satisfaction, thereby strengthening overall airline performance.

2.2. Hypothesis Development

Zou and Hansen (2021) research on passenger load factors (PLF) highlights a complex relationship between operational efficiency and financial performance in the airline industry. Zou Zou and Hansen (2021) found that lower PLFs during the COVID-19 pandemic in the U.S. reduced congestion and improved on-time performance, though at the expense of financial sustainability. Similarly, Safiuddin (2019) demonstrated that higher PLFs contribute positively to financial health using Altman's Z-score, underscoring the importance of optimal seat utilization for long-term viability. In southern Africa, Mhlanga (2019) confirmed that PLF, alongside factors like aircraft size and revenue hours, significantly drives both technical and cost efficiency, particularly benefiting low-cost carriers. Evidence from Kenya by Aomo et al. (2016) further revealed that fleet capacity expansion strengthens PLF, suggesting that aligning capacity with market demand is vital for improving utilization and efficiency.

Other studies emphasize economies of scale and fleet strategy in relation to PLF. Chua et al. (2015) found that higher PLFs reduce total operating costs, reinforcing the efficiency benefits of maximizing seat occupancy. However, Besanko et al. (2014) cautioned that PLFs must be interpreted alongside aircraft size, noting that smaller aircraft with high occupancy can be more efficient than larger ones with underutilization. Yılmaz and Köse (2023) expanded this perspective by using panel ARDL analysis to show that while external factors like GDP and oil prices weigh heavily on airline profitability, sustained increases in PLF also yield significant long-term financial gains. These findings highlight the importance of balancing PLF optimization with fleet composition, external conditions, and strategic cost management.

The COVID-19 pandemic offered further insights into PLF's role in airline resilience. Wu et al. (2024) used dynamic network DEA and showed that no airline achieved full efficiency during the pandemic, with falling PLFs and network disruptions severely impacting performance, particularly for low-cost carriers. Martini et al. (2023) found similar inefficiencies among African airlines between 2010 and 2019, where low PLFs and overcapacity drove high operating costs and reduced competitiveness. Ngabirano et al. (2024) reported that although Africa's PLF improved from 64.6% in 2021 to 71.6% in 2022, it still lagged behind global averages, mainly due to weak intra-African connectivity and policy constraints. These studies collectively highlight the need for stronger capacity optimization, liberalization, and adaptability to external shocks. Thus, the study hypothesized that:

H_1: There is significant effect of load factors on performance of selected airlines in Kenya

Research on aircraft fleet management and operational efficiency emphasizes the importance of modern technologies, strategic planning, and optimization in enhancing airline performance. Akmaldinova and Volkovska (2021) highlighted that advanced aviation modeling, forecasting, and optimization tools can improve decision-making in fleet management, routing, and passenger services. They stressed that fleet planning must account for political, economic, social, and environmental factors to achieve global competitiveness. Complementing this, Mizuno, Ohba, and Ito (2020) analyzed flight operations using actual flight data and regression models, finding that pilot decisions regarding cruising altitude, climb rates, and descent speeds significantly affect both flight time and fuel consumption. These findings point to the crucial role of technology and human expertise in boosting operational efficiency.

Fleet capacity and utilization also play a central role in airline efficiency. Studies by Aomo, Oima, and Oginda (2016) and Mhlanga (2019) found that larger fleets, when properly managed, positively influence load factors and cost efficiency, especially for low-cost carriers. Beyond fleet size, air traffic control (ATC) efficiency is equally vital: delays in ATC increase fuel burn and costs, while intelligent ATC services and improved coordination streamline traffic flow and reduce operational disruptions. Together, these findings underscore the need for airlines to integrate fleet capacity optimization with improved traffic management systems to maximize efficiency and minimize waste.

In the African context, maintenance practices and regulatory environments heavily affect performance outcomes. Bor and Nyadianga (2024) showed that workforce development, safety culture, management support, and cooperation significantly improved the performance of Kenya's aircraft maintenance organizations. Sylva and Amah (2021) similarly found that Nigerian airlines struggle with outdated fleets and poor maintenance policies, leading to inefficiencies and financial losses. Martini et al. (2023) extended this perspective across African carriers, reporting persistently low productivity caused by policy and regulatory constraints, while liberalized markets improved efficiency.

Globally, operational and scheduling factors also shape airline performance. Lonzius and Lange (2024) found that complex hybrid routings increase delays compared to simpler structures, linking scheduling directly to service quality. In Brazil, Oliveira et al. (2021) showed that fuel price fluctuations prompt fleet renewal and long-term efficiency improvements, though market competition effects on fuel efficiency remained inconclusive. Hassan et al. (2021) further demonstrated that flight distance and aircraft weight strongly predict fuel burn, with high explanatory power for operational cost efficiency. Collectively, these global studies reveal that scheduling design, fuel efficiency strategies, and payload management are critical for minimizing costs and improving service reliability, reinforcing the broader significance of operational decision-making in airline performance. Thus, the study hypothesized that:

H_2: There is significant effect of operational factors on performance of selected airlines in Kenya.

3. Methodology

The study adopted an explanatory research design, which was appropriate for examining cause-and-effect relationships between variables, particularly how changes in independent variables such as load factors influence the dependent variable, airline performance. This design allowed for hypothesis testing and emphasized grounding theoretical assumptions in empirical evidence, thereby strengthening the credibility of the findings (Gay et al., 2011; Cohen, Manion, & Morrison, 2011; Hammersley, 2013).

3.1. Sampling

The target population comprised 355 top management employees, pilots, and engineers from Kenya's five major airlines: Kenya Airways, Safari Link, African Express Airways, Airkenya Express, and Mombasa Air Safari. To ensure fair representation, the study employed a stratified random sampling technique, dividing the population into strata based on airlines and randomly selecting respondents within each subgroup. Using Slovin's formula at a 5% margin of error, the sample size was calculated as 186, proportionately distributed across the five airlines.

3.2. Data Collection and Measurement of Variables

Data were collected using a structured questionnaire designed with closed-ended, Likert-scale items to ensure consistency, quantifiability, and reliability of responses. A pilot test involving 18 respondents (10% of the sample) from Jambo Jet confirmed the instrument's validity and reliability. Reliability was measured using Cronbach's Alpha, with a benchmark value of 0.70 or higher considered acceptable (Cronbach, 1951), while validity was assessed through face, content, criterion, and construct validity to confirm accuracy and comprehensiveness (Kothari, 2015; Nachmias & Nachmias, 2014; Creswell & Creswell, 2018). The measurement of variables was guided by established literature. The performance of selected airlines in Kenya was assessed using five items adapted from Alici and Sevil (2022), Sezgen et al. (2019), and Saini et al. (2023). Load factor was measured through five items derived from Walters and Rodriguez (2017) and Mncedisi (2020). Aircraft operation factors were examined using five items informed by Kinnison and Siddiqui (2018) and Bonuke et al. (2024), while aerodynamic factors were captured using five items adapted from Lu and Chung (2023) and Grimme et al. (2021). All variables were measured on a five-point Likert scale, which provided a standardized approach for quantifying responses.

3.3. Data analysis and model Specification

For data processing and analysis, responses were coded and analyzed using SPSS Version 25, applying descriptive statistics (frequencies, means, percentages, and standard deviations) to summarize variable characteristics and inferential techniques such as Pearson correlation and multiple linear regression to test hypotheses and establish the significance, direction, and strength of relationships among variables. This methodological approach ensured that the study's conclusions were both rigorous and reflective of real-world airline operations in Kenya. The resulting regression models were used to test the study's hypotheses.

$$\mathrm{Y} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \varepsilon$$

Y = performance of selected airlines in Kenya, X_1 = load factor, X_2 = aircraft operation factors, β_0 = Constant term, β_1, β_2, = Coefficients of the Regression (change of performance of selected airlines in Kenya as a result of change in independent variables), ε = Error term

4. Findings

This section presents the findings of the study on the effect of aircraft-related factors on the performance of selected airlines in Kenya. A total of 186 questionnaires were distributed across these airlines. Out of these, 145 were successfully completed and returned, resulting in a response rate of 77.9%. This response rate is considered satisfactory and adequate for data analysis and generalization of findings

4.1. Airline Characteristics

The characteristics of the participating airlines show that 50.3% have been in operation for over 15 years, while 33.8% have operated between 6–10 years, indicating that the majority are well-established with mature operational systems and experienced personnel. In terms of workforce size, 42.8% of the airlines employ over 301 staff, and 31% have between 101–200 employees, reflecting strong technical capacity and departmental specialization for managing functions such as load balancing, maintenance scheduling, and aerodynamic optimization. Only 4.8% of the airlines reported having between 1–100 employees, underscoring that the sample is dominated by medium to large carriers with adequate human capital to handle complex operations.

Table 1: *Airline Characteristics*

		Frequency	Percent
Years the airline has been in operation	1-5 years	15	10.3
	6-10 years	49	33.8
	11- 15 years	8	5.5
	Over 15 years	73	50.3
	Total	**145**	**100**
Number of employees	1-100	7	4.8
	101-200	45	31
	201-300	31	21.4
	over 301	62	42.8
	Total	**145**	**100**

Source; Field Data (2025)

4.2. Descriptive Statistics

Descriptive statistics revealed that respondents generally rated airline performance positively, with an overall composite mean of 4.36 (SD = 0.70), supported by negative skewness (-2.41) and high kurtosis (6.91), indicating consistent clustering of high scores. However, specific dimensions painted a more mixed picture: profitability (Mean = 3.21, SD = 1.42) and market share expansion (Mean = 3.09, SD = 1.48) were only moderately rated, while competitiveness (Mean = 2.65, SD = 1.27), customer satisfaction (Mean = 2.73, SD = 1.30), and customer loyalty (Mean = 2.72, SD = 1.06) scored lower, suggesting weaknesses in strategic positioning and service delivery. These findings align with broader industry concerns where both financial outcomes and operational excellence are critical, alongside emerging emphasis on environmental sustainability, which is increasingly shaping airline performance evaluations. Overall, the results highlight that while Kenyan airlines demonstrate strong general performance, challenges remain in profitability, competitiveness, and customer-centered outcomes.

Table 2: *Airline Performance*

n=145	Mean	Std. Deviation	Skewness	Kurtosis
The airline's profitability has increased in recent years.	3.21	1.42	-0.64	-1.17
The airline has successfully expanded its market share in the Kenyan aviation industry.	3.09	1.48	-0.50	-1.35
The airline is competitive in terms of market share compared to other airlines operating in Kenya.	2.65	1.27	-0.15	-1.60
I am satisfied with the overall customer service experience provided by the airline.	2.73	1.30	-0.29	-1.61
The airline has a high level of customer loyalty, as evidenced by repeat business and positive reviews.	2.72	1.06	-0.20	-1.07
Airline performance	**4.36**	**0.70**	**-2.41**	**6.91**

Source: *(Survey Data, 2025)*

Descriptive statistics on load factors revealed a generally favorable perception among respondents, with an overall mean of 3.90 (SD = 0.80), indicating that Kenyan airlines are moderately effective in managing seat utilization. The highest-rated aspect was capacity-demand alignment (Mean = 3.91, SD = 0.98), suggesting airlines are relatively successful at matching fleet capacity with passenger traffic. However, several operational weaknesses emerged: minimizing idle aircraft time (Mean = 2.90, SD = 1.41), adjusting fleet size for demand fluctuations (Mean = 2.41, SD = 1.20), and optimizing aircraft across routes (Mean = 2.30, SD = 1.35) all scored low, highlighting challenges in flexibility and real-time deployment. Fleet management for operational efficiency also received only moderate ratings (Mean = 2.63, SD = 1.38). The distribution of responses showed acceptable skewness (–0.73) and kurtosis (1.54), indicating a normal though peaked clustering of opinions. These findings emphasize that while airlines are perceived as aligning capacity with demand, they face significant gaps in adaptability and efficiency key factors that directly affect profitability, sustainability, and competitiveness in the aviation sector.

Table 3: *Descriptive Statistics for Load factors*

n=145	Mean	Std. Deviation	Skewness	Kurtosis
The airline effectively matches its fleet capacity with passenger demand.	3.91	0.98	-1.26	1.87
The airline's aircraft are utilized efficiently, with minimal idle time.	2.90	1.41	-0.05	-1.41
The fleet size is adequate to accommodate fluctuations in passenger demand.	2.41	1.20	0.22	-1.41
The airline's fleet management ensures better operational efficiency.	2.63	1.38	0.28	-1.14
I believe the airline optimally utilizes its available fleet for different routes.	2.30	1.35	0.97	-0.37
Load factors	**3.90**	**0.80**	**-0.73**	**1.54**

Source: *(Survey Data, 2025)*

Descriptive statistics on operational factors showed that respondents generally rated airline operational practices positively, with an overall mean of 3.82 (SD = 0.78), reflecting favorable perceptions of how Kenyan airlines manage efficiency. The highest-rated aspect was the use of aircraft with low maintenance costs (Mean = 3.88, SD = 1.13), suggesting airlines prioritize cost-effective fleet management. Moderate scores were recorded for optimal utilization of aircraft across routes (Mean = 3.23, SD = 1.32) and the use of fuel-efficient aircraft (Mean = 2.99, SD = 1.32), indicating partial progress in maximizing fleet deployment and sustainability. However, the lowest ratings emerged in the integration of advanced technologies (Mean = 2.69, SD = 1.30) and effective scheduling and routing (Mean = 2.36, SD = 1.16), highlighting areas where modernization and efficiency improvements are needed. The distribution results, with skewness (–0.37) and kurtosis (1.62) within acceptable ranges, reflect general consensus among respondents, though the findings point to persistent gaps in technology adoption, planning, and operational transformation critical for cost reduction, service reliability, and sustainability alignment..

Table 4: Descriptive Statistics for Operational Factors

n=145	Mean	Std. Deviation	Skewness	Kurtosis
The airline operates aircraft with low maintenance costs to enhance operational efficiency.	3.88	1.13	-0.67	-0.75
Aircraft scheduling and routing are effectively managed to minimize delays and inefficiencies.	2.36	1.16	0.30	-1.37
The airline ensures optimal utilization of its aircraft fleet across all routes.	3.23	1.32	-0.46	-1.01

Advanced technologies are integrated into operations to improve efficiency and safety.	2.69	1.30	0.10	-1.27
The airline uses fuel-efficient aircraft designed to maintain safety standard	2.99	1.32	-0.03	-1.25
Aircraft operation	**3.82**	**0.78**	**-0.37**	**1.62**

Source: *(Survey Data, 2025)*

4.3. Correlation Analysis

Correlation analysis revealed that all three independent variables—load factors, aircraft operation, and aerodynamic factors had strong, positive, and statistically significant relationships with airline performance. Load factors showed the highest correlation ($\rho = 0.770$, $p < 0.01$), followed closely by aircraft operation ($\rho = 0.769$, $p < 0.01$) and aerodynamic factors ($\rho = 0.739$, $p < 0.01$), indicating that effective capacity utilization, efficient maintenance and scheduling, and aerodynamic improvements all play vital roles in enhancing airline outcomes. Intercorrelations were also observed among the predictors, with load factors moderately linked to both aircraft operation ($\rho = 0.529$, $p < 0.01$) and aerodynamic factors ($\rho = 0.542$, $p < 0.01$), while aircraft operation strongly correlated with aerodynamic factors ($\rho = 0.696$, $p < 0.01$), suggesting mutual reinforcement. These results confirm that improvements in load management, operational efficiency, and aerodynamic strategies collectively drive better financial and competitive performance in the airline industry.

Table 5: *Correlation Analysis*

	Airline performance	Load factors	Aircraft operation
Airline performance	1		
Load factors	.770**	1	
Aircraft operation	.769**	.529**	1

** Correlation is significant at the 0.01 level (2-tailed).
Source: *(Survey Data, 2025)*

4.4. Hypothesis Testing

Before hypothesis testing using regression, a series of diagnostic tests were carried out to ensure that key statistical assumptions were met. Normality of residuals was assessed using the Kolmogorov–Smirnov and Shapiro–Wilk tests, both of which returned non-significant results ($p > 0.05$), confirming that the data followed an approximately normal distribution and justifying the use of parametric analysis. Multicollinearity was tested using Tolerance and Variance Inflation Factor (VIF) values, with all predictors load factors (VIF = 3.395), aircraft operation (VIF = 4.169), and aerodynamic factors (VIF = 2.898) falling within acceptable thresholds, indicating that each contributed uniquely to the model. Linearity tests based on ANOVA further confirmed strong and significant linear relationships between each independent variable and airline performance (all $p < 0.001$), validating the use of multiple regression. Finally, Levene's test showed no evidence of heteroscedasticity (all $p > 0.05$), confirming equal error variances across variables. Collectively, these results demonstrate that the dataset met all key regression assumptions, thereby supporting the robustness and reliability of subsequent hypothesis testing.

The regression results showed that aerodynamic factors, load factors, and operational factors collectively explained a significant portion of airline performance, with an R^2 value of 0.671 and an adjusted R^2 of 0.664, indicating that about 66–67% of the variance in performance was accounted for by the model. The small gap between R^2 and adjusted R^2 confirmed the model's robustness and lack of overfitting, while the standard error of 0.40788 reflected a good fit. ANOVA results further validated the model's significance ($F = 96.066$, $p = 0.000$), confirming that the combined effect of the three predictors strongly and reliably explains variations in airline performance. Overall, the findings demonstrate that the model provides a statistically sound basis for predicting airline performance among Kenyan airlines.

Hypothesis 1 (H_{01}) stated that load factors have no significant effect on the performance of selected airlines in Kenya. The findings revealed that the standardized beta coefficient for load factors was $\beta = 0.354$, with a p-value = 0.000, which is less than the significance threshold of $\alpha = 0.05$. This implies that the relationship between load factors and airline performance is both positive and statistically significant. Therefore, the null hypothesis H_{01} was rejected, and it was concluded that load factors have a significant effect on the performance of airlines. This suggests that a one-unit improvement in load factors would result in a 0.354 unit increase in airline performance, holding all other factors constant.

Hypothesis 2 (H_{02}) proposed that operational factors have no significant effect on the performance of selected airlines in Kenya. Regression results indicated a standardized coefficient of $\beta = 0.262$, with a p-value = 0.009, which is also below $\alpha = 0.05$, indicating a statistically significant effect. As a result, the null hypothesis H_{02} was rejected, and it was concluded that operational factors significantly influence airline performance. This means that improvements in operational efficiency such as low maintenance costs, optimized routing, and use of fuel-efficient aircraft—can lead to a 0.262 unit increase in performance, all else being equal.

Table 6: *Regression analysis*

	Unstandardized Coefficients		**Standardized Coefficients**		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	1.023	0.200		5.128	0.000
Load factors	0.310	0.078	0.354	3.984	0.000
Aircraft operation	0.236	0.089	0.262	2.662	0.009
Model Summary					
R	0.819				
R Square	0.671				
Adjusted R Square	0.664				
Std. Error of the Estimate	0.408				
ANOVA					
F	96.066				
Sig.	0.000				

a Dependent Variable: airline performance

Source: *(Survey Data, 2025)*

5. Discussion of the Results

The regression analysis confirmed that load factors significantly and positively influence airline performance ($\beta = 0.354$, $p < 0.000$), underscoring the role of effective seat utilization in boosting efficiency and profitability. This finding is consistent with previous studies such as Safiuddin (2019), who linked higher load factors to stronger financial health, and Mhlanga (2019), who demonstrated their contribution to cost and technical efficiency in Southern Africa. Chua et al. (2015) similarly validated the economies of scale derived from high occupancy, while Aomo, Oima, and Oginda (2016) emphasized the importance of fleet-demand alignment in Kenya. However, the relationship is not always straightforward: Zou and Hansen (2021) found that lower load factors during COVID-19 improved on-time performance, and Besanko et al. (2014) noted that smaller, highly utilized aircraft can outperform larger, underutilized ones. Recent evidence reinforces these nuances: Yılmaz and Köse (2023) showed PLF's long-term contribution to profitability, while Wu et al. (2024) highlighted how pandemic-driven declines undermined operational efficiency, especially for low-cost carriers. In Africa, Martini et al. (2023) linked low PLFs and excess capacity to inefficiencies, and Ngabirano et al. (2024) reported that Africa's PLFs remain below global averages due to weak connectivity and market restrictions. Kenya Airways exemplifies this dynamic, with a PLF drop to 64.8% during the pandemic driving a KSh 36.2 billion loss (2020), followed by a post-pandemic recovery that saw PLFs rebound and revenues surge by 66% (2023). Collectively, these findings affirm that sustained PLF optimization, balanced with strategic fleet composition and adaptability to shocks, is critical for long-term airline performance.

Operational factors were also found to have a significant positive effect on airline performance ($\beta = 0.262$, $p = 0.009$), confirming that practices such as efficient scheduling, predictive maintenance, fuel management, and technological adoption enhance both cost and service outcomes. Akmaldinova and Volkovska (2021) emphasized the importance of intelligent air traffic systems and strategic fleet planning, while Mizuno, Ohba, and Ito (2020) demonstrated how effective management of flight phases reduces time and fuel costs. In Africa, Bor and Nyadianga (2024) showed that human capital factors like training, safety culture, and management support significantly improve maintenance organization performance, while Sylva and Amah (2021) highlighted how outdated fleets and weak policies undermine Nigerian carriers. Martini et al. (2023) further revealed that restrictive policies and labor inefficiencies keep many African airlines below their productivity frontier. Globally, Lonzius and Lange (2024) linked complex scheduling designs to higher delays, Oliveira et al. (2021) found fuel efficiency improvements often follow price shocks via fleet renewal, and Hassan et al. (2021) confirmed that operational variables such as flight distance and takeoff weight strongly predict fuel burn. Together, this evidence shows that operational efficiency—ranging from scheduling and routing to maintenance, technology integration, and workforce development—is a cornerstone of airline performance. By addressing both cost and service dimensions, operational factors complement load factor optimization to create a comprehensive framework for improving competitiveness and sustainability in the airline industry.

6. Conclusion of the Study

In conclusion, the findings of the study confirm that load factors have a positive and significant influence on airline performance. Airlines that successfully align fleet capacity with passenger demand and minimize idle aircraft time tend to perform better in terms of operational and financial outcomes. While many airlines have demonstrated effective capacity-demand matching, there remain challenges in optimizing route utilization and ensuring flexibility to respond to demand fluctuations. Enhancing strategies around aircraft deployment and improving route assignment efficiency can further strengthen overall performance outcomes linked to load management. It was also established that operational factors play a crucial role in determining airline performance. Airlines that prioritize cost-effective fleet choices—such as using aircraft with low maintenance costs and improved fuel efficiency—are more likely to maintain competitive operations. However, gaps still exist in areas such as effective aircraft scheduling and full integration of modern technologies. These operational weaknesses can hinder performance if not addressed. Continuous improvement in technological adoption and schedule planning was key to enhancing the operational strength of airlines.

7. Recommendations of Study

Managerial Implications

The study findings indicate that aligning fleet capacity with passenger demand and minimizing aircraft idle time are key drivers of improved airline performance. Managers should therefore prioritize demand forecasting tools and dynamic scheduling systems to ensure that fleet deployment closely matches actual travel patterns. Implementing route optimization strategies and investing in crew and ground support coordination will help improve aircraft turnaround times and enhance operational efficiency across the network.

Operational factors such as maintenance practices, scheduling efficiency, and the integration of modern technologies were also found to significantly impact airline performance. Airline managers should enhance maintenance planning by adopting predictive maintenance systems and ensuring that aircraft with low operational costs form the core of the fleet. In addition, improving aircraft scheduling and routing systems through data-driven tools can help reduce delays and inefficiencies, thus boosting service reliability and customer satisfaction.

Policy Implications

Policymakers in the aviation sector should encourage airlines to adopt more efficient load factor management practices by promoting regulations and incentives that support fleet modernization and efficient route planning. This could include tax incentives or subsidies for airlines that maintain high-capacity utilization standards, especially those investing in technologies that reduce idle aircraft time and improve demand alignment.

Given the importance of operational factors in enhancing airline performance, policy frameworks should support the adoption of aviation technologies and digital infrastructure across the industry. This may involve creating public-private partnerships to accelerate the deployment of intelligent scheduling systems, air traffic coordination tools, and integrated maintenance databases. Regulatory bodies should also develop benchmarks for operational efficiency that airlines can use to evaluate and improve their internal systems.

Theoretical Implications

This study offers several important theoretical implications grounded in the Economies of Density Theory, Transaction Cost Theory, and knowledge-based perspectives. From the standpoint of the Economies of Density Theory, the findings reinforce the idea that operational efficiency and performance gains in the airline industry are maximized when airlines optimize load factors by consolidating demand on high-density routes and effectively utilizing available capacity. The positive relationship between load factors and airline performance demonstrates that when airlines achieve better aircraft utilization and minimize idle capacity, they benefit from reduced per-unit costs, confirming the central tenet of the theory. Moreover, the results support Transaction Cost Theory by highlighting how efficient fleet operations, maintenance scheduling, and aerodynamic optimization reduce uncertainty and minimize the costs of coordination, monitoring, and execution in complex airline environments. The adoption of technology to streamline operations and flight planning reflects efforts by airlines to reduce transaction costs through internal efficiencies rather than relying on external market solutions. Finally, through the lens of knowledge-based theory, the study underscores the role of internal capabilities and technological knowledge—such as advanced flight planning systems and maintenance intelligence in driving competitive advantage. Airlines that leverage specialized knowledge in operational and aerodynamic practices are better positioned to enhance performance outcomes. Therefore, future research should explore how knowledge accumulation and sharing within and across airlines influence the deployment of these strategic resources, as well as how these theories can be further integrated to explain performance variability in the aviation sector.

8. Limitations of the study and Further Studies

This study provided valuable insights into how load factors, operational factors, and aerodynamic factors influence the performance of selected Kenyan airlines, but several limitations should be acknowledged. The research focused on only five airlines, limiting the generalizability of findings to the wider aviation sector, particularly international and budget carriers with different structures. It also considered only three dimensions of aircraft performance, excluding other critical factors such as technological innovation, maintenance turnaround, and regulatory compliance. Data collection relied solely on responses from top management, leaving out perspectives from middle managers, operational staff, and passengers that could have enriched the analysis. Additionally, the exclusive use of a five-point Likert scale restricted the depth and nuance of responses. To address these gaps, future studies should expand to include more diverse airlines, integrate additional performance variables, adopt mixed-methods approaches, explore alternative measurement scales for greater sensitivity, and employ longitudinal designs to capture how performance strategies evolve over time in response to industry changes.

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