Creative Research Publishers
https://www.crossref.org/06members/50go-live.html

Journal of Behavioral Informatics
Digital Humanities & Development Research
Vol 12, No 3, September, 2026 Series

Evaluating the Nexus between Organizational Safety Culture and Operational Management Efficiency: A Case of the Nigerian College of Aviation Technology (NCAT), Zaria, Nigeria

Danjuma A. I. & Ibrahim M.
Aviation Management School
Nigerian College of Aviation Technology, Zaria, Nigeria
E-mails: danjuisma@gmail.com; murtalaibrahimbawa@gmail.com
Phone no. +2348032784657, +2348060855860

ABSTRACT

This study evaluates the nexus between organizational safety culture and operational management efficiency at the Nigerian College of Aviation Technology (NCAT), Zaria. The study is framed by Reason's Swiss Cheese Model, the International Civil Aviation Organization (ICAO) Safety Management System (SMS) framework, and High Reliability Organization theory, and uses a mixed-methods design. Primary data were collected with a structured five-point Likert-scale questionnaire administered to a simple random sample of 100 staff members drawn from academic, maintenance, technical-support, and administrative cadres. Descriptive statistics and Pearson product-moment correlation were used for analysis. Results indicated moderate management commitment (overall mean = 3.83), moderate Just Culture maturity (composite mean = 3.24), and moderately high SMS integration (overall mean = 3.90). All three dimensions were positively and significantly related to operational management efficiency: management commitment ($r = 0.667$, $p < 0.001$), Just Culture ($r = 0.553$, $p < 0.001$), and SMS integration ($r = 0.894$, $p < 0.001$). The study concludes that a robust safety culture is a driver, rather than a cost, of operational efficiency. Recommendations include institutionalizing visible leadership walk-rounds, formalizing a written Just Culture policy with confidential digital reporting channels, investing in technology-enabled safety-data platforms, and ring-fencing safety-related budgets.

Keywords: Organizational safety culture; operational management efficiency; Just Culture; Safety Management System; aviation training organization.

Keywords: Digital Nursing Competence; Digital Health; Nursing Informatics; Models, Future, Competency Framework; Digital Literacy; Concept Analysis

Journal Reference Format:
Danjuma A. I. & Ibrahim M. (2026): Evaluating the Nexus between Organizational Safety Culture and Operational Management Efficiency: A Case of the Nigerian College of Aviation Technology (NCAT), Zaria, Nigeria. Journal of Behavioural Informatics, Digital Humanities and Development Res. Vol. 12 No. 3. Pp 31-44. https://www.isteams.net/behavioralinformaticsjournal. dx.doi.org/10.22624/AIMS/BHI/V12N3P4

1. INTRODUCTION

The global aviation industry operates on the principle of "safety first," which extends beyond mechanical reliability to the human and organizational systems that manage flight operations. As the aviation system has become more complex, the International Civil Aviation Organization (ICAO)

has shifted emphasis from reactive safety measures to proactive Safety Management Systems (SMS). At the centre of this transition is organizational safety culture: the shared values, beliefs, and practices that determine how safety is prioritized within an institution (Reason, 1997; ICAO, 2016, 2018).

A positive safety culture fosters open communication, encourages voluntary reporting of hazards and incidents, and supports continuous improvement. A weak culture can produce under-reporting, complacency, and a higher risk of accidents. For a premier training institution such as the Nigerian College of Aviation Technology (NCAT), Zaria, safety culture is not only a regulatory requirement; it is central to operational management efficiency. In this study, operational management efficiency is the capacity of the college to integrate administrative oversight, resource allocation, and flight-training schedules while maintaining zero tolerance for avoidable risk and minimizing disruption, rework, and waste (Ciuică et al., 2020; Stolzer & Goglia, 2015).

NCAT was established in 1964 as the Nigerian Civil Aviation Training Centre by Act No. 31 of 1964, following a joint programme of the Federal Government of Nigeria, the United Nations Development Programme (UNDP), and ICAO. The idea was first raised at the 12th ICAO Assembly in San Diego in 1959; the enabling bill was passed on 29 September 1964 and signed into law on 23 October 1964. UNDP–ICAO assistance ended on 31 December 1974, after which the Federal Government assumed full responsibility. The institution was renamed the Nigerian College of Aviation Technology in anticipation of expanded training, with the change later reflected in Decree No. 41 of 1990 (Nigerian College of Aviation Technology [NCAT], 2026). NCAT is an NCAA-approved training organization and an ICAO TRAINAIR PLUS Regional Training Centre of Excellence, and it has retained ICAO Training Centre of Excellence Platinum status for six consecutive years, 2021–2026 (ICAO, 2024; NCAT, 2026).

It operates six schools—the Flying School, Aircraft Maintenance Engineering School, Aeronautical Telecommunications Engineering School, Air Traffic Services/Communications School, Aviation Management School, and Airport Emergency Training School and trains pilots, engineers, air traffic controllers, and other aviation professionals (NCAT, 2026). College management has stated that more than 70 percent of Nigerian aviation professionals received either initial or subsequent training at NCAT (BusinessDay, 2025). Because the college shapes the safety competencies of future aviation personnel, the strength of its safety culture has implications for the Nigerian airspace and the wider West African region.

Despite global and national mandates for SMS, gaps often remain between policy and practice in training environments. ICAO Annex 19 requires States to establish a State Safety Programme and service providers, including approved training organizations exposed to operational safety risks, to implement an SMS (ICAO, 2016). Nigeria has domesticated these standards in Part 20 of the Nigeria Civil Aviation Regulations (Nig. CARs), which addresses safety management and aligns with Annex 19, and in NCAA Advisory Circular NCAA-AC-GEN006, which gives SMS guidance to approved training organizations among other certificate holders (Nigerian Civil Aviation Authority [NCAA], 2023a, 2023b).

Research on Nigerian approved maintenance organizations found that most had plans to implement SMS, yet lacked safety-management education, training, motivation, and the analytical skills required to evaluate hazards (Uhuegho et al., 2013). A fear-based reporting culture compounds the problem. ICAO defines a Just Culture as one in which front-line operators and others are not punished for actions, omissions, or decisions commensurate with their experience and training, but in which gross negligence, wilful violations, and destructive acts are not tolerated (ICAO, 2018). Without that atmosphere of trust, reporting rates fall and the institution is deprived of the predictive data required for proactive risk management.

Weak management commitment often appears as inadequate resource allocation and inconsistent leadership communication, producing a culture of minimal compliance in which standards are followed mainly to satisfy regulatory audits (Van Dyke, 2006). At NCAT, infrastructure and resource constraints continue to press on the relationship between safety and management (Independent Nigeria, 2025). In high-pressure environments, efficiency pressures can push safety toward a secondary goal (Pettersen & Aase, 2010). A critical gap therefore remains in the transition from SMS policy to everyday organizational behaviour at NCAT.

Against this background, the study evaluates the nexus between organizational safety culture and operational management efficiency at NCAT, Zaria. Specifically, it aims to: (a) evaluate the level of management commitment to safety culture; (b) identify factors hindering effective safety reporting and Just Culture practices among staff; and (c) assess the integration of ICAO-mandated SMS into daily administrative and flight operations. The corresponding null hypotheses state that there is no significant relationship between each of these three dimensions and operational management efficiency at NCAT.

2. LITERATURE REVIEW

2.1 Organizational Safety Culture

Organizational safety culture refers to the shared values, beliefs, and behavioural norms that shape how members of an organization approach safety. It is widely regarded as the “software” that determines whether formal safety systems are implemented or merely exist on paper (Cooper, 2000; Guldenmund, 2000). In aviation, Reason (1997) distinguished reporting culture, Just Culture, flexible culture, learning culture, and informed culture. A mature safety culture enables organizations to move from reactive compliance to proactive and generative safety performance.

In aviation training organizations the stakes are particularly high, because these institutions shape the attitudes and competencies of future pilots, engineers, air traffic controllers, and managers. ICAO’s Manual on the Approval of Training Organizations requires approved training organizations to maintain documented training and quality systems, and Annex 19 extends safety-management obligations to organizations whose activities support the safe operation of aircraft (ICAO, 2016, 2018). A weak safety culture in a training environment can propagate poor habits into the wider industry, whereas a strong culture can institutionalize best practice across successive cohorts (Stolzer & Goglia, 2015).

NCAT's own training and safety manuals, including the college Safety Management Manual and school training procedures manuals, are the local instruments through which these ICAO and NCAA requirements are meant to be applied in daily instruction, maintenance, and airside operations (NCAT, 2024).

2.2 Operational Management Efficiency and The Safety–Efficiency Nexus

Operational management efficiency in an aviation training organization is the capacity to deliver high-quality training outputs while optimizing human, material, and temporal resources and maintaining rigorous safety standards (Stolzer & Goglia, 2015). Efficiency is not merely speed or cost reduction. It includes the elimination of waste arising from incidents, rework, bureaucratic delay, and under-used assets. A resilient safety culture contributes to efficiency by reducing disruptions caused by safety events, improving decision-making through better information flow, and building the trust that accelerates operational processes (Ciuică et al., 2020). The literature suggests that a resilient safety culture does more than reduce accidents. It can reduce resource wastage and build stakeholder trust. Efficient operations and a strong safety culture are not mutually exclusive; they reinforce each other when management commitment, Just Culture, and SMS integration are aligned (Pettersen & Aase, 2010; Weick & Sutcliffe, 2015).

2.3 Management Commitment

Management commitment is widely recognized as the cornerstone of an aviation organization's safety culture (Van Dyke, 2006; ICAO, 2018). When leadership prioritizes safety over competing operational goals, it influences both mandatory compliance and proactive engagement. Weak commitment often appears as inadequate resources and inconsistent communication, and therefore as minimal compliance (Uhuegho et al., 2013). Visible leadership—through safety briefings, resource prioritization, and non-punitive responses to honest error—has been shown to raise safety-climate scores and reporting rates. Nig. CARs Part 20 places accountability for the SMS with the accountable executive, which at an approved training organization is the senior manager responsible for ensuring that safety policy, resources, and promotion are in place (NCAA, 2023a).

2.4 Barriers to Safety Reporting and Just Culture

A Just Culture holds individuals accountable for reckless behaviour while protecting those who report honest mistakes in good faith (Dekker, 2012; ICAO, 2018). The primary barrier to reporting in aviation is fear of reprisal. In collegiate and training environments this is often compounded by hierarchy, which can inhibit junior staff or students from reporting errors to senior management (ICAO, 2024). Lack of feedback after a report is submitted often leads employees to treat the process as meaningless, further eroding voluntary reporting (Adjekum et al., 2023). Organizations with mature Just Culture frameworks tend to record higher voluntary reporting, earlier identification of latent hazards, and better safety performance indicators. NCAA guidance expects approved organizations to protect safety data and to distinguish error from violation in their reporting and investigation procedures (NCAA, 2023b).

2.5 Integration of Safety Management Systems

The ICAO SMS is a formal, top-down approach to managing safety risk and assuring the effectiveness of controls (ICAO, 2016, 2018; Akselsson et al., 2009; Stolzer & Goglia, 2015). Its four components are Safety Policy and Objectives, Safety Risk Management, Safety Assurance, and Safety Promotion. Although training organizations were among the early adopters of structured safety systems, the move from policy to administrative integration remains uneven. Effective implementation requires alignment between managers' and front-line employees' views of safety; discrepancies often produce minimal compliance. Nigerian maintenance-organization evidence shows plans for SMS alongside gaps in education, training, and hazard-analysis skills (Uhuegho et al., 2013). For NCAT, integration means that the college Safety Management Manual, emergency response plan, and school standard operating procedures are used in flight training, maintenance, and scheduling, not only during NCAA surveillance (NCAT, 2024; NCAA, 2023b).

2.6 Theoretical Framework

The study is underpinned by Reason's Swiss Cheese Model, the ICAO SMS framework, and High Reliability Organization (HRO) theory. Reason (1997) argued that accidents result when latent organizational failures and active errors align; organizational safety culture is a critical defensive layer because it influences whether holes in successive defences are detected and closed. The ICAO SMS framework comprises Safety Policy and Objectives, Safety Risk Management, Safety Assurance, and Safety Promotion. Management commitment is central to the first component, and Just Culture underpins safety assurance and promotion (ICAO, 2018). HRO theory emphasizes preoccupation with failure, reluctance to simplify, sensitivity to operations, commitment to resilience, and deference to expertise (Weick & Sutcliffe, 2015). These principles align closely with a mature safety culture and with the expectation, in both Annex 19 and Nig. CARs Part 20, that organizations manage risk proactively rather than after an occurrence.

2.7 Gaps in the Literature

Substantial literature exists on safety culture and SMS in airlines and maintenance organizations, but fewer empirical studies focus on aviation training organizations in developing economies, particularly in West Africa. Limited research examines management commitment, reporting barriers and Just Culture, and SMS integration together as determinants of operational efficiency within a single approved training organization. This study addresses that gap at NCAT, Zaria, using the college's regulatory setting under NCAA and ICAO as the frame.

3. METHODOLOGY

3.1 Research Design

The study adopted a mixed-methods design, combining a quantitative survey with qualitative insight from document review. The primary component was a structured survey used to identify trends and statistical relationships among management commitment, reporting practices, SMS integration, and perceived operational efficiency.

Institutional documents such as NCAT safety and training manuals, Nig. CARs Part 20, NCAA Advisory Circular NCAA-AC-GEN006, and ICAO Annex 19 and Doc 9859 were reviewed to triangulate survey findings and to locate local practice against regulatory requirements (ICAO, 2016, 2018; NCAA, 2023a, 2023b; NCAT, 2024).

3.2 Study Area and Population

The study was conducted at NCAT, Zaria, located at the Zaria Aerodrome in Kaduna State, Nigeria. The college comprises the Flying School, Aviation Management School, Aeronautical Telecommunications Engineering School, Aircraft Maintenance Engineering School, Air Traffic Services and Communications School, and Airport Emergency Training School (ICAO, 2023.; NCAT, 2026). The target population was staff of the college, including academic staff, maintenance engineers, technical-support staff, and administrative staff.

3.3 Sample Size and Sampling Technique

A sample of 100 respondents was selected by simple random sampling so that every eligible staff member had an equal chance of selection. A sample of this size exceeds the conventional minimum of about 30 for stable correlation estimates and provides adequate power to detect a medium effect ($r = 0.30$) at the 0.05 significance level in a two-tailed Pearson test (Cohen, 1992). It is also consistent with sample sizes commonly accepted for descriptive and correlational organizational surveys where the sampling frame is a single institution and fieldwork time is limited (Krejcie & Morgan, 1970). The design prioritised equal selection probability over stratification; future work could stratify by school.

3.4 Data-Collection Instrument

The primary instrument was a structured questionnaire on a five-point Likert scale (Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, Strongly Disagree = 1). It had three thematic sections aligned with the objectives: (i) management commitment (10 items on resource allocation, leadership by example, policy visibility, and recognition); (ii) barriers to safety reporting and Just Culture (10 items on fear of blame, hierarchical barriers, feedback, and training); and (iii) SMS integration into operations (10 items on application of SMS principles, risk assessments, use of incident data, emergency-response drills, and adherence to standard operating procedures). Demographic items were included. Item wording was informed by ICAO SMS elements and by the college Safety Management Manual and related training procedures (ICAO, 2018; NCAT, 2024). Complementary secondary data were drawn from NCAT safety policy and training manuals and from publicly available NCAA and ICAO materials.

3.5 Validity and Reliability

The instrument was subjected to face and content validity by experts in aviation safety and research measurement. A pilot study was conducted with a small subset of respondents excluded from the final sample. Cronbach's alpha coefficients of 0.70 or higher were treated as acceptable internal consistency for each thematic scale (Nunnally & Bernstein, 1994).

3.6 Method of Data Analysis

Data were analysed with descriptive statistics (frequencies, percentages, means, and standard deviations) and Pearson product-moment correlation. Mean scores were interpreted as follows: mean of 4.00 or above = high/strong; 3.00–3.99 = moderate; below 3.00 = low/weak. Operational management efficiency was operationalized as a composite of Items 23, 26, 29, and 30 (SMS as an efficiency tool, alignment of workflows with safety goals, adherence to procedures under schedule pressure, and reduction of disruptions and wastage). Negatively worded Just Culture items were reverse-scored before the composite index was computed. Data were processed in the Statistical Package for the Social Sciences (SPSS).

3.7 Ethical Considerations

Informed consent was obtained from all respondents. Participation was voluntary, and confidentiality and anonymity were maintained. Institutional approval was obtained from the relevant authorities at NCAT before data collection. No respondent is identified in the results.

4. RESULTS

4.1 Demographic Characteristics

Although a detailed demographic breakdown was not the primary focus, respondents comprised academic staff, maintenance engineers, technical-support staff, and administrative staff of NCAT. The sample is therefore treated as representative of the cadres whose perceptions shape and reflect the college's safety culture.

4.2 Level of Management Commitment to Safety Culture

Ten items measured resource allocation, leadership by example, safety as a standing agenda item, empowerment of safety staff, budgetary discipline, visible leadership presence, policy updating, provision of personal protective equipment, existence of a signed safety policy, and recognition of safety-conscious behaviour. Table 1 presents the summary statistics.

Creative Research Publishers
https://www.crossref.org/06members/50go-live.html
Journal of Behavioral Informatics
Digital Humanities & Development Research
Vol 12, No 3, September 2026 Series

Table 1. Responses on Management Commitment to Safety Culture (N = 100)

Item (abbreviated)	SA %	A %	N %	D %	SD %	Mean	SD
1. Sufficient funds for aircraft/equipment	26.5	44.9	15.3	6.1	7.1	3.78	1.15
2. Leadership leads by example	34.3	42.4	9.1	8.1	6.1	3.91	1.12
3. Safety permanent agenda item	40.4	38.4	15.2	5.1	1.0	4.12	0.91
4. Safety staff authority to halt operations	34.7	37.8	17.3	5.1	5.1	3.92	1.08
5. Budget not diverted from training	29.6	27.6	28.6	10.2	4.1	3.68	1.13
6. Rector/management visit operational areas	29.0	38.0	14.0	8.0	11.0	3.66	1.25
7. Policies updated to ICAO standards	41.4	38.4	11.1	5.1	4.0	4.08	1.05
8. High-quality PPE provided	36.7	43.9	6.1	8.2	5.1	3.99	1.10
9. Visible signed safety policy	38.4	38.4	18.2	5.1	0.0	4.10	0.88
10. Recognition/reward for safety consciousness	12.1	32.3	24.2	18.2	13.1	3.12	1.23
Overall management commitment	—	—	—	—	—	3.83	0.72

Note. SA = Strongly Agree; A = Agree; N = Neutral; D = Disagree; SD = Strongly Disagree (percentage columns) or standard deviation (final column). Scale: 5 = Strongly Agree to 1 = Strongly Disagree. Decision bands: mean ≥ 4.00 = high; 3.00–3.99 = moderate; mean < 3.00 = low. Source: Field survey, 2026.

The overall mean for management commitment was 3.83 (SD = 0.72), within the moderate band. The highest means were Item 3 (safety as a permanent agenda item; M = 4.12), Item 9 (visible signed safety policy; M = 4.10), and Item 7 (policies updated to ICAO standards; M = 4.08). These indicate relatively strong formal and procedural commitment, consistent with the policy-and-objectives component of the ICAO SMS and with Nig. CARs Part 20 (ICAO, 2018; NCAA, 2023a). The lowest means were Item 10 (recognition and reward of safety-conscious staff; M = 3.12) and Item 6 (visits by the Rector and management to operational areas; M = 3.66). NCAT has established formal safety structures aligned with ICAO expectations, but the relational and behavioural aspects of management commitment still require strengthening.

Creative Research Publishers
https://www.crossref.org/06members/50go-live.html
Journal of Behavioral Informatics
Digital Humanities & Development Research
Vol 12, No 3, September 2026 Series

4.3 Factors Hindering Effective Safety Reporting and Just Culture

Items 11–20 covered comfort in reporting personal mistakes, fear of blame for near misses, complexity of the reporting process, differentiation of honest error from negligence, confidentiality, perceived career impact, feedback, perception of the system as punitive, peer pressure, and training on the voluntary reporting system. Several items were negatively worded, so a higher mean indicates a stronger barrier.

Table 2. Responses on Safety Reporting and Just Culture (N = 100)

Item (abbreviated)	SA %	A %	N %	D %	SD %	Mean	SD
11. Comfortable reporting own mistakes	12.1	41.4	33.3	7.1	6.1	3.46	1.00
12. Fear of blame prevents near-miss reporting*	30.3	29.3	16.2	17.2	7.1	3.59	1.28
13. Reporting process too long/complicated*	10.1	19.2	25.3	41.4	4.0	2.90	1.08
14. Honest errors treated differently from negligence	16.2	42.4	24.2	13.1	4.0	3.54	1.04
15. Reports kept confidential	20.2	34.3	40.4	3.0	2.0	3.68	0.90
16. Career progression affected by reporting*	9.1	15.2	22.2	34.3	19.2	2.61	1.22
17. Timely feedback on reports	11.1	49.5	29.3	6.1	4.0	3.58	0.92
18. System perceived as catching people*	7.1	23.2	22.2	33.3	14.1	2.76	1.17
19. Peer pressure discourages reporting*	10.1	39.4	19.2	25.3	6.1	3.22	1.12
20. Adequately trained on reporting system	12.1	38.4	16.2	27.3	6.1	3.23	1.16

Note. SA = Strongly Agree; A = Agree; N = Neutral; D = Disagree; SD = Strongly Disagree (percentage columns) or standard deviation (final column). Source: Field survey, 2026.

A substantial proportion of respondents (59.6 percent combining Strongly Agree and Agree) indicated that fear of blame prevents reporting of near misses (Item 12, M = 3.59). Only 53.5 percent felt comfortable reporting their own mistakes (Item 11, M = 3.46). After reverse-scoring the negatively worded barrier items, the composite Just Culture index had a mean of 3.24 (SD = 0.52), confirming moderate Just Culture maturity. The dominant barriers were fear of blame, insufficient training on the reporting system, and residual peer pressure. These findings align with ICAO observations on hierarchical cultures in training environments (ICAO, 2024) and with evidence on reporting intention (Adjekum et al., 2023). They also indicate that the Just Culture protection described in Doc 9859 and expected under NCAA SMS guidance is not yet fully experienced by staff (ICAO, 2018; NCAA, 2023b).

Creative Research Publishers
https://www.crossref.org/06members/50go-live.html
Journal of Behavioral Informatics
Digital Humanities & Development Research
Vol 12, No 3, September 2026 Series

4.4 Integration of ICAO-mandated SMS into Daily Operations

Items 21–30 covered application of SMS in flight training, pre-task risk assessments, perception of SMS as an efficiency tool, use of incident data, emergency-response drills, alignment of workflows with safety goals, information flow between the flying school and maintenance, technology for trend monitoring, adherence to standard operating procedures under schedule pressure, and the contribution of SMS to fewer disruptions and less wastage.

Table 3. Responses on SMS Integration into Operations (N = 100)

Item (abbreviated)	SA %	A %	N %	D %	SD %	Mean	SD
21. SMS principles in every flight training session	39.8	48.0	11.2	0.0	1.0	4.26	0.74
22. Risk assessments before new tasks	30.3	48.5	12.1	5.1	4.0	3.96	1.00
23. SMS seen as a tool for efficiency	32.3	50.5	12.1	2.0	3.0	4.07	0.90
24. Incident data used to prevent recurrence	41.4	37.4	12.1	7.1	2.0	4.09	1.00
25. ERP regularly practised through drills	25.3	36.4	26.3	8.1	4.0	3.71	1.06
26. Workflows aligned with safety goals	25.3	49.5	12.1	9.1	4.0	3.83	1.04
27. Seamless safety information flow (flying–maintenance)	24.2	40.4	24.2	10.1	1.0	3.77	0.97
28. Technology used to track safety trends	14.1	45.5	26.3	10.1	4.0	3.56	0.99
29. SOPs followed even when behind schedule	25.5	51.0	13.3	5.1	5.1	3.87	1.02
30. SMS reduced disruptions and resource wastage	24.2	53.5	15.2	5.1	2.0	3.93	0.88
Overall SMS integration	—	—	—	—	—	3.90	0.63

Note. SA = Strongly Agree; A = Agree; N = Neutral; D = Disagree; SD = Strongly Disagree (percentage columns) or standard deviation (final column). Source: Field survey, 2026.

The overall mean for SMS integration was 3.90 (SD = 0.63), approaching the high threshold. The strongest items were Item 21 (SMS principles applied in every flight training session; M = 4.26) and Item 24 (use of incident data for prevention; M = 4.09). The weakest relative areas were technology for trend monitoring (Item 28; M = 3.56) and regular emergency-response drills (Item 25; M = 3.71). Core SMS processes are reasonably well embedded, particularly in the Flying School, but technological enablement and emergency-preparedness exercises lag.

This pattern is consistent with the safety-assurance gap identified in Nigerian maintenance organizations, where plans existed but analytical capability was limited (Uhuegho et al., 2013), and with the expectation in the college Safety Management Manual and NCAA-AC-GEN006 that hazard tracking and emergency exercises be demonstrable, not merely documented (NCAT, 2024; NCAA, 2023b).

4.5 Test of Hypotheses

Three null hypotheses were tested with Pearson product-moment correlation. Operational management efficiency was a composite of Items 23, 26, 29, and 30. The efficiency index had a mean of 3.93 (SD = 0.68).

Table 4. Summary of Hypothesis Tests

Hypothesis	Variables	r	p-value	Decision
H01	Management commitment and efficiency	0.667	< 0.001	Reject H0
H02	Just Culture and efficiency	0.553	< 0.001	Reject H0
H03	SMS integration and efficiency	0.894	< 0.001	Reject H0

Note. Operational management efficiency is the composite of Items 23, 26, 29, and 30.
Source: Field survey data analysed with SPSS, 2026.

All three null hypotheses were rejected. Management commitment had a strong, positive, and statistically significant relationship with operational efficiency ($r = 0.667$, $p < 0.001$). Just Culture was moderately and significantly associated with efficiency ($r = 0.553$, $p < 0.001$). SMS integration showed a very strong positive correlation with operational management efficiency ($r = 0.894$, $p < 0.001$). Because the efficiency index was drawn from items that also sit within the SMS-integration scale, the coefficient for H03 should be read as evidence of a strong association, not as a fully independent effect. An independent efficiency measure would be preferable in a follow-up study.

4.6 Discussion of Findings

The results demonstrate a positive nexus between organizational safety culture and operational management efficiency at NCAT. Management commitment, moderate overall, is significantly related to efficiency. Formal structures—policy visibility, agenda status, and ICAO alignment—are stronger than behavioural and incentive dimensions. This mirrors the efficiency–safety asymmetry noted by Pettersen and Aase (2010) and the resource-constrained pattern described for Nigerian organizations by Uhuegho et al. (2013). It also matches the accountable-executive expectation in Nig. CARs Part 20: policy exists, but visible leadership and recognition remain thinner than the regulation implies (NCAA, 2023a).

Just Culture remains only moderately developed. Fear of blame continues to suppress near-miss reporting for a majority of respondents, consistent with ICAO (2024) observations on hierarchical training environments and with Dekker's (2012) argument that a Just Culture fails when staff cannot predict how an honest report will be treated. The moderate positive correlation with efficiency nevertheless indicates that improvements in trust and non-punitive reporting would yield operational benefits through better predictive data and fewer latent failures, as Reason's (1997) model would predict. SMS integration is the strongest correlate of efficiency.

High means on application of SMS principles in training and on use of incident data indicate that the formal architecture is taking root, in line with Annex 19 and Doc 9859 (ICAO, 2016, 2018). Gaps in technology-enabled monitoring and regular emergency-response drills point to resource and prioritisation challenges rather than rejection of SMS. These findings support the expectation from High Reliability Organization theory that mindfulness, preoccupation with failure, and commitment to resilience enhance both safety and operational reliability (Weick & Sutcliffe, 2015). Overall, the evidence supports the central premise: a robust safety culture is not a cost centre but a driver of operational efficiency through fewer disruptions, better information flow, disciplined adherence to procedures, and proactive risk management. The college training and safety manuals remain the practical bridge between NCAA and ICAO requirements and day-to-day instruction; the survey suggests that bridge is in place formally, but not yet fully in reporting culture, recognition, and data technology (NCAT, 2024).

5. CONCLUSION AND RECOMMENDATIONS

Organizational safety culture and operational management efficiency at NCAT are positively and significantly interrelated. Formal management-commitment structures are relatively strong, yet behavioural leadership visibility and recognition systems lag. Fear of blame remains the most salient barrier to voluntary reporting and constrains the predictive power of the safety-data system. SMS principles are reasonably well embedded in training and risk assessment, but technological support for trend monitoring and regular emergency-response drills require further investment. Strengthening visible management commitment, a genuine Just Culture, and deeper SMS integration offers a coherent path to both better safety performance and greater operational efficiency. Based on the findings, the following recommendations are offered.

i. Strengthen visible leadership engagement. The Rector and senior management should institutionalize scheduled, documented walk-rounds of operational areas at least monthly, with feedback to staff. Recognition programmes that publicly acknowledge safety-conscious behaviour should be formalized and resourced, closing the gap on the lowest-scoring commitment item.
ii. Deepen Just Culture implementation. NCAT should adopt and disseminate a written Just Culture policy, consistent with ICAO Doc 9859 and NCAA SMS guidance, that clearly distinguishes honest human error from wilful violation. Confidential, simplified digital reporting channels should be introduced or enhanced, with mandatory training for all staff and students on the voluntary reporting system. Feedback on every submitted report should be provided within a defined timeframe.

iii. Accelerate technology-enabled safety assurance. Investment in a dedicated safety-data platform capable of trend analysis, hazard tracking, and automated reporting metrics is recommended. Emergency response plan drills should be scheduled and evaluated at least twice a year, and the outcomes should be recorded against the college Safety Management Manual.

iv. Align resource allocation with safety priorities. Budgetary ring-fencing of safety training, safety-data systems, and personal-protective-equipment funds should be enforced. Diversion of safety allocations to other administrative costs should be prohibited by internal financial regulations and subject to internal audit, in keeping with the accountable-executive duty in Nig. CARs Part 20.

v. Continue capacity building. Periodic refresher training on SMS principles, risk assessment, and Just Culture should be mandatory for all categories of staff and should be written into school training procedures. Collaboration with the NCAA and ICAO TRAINAIR PLUS Regional Training Centres of Excellence can provide external benchmarking and specialised facilitation.

Acknowledgements

This research was sponsored by an Institution-Based Research (IBR) grant from the Tertiary Education Trust Fund (TETFund); the authors sincerely appreciate this support. The authors gratefully acknowledge the management and staff of the Nigerian College of Aviation Technology, Zaria, for approving the study and participating in the survey.

REFERENCES

Adjekum, D. K., Keller, J., Walala, M., Christensen, C., DeMik, R. J., Young, J. P., & Northam, G. J. (2023). Collective culture and safety reporting intention: The serial mediation of trust and perceived control. Safety Science, 164, Article 106155. https://doi.org/10.1016/j.ssci.2023.106155

Akselsson, R., Ek, Å., Koornneef, F., Stewart, S., & Ward, M. (2009). Resilience, safety management and safety culture in aviation organizations. In Proceedings of the 17th World Congress on Ergonomics. International Ergonomics Association.

BusinessDay. (2025, July 17). Aviation training reborn: NCAT rector's bold plan for growth. BusinessDay. https://businessday.ng/aviation/article/aviation-training-reborn-ncat-rectors-bold-plan-for-growth/

Ciuică, O., Bucsa, R., & Radu, C. (2020). Safety culture model in military aviation organisation. Scientific Journal of Silesian University of Technology. Series Transport, 107, 25–38.

Cohen, J. (1992). A power primer. Psychological Bulletin, 112(1), 155–159. https://doi.org/10.1037/0033-2909.112.1.155

Cooper, M. D. (2000). Towards a model of safety culture. Safety Science, 36(2), 111–136. https://doi.org/10.1016/S0925-7535(00)00035-7

Dekker, S. (2012). Just culture: Balancing safety and accountability (2nd ed.). Ashgate.

Guldenmund, F. W. (2000). The nature of safety culture: A review of theory and research. Safety Science, 34(1–3), 215–257. https://doi.org/10.1016/S0925-7535(00)00014-X

Independent Nigeria. (2025). NCAT staying relevant amid infrastructure challenges. Independent Nigeria.
International Civil Aviation Organization. (2021). Nigerian College of Aviation Technology (NCAT): TRAINAIR PLUS profile. ICAO. https://igat.icao.int/ated/trainingcatalogue/Profile/19
International Civil Aviation Organization. (2016). Annex 19 to the Convention on International Civil Aviation: Safety management (2nd ed.). ICAO.
International Civil Aviation Organization. (2018). Safety management manual (Doc 9859, 4th ed.). ICAO.
International Civil Aviation Organization. (2018). Manual on the approval of training organizations (Doc 9841, 3rd ed.). ICAO.
International Civil Aviation Organization. (2024). Cultivating a just culture: Initiatives and challenges (IP/10, Agenda Item 3). ICAO.
Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30(3), 607–610. https://doi.org/10.1177/001316447003000308
Nigerian Civil Aviation Authority. (2023a). Nigeria Civil Aviation Regulations (Nig. CARs), Part 20: Safety management. NCAA. https://ncaa.gov.ng/documents/regulations/nig-cars-2023/part-20-safety-management/
Nigerian Civil Aviation Authority. (2023b). Safety management systems: Guidance to organisations (Advisory Circular NCAA-AC-GEN006). NCAA. https://ncaa.gov.ng/documents/fsg/general-advisory-circulars-2025/safety-management-systems-guidance-to-organisations/
Nigerian College of Aviation Technology. (2024). Safety management manual and school training procedures manuals [Internal institutional documents]. NCAT, Zaria.
Nigerian College of Aviation Technology. (2026, February 11). NCAT retains ICAO platinum status. https://ncat.gov.ng/2026/02/11/ncat-retains-icao-platinum-status/
Nunnally, J. C., & Bernstein, I. H. (1994). Psychometric theory (3rd ed.). McGraw-Hill.
Pettersen, K. A., & Aase, K. (2010). Safety first!? Organizational efficiency trends and their influence on safety. Safety Science Monitor, 14(1), 1–12.
Reason, J. (1997). Managing the risks of organizational accidents. Ashgate.
Stolzer, A. J., & Goglia, J. J. (2015). Safety management systems in aviation (2nd ed.). Ashgate.
Uhuegho, K. O., Okafor, E. G., & Bond, S. (2013). Assessment of safety management system implementation in an approved maintenance organization: A case study of Nigeria operators. Research Journal of Applied Sciences, Engineering and Technology, 6(20), 3879–3887. https://doi.org/10.19026/rjaset.6.3605
Van Dyke, D. L. (2006). Management commitment: Cornerstone of safety culture. SKYbrary. https://skybrary.aero
Weick, K. E., & Sutcliffe, K. M. (2015). Managing the unexpected: Sustained performance in a complex world (3rd ed.). Jossey-Bass.