Jurnal Aplikasi Bisnis dan Manajemen (JABM), Vol. 12 No.3, September 2026
Permalink/DOI: http://dx.doi.org/10.17358/jabm.12.3.1066

Available online
http://journal.ipb.ac.id/index.php/jabm

ERM-BASED RISK MITIGATION IN AN AVIATION TRAINING CENTER UNDER INDONESIAN STATE-OWNED ENTERPRISE (SOE) GOVERNANCE

M.L Denny Tewu*, Bramantyo Djohan Putro, Dita Rahadyan Fap

Master's Degree Manajemen, Universitas Kristen Indonesia
Jl. Mayjen Sutoyo No. 2, Cawang, Kramat Jati, Jakarta, 13630, Indonesia

Article history:

Received
14 August 2026

Revised
24 August 2026

Accepted
14 September 2026

Available online
30 September 2026

This is an open access article under the CC BY license (https://creativecommons.org/licenses/by/4.0/)

How to Cite:
Tewu, M. L. D., Putro, B. D., & Fap, D. R. (2026). ERM-based risk mitigation in an aviation training center under Indonesian state-owned enterprise (SOE) governance. *Jurnal Aplikasi Bisnis dan Manajemen,* 12(3), 1066. https://doi.org/10.17358/jabm.12.3.1066

Abstract:

Background: The aviation industry operates in a dynamic, highly regulated environment where human resource competence serves as a fundamental pillar for safety, security, and service quality. The global pandemic significantly impacted national aviation performance, leading to structural shifts such as early retirement programs that drastically reduced employee numbers across key professions. Managing risks within an aviation training center is critical because unmanaged operational challenges directly threaten training quality, regulatory compliance, and corporate sustainability. Despite these critical vulnerabilities, systematic studies focusing on enterprise risk management (ERM) inside specialized aviation training centers remain limited.
Purpose: This study aims to evaluate and formulate operational and strategic risk mitigation strategies for the internal training center of an aviation company in Jakarta. Specifically, it analyzes the business processes, assesses the risks of not achieving training objectives, evaluates risk priority levels, and maps structured monitoring mechanisms based on Indonesian state-owned enterprise (SOE) risk governance frameworks.
Design/methodology/approach: This qualitative case study involved six purposively selected informants: two informants representing the risk-management and training-management function and four informants representing flight instructors or training participants. Informants were selected because they had direct experience with training operations, risk governance, instructional delivery, facility or training-media management, or participation in training programs. Semi-structured interviews were conducted in December 2025, while direct observation at the West Jakarta training facility was undertaken during the third quarter of 2025. Corporate reports and internal documents supported source, technique, and time triangulation. The qualitative data were analyzed through reflective thematic analysis involving data compilation, reduction, categorization, theme identification, and interpretive synthesis. The resulting themes informed the risk-event and root-cause register. Likelihood and impact were assessed on five-point scales under PER-2/MBU/03/2023 and SK-6/DKU.MBU/10/2023.
Findings/Results: The study identifies nine primary risks across operational, strategic, compliance, and safety dimensions. Operational risks account for 56% of the identified risk events. The risk with the highest exposure is the suboptimal utilization of training facilities (R01), which falls into the High-risk category. Furthermore, training media downtime (R02), instructor shortages following early retirement (R03), and external customer retention (R06) present Moderate-to-High risk levels that may constrain training execution and unit performance.
Conclusion: The core training process is the phase most exposed to the risk of unachieved objectives. The proposed treatments are expected to reduce the modeled residual-risk positions from High to Moderate or Low-to-Moderate levels. These values are projections and require post-implementation validation. Current monitoring still relies heavily on periodic manual documentation rather than real-time data integration. A more integrated monitoring system could help preserve training production hours, regulatory certification, and the training center's contribution to corporate EBITDA.
Originality/value (State of the art): This study bridges theoretical ERM frameworks and practical risk management in a highly regulated aviation learning environment during post-crisis recovery. It maps operational vulnerabilities to structured Objectives and Key Results (OKRs) and Key Performance Indicators (KPIs), while integrating ISO 31000 principles with mandatory Indonesian SOE risk taxonomy and risk-aggregation requirements.

Keywords: enterprise risk management, risk mitigation, aviation training center, operational risk, SOE regulation

* Corresponding author:
Email: denny.tewu@uki.ac.id

Copyright © 2026 The Author(s), ISSN: 2528-5149/EISSN: 2460-7819

INTRODUCTION

The aviation industry operates within a highly dynamic, complex, and stringently regulated environment where strict safety, security, and service quality standards govern every operation. Within this ecosystem, human resource competence serves as a foundational pillar for operational continuity, organizational safety, and regulatory compliance. To uphold these standards, aviation companies rely on systematic and structured training delivered through dedicated internal training centers. These centers administer a comprehensive portfolio of training programs, including regulatory-mandated licensing programs for pilots, flight attendants, and engineers; corporate-mandated competencies; and optional personal-development modules.

However, the global COVID-19 pandemic severely disrupted the operational landscape of national aviation companies. In response to severe financial strains, the state-owned aviation enterprise examined in this study implemented structural downsizing, including early retirement packages, which precipitated a sharp 24.28% drop in overall personnel between 2020 and 2024. Significant reductions were recorded across critical technical and specialized flight professions, including a 13.90% reduction in pilots and an 18.76% reduction in flight attendants. This contraction in staff size increased pressure on the remaining workforce. Consequently, managing an aviation training center involves significant vulnerabilities; failures in core training processes can directly impair training quality, compliance tracking, and operational efficiency. This context establishes the practical need for a structured and institutionalized risk-management mechanism within specialized learning units.

Enterprise Risk Management (ERM) is increasingly linked to performance, value creation, and managerial decision-making (Akbaş, 2024; Crawford & Jabbour, 2024). In aviation, post-pandemic risk research has expanded toward business continuity, digitalization, sustainability, occupational safety, and flexible risk governance (Çopur & Küçük Yılmaz, 2025; Ortiz-Rangel et al., 2025). Nevertheless, limited empirical research has examined localized ERM systems within specialized internal aviation training units during post-crisis corporate restructuring. This gap matters because training centers function as regulated operational units rather than merely administrative human-resource functions.

Recent research on aviation risk management has increasingly shifted from conventional hazard identification toward integrated, data-driven, and performance-oriented approaches. In flight training, Zhuang et al. (2024) developed a data-driven Flight Training Risk Network using text mining, deep learning, and network analysis to identify risk factors and their interrelationships in flight-training accidents. Their study demonstrates the increasing sophistication of aviation risk identification, particularly in understanding the interaction and propagation of safety risks. However, the approach remains primarily focused on accident-related safety risks and does not address the broader enterprise-level risks that may prevent an aviation training organization from achieving its strategic, operational, financial, human-resource, and compliance objectives.

Recent studies on Approved Training Organizations have focused mainly on Safety Management Systems (SMS), safety assurance, hazard reporting, and safety performance. Seo et al. (2024) identified priority elements for improving SMS implementation in university-operated flight training organizations, while Nugraha et al. (2025) highlighted continuing weaknesses in safety assurance. Research on residual-risk assessment in general aviation also shows that systematic evaluation can support flight-safety performance, although observed outcomes should be distinguished from modeled residual risk (The Effectiveness of Operational Residual Risk Assessment, 2024). At the enterprise level, post-pandemic aviation research emphasizes continuity, digitalization, sustainability, and adaptive risk governance (Çopur & Küçük Yılmaz, 2025; Ortiz-Rangel et al. 2025). ERM effectiveness therefore depends not only on numerical scoring but also on how managers use risk information, governance requirements, and risk artifacts in decision-making (Crawford & Jabbour, 2024).

These developments reveal three research gaps. First, a contextual gap exists because existing aviation risk studies predominantly examine flight safety, accident causation, airlines, airports, or formal SMS implementation, while limited empirical attention has been given to internal aviation training centers as enterprise-level risk-bearing organizational units. Second, an integration gap remains because existing studies tend to separate safety, operational, strategic, human-resource, technology, and compliance risks, whereas an aviation training center requires an

integrated risk architecture linking these dimensions to the achievement of organizational training objectives. Third, an implementation and governance gap exists because limited research has demonstrated how enterprise risk assessment can be operationalized through a national SOE risk-governance framework and translated into prioritized mitigation, residual-risk evaluation, performance indicators, and continuous monitoring.

This study addresses these gaps by integrating ISO 31000 principles with the Indonesian Ministry of SOEs Regulation Number PER-2/MBU/03/2023 and SK-6/DKU.MBU/10/2023. The study operationalizes the risk of non-achievement of training objectives, referred to as Ketidaktercapaian Tujuan (KTD), as the central unit of analysis and connects risk identification, likelihood-impact assessment, risk prioritization, mitigation treatment, residual-risk evaluation, and monitoring with the training center's strategic and operational objectives. The resulting framework provides a localized ERM-based risk mitigation architecture for an internal aviation training center and connects risk management with training production, regulatory certification, facility utilization, instructor availability, and organizational performance.

The study employs an empirical qualitative case study conducted at an aviation company's internal training center facility in Jakarta. The research analyzes primary business workflows, gathers qualitative evidence through in-depth interviews and direct site observations, and reviews corporate annual reports and internal documents. Risks are assessed using five-point likelihood and impact risk matrices aligned with the portfolio risk taxonomy mandated by Indonesian SOE guidelines. High-level exposures are visualized using risk registers and risk heat maps, supporting the formulation of actionable mitigation strategies linked to the unit's Objectives and Key Results (OKRs). Figure 1 summarizes the 2023 training portfolio. Mandatory programs dominate the portfolio, indicating that interruptions to facilities, instructors, or training media can directly affect regulatory and corporate competency obligations.

An aviation training center plays a critical role in meeting national and international standards, including regulations from the Directorate General of Civil Aviation, IATA, and ICAO. However, internal bottlenecks such as resource limitations and rigid procedures, alongside external shifts such as regulatory changes or geopolitical conditions, can hinder training goals. The global COVID-19 pandemic in 2020 severely impacted the Indonesian aviation industry, forcing the company to implement an early retirement program to maintain business continuity. This structural downsizing drastically reduced the workforce. The following data show the employee numbers by profession from 2020 to 2024, derived from the corporate annual reports. Figure 2 presents employee trends by profession from 2020 to 2024. The decline in several operational groups supports the identification of instructor capacity and workload as material training-center risks.

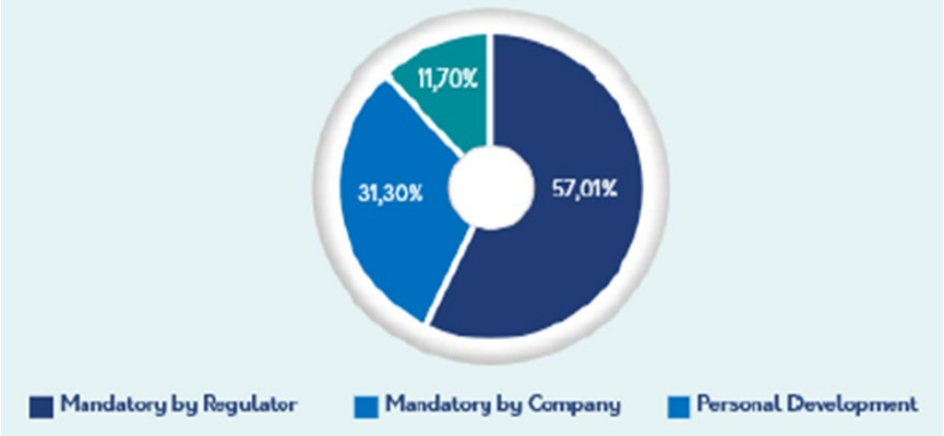


Figure 1. Training category composition 2023

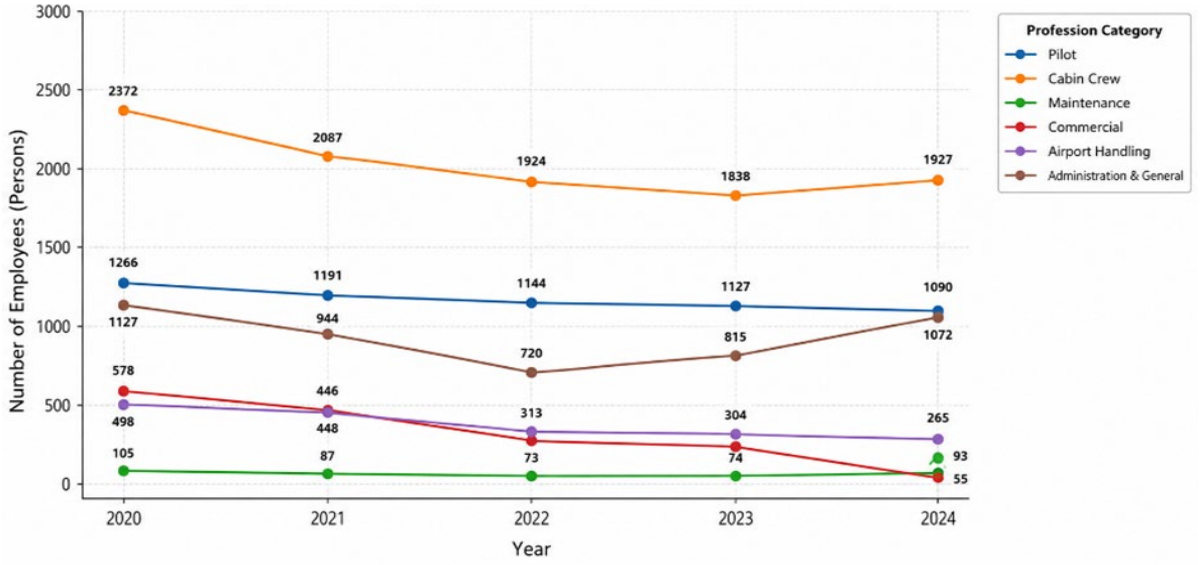


Figure 2. Employee demographic trends by profession, 2020–2024

This study aims to evaluate and strengthen the operational and strategic resilience of an internal aviation training center through a structured Enterprise Risk Management (ERM) model. The research maps the core business processes governing internal flight and professional training management, assesses the probability and impact of failing to achieve training objectives (KTD), evaluates and prioritizes identified risk exposures using risk heat maps, formulates mitigation plans for high-level operational and strategic risks, and evaluates existing risk-monitoring and reporting mechanisms.

This study fundamentally aims to evaluate and strengthen the operational and strategic resilience of an internal aviation training center through the application of a structured Enterprise Risk Management (ERM) model. To achieve this overarching goal, the research outlines several interconnected objectives that progress systematically. The process begins by comprehensively mapping and illustrating the core business processes that govern internal flight and professional training management. Building upon this mapped workflow, a thorough risk assessment is conducted to identify the probability and impact of failing to reach designated training goals conceptually defined as Ketidaktercapaian Tujuan (KTD) across each distinct operational phase. Subsequently, these identified risk exposures are evaluated and prioritized using interactive heatmaps to effectively isolate high-risk entries requiring immediate structural intervention. Guided by these priority rankings, the study formulates concrete, data-backed strategic mitigation plans tailored for high-level operational and strategic risks, thereby safeguarding corporate performance and strict regulatory compliance. Finally, the research concludes by evaluating the existing risk monitoring and reporting mechanisms to ensure the establishment of an adaptive, continuous, and institutionalized risk control framework within the enterprise.

METHODS

This study used a qualitative empirical case-study design to evaluate operational and strategic risk management within an internal aviation training center. Six informants were selected purposively: two informants represented the risk-management and training-management functions, while four informants represented flight instructors or training participants. The inclusion criteria required informants to have direct involvement in corporate risk management, training management, facility or training-media management, instructional delivery, or participation in training programs. Interviews were conducted in December 2025. Information on the informants' exact years of experience was not available; therefore, eligibility was defined based on functional involvement and direct knowledge of the case. Secondary sources included corporate annual reports, business-process maps, three-year training and unit-performance records, internal curriculum records, PER-2/MBU/03/2023, and SK-6/DKU.MBU/10/2023.

Data collection combined three techniques. First, semi-structured interviews examined risk events, root causes, likelihood, operational consequences, existing controls, and treatment barriers. The documented interviews included two online sessions with representatives of the risk-management function on 4 December 2025 (approximately 30 minutes) and 8 December 2025 (approximately 90 minutes), supported by structured interview matrices for instructors and training participants. Interview evidence was documented in response matrices and meeting records. Second, direct observation was conducted at the West Jakarta training center during the third quarter of 2025 to examine mandatory and non-mandatory training operations, personal-development activities, physical facilities, training media, and daily workflows. Third, document review covered three years of training data, unit-performance data, business-process information, and regulatory criteria. Data credibility was assessed through consistency across informant groups, methods, and collection periods using source, technique, and time triangulation. Information on a separate research-ethics approval number or a formal saturation threshold was not available.

The qualitative material was analyzed through reflective thematic analysis. The procedure involved systematically compiling interview, observation, and documentary data; excluding information unrelated to risk causes, consequences, and solutions; grouping the retained information into internal factors, external factors, and learning-method themes; and interpreting recurring patterns against the conceptual framework. Source, technique, and time triangulation were used to test the consistency of the interpretation. The study then mapped the themes to the SOE risk taxonomy and corporate five-point likelihood-impact criteria. Likelihood scores were assigned by matching the available evidence with the corporate frequency and probability parameters. Impact scores from respondents were averaged and matched with the corporate impact criteria. Final inherent-risk positions were determined through the approved likelihood-impact matrix. Because the analysis was conducted by a single researcher, independent parallel coding and a formal inter-coder disagreement procedure were not used. Post-treatment positions are projected residual risks based on the proposed treatments and require validation after implementation.

The research framework (Figure 3) illustrates how external pressures and regulatory updates drive the restructuring of risk management within the aviation training center. It begins with two external catalysts: the post-pandemic landscape and mandatory SOE regulations, which require the organization to examine its core training workflows and personnel capacity. These operational conditions are subjected to a structured risk-assessment process encompassing risk identification, analysis, evaluation using risk heat maps, and mitigation design. The process results in risk treatment plans and continuous monitoring mechanisms to support the training center's operational and strategic objectives.

RESULTS

Training Center Management Business Process

The Learning & Development unit ensures that all internal training programs align directly with the company's core business strategy to optimize overall organizational performance through targeted competency development. To maintain this strategic alignment, the company systematically executes three primary process areas: managing learning processes and organizational knowledge assets to maximize stakeholder value, equipping employees to capture emerging market opportunities while fostering a continuous learning culture, and aligning specific learning tracks with distinct job functions and career development paths. To accommodate the company's diverse workforce demographics, the training center categorizes its operations into nine specialized streams, which include qualification programs for pilots, safety and service training for flight attendants, and operational control courses for flight operation officers and ground support teams. Additionally, the center manages technical aircraft maintenance and engineering certifications, commercial sales and marketing programs, frontline ground service training, cargo and logistics operations, leadership tracks for unit managers, and general operational training coursework. Figure 3 maps the management, core, and supporting processes. The core process concentrates curriculum development, instructor coordination, learning delivery, and certification, making it the principal exposure point for the non-achievement of training objectives.

Table 1 links training-center objectives with nine key drivers, measures, and weights. It establishes the performance basis used to define the risk of non-achievement of objectives. Figure 4 groups the nine identified risks by contribution. Operational risks, including human-resource and technology risks, account for 56% of the identified risks.

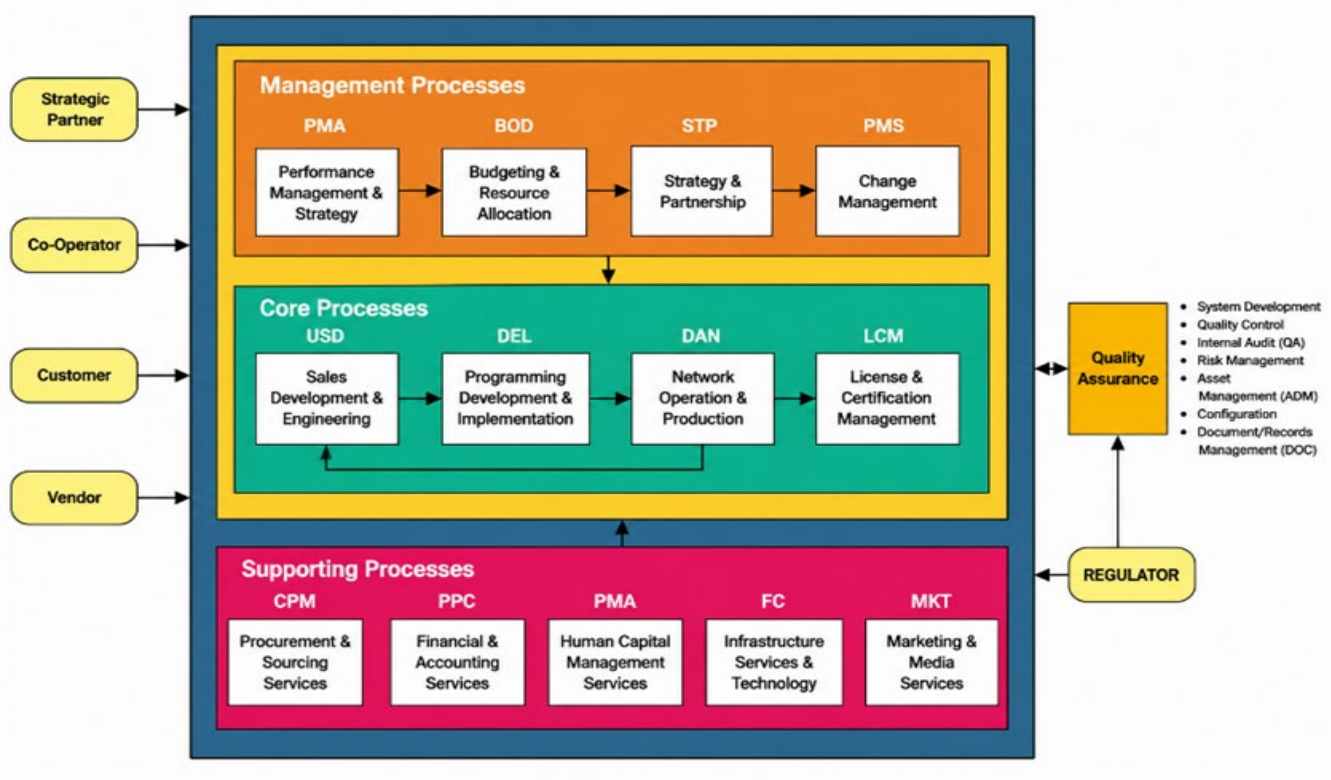


Figure 3. Training center management business process

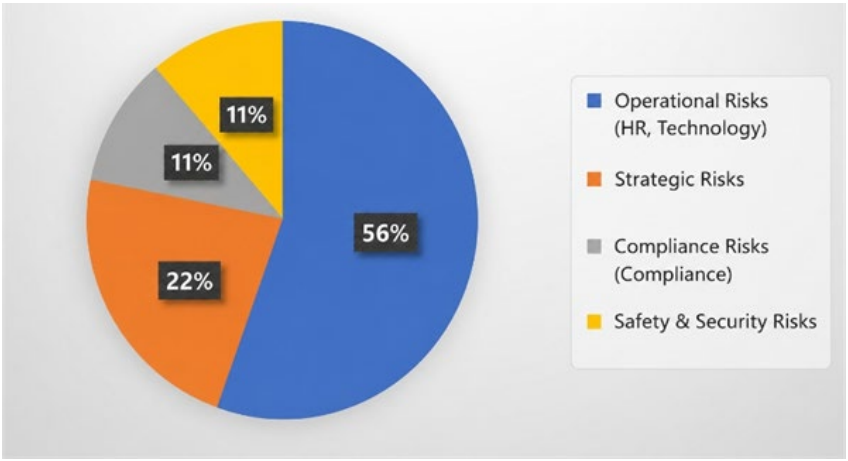


Figure 4. Distribution of identified risks by category

Table 1. Training Center Goal Matrix

Objectives	Key Drivers	Reference	Measurement Unit	Weight
Increase Revenue from Excess Capacity Training Program	Increase Revenue from Excess Capacity Training Program	KPI	IDR Bio	20%
	Increase Revenue from Excess Capacity Training Facility and Training Media	KPI	IDR Bio	
Increase Training Production Hours	Increase Mandatory by Regulation Training Production Hours	KPI	Hour	25%
	Increase Mandatory by Company Training Production Hours	KPI	Hour	
	Increase Personil Development Training Production Hours	KPI	Hour	
	Increase Student Satisfaction Index	KPI	%	
Maintain Compliance to Regulation 100% Implemented by December 2024	Maintain Employee competence document 100% ready by time needed	KPI	%	25%
	Maintain Compliance to Regulation 100% Implemented by december 2024	KPI	%	
Increase EBITDA	Optimization of cost budget absorption 95% from RKAP	KPI	%	30%
	Total Weight			100%

The training center operates through three core interconnected workflows: management, core, and supporting processes. The management process formulates long-term plans, cascades annual programs and budgets, establishes strategic partnerships, and compiles management review reports. As the primary operational driver, the core process develops curriculum designs based on corporate strategy, coordinates instructor management, schedules learning events, and tracks participant progress. This process utilizes five distinct instructional methods: conventional, experiential, technology-based, blended, and virtual learning. Post-training activities measure participant satisfaction to ensure alignment with corporate needs, ultimately resulting in regulatory certificates or licenses. Finally, the supporting process maintains daily training operations by managing administrative logistics, procurement, catering, accommodation, facility maintenance, and the integrated Learning Management System (LMS).

Risk Identification

Table 2 consolidates each risk event, its category, root cause, and operational or strategic impact. The matrix shows that most exposures originate within facilities, technology, staffing, and internal resource allocation. Table 3 translates each risk into a measurable Key Risk Indicator with green, yellow, and red thresholds. These thresholds provide an operational basis for escalation and monitoring. Table 4 defines the five likelihood levels used in the assessment, ranging from very rare to almost certain, based on percentage probability and estimated annual frequency. Table 5 defines the impact criteria across human resources, turnover, workload, safety, and accuracy. These criteria standardize how consequences are compared across heterogeneous risk events.

Risk Analysis and Evaluation

Likelihood and impact scores were determined by mapping evidence from interviews, observations, and documents to the company's five-point criteria. Likelihood was determined from the stated probability and estimated annual frequency of each risk event. Impact values obtained from respondents were averaged and compared with the company's impact parameters. The results were consolidated in the risk register, and the final risk level was determined through the corporate likelihood-impact matrix. The resulting inherent-risk positions support treatment prioritization. Residual-risk positions are projections that must be reassessed after treatment implementation.

Table 2. Combined Risk Identification Matrix

Risk ID	Risk Category	Risk Event (Likelihood)	Specific Root Cause / Factor	Operational & Strategic Impact
R01	Operational	Training facilities (buildings) cannot be used optimally.	Internal: Limited maintenance budget and deterioration of training facilities due to aging infrastructure.	Structural damage disrupts learning activities, while partial damage increases occupational safety risks for instructors and trainees.
R02	Operational/ Technology	Training media (digital learning systems, simulators, and mock-ups) fail to operate optimally.	Internal: Outdated simulator software and insufficient investment in technology upgrades due to budget limitations.	Learning activities are interrupted, training hours decrease, and flight crews are unable to complete mandatory competency requirements.
R03	Operational/ Human Resources	Shortage of certified training instructors.	Internal: Instructor succession planning has not been effectively implemented following early retirement and workforce reductions.	Reduced training capacity decreases student learning hours and creates competency gaps among airline personnel.
R04	Compliance	Insufficient resources to fulfill regulatory compliance requirements.	Internal & External: Workforce downsizing combined with annual budget adjustments affecting compliance activities.	Failure to achieve full regulatory compliance may jeopardize mandatory aviation training certification requirements.
R05	Operational/ Human Resources	Excessively high workload among supporting and administrative staff.	Internal: Workforce reductions combined with the absence of fully integrated information systems.	Employee fatigue increases administrative errors, scheduling inaccuracies, and overall operational inefficiency.
R06	Strategic	Declining interest from third-party organizations in utilizing the training center.	External: Training fees are relatively higher than those offered by competing aviation training providers.	Revenue generated from excess training capacity decreases, negatively affecting organizational financial performance.
R07	Strategic	Budget limitations affecting training program implementation.	Internal: Budget reductions and financial restructuring within annual organizational work plans.	Non-mandatory training programs are postponed or cancelled, while overall training quality may decline.
R08	Safety & Security	Occupational Health and Safety (OHS/ K3) risks within the training environment.	Internal: Absence of a dedicated Occupational Health and Safety management unit at the training center.	Workplace accidents involving instructors or trainees may interrupt or suspend training operations.
R09	Compliance	Regulatory or policy changes affecting existing training programs.	External: Continuous changes in aviation regulations and post-pandemic training standards requiring curriculum revisions.	Delays in adapting training curricula may result in non-compliance with regulatory requirements and extended implementation lead times.

Following the assessment of the operational impacts of potential risks on the training center, the evaluation criteria for impact are categorized based on the severity of their effect on training center management. The specific impact values and their corresponding metrics are presented in the impact evaluation criteria table. Figure 5 maps the nine inherent risks by likelihood and impact. R01 is classified as High, while most other risks are classified as Moderate-to-High or Moderate.

Table 3. Key Risk Indicators (KRIs)

ID	Risk	Key Risk Indicator (KRI)	Unit	Safe Limit (Green)	Caution (Yellow)	Danger (Red)
R01	Training facilities (buildings) cannot be used optimally.	Training Facility Reliability %	% (monthly)	> 90%	60-90%	< 60%
R02	Training media (LMS, simulator, mock-ups) cannot be used optimally.	Percentage of downtime (simulator/LMS)	% downtime	≤ 2%	3-5%	> 5%
R03	Limited number of instructors.	Number of classes canceled due to instructor unavailability	Classes/month	0 classes	1 class	≥ 2 classes
R04	Insufficient human resources to fulfill regulatory compliance.	Number of regulatory audit findings	Findings/audit	0 findings	1-2 findings	≥ 3 findings
R05	High workload of supporting/ administrative staff.	Percentage of administrative process delays (certificates, attendance, reports)	% of delayed processes	≤ 5%	6-10%	> 10%
R06	Declining interest from third parties in utilizing the training center.	Number of external classes canceled/ postponed by customers	Classes/quarter	0-1	2-3	≥ 4
R07	Training budget limitations.	Percentage of effective training budget absorption	%	≥ 90%	80-89%	< 80%
R08	Occupational health and safety (OHS) risks in the training area.	Number of OHS incidents	Incidents/year	0 incidents	1 incident	≥ 2 incidents
R09	Regulatory or policy changes that affect the training program.	Lead time for curriculum adjustment post-regulation	Days	≤ 30 days	31-60 days	> 60 days

Table 4. Likelihood Parameters

Parameter	1 Very Rare	2 Rare	3 Possible	4 Very Likely	5 Almost Certain
Percentage	Probability of a risk event below 20%	Probability of a risk event from 20% up to 40%	Probability of a risk event from 40% up to 60%	Probability of a risk event from 60% up to 80%	Probability of a risk event from 80% up to 100%
Estimated Frequency (per year)	The risk may occur very rarely, at most once every 5 years	The risk may occur only once within a 4-year period	The risk has occurred but not frequently, about once within a 3-year period	The risk has occurred several times, about once within a 2-year period	The risk has occurred every year

Based on the likelihood and impact assessment, nine potential risks were positioned in the inherent-risk heat map shown in Figure 5. R01 was classified as High; R02, R04, R06, R07, R08, and R09 were classified as Moderate-to-High; and R03 and R05 were classified as Moderate. The concentration above the risk-tolerance line indicates that facility, technology, compliance, staffing, and external-customer risks require coordinated treatment. Figure 6 summarizes the distribution of inherent-risk levels. The predominance of Moderate-to-High risks indicates that treatment should address multiple risk exposures rather than focus solely on the single High risk.

Figure 7 compares inherent risks with projected post-treatment positions. The projected residual-risk positions represent modeled outcomes based on the proposed treatments, not observed outcomes after implementation.

Table 5. Impact parameters

Aspect	A	B	C	D	E
Description	Very Low	Low	Medium	High	Very High
Human Resources	There is a shortage of staff, but the leader/unit head can be replaced quickly (by the acting leader/unit head or by another staff member at least 1 level below the position).	There is a shortage of staff needed, which can be addressed by the leader/unit head or other staff within the same unit.	There is a shortage of staff, which can be resolved up to the Unit/Section Head level or equivalent / regional head level.	There is a shortage of staff that disrupts activities within the company.	Critical work that is essential for the company is disrupted due to a shortage of staff.
Employee Turnover Rate	Turnover rate below 1% per year	Turnover rate 1%–5% per year	Turnover rate 5%–10% per year	Turnover rate 11%–15% per year	Turnover rate above 15% per year
Number of Human Resources Compared to Workload	Ratio < 10% from target	Ratio ≥ 10% and < 20% from target	Ratio ≥ 20% and < 30% from target	Ratio ≥ 30% and < 40% from target	Ratio ≥ 40% from target
Development Safety	Compliance with applicable regulations results in no negative impact on development safety.	Compliance with applicable regulations results in minor impact on development safety; operational disruption does not affect business continuity.	Compliance with applicable regulations results in significant impact on development safety; operational disruption can be tolerated and does not significantly impact business continuity.	Compliance with applicable regulations results in no safety margin; operational disruption can be tolerated and may significantly impact business continuity.	Compliance with applicable regulations results in no safety margin; operational disruption leads to casualties.
Development Accuracy	No errors or errors occurred but were corrected through initial review or intervention.	Minor errors occurred; correction requires a second review or follow-up intervention.	Significant errors occurred; correction requires more than 2–3 reviews and takes more than 1 week from the occurrence.	Critical errors occurred; correction requires involvement of one sector/department related to operational aspects.	Critical errors occurred; correction requires involvement of more than one sector/department related to operational aspects.

Monitoring and Reporting

The risk monitoring and evaluation process operates through a structured workflow managed via email or corporate information systems. Under this framework, the Risk Management Officer (RMO) from each unit is responsible for completing the Risk Monitoring & Evaluation Form with updated data, obtaining approval from the unit's Group Head, submitting it to the Unit In-Charge (UIC) Risk Information & Reporting, and archiving the finalized document. The UIC Risk Information & Reporting provides analytical guidance to the RMO, reviews submitted forms, and documents completed files, while the Group Head holds the final authority to approve the risk evaluations. Risk mitigation implementation is monitored monthly, whereas residual-risk statuses, risk heat maps, and year-end exposure projections are evaluated on a quarterly basis. Finally, the completed risk reports must be submitted to the UIC Risk Information & Reporting within ten working days following the end of each quarterly reporting period. Table 6 assigns risk events, impacts, treatment plans, and monthly implementation status. It provides the operational control record for follow-up by the Risk Management Officer and approving managers.

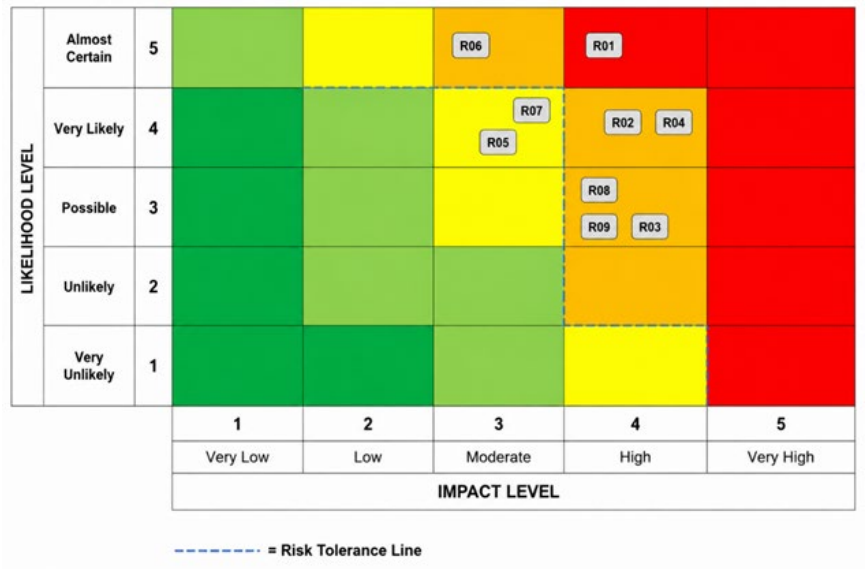


Figure 5. Inherent Risk Heat Map

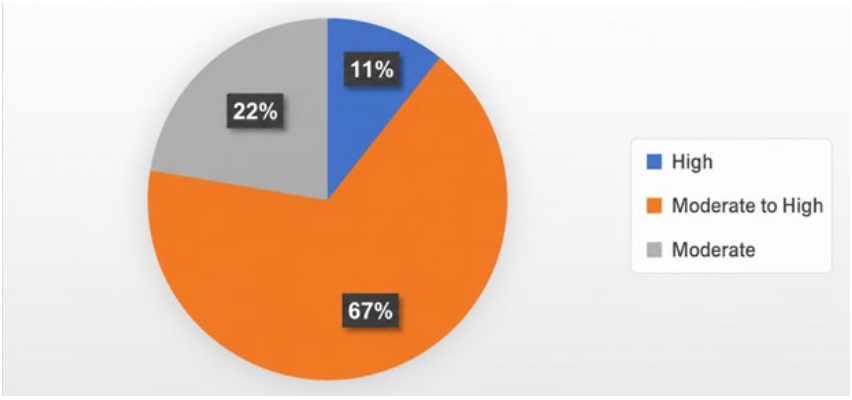


Figure 6. Distribution of Inherent Risk Levels

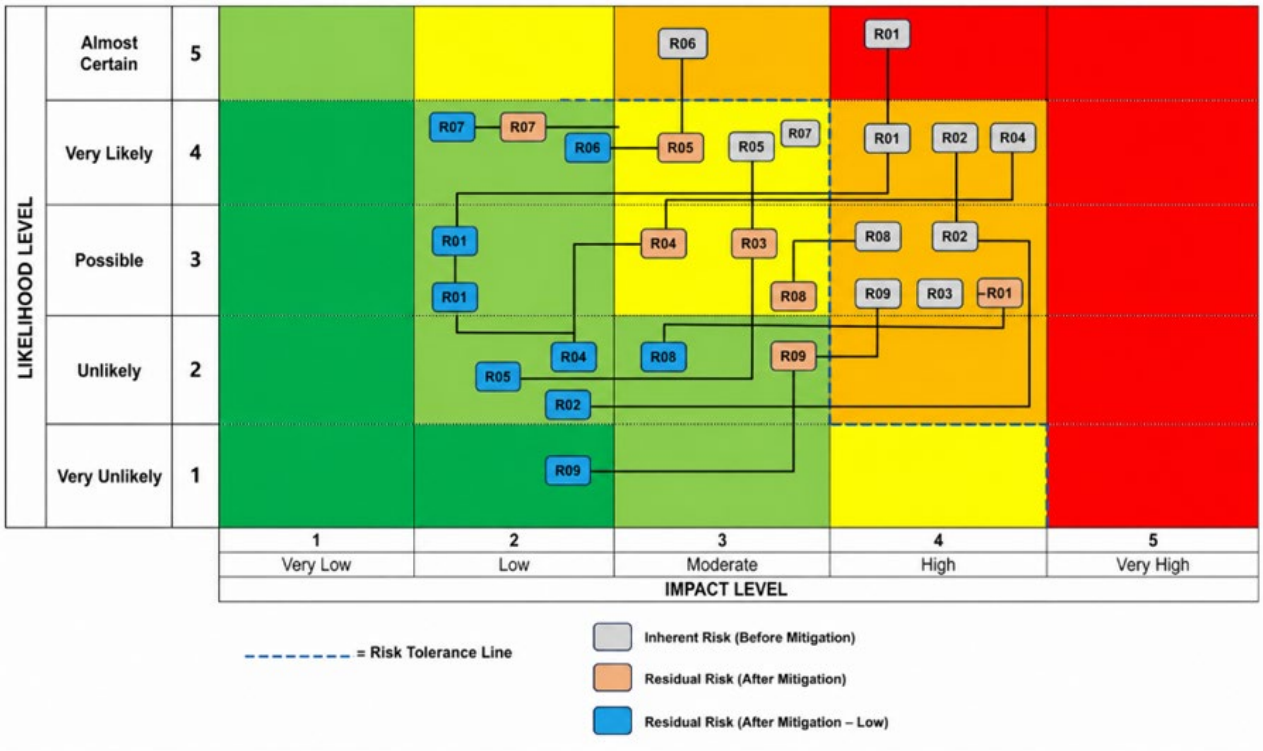


Figure 7. Inherent and Projected Residual Risk Heat Map

Table 6. Risk monitoring table

No.	Risk Description	Impact of Risk	Plan/ Actual	Mitigation Implementation											
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
R01	Training facilities (buildings) cannot be used optimally.	Disruption of learning processes due to unusable facilities.	Plan												
		Conduct building condition inspections and maintenance based on CAPEX.	Actual												
R02	Training media (learning management system, simulator, mock-up) do not operate optimally.	Disruption of learning processes.	Plan												
		Perform software updates and scheduled maintenance.	Actual												
R03	Shortage of trainers.	Disruption in the implementation of training programs.	Plan												
		Recruit certified trainers and prepare succession plans.	Actual												
R04	Insufficient human resources to meet regulatory compliance requirements.	Failure to meet regulatory compliance standards.	Plan												
		Optimize resources and monitor compliance performance regularly.	Actual												
R05	Excessive workload on supporting / administrative staff.	Workload imbalance and decreased operational efficiency.	Plan												
		Optimize workflows and deploy an integrated information system.	Actual												
R06	Declining interest from third parties in using the training center.	Decrease in revenue from the training program.	Plan												
		Improve service quality and expand marketing to potential customers.	Actual												
R07	Training budget limitations.	Disruption or cancellation of training programs.	Plan												
		Adjust program priorities and allocate budget according to strategic needs.	Actual												
R08	Occupational Health and Safety (OHS) risks in the training area.	Increased potential for workplace accidents.	Plan												
		Implement OHS management system and conduct regular inspections and training.	Actual												
R09	Changes in regulations/ policies affecting the training program.	Delays in curriculum adjustments and compliance.	Plan												
		Monitor regulatory updates and adjust curriculum and SOPs accordingly.	Actual												

The predominance of operational risks indicates that the training center's risk exposure reflects the interaction among physical infrastructure, technology, instructor availability, and process capacity. This finding complements Zhuang et al. (2024), who showed that flight-training risks form an interconnected network rather than isolated events. The present study extends that insight beyond accident causation by linking training disruptions to strategic objectives, regulatory certification, and financial performance. The prominence of facility downtime, training-media failure, and instructor shortages also supports the need to integrate operational risk with the Safety Management System. Seo et al. (2024) and Nugraha et al. (2025) similarly emphasize systematic safety assurance in aviation training organizations. However,

the current case indicates that safety assurance alone may not capture revenue, staffing, technology, and compliance exposures. The findings therefore suggest the value of an enterprise-wide risk architecture that integrates operational, safety, staffing, technology, and compliance exposures. The study is consistent with Crawford and Jabbour's (2024) argument that ERM becomes useful when risk information informs managerial judgment. In this case, KRI thresholds, heat maps, and monitoring responsibilities convert dispersed operational evidence into prioritized decisions. The projected residual-risk reductions should nevertheless be interpreted cautiously. They indicate the expected direction of change under the proposed treatments and require validation through post-implementation KRI data, incident records, facility availability, instructor capacity, training production hours, and compliance outcomes. This distinction aligns with research emphasizing disciplined residual-risk assessment in general aviation (The Effectiveness of Operational Residual Risk Assessment, 2024).

Managerial Implications

Management should use the risk register as a resource-allocation instrument rather than a periodic compliance file. First, facility maintenance and training-media availability should be governed through measurable service-level agreements tied to downtime thresholds. Second, instructor succession should combine certification planning, an associate-instructor pool, and workload monitoring. Third, the risk owner should integrate KRI data with training production, certification status, customer retention, and budget performance in a management dashboard. Fourth, projected residual risks should be reviewed after each treatment cycle and replaced with observed values only when evidence confirms implementation and effect. These actions connect the SOE governance requirements with daily training-center decisions and annual KPI or OKR reviews.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The study identifies the core process, including curriculum design, instructor coordination, learning-event execution, and certification, as the main concentration point for the non-achievement of training objectives. Operational risks are the dominant category, driven primarily by facility limitations, training-media reliability, workforce downsizing, and instructor shortages. R01, suboptimal use of training facilities, represents the highest inherent-risk exposure. The proposed treatments provide a structured pathway that is expected to move High and Moderate-to-High risks toward Moderate or Low-to-Moderate positions. These residual-risk values remain projections until treatments are implemented and evaluated. The monitoring schedule follows the SOE governance framework, but its dependence on periodic manual documentation may limit real-time visibility and proactive intervention.

Recommendations

In the short term, management should prioritize repairs in Buildings C and F, which were identified during direct observation at the West Jakarta training center in the third quarter of 2025. The supporting findings concerned structural conditions, air-conditioning performance, water leakage, and room-safety requirements. These findings support the prioritization of R01 because inadequate building conditions can interrupt learning activities and increase safety exposure for instructors and participants. Management should also establish service-level agreements with maintenance and IT units to reduce simulator and learning-system downtime. In the medium term, the center should develop an associate-instructor pipeline by mobilizing certified operational personnel and should strengthen external marketing to improve the use of excess capacity. In the long term, management should apply risk-based budgeting, integrate risk data with training and maintenance information systems, and link verified mitigation outcomes to annual KPI or OKR reviews.

FUNDING STATEMENT: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CONFLICTS OF INTEREST: The authors declare no conflicts of interest.

REFERENCES

Akbaş, M. Ç. (2024). Measuring the impact of enterprise risk management on performance, value, and risk indicators of Borsa Istanbul XBANK companies

with data mining prediction models. *Humanities and Social Sciences Communications,* 11, 1350. https://doi.org/10.1057/s41599-024-03871-z

Çopur, T., & Küçük Yılmaz, A. (2025). Post-pandemic trends in corporate risk management: a bibliometric review in the context of the aviation industry. *Journal of Aviation,* 9(3), 797–807. https://doi.org/10.30518/jav.1682362

Crawford, J., & Jabbour, M. (2024). The relationship between enterprise risk management and managerial judgement in decision-making: A systematic literature review. *International Journal of Management Reviews,* 26(1), 110–136. https://doi.org/10.1111/ijmr.12337

International Organization for Standardization. (2018). ISO 31000:2018 risk management guidelines. ISO.

Kementerian Badan Usaha Milik Negara Republik Indonesia. (2023a). Peraturan Menteri BUMN Nomor PER-2/MBU/03/2023 tentang pedoman tata kelola dan kegiatan korporasi signifikan badan usaha milik negara. https://bumn.go.id/

Kementerian Badan Usaha Milik Negara Republik Indonesia. (2023b). SK-6/DKU.MBU/10/2023 tentang petunjuk teknis proses manajemen risiko dan agregasi pada taksonomi risiko portofolio BUMN. https://bumn.go.id/

Nugraha, W., Komalasari, Y., Hariri, A., et al. (2025). Challenges and improvements in safety assurance implementation at aviation training organizations. *Journal of Social Work and Science Education*, 6(3), 1231–1242. https://doi.org/10.52690/jswse.v6i3.1234

Ortiz-Rangel, D., Rocha-Lona, L., Bada-Carbajal, L. M., et al. (2025). A framework to minimize environments risks and to identify repurposing operations in the commercial aviation sector. *Operations Management Research,* 18, 1226–1242. https://doi.org/10.1007/s12063-024-00533-w

Seo, J. S., Kim, J. B., & Lee, G. Y. (2024). A Study on improving safety management system's operation of the approved (flight) training organizations operated by Universities. *Journal of the Korean Society for Aviation and Aeronautics,* 32(3), 1–14. https://doi.org/10.12985/ksaa.2024.32.3.001

Ewertowski, T., Berlik, M., & Sławińska, M. (2024). The effectiveness of operational residual risk assessment: the case of general aviation organizations in enhancing flight safety in alignment with sustainability. *Sustainability,* 16(23), 10606. https://doi.org/10.3390/su162310606

Zhuang, Z., Hou, Y., Yang, L., Gong, J., et al. (2024). Toward safer flight training: the data-driven modeling of accident risk network using text mining based on deep learning. *International Journal of Computational Intelligence Systems,* 17, 291. https://doi.org/10.1007/s44196-024-00705-3