



**ENHANCING SAFETY CULTURE IN THE AVIATION SECTOR AT EAST
KALIMANTAN: A STUDY ON ORGANIZATIONAL, GROUP, AND INDIVIDUAL
SAFETY**

**Ida Ayu Indira Dwika Lestari*, Dewi Novita Hardianti, Iwan M Ramdan, Muhammad Sultan, Ika Wulan
Sari**

Faculty of Public Health, Universitas Mulawarman, Jl. Kuaro, Gn. Kelua, Samarinda Ulu, Samarinda,
Kalimantan Timur 75119, Indonesia

*gek.indira@fkm.unmul.ac.id

ABSTRACT

The aviation industry operates in a high-risk environment where safety is paramount. Despite the implementation of Safety Management Systems (SMS), aviation incidents often highlight gaps not in procedural compliance, but in safety culture—that is, how individuals and organizations perceive, prioritize, and act on safety. A mature and robust safety culture is crucial to reducing accidents and improving operational reliability. This study explores and describes the safety culture profile within the aviation sector, focusing on the maturity of safety practices at the individual, group, and organizational levels. A cross-sectional study was conducted using the Nordic Occupational Safety Climate Questionnaire (NOSACQ-50), a validated instrument for assessing safety culture. A total of 183 aviation workers from various operational units participated in the survey. Complementary qualitative data were gathered through focus group discussions (FGDs) with selected management and operational staff to contextualize the findings. Results indicated that the overall safety culture maturity level was categorized as "proactive," with the highest scores observed in management commitment (85.0) and safety procedures (85.0). However, lower scores in risk perception (70.5) and work environment (70.0) suggest key areas for targeted improvement. These findings suggest that while aviation organizations have made considerable progress in establishing a strong safety culture, more emphasis is needed on enhancing individual risk awareness and optimizing environmental conditions that influence safety behavior. Recommended interventions include participatory safety practices, continuous communication, and reinforcement of risk-based thinking.

Keywords: aviation industry; NOSACQ-50; risk perception; occupational health and safety management system; safety culture

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INTRODUCTION

The aviation industry is one of the most safety-sensitive sectors globally, operating in a dynamic environment with complex systems, high workloads, and stringent regulatory requirements. Given the potential for catastrophic consequences, safety has always been at the forefront of aviation operations. Over the past few decades, advancements in technology, regulatory frameworks, and operational protocols—such as the introduction of the Safety Management System (SMS)—have significantly contributed to reducing the number of aviation accidents worldwide. The International Civil Aviation Organization (ICAO) mandates the implementation of SMS to ensure that safety is managed systematically through hazard identification, risk assessment, and continuous performance monitoring (Annual Report 2018, n.d.) Despite these improvements, a number of incidents and near-misses continue to occur across the aviation sector. Investigations into such events often reveal that non-compliance with procedures is not the only contributing factor; rather, deficiencies in the underlying safety culture are frequently identified as root causes (Reason, J. (1997)). A robust safety culture provides the “missing link” between well-designed safety systems and actual

performance on the ground. It encompasses the shared values, beliefs, attitudes, competencies, and behaviour that reflect the degree of commitment to safety at all levels of the organization (Antonsen, 2009; Hudson, n.d.)

In Indonesia and other developing countries, similar concerns have been raised in other high-risk sectors such as mining, construction, and oil and gas. According to BPJS Ketenagakerjaan (2023), occupational accidents in Indonesia have steadily increased, from 221,740 cases in 2020 to 265,334 in 2023. These sectors often exhibit characteristics comparable to aviation in terms of operational hazards and workforce dynamics. Studies in those sectors suggest that organizations may possess comprehensive safety documentation and formal procedures but fail to foster a culture in which safety is truly internalized by all workers. A positive safety culture is marked by open communication, shared responsibility, proactive hazard management, and continuous learning. It moves beyond compliance and becomes integrated into daily behaviour, decision-making, and leadership styles (Hudson, 2001). Conversely, weak safety cultures are often reactive, relying on incident data to trigger corrective action and lacking worker engagement in safety initiatives.

This study draws inspiration from research conducted in the mining and oil and gas sectors to explore the maturity of safety culture within aviation organizations. Using a systemic approach, the study evaluates safety culture across three interrelated levels: the individual (personal values and risk perception), the group (peer interactions and team norms), and the organizational (leadership, communication, and system implementation). By understanding the strengths and weaknesses of each level, aviation organizations can develop more effective strategies to strengthen their safety culture and improve overall safety performance. The main objective of this research is to evaluate the safety culture maturity in the aviation sector in East Kalimantan, by identifying strengths and weaknesses across individual, group, and organizational domains. The findings aim to support aviation organizations in designing more targeted and participatory interventions to foster a stronger and more resilient safety culture.

METHOD

This study employed a descriptive cross-sectional design to assess the maturity of safety culture within the aviation sector in Balikpapan Airport. The design was chosen to capture a snapshot of the prevailing safety culture perceptions at a single point in time among aviation personnel from various operational levels and contract types. The primary instrument used was the Nordic Occupational Safety Climate Questionnaire (NOSACQ-50), a widely validated tool developed by a consortium of Nordic research institutions. NOSACQ-50 is specifically designed to measure safety climate as a proxy for safety culture, focusing on workers' perceptions of safety-related attitudes and practices within their organization. It consists of 50 items grouped into seven dimensions that reflect both management and worker perspectives, including safety commitment, communication, involvement, and risk awareness. The questionnaire was administered to 183 respondents working in various departments of aviation organizations, including both permanent and contract employees. Stratified purposive sampling was used to ensure representation across different job roles (e.g., maintenance, ground handling, flight operations, safety departments), contract types, and work locations.

The NOSACQ-50 has been rigorously validated across multiple high-risk industries, including construction, mining, healthcare, and transportation. It demonstrates strong psychometric properties, with reported Cronbach's alpha values ranging from 0.70 to 0.89 across its dimensions, indicating good to excellent internal consistency (Kines et al., 2011). Furthermore, the instrument has been adapted and used in various cultural contexts, confirming its cross-

cultural applicability and construct validity. In this study, the English version of the questionnaire was used with minor contextual adjustments to suit the aviation sector. Quantitative data from the NOSACQ-50 questionnaires were analyzed using descriptive statistical techniques, including means, standard deviations, and frequency distributions. Average scores were calculated for each NOSACQ-50 dimension and then mapped onto a safety culture maturity model ranging from "pathological" to "generative," to classify the overall safety culture profile. To complement the quantitative data, a series of Focus Group Discussions (FGDs) were conducted with selected participants from both management and operational staff. Each FGD consisted of 8–12 participants and was guided by a semi-structured protocol exploring themes such as safety leadership, communication practices, worker engagement, and contextual barriers to safety implementation. Qualitative data from FGDs were thematically analyzed and triangulated with survey findings to provide a richer, more contextualized understanding of the safety culture. This mixed-method approach allowed for a more nuanced understanding of the safety culture in the aviation sector, offering both measurable indicators and rich contextual insights into the organizational and behavioral factors influencing safety performance.

RESULT

A total of 183 respondents participated in the study, representing a diverse cross-section of aviation personnel, including ground handling, maintenance, safety management, and flight support services. The sample consisted of both permanent employees and contract workers, ensuring varied perspectives from across operational roles and employment categories. The analysis of responses using the NOSACQ-50 instrument produced insights across three core levels of safety culture: individual, group, and organizational. The overall average safety culture score was 77.0, which falls within the "proactive" maturity level according to the safety culture maturity framework.

Table 1.
Respondent characteristic (n=183)

Variable	Category	f	%
Gender	Male	135	73.8
	Female	48	26.2
Employment Status	Permanent	110	60.1
	Contractual	73	39.9
Length of Service	< 5 years	19	10.4
	5–10 years	87	47.5
	> 10 years	77	42.1
Education Level	Senior High School	77	42.1
	Diploma (D1–D3)	31	16.9
	Bachelor's Degree (S1)	68	37.2
	Master's Degree (S2)	7	3.8
Department / Role	Ground Operations	58	31.7
	Maintenance	42	23.0
	Safety/Quality Dept	37	20.2
	Flight Ops / Cabin Crew	26	14.2
	Others (Admin/Support)	20	10.9

Organizational-Level Results

The highest scoring dimensions were found at the organizational level, with particularly strong results in Management commitment to safety (85.0), Compliance with safety rules and procedures (85.0), nEffectiveness of safety communication (80.0). These scores indicate a robust safety leadership presence, clear procedures, and relatively strong information flow between management and employees. Respondents generally agreed that their organizations take safety seriously and provide visible support for safety initiatives. These findings indicate

a well-developed top-down safety structure and leadership visibility, echoing studies that highlight the role of management behavior and resource allocation in shaping safety norms (Fernández-Muñiz et al., 2007; Gao et al., 2019; Khan et al., 2018). Respondents generally perceived that safety policies were taken seriously at the institutional level and that safety messages were clearly communicated.

Group-Level Results

At the group level, the following average scores were observed that the score of Peer support and cooperation (75.0), Worker involvement in safety activities (77.5), Work environment factors (70.0) While involvement and peer support were rated as moderately strong, the work environment score was among the lowest in the survey. Respondents reported challenges such as workload pressure, conflicting priorities between safety and productivity, and occasional lack of safety resources. While peer support and involvement were within the proactive range, the relatively low score on the work environment dimension suggests ongoing operational constraints. Participants frequently reported issues such as time pressure, task overload, and tension between productivity and safety. These findings are consistent with earlier research in aviation and other high-reliability industries, where safety climates may be undermined by logistical and organizational stressors (Fonseca & Carvalho, 2019; Jasiulewicz-Kaczmarek et al., 2022; McQuaid, 2000)

Individual-Level Results

The individual level revealed a mixed profile Personal prioritization of safety (77.5), Perceived need for safety (80.0), Individual risk awareness (70.5). While the first two domains show that employees generally value safety, the low score in risk awareness suggests that hazard perception and situational awareness may not be consistently internalized—particularly under operational pressure. This aligns with the findings of Wiegmann et al. (2004) and Griffin & Neal (2000), who emphasized that valuing safety does not always translate into effective hazard recognition or adaptive behavior (Bisbey et al., 2021; Nordlöf et al., 2017; Sorensen, 2002).

Tabel 2.
Safety Culture Profile in the Aviation Sector

Level	Safety Culture Domain	Average Score (0–100)
Individual	Personal Safety Priority	80.0
	Risk Awareness	70.5
	Need for Safety	77.5
Group	Peer Support	75.0
	Work Environment	70.0
	Worker Involvement	77.5
Organizational	Management Commitment	85.0
	Communication	80.0
	Safety Procedures	85.0
Total Average Score	-	77.0

The overall average of 77.0 places the aviation organizations studied within the “Proactive” level on the safety culture maturity scale. This indicates that while systems and leadership are well-established and proactive in managing safety, gaps remain at the worker level, particularly in risk awareness and environmental conditions that support safe behaviors. Qualitative data from FGDs reinforced the survey findings. Participants acknowledged that while safety briefings, procedures, and audits were regularly conducted, safety ownership at the individual level was still lacking. Some frontline workers felt that safety was viewed primarily as a managerial responsibility, rather than a shared obligation. Several participants

cited examples where safety protocols were compromised due to workload, lack of resources, or time constraints—phenomena well documented in organizational safety research as part of the "drift into failure" model (M. D. Cooper, 2000). Others expressed a desire for more meaningful worker involvement in safety planning, echoing the need for participatory governance as outlined by and (Saleem et al., 2021)

DISCUSSION

This study aimed to assess the maturity of safety culture in the aviation sector by analyzing perceptions across three levels: individual, group, and organizational. The results indicate an overall proactive level of safety culture maturity with a total average score of 77.0 based on NOSACQ-50 indicators. At the organizational level, respondents perceived a strong management commitment to safety (average score = 85.0), supported by consistent implementation of safety procedures and rules (85.0) and effective safety communication (80.0). These results suggest that safety is a well-established value at the leadership level, aligned with prior findings by (M. D. Cooper, 2000; Hudson, n.d.) who emphasized the critical influence of leadership behavior on organizational safety outcomes. Moreover, the strong performance in the communication domain (80.0) indicates that safety messages are generally transmitted clearly throughout the organization. This is critical, as communication gaps have been associated with increased risk of incidents in aviation and other high-reliability sectors (Lee & Quinn, 2020; Quenon et al., 2020) .

At the group level, respondents reported moderately positive perceptions of peer support and cooperation (75.0), worker involvement in safety practices (77.5), and perceived safety of the work environment (70.0). These scores reveal some level of safety ownership among teams, though not uniformly distributed. Previous studies in high-reliability organizations have shown that a strong group safety climate is essential for transferring management policies into day-to-day behaviors (Perez et al., 2024; Profesyionellerinde et al., 2023; Sorensen, 2002) At the individual level, scores for personal prioritization of safety (77.5) and need for safety (80.0) were relatively high, suggesting that most workers value safety. However, the score for risk awareness (70.5) was notably lower, indicating a potential overconfidence or underestimation of workplace hazards. This gap between safety values and risk perception has been documented in studies by Griffin and Neal (2000), who found that individual motivation for safety does not always translate into hazard recognition or safe decision-making under pressure.

Leadership and Organizational Safety Culture

The high scores for management commitment and structured procedures reflect a strong top-down implementation of safety systems. This is encouraging and aligns with the ICAO (2018) Safety Management Manual, which emphasizes leadership as the foundation of a robust SMS. However, as Hudson (2001) noted, a “proactive” safety culture must evolve toward interdependence, where safety becomes everyone's responsibility—not just that of management (Braun et al., 2020).

Risk Awareness and Safety Behavior

The relatively low score in individual risk awareness is critical. Workers may comply with rules but still lack situational awareness, which can lead to unsafe behavior in high-pressure environments. This phenomenon has been reported in the aviation literature by (Braun et al., 2020) who argued that risk normalization in routine operations can desensitize workers to emerging threats.

Environmental and Operational Constraints

The low score in work environment (70.0) suggests that contextual factors—such as workload, time pressure, or conflicting priorities between safety and productivity—remain challenges. These findings are consistent with (Jaroenroy et al., 2024) notion of “drift into failure,” where well-intentioned operators make decisions that gradually compromise safety under complex constraints.

Participation and Ownership of Safety

While worker involvement (77.5) scored in the proactive range, qualitative data from FGDs indicated that safety decisions are still perceived as the domain of management. Workers noted that while they are expected to follow procedures, they are rarely consulted in the development or review of safety policies, echoing the findings of (Abdullah et al., 2016; Alruqi et al., 2018; Martínez-Córcoles et al., 2011) Mearns et al. (2003), who emphasized the role of inclusive safety governance in fostering engagement. FGDs provided nuanced insights into the survey data. Several participants acknowledged that safety is prioritized during formal activities (e.g., briefings, audits), but informal practices sometimes deviate, especially under time constraints or operational pressure. Participants also expressed a desire for more participatory safety communication and feedback mechanisms.

These reflections are in line with (D. Cooper, 2002) model of safety culture, which highlights the importance of aligning psychological (beliefs), behavioral (actions), and situational (systems) dimensions. Interestingly, similar studies in the mining and oil and gas industries in Kalimantan Timur (Lestari et al., 2021) found parallel patterns: high management commitment but lower worker risk perception and involvement. These parallels suggest a broader trend in high-risk industries in Indonesia, where formal compliance is well developed, but behavioral safety and risk internalization remain areas for growth. Comparatively, aviation organizations globally have shown a progressive shift toward interdependent safety cultures (Kim & Song, 2015) where employees not only protect themselves but also actively ensure the safety of their peers—known as “other-keeping behavior.” This study’s findings suggest that Indonesian aviation organizations are on the right trajectory but need to strengthen bottom-up engagement to move toward that interdependent model.

CONCLUSION

The aviation sector shows promising development toward a mature safety culture, especially at the management level. However, discrepancies between individual perceptions and organizational policies reveal areas for growth. Emphasizing worker involvement and risk awareness is essential to reach a resilient safety culture. We suggest for this research is about to Conduct regular safety training that includes psychological risk assessment and hazard awareness. Implement participatory programs such as Safety Committees and peer-to-peer observation. Improve vertical and horizontal communication channels for safety reporting and feedback. Assess and redesign work environments to reduce safety stressors and support safe behaviors and do the periodic safety culture assessments should be institutionalized using validated tools like NOSACQ-50.

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