

SAFETY MANAGEMENT

Peer-Reviewed

ASSESSING SAFETY CULTURE

Lessons From the Aviation Industry

By Mirrette Gendi, Cheri L. Marcham and Michael O'Toole



SAFETY CULTURE has been a topic of debate in academia as much as it has been in the practice of various industries (Zohar, 2010). Although the concept and definition of safety culture and what it entails have consumed much of the debate, the assessment of safety culture has been the most controversial. Yet, on the academic level, the topic of monitoring and measuring safety culture has seen limited research that offers reliable and valid assessment tools (Goodheart & Smith, 2014), especially when compared to the importance of safety culture as a component of a safety management system (SMS).

The question of how to evaluate and measure safety culture is important to all industries but is of particular importance in the field of aviation (Petitt, 2017). The Federal Aviation Administration (FAA, 2021) mandates air carriers to implement an SMS to manage safety risks in accordance with the requirements of the International Civil Aviation Organization (ICAO). The SMS is established on four pillars: safety policy, safety risk management, safety assurance and safety promotion. Safety culture is the cornerstone of the safety promotion pillar, and air carriers are expected to measure, monitor and improve safety culture as part of managing an SMS (Petitt, 2017). Accordingly, safety culture assessment is not only an excellent safety management practice or international industry guideline, but also a regulatory requirement that air carriers must comply with and that the FAA is tasked to oversee.

As part of this oversight, the FAA conducts audits of air carriers to confirm compliance with regulatory requirements, evaluate SMS operation and ensure adequacy of the SMS to assess potential safety hazards and implement risk mitigation controls. However, the FAA has been scrutinized by the U.S. Department of Transportation Office of Inspector General (OIG, 2020) for shortcomings in safety culture assessment during air carrier SMS audits. The OIG attributed these shortcomings to the absence of FAA audit guidelines on how safety culture should be evaluated. The implications of these shortcomings are believed to contribute to air carriers potentially running operations that do not meet FAA aviation safety regulations, posing risk to passenger safety. An enforcement gap exists in defined safety culture assessment methods, which creates challenges for both the FAA and air carriers to meet their regulatory obligations. Therefore, the OIG has instructed the FAA to develop guidance for its inspectors to evaluate safety culture during air carrier audits and factor it into FAA oversight decisions.

Accomplishing this requires identifying adequate tools for safety culture assessment that can be used during SMS audits. This assessment is essentially a

macro-level evaluation of organizational performance rather than a micro-level estimation of individual perceptions. These tools can be used to evaluate the status of an organization's safety culture during the limited time frame in which an audit is conducted to ensure comprehensive SMS audits. These tools can also be utilized in safety culture evaluation beyond the aviation industry.

Definition of Safety Culture

To develop a method of measuring safety culture, the term must be defined in light of the ongoing debate around the concepts of safety culture and safety climate to align what is being measured and how (Figure 1, p. 28). The aviation industry uses the terms "safety culture" and "safety climate" interchangeably to refer to organizational and individual manifestations of the safety promotion aspect of the SMS, where safety climate is a glimpse of a group's safety culture (Key et al., 2023a).

ICAO (2018, p. 3-1) defines "safety culture" as "how people behave in relation to safety and risk when no one is watching." It is an index of employee perception of the extent of organizational commitment to safety (Key et al., 2023a). This definition is based on the perception and prioritization of safety by members of the organization and is used interchangeably with what academic literature usually refers to as "safety climate."

While the debate continues around the semantics of safety culture and safety climate (Goodheart & Smith, 2014), compliance with a regulatory requirement is challenged as FAA safety audits lack consistent methods to evaluate safety culture among air carriers. As the goal is the assessment of organizational safety culture during SMS audits, the term "safety culture" is used in this article to align with standard language of the industry's international organizations and regulatory text.

Safety culture is an evolving and critical element of safety management across industries, so there is need to monitor, assess and continuously improve it. Industry-specific tools may need to be considered to account for context-dependent targets, such as employees' perception of the safety climate to allow for adequate comparisons and meaningful benchmarking opportunities (Zohar, 2010). This is achievable through an analysis of the industry risk profile to develop adequate safety culture assessment tools. Nevertheless, common constructs of safety culture have been identified in all industries whose evaluation methods could be benchmarked across industries.

For instance, high-risk industries such as aviation, nuclear power, medicine, and chemical manufacturing share a peculiar attribute of operations complexity and process safety sophistication that is inevitably tied to the features of safety culture in such organizations. Inadequate risk mitigation can have serious and at times catastrophic implications both within the organization and beyond it (Wiegmann et al., 2004). This contextual consideration denotes that safety culture is a critical element of both OSH and operational safety. For the aviation industry, occupational and aviation safety are both impacted by the status of safety culture in the organization.

Accordingly, a positive safety culture in aviation is multifaceted and encompasses organizational culture, just culture, reporting culture, learning culture and informed

KEY TAKEAWAYS

- Safety culture is a significant element of a safety management system that must be monitored and evaluated to continually improve safety performance.
- The evaluation of safety culture in the aviation industry has been challenging in the absence of clear guidelines on what to measure and how to measure it.
- Safety culture can be assessed through a combination of qualitative and quantitative tools.
- Common features of safety culture across industries allow lessons learned from the aviation industry to be benchmarked for effective safety culture assessment.

culture (Houston, 2015). Although inseparable, occupational safety culture in aviation is seen to hold the weight of employee perceptions of organizational safety culture, which subsequently reflects on operational safety outcomes. An example that attests to this dynamic can be seen in a 2018 hotline complaint that the OIG (2020) received from employees of a major airline regarding recurring violations of operational safety controls at the airline, which triggered an investigation into the FAA safety audit of the airline. When investigating the complaint, the OIG found that FAA audits did not evaluate the air carrier risk assessments or safety culture. Accordingly, FAA inspectors did not explore occurrences of the air carrier's inability to adequately assess hazards and complete corrective actions to bridge compliance gaps. Inspectors did not address the airline's safety culture through systematic auditing tools despite FAA representatives' concerns about the status of safety culture such as the absence of a just safety culture as was uncovered during whistleblower investigations. In aviation, the notion of just culture plays an important role in safety management as it seeks to balance the concepts of psychological safety and accountability, a balance whose absence can be determinantal for safe operations. Individuals must be encouraged to speak up about safety issues in a system that fosters a fair account of responsibility and appropriate corrective action with an end goal of continuous improvement (Houston, 2015). The 2018 complaint ultimately resulted in OIG providing the FAA opportunities for improvement in safety culture assessment.

This example and many others in which employees resort to contacting enforcement agencies to raise safety concerns indicate a safety culture where safety communication is deficient and safety messaging is disconnected. Organizations committed to safety ensure that employees feel heard and that their safety concerns are addressed. Therefore, organizations must focus on employee engagement metrics to ensure that resources are allocated to deliberately improve safety culture since a direct correlation exists between employee safe behaviors and management commitment to safety on one hand, and perceptions of

organizational safety culture on the other (Blair & O'Toole, 2010). An organization's ability to act upon this need is one aspect of safety culture that should be evaluated.

The limited research on safety culture in the aviation industry has focused on either specific operational needs [e.g., Pettitt (2017) on airline pilot training as an application of safety culture impact on safety management; Musa and Isha (2021) on safety culture assessment in aircraft ground handling operations] or domain-specific needs [e.g., Key et al. (2023b) on safety culture assessment within aviation maintenance]. Moreover, even the rare studies that tackled the topic in its comprehensive sense did not fully address how organizational safety culture could be practically assessed. Studies have recommended that the FAA fund more research targeted at developing safety culture assessment tools (Zubowski, 2021) or have concluded with skepticism about study outcomes because of validity and reliability limitations of existing literature or even the ability of the study to answer the research question or evaluate hypotheses (Goodheart & Smith, 2014), leaving more to be said about the topic.

Industry resources include guidance published by international organizations suggesting methods of assessing safety culture. On the international level, the International Air Transport Association (IATA) and ICAO resources set expectations on how safety culture can be assessed and offer ideas on safety culture indicators. IATA offers recommendations about safety culture indicators that an organization can use to monitor management commitment, employee behavior, adequacy of information and communication, the notion of just culture, and the level of safety awareness and adaptability in the organization (Houston, 2015). ICAO outlines six manifestations of safety culture that can be the target of assessment: awareness of hazards and risks, continuous prioritization of safety, access to resources needed for safe operations, response to safety issues, communication of safety issues, and assessment of safe behaviors throughout the organization. To assess safety culture, ICAO (2018) recommends a combination of questionnaires, interviews and focus groups, observations, and document reviews.

Industry resources also include published FAA perspective on safety culture assessment. The FAA has funded a few studies in this area of research, but not in application to air carriers. For example, Key et al. (2023b) conducted research sponsored by FAA to develop and validate an occupational safety culture assessment and improvement tool kit for the aviation maintenance domain focusing on three main components: shared values, actions and behaviors. The tool kit provides a survey tool and scoring guidance, as well as best practices on safety culture improvements that support the safety promotion pillar of an SMS.

FIGURE 1
SAFETY CULTURE VS. SAFETY CLIMATE

Safety culture	Safety climate
<ul style="list-style-type: none"> • An enduring organizational attribute of shared values and collective contributions across all organizational levels (Wiegmann et al., 2004) • Evaluated using pattern analysis and interpretation of relationships and events (Rentsch, 1990) • Measured using qualitative methods such as audits (CANSO, 2013) 	<ul style="list-style-type: none"> • Refers to employees' perceptions of an organization's safety programs and practices. It changes based on events and can be quantitatively measured using tools such as questionnaires (Zohar, 1980) • An output of an organization's safety culture (Blair & O'Toole, 2010) • Based on individuals' feelings and perceptions, thereby providing a snapshot of an organization's safety culture (CANSO, 2013) • Measured using quantitative tools such as perception surveys and interviews (CANSO, 2013)

The gap resulting from the lack of FAA guidance on safety culture assessment tools is twofold. One aspect relates to lack of guidance for organizations to monitor their safety culture maturity through measurable goals, and another aspect relates to the need for guidelines to help inspectors consistently evaluate organizational safety culture using reliable audit tools. Although efforts such as the maintenance tool kit survey can be modified to serve other work groups beyond maintenance (FAA, 2023a) and can be helpful to guide organizations in monitoring, assessing, and improving their safety culture, it does not offer the guidelines needed for FAA audit purposes.

Regulatory Expectations

ICAO (2018) views safety culture as an indicator of SMS maturity level and a driver of safety performance to the extent of naming it the single most influential element in safety management. Safety culture, in turn, has its own indicators such as visible leadership support and employees' perception of their ownership of organizational safety objectives. A significant indicator of safety culture is safety reporting and management of safety issues raised by personnel. Another important aspect of safety culture is a disciplinary policy that is clear, transparent, consistent and appropriate for the organization's activities. When assessing safety culture, the goal is to understand safety culture with the intent of improving it rather than achieving a favorable score. The organization should be open to this process and stay focused on the goal of a continuously maturing safety culture. ICAO offers examples of actions that both enable a positive safety culture and can be assessed to evaluate that culture. These include commitment to safety, adaptability, awareness, behavior with respect to safety, information and trust.

Under the safety promotion pillar of the aviation SMS, FAA regulatory requirements are limited to ensuring adequate competencies and training of parties responsible for managing and operating the SMS, and establishing means for communicating SMS policies, processes, and tools; conveying relevant hazard information; and explaining safety actions and changes to safety procedures (FAA, 2023b). Accordingly, as FAA inspectors attempt to audit safety culture, they are limited to elements such as training records, job descriptions and means of top-down communication. These elements do not provide a holistic evaluation of the core elements of safety culture as described by ICAO (2018) and fall short of achieving the intended oversight expectations that the FAA is tasked with when examining evidence of safety promotion in an SMS. In addition, this limited regulatory reference impacts organizations' ability to comprehensively monitor their safety culture, where despite potential compliance with FAA competency and communication requirements, other significant safety culture aspects are disregarded. This shortcoming explains the gaps identified by OIG (2020) where inspector observations on safety culture were not tied to any corrective action.

The Relationship Between Safety Culture & Safety Performance

The relationship between safety culture and safety performance has been described in literature in several ways

(Kalteh et al., 2021; O'Connor et al., 2011). Understanding the nature and dynamics of this relationship is important to developing meaningful indicators of safety culture and ensuring that what is being measured is in fact related to safety performance and affects safety management practices. Selection of leading and lagging indicators to assess safety culture must factor in industry-wide characteristics and reflect what is important per the industry risk profile.

To elaborate, some literature suggests that reactive indicators are more appropriate for dynamic and project-based industries such as construction, whereas proactive indicators better fit uniform and process-based industries such as manufacturing (Kalteh et al., 2021). This approach is supported by the fact that lagging indicators may not offer a true gauge of safety performance in high-risk industries. Additionally, lagging indicators tend to lack any sort of ability to predict future mishaps in a meaningful way. High-hazard industries must identify more sensitive metrics to reduce the likelihood of catastrophic mishaps. For example, the structured safety management in the aviation industry as mandated by the SMS safety risk management and safety assurance pillars minimize safety mishaps by design. Thus, low incident rates may not necessarily reflect satisfactory safety performance. Therefore, leading indicators are better fit to measure safety performance in aviation (O'Connor et al., 2011). As structured as the aviation industry is due to regulatory oversight, proactive indicators cannot be overemphasized. Measuring safety performance in this case is expected to rely heavily on well-designed leading indicators that cover various aspects of the SMS, including safety culture and relevant perceptions.

Although incidents may be an inappropriate indicator of safety performance in the industry, this does not call for completely discarding the measure. Instead of mishaps, employee self-reporting of minor safety incidents or close calls can be considered an indicator of safer work conditions (O'Connor et al., 2011). Significant self-reporting is an indicator of safe work conditions as well as a positive safety culture. The more hazards and minor incidents are reported, the safer the workplace and the more positive the safety culture. This reflection on the status of safety culture relates to employee engagement, management support of a reporting system based on principles of just culture, and a responsive process of hazard recognition that shows trust in management's commitment to safety. Safety culture sets expectations of safe behavior through shared norms, values and beliefs, and safe behavior enforces a positive safety culture. Consequently, safety culture can have an impact on occupational injuries and incidents through employee behavior, safe working conditions, and expectations established by safety policies and procedures. Safety culture also impacts safety performance outcomes such as safety compliance and safety participation as it drives employee motivation, behavior and adherence to established procedures and, consequently, safety events (Kalteh et al., 2021). Thus, safety culture is an antecedent for safety performance and must be measured to improve safety performance. Safety commitment, in turn, is an antecedent for safety culture and must be measured as well (Goodheart & Smith, 2014). Accordingly, an assessment of safety culture must seek to evaluate leadership commitment to safety and examine tools of managing safe work conditions, safe behaviors and

FIGURE 2
ASPECTS OF THE WORK ENVIRONMENT

Job resources	Job demands	Employee satisfaction	Employee well-being	Organizational outcomes
<ul style="list-style-type: none"> • Communication • Autonomy • Training • Supervision • Management • Commitment • Fatigue risk management • Just culture • Equipment and tools • Documentation • Reporting system 	<ul style="list-style-type: none"> • Personal and team role overload • Workplace limitations • Bullying and coworker concerns • Safety concerns 	<ul style="list-style-type: none"> • Job satisfaction • Employee morale • Turnover intentions 	<ul style="list-style-type: none"> • Fatigue • Strain • General health 	<ul style="list-style-type: none"> • Willingness to report • Compliance • Performance • Errors

FIGURE 3
ELEMENTS OF SAFETY MANAGEMENT FOR ASSESSMENT

Adequate allocation of resources to safety management	This includes financial and human resources, as well as facilities and necessary logistics. Assessment aspects include staffing, workload, job security, training, and alignment between work assignments and adherence to established procedures.
Leadership commitment in both theory and practice	Assessment aspects include management presence in the work environment. Employee perception of leadership commitment is based on their view of management’s real prioritization of safety, that is, the degree of alignment between declared safety policy and actual situational manifestations of putting safety at the core of operations and business decisions (Zohar, 2014).
Efficient communication of safety information	Assessment aspects include timely and complete dissemination of safety goals, objectives, initiatives, programs and measures across all affected levels of the organization.
Clear and reciprocal communication across all organizational levels	Assessment aspects include a reporting system that has just culture, rather than blame and punitive culture, at its core, along with elements of accountability reflected in reward and discipline as appropriate.
Decision-making process that considers safety	Assessment aspects include collaboration in decision-making, considering safety at the forefront of business decisions.
Comprehensive risk management approach	Assessment aspects include whether risk management is based on informed assessment of hazards and reasonable mitigation controls.
People management protocols based on just culture, transparency, consistency and conflict resolution	Assessment aspects include employee engagement, reporting of safety issues, psychological safety to raise safety concerns, clarity of roles and responsibilities, accountability, and fair management of every safety-relevant situation per an established protocol.

safety events, all as standing components of an SMS.

Although research has not definitively identified whether safety culture drives SMS implementation or vice versa, both variables drive safety performance. A safety culture that promotes managing safety according to a robust SMS can mitigate risk and improve safety performance (McNeely, 2012).

Safety Culture Assessment

In the third edition of its safety management manual, ICAO (2013) states that “effectiveness of a safety culture can indeed be measured and monitored through the use of tangible metrics” (p. 2-12). Interestingly, the next edition of the safety management manual does not duplicate this language about tangible metrics, but rather promotes an assessment of safety culture through tools such as questionnaires, interviews and focus groups, observations, and document reviews (ICAO, 2018). Further, a subsequently published ICAO resource notes that safety culture is difficult to measure and suggests assessing it instead (Lee, 2021).

Safety culture is multidimensional, so mixed assessment tools may be necessary to assess it comprehensively. The complexity of safety culture also calls for an approach of continuous improvement that is targeted toward safety management rather than being a collateral of operational excellence efforts. Assessing safety culture maturity is a long-term process that reflects upon commitment to safety within the holistic organizational culture as it competes with other organizational performance goals such as productivity, profitability and business growth opportunities and challenges (Key et al., 2023a). Safety culture assessment tools capture a snapshot in time, and working toward a comprehensive assessment denotes the use of a mix of measurement tools and regular assessment activities to ensure that the various aspects of culture are accounted for and continuously improved over time.

The FAA looks at three main components of safety culture: shared values, actions and behaviors. These components tell a story about the commitment to safety in the presence of various organizational goals and demands, and they can be evaluated by assessing perceptions around safety culture. Perceptions vary across job roles and within the same job across teams and supervisors. An example of assessing employee perceptions of safety culture is presented in the FAA maintenance safety culture assessment and improvement tool kit, which offers a survey of perceptions of various aspects of the work environment (Figure 2; Key et al., 2023b). Among the demographic data collected for the survey is a question on whether the employee has experienced any injuries. However, these data are not part of the survey analysis or report. It would be interesting to analyze the trends in safety culture perceptions between employees who had experienced safety events and those who had not.

The FAA tool kit, originally developed for application to the aviation maintenance domain (Key et al., 2023b), can be

The FAA maintenance safety culture assessment and improvement tool kit can be modified to serve other work groups beyond aviation maintenance. In addition, it can be used in nonaviation settings to help organizations assess employee perceptions of safety culture.

modified to serve other work groups beyond maintenance (FAA, 2023a). In aviation, the FAA should raise awareness about the tool kit and organize campaigns to guide organizations to adopt this assessment guidance, or an equivalent, and customize it to various work groups to gauge the organization's safety culture beyond the descriptive elements of training, competency and communication outlined in FAA regulations. This tool could also be promoted as an opportunity for improvement during FAA

audits in the absence of an effective assessment tool. In addition, the tool can be used in nonaviation settings to help organizations assess employee perceptions of safety culture.

Organizations should seek to periodically assess positive safety culture aspects (Key et al., 2023a). Regardless of the tool used to carry out this assessment, the organization must comprehensively evaluate the various elements of safety management to capture the status of safety culture (Figure 3). These elements that an SMS audit should seek to evaluate when assessing an organization's safety culture align with the recommendations of the Safety Management International Collaboration Group (SMICG, 2019), which identifies six characteristics of a positive safety culture: leadership commitment and investment in safety, justness (just culture), well-distributed safety information and reporting of safety issues, workforce awareness of risks, adaptability to lessons learned from safety events, and opting for safety by both employees and management.

The assessment of safety culture is not an end in and of itself, but a means to understanding where the organization stands and identifying opportunities for continuous improvement. Organizations must utilize assessment results to develop appropriate interventions for addressing identified gaps or improvement opportunities (Key et al., 2023a). Therefore, the evaluation of safety culture should not be limited to defined measurements of safety culture such as using employee safety perception surveys, documenting hazard recognition procedures or safety reporting programs. The evaluation should extend to manifestations of the organization's understanding of safety culture measurements and employing interventions that seek targeted improvements in areas of concern.

In aviation, FAA evaluation of the SMS safety promotion pillar should also seek to uncover undesirable safety promotion challenges. This is a missing aspect in the FAA SMS audit experience. For example, FAA inspectors failed to highlight findings relevant to the status of safety culture as part of SMS audits despite reports of employee safety concerns at an air carrier, as well as failure to audit evidence of rapid compliance with regulatory requirements and verification of the status of any assigned FAA corrective actions (OIG, 2020). These elements are indicators that safety is not a priority among competing organizational business needs and reflect the lack of a just safety culture that allows employees to raise safety



concerns within a consistent, transparent process where management takes safety concerns seriously and strives to address them through appropriate response.

Evaluation of organizational safety culture can also benefit from established consensus standards in occupational safety management, where audit experience has been built for years on continuously refined audit guidelines. For example, ANSI/ASSP/ISO 45001-2018, Occupational Health and Safety Management Systems—Requirements With Guidance for Use, can be consulted for aspects of safety culture assessment. This voluntary standard is well-founded on elements that are fit for external audit purposes and can be used by FAA or other inspectors during an audit. Most safety culture aspects in this standard overlap with ICAO (2018) manifestations of safety culture. Examples include understanding the needs and expectations of workers and other interested parties, leadership and commitment, organizational roles and responsibilities, consultation and participation of workers, hazard identification and assessment of risks and opportunities, resources, competence, awareness, communication, hazard elimination, risk reduction, management of change, management of incidents, nonconformities, and corrective actions, and continual improvement. This can allow the FAA audit process, or any safety audit process, to benefit from ANSI/ASSP/ISO 45001 accumulated knowledge in external audit.

Recommendations for All Industries

Safety culture is a driver of safety performance, and therefore must be continuously monitored and consistently assessed by organizations. By extension, external stakeholders that aim to examine the status of an organization's SMS should evaluate the effectiveness of the organization's safety culture assessment tools and its efforts to monitor and improve safety culture. The following recommendations are applicable to SMS audits beyond the aviation industry and can be extended to guide the evaluation of safety culture in other industries:

1) Evaluation of leadership commitment to safety.

Do leadership roles demonstrate safety as a priority in words and actions? Evidence may include allocating resources to safety needs such as safety personnel,

necessary role-specific training and adequate equipment, documented safety procedures, established safety management oversight and governance, and management prioritization of safety in business decisions. This aspect can be observed in leadership commitment to safety that is not limited to regulatory requirements or reactive measures after safety incidents but rather that is based on an organization-specific needs assessment driven by risks and opportunities (Key et al., 2023a).

2) Evaluation of safety awareness in the organization.

Does the organization maintain a high level of vigilance with respect to safety issues? Evidence may include documented enterprise risk management; hazard identification; risk assessments and controls for job-related hazards; continuous evaluation of the adequacy of risk controls; diligence in assessing compliance with regulatory requirements; employees and management being aware and considerate of safety risks of operations; safety communications in the organization that are clear, frequent and transparent; and the dissemination of complete and timely safety-relevant information among affected employees and management levels to allow for safe operation and safety-cognizant decisions (ICAO, 2018; Key et al., 2023a).

3) Evaluation of the safety reporting process.

Does the organization have an established process for employees to report safety events, raise safety concerns and provide safety suggestions? Evidence may include a documented process of investigating safety events and means of tracking management response to closure, proactive versus reactive management of reported events, identification of root causes and contributing factors using a systematic approach, development of preventive actions beyond corrective actions, and evaluation of the effectiveness of corrective actions. In this context, action is expected to go beyond human factors and include systemic elements of the work environment (Key et al., 2023a; Musa & Isha, 2021).

4) Evaluation of the organization's adaptability.

Does the organization learn from past safety events, follow a preventive approach to safety management and cope with changing needs? Evidence may include managing learnings from previous safety events, investigating audit findings and employee feedback on safety concerns, periodic assessment of safety aspects of operations driven by preventive actions, continuous improvement, change management and industry technology standards (Houston, 2015).

5) Evaluation of the accountability aspect of operations.

Does the organization define and practice accountability for safe operations? Evidence may include documented procedures that outline expectations of safe behavior, working conditions that support safety requirements mandated by documented procedures, individuals across organizational levels being held accountable for safety aspects of operations, and consistent accountability for unsafe behaviors or violations of safety protocols (ICAO, 2013, 2018; Key et al., 2023a).

6) Evaluation of safety recognition programs.

Does the organization reward safe behaviors and safety engagement? Evidence may include employee engagement programs that provide recognition of good safety

performance and reward constructive feedback to improve operations' safety.

7) Evaluation of disciplinary policy. Does the organization have a disciplinary policy and apply it to safety-related matters? Evidence includes documented safety policy, communication of policy across all levels of the organization, unsafe behavior and safety violations not tolerated across management and employee levels, and consistent application of discipline as appropriate (ICAO, 2013, 2018).

8) Evaluation of just culture and psychological safety. Does the organization integrate principles of just culture and foster psychological safety? Evidence may include a documented process that allows anonymous and confidential reporting of safety issues, evidence of process implementation and management response to reported safety issues according to the process, and employees holding themselves and others accountable for safety without fear of retribution (CANSO, 2013; Houston, 2015).

9) Evaluation of how the organization monitors safety culture in terms of personnel perceptions, identification of strengths and weaknesses, and continuous improvement process. Does the organization use appropriate tools to assess safety culture? Evidence may include the use of culture surveys, questionnaires, interviews and focus groups, and observations to assess culture.

10) Evaluation of the use of safety culture assessment results. Does the organization develop interventions for improving identified gaps? Evidence may include response to identified gaps, development of interventions, follow-up actions to assess the effectiveness of interventions in addressing identified gaps, and inclusion of culture-relevant aspects in continuous improvement plans (Key et al., 2023a).

11) Evaluation of how cultural diversity impacts consistent safe operation. Does the organization establish consistent acclimatization to the organization's perspective on risk tolerance and prioritization of safety? Evidence may include orientation protocols and onboarding training programs for new hires to establish common awareness of hazards and risks, and communication of expected safe behaviors (ICAO, 2018).

12) Evaluation of safety aspects of the change management process. Does the change management process account for the safety aspects and the human element in change? Evidence may include a change process that accounts for safety risk assessment and controls prior to the introduction of change, employee feedback on change, assessment of additional training needs and accounting for workload variations due to the change (Key et al., 2023a).

In addition to these guidelines on aspects of safety culture to be assessed during an SMS audit, it is highly recommended that targeted efforts be directed to enhance the qualifications of personnel conducting audits. For FAA purposes, field inspectors must be trained on the intent of FAA oversight tools to make adequate determinations of satisfactory compliance with FAA requirements, including enforcing actions for significant discrepancies, appropriate determination of root causes of safety concerns and completing adequate corrective actions.

For other industries, auditors must understand what a positive safety culture is expected to look like according

to the safety standard they are auditing to, and the requirements of the SMS they are evaluating. Keep in mind that safety culture is ultimately an intangible component of a safety program, but one that manifests in multiple elements that can be observed and assessed in an organization. This assessment is intended to seek evidence of the value of safety in the organization, as manifested in safe operations and a work environment where management is committed to safety, employees are engaged, risks are mitigated and improvement opportunities are optimized.

Conclusion

The lack of guidelines on safety culture assessment poses challenges to the consistent evaluation of safety culture during SMS audits, particularly in audits of air carriers in the aviation industry. This gap in guidance has affected organizations' ability to monitor their safety culture, as well as the ability of inspectors to evaluate safety culture during SMS audits. To address this gap, this article discusses the relationship between safety culture and safety performance, highlighting the dynamics of how safety culture must be monitored, assessed and improved as a driver of safety performance. Understanding these dynamics is valuable to the safety culture assessment process to determine which indicators are relevant to the status of safety culture and to ensure that organizations focus on monitoring and improving the right elements that are indicative of safety culture and, in turn, impactful on safety performance.

The need to assess safety culture and improve it is an occupational safety need for all industries. Safety culture is a complex and multilevel component of an organization's SMS, and any assessment efforts must take into account its various aspects to allow for a comprehensive and meaningful evaluation of where an organization's safety culture stands and where it needs to go, using a continuous improvement approach in a safety culture maturity journey. Thus, positive safety culture assessment outcomes are not an end result, but a pulse check for any organization to determine how to continuously refine its vision on safety management. Safety culture assessment is not a goal in and of itself, but a means to develop interventions that address improvement opportunities identified by the assessment as a crucial part of managing safety culture. External audits must evaluate organizational efforts in monitoring and improving safety culture as an integral part of the safety management program audit.

While these are recommendations that the FAA could use as guidelines for field inspectors during SMS audits to allow for a comprehensive and consistent evaluation of safety culture, the use of these recommendations can benefit other industries where safety management takes place within the framework of an SMS to guide the evaluation of an organization's safety culture in the context of external audits. A positive safety culture across industries and organizations is visible in aspects such as leadership commitment to safety, communication, adaptability, awareness, continuous improvement and living values of justness, psychological safety, recognition, accountability, and vigilance for safety issues. **PSJ**

References

- Blair, E. & O'Toole, M. (2010, Aug.). Leading measures: Enhancing safety climate and driving safety performance. *Professional Safety*, 55(8), 29-34.
- Civil Air Navigation Services Organization (CANSO). (2013, April 11). Safety culture definition and enhancement. <https://bit.ly/3ZyWous>
- Federal Aviation Administration (FAA). (2021, Nov. 17). Safety management. U.S. Department of Transportation. www.faa.gov/about/initiatives/sms/international
- FAA. (2023a). FAA maintenance safety culture assessment and improvement toolkit (M-SCAIT) frequently asked questions. U.S. Department of Transportation. Retrieved Oct. 31, 2023, from <https://bit.ly/4gIJK26>
- FAA. (2023b). Aeronautics and space, 14 CFR Part 5 Subpart E. www.ecfr.gov/current/title-14/part-5/subpart-E
- Goodheart, B.J. & Smith, M.O. (2014). Measurable outcomes of safety culture in aviation—A meta-analytic review. *International Journal of Aviation, Aeronautics and Aerospace*, 1(4), 1. <https://doi.org/10.58940/2374-6793.1017>
- Houston, A. (2015, April 6). Creating a positive safety culture. International Air Transport Association. <https://bit.ly/4dd3W9o>
- International Civil Aviation Organization (ICAO). (2013). *Safety management manual* (3rd ed.). <https://bit.ly/4dkcOd3>
- ICAO. (2018). *Safety management manual* (4th ed.). <https://store.icao.int/en/safety-management-manual-doc-9859>
- Kalteh, H.O., Mortazavi, S.B., Mohammadi, E. & Salesi, M. (2021). The relationship between safety culture and safety climate and safety performance: A systematic review. *International Journal of Occupational Safety and Ergonomics*, 27(1), 206-216. <https://doi.org/10.1080/10803548.2018.1556976>
- Key, K.N., Hu, P.T., Choi, I. & Schroeder, D.J. (2023a). Safety culture assessment and continuous improvement in aviation: A literature review. Federal Aviation Administration. <https://bit.ly/3zgYiVP>
- Key, K.N., Hu, P.T., Choi, I. & Schroeder, D.J. (2023b). Validation of the FAA maintenance safety culture assessment and improvement tool (FAA M-SCAIT). Federal Aviation Administration. <https://bit.ly/3Zszfd1>
- Lee, L.S. (2021, Oct. 27-28). *Introduction to ATM safety culture* [Webinar]. International Civil Aviation Organization. <https://bit.ly/3ZDKe38>
- McNeely, S.C. (2012). *Examining the relationship between organizational safety and culture and safety management system implementation in aviation* (Publication No. 3504812) [Doctoral dissertation, Northcentral University]. ProQuest Dissertations and Theses Global. www.proquest.com/docview/1002445201
- Musa, M. & Isha, A.S.N. (2021). Holistic view of safety culture in aircraft ground handling: Integrating qualitative and quantitative methods with data triangulation. *Journal of Air Transport Management*, 92, Article 102019. <https://doi.org/10.1016/j.jairtraman.2021.102019>
- O'Connor, P., O'Dea, A., Kennedy, Q. & Buttrey, S.E. (2011). Measuring safety climate in aviation: A review and recommendations for the future. *Safety Science*, 49(2), 128-138. <https://doi.org/10.1016/j.ssci.2010.10.001>
- Office of Inspector General (OIG). (2020, Feb. 11). FAA has not effectively overseen Southwest Airlines' systems for managing safety risks. U.S. Department of Transportation. <https://bit.ly/4dk7lmG>
- Pettitt, K. (2017). SMS, safety culture and the four pillars of safety applied to airline pilot training: NextGen demands to improve safety. *International Journal of Aviation Systems, Operations and Training*, 4(2), 45-61. <https://doi.org/10.4018/IJASOT.2017070104>
- Rentsch, J.R. (1990). Climate and culture: Interaction and qualitative differences in organizational meanings. *Journal of Applied Psychology*, 75(6), 668-681. <https://doi.org/10.1037/0021-9010.75.6.668>
- Safety Management International Collaboration Group (SMICG). (2019). Industry safety culture evaluation tool and guidance. <https://skybrary.aero/sites/default/files/bookshelf/4630.pdf>
- Wiegmann, D.A., Zhang, H., von Thaden, T.L., Sharma, G. & Gibbons, A.M. (2004). Safety culture: An integrative review. *International Journal of Aviation Psychology*, 14(2), 117-134. https://doi.org/10.1207/s15327108ijap1402_1
- Zohar, D. (1980). Safety climate in industrial organizations: Theoretical and applied implications. *Journal of Applied Psychology*, 65(1), 96-102. <https://doi.org/10.1037/0021-9010.65.1.96>
- Zohar, D. (2010). Thirty years of safety climate research: Reflections and future directions. *Accident Analysis and Prevention*, 42(5), 1517-1522. <https://doi.org/10.1016/j.aap.2009.12.019>
- Zohar, D. (2014). Safety climate: Conceptualization, measurement and improvement. In B. Schneider & K.M. Barbera (Eds.), *The Oxford handbook of organizational climate and culture* (pp. 317-334). Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780199860715.013.0017>
- Zubowski, D.R. (2021). Measuring safety culture: Qualitative and quantitative means of measuring safety culture for safety management system optimization. *International Journal of Aviation, Aeronautics, and Aerospace*, 8(4), 4. <https://doi.org/10.15394/ijaaa.2021.1661>

Cite this article

Gendi, M., Marcham, C.L. & O'Toole, M.F. (2024, Oct.). Assessing safety culture: Lessons from the aviation industry. *Professional Safety*, 69(10), 26-34.

Mirrette Gendi, M.S., CSP, CHMM, is senior manager of health and safety for specialty groups at Ferguson Enterprises LLC. She is an environmental, health and safety professional with more than a decade of experience in managing OSH across many industries. She holds a M.S. in Occupational Safety Management from Embry Riddle Aeronautical University. She is also an authorized OSHA outreach trainer for general industry, and a lead auditor for several consensus standards including ISO 9001, ISO 14001 and OHSAS 18001. Gendi is a professional member of ASSP's North Florida Chapter.

Cheryl L. (Cheri) Marcham, Ph.D., CSP, CIH, CHMM, FAIHA, is an associate

professor and program chair for the Master of Science in Occupational Safety Management in the Worldwide Online Campus for Embry-Riddle Aeronautical University. She holds a Ph.D. and an M.S. from the University of Oklahoma Health Sciences Center Department of Occupational and Environmental Health, and a B.S. in Biology from Arizona State University. She has served on the board of directors of the American Industrial Hygiene Association, BCSP, the ASSP Educational Standards Committee, and the Board for Global EHS Credentialing (formerly ABIH). Marcham is a professional member of ASSP's Oklahoma City Chapter.

Michael F. O'Toole, Ph.D., is professor emeritus of aerospace and occupational

safety and adjunct faculty for the Master of Science in Occupational Safety Management in the Worldwide Online Campus of Embry-Riddle Aeronautical University. He is owner of O'Toole & Associates, serving clients in the U.S. and internationally. O'Toole holds a Ph.D. in Public Health Policy Administration from University of Illinois Chicago, an M.S. in Safety Engineering Technology from Northern Illinois University, and an M.A. in Industrial Psychology and B.A. in Behavioral Psychology from Western Michigan University. He serves on an ANSI committee and is an editorial reviewer for the *Journal of Safety Research and Safety Science*. He is a professional member of ASSP's Northern Ohio Chapter.