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User Handbook: FAA Maintenance Safety Culture Assessment and Improvement Toolkit (M-SCAIT)

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Overview and Summary

Promoting a positive safety culture – the shared values, actions, and behaviors that demonstrate a commitment to safety – is a critical aspect of improving safety management. The purpose of this document is to provide practical guidance for how to assess and improve your organization's safety culture. This handbook outlines how to assess safety culture, promote a positive safety culture, and improve employee engagement. Ultimately, these efforts may translate to improved key performance indicators (KPI) related to safety. This handbook is intended to be easy-to-use for any organization to implement with minimal support from researchers or consultants.

Keywords: safety culture, organizational culture, assessment, improvement, aviation, maintenance, safety management systems, survey, human factors guidance

List of Abbreviations

FAA	Federal Aviation Administration
IAEA	International Atomic Energy Agency
IATA	International Air Transport Association
JD-R	Job Demands – Resources
KPI	Key Performance Indicator
LOSA	Line Operations Safety Assessment
M-SCAIT	Maintenance Safety Culture Assessment and Improvement Toolkit
NASEM	National Academies of Science, Engineering, and Medicine
PII	Personally Identifiable Information
SMBWA	Safety Management by Walking Around

Introduction

> "Our focus must be less about human error, and more about behavioral choices. Less about blame, and more about learning…The question is can we design a system, a culture, a world where we can safely learn from our mistakes – or do we continue with the game of Whack-a-Mole?" (Marx, 2009, p. 127).

As Marx (2009) illustrates, human fallibility is unavoidable. But with better system design, organizations can create a culture where safety is paramount. Employees may be more forthcoming when it comes to sharing safety-related mistakes and concerns if they trust that the information will be used for learning rather than for blaming. Better information from employees, in turn, provides a richer base of information from which the organization can continue to learn and improve.

Promoting a positive safety culture – the shared values, actions, and behaviors that demonstrate a commitment to safety – is a critical aspect of improving safety management. A positive safety culture has been linked to many key performance indicators (KPIs), such as: safety behaviors, safety motivation, safety compliance, injuries, and employee well-being.[i]

Safety culture measurement is a central component of effective safety management. Remember the adages: "if you can't measure it, you can't manage it," and "what gets measured gets managed."[ii] Benefits of conducting periodic safety culture assessments include:

1. Sets a baseline for the organization's safety culture.
2. Informs safety promotion efforts.
3. Empowers proactive management of safety culture evolution across time.

To help foster a positive safety culture, the Federal Aviation Administration (FAA) developed a new toolkit, the Maintenance Safety Culture Assessment and Improvement Toolkit (M-SCAIT). This toolkit includes: a survey instrument specifically designed to assess aviation maintenance safety culture; data analysis templates; a roadmap for safety culture assessment and improvement; and other supporting materials (e.g., this handbook).

M-SCAIT Background

The M-SCAIT was not developed at a whim. It has been actively developed over four years, leveraging insights from both the scientific literature (200+ peer-reviewed sources)[iii] and other regulatory agency frameworks for culture management. The survey was adapted from an instrument which has successfully measured safety culture in the military setting for over 20 years.[iv] That instrument has been shown to be a strong predictor of safety-related KPIs.[v]

Building on that strong scientific foundation, the M-SCAIT was designed specifically for assessing safety culture in civil aviation maintenance operations. It has successfully undergone

initial tests with a range of maintenance-performing organizations totaling over 900 respondents, and is ready for large-scale application.[vi] Unlike other assessments that only provide high-level aggregated feedback, the M-SCAIT can be used to make comparisons across departments or work units, find culture silos, and identify targeted areas of opportunity for improvement. This level of feedback ensures the survey results are actionable, and can be used to affect meaningful change. It enables customization and strategic planning for improving safety culture.

How Will This Handbook Help

Safety culture is malleable *– you can improve it.*

This handbook is designed to empower independent use of the M-SCAIT. The handbook illustrates that safety culture shapes all human interactions in the workplace, that safety culture is measurable, and that safety culture is malleable – *you can improve it*. With this in mind, the handbook provides a step-by-step approach to safety culture change based on current best practices. This stepwise approach includes:

1. Prepare for assessment by creating a shared vision of the desired culture.
2. Assess safety culture using the M-SCAIT in conjunction with other indices of organizational performance.
3. Score, interpret, and share the results.
4. Develop and implement a plan to improve safety culture.
5. Reassess periodically to track progress over time (Return to Step 1).

This handbook provides additional depth regarding each step, and was written for the end-user who will be implementing each step. All parts of the assessment, from administration to analysis and beyond, should be managed by an Assessment Coordinator - someone who can assume an unbiased role. The Assessment Coordinator is often someone from the organization's safety department or an outside consultant. Importantly, this coordinator must demonstrate strong enthusiasm and commitment to organizational change, and be able to energize others to participate. Responsibilities of the Assessment Coordinator include obtaining management buy-in, promotion and encouraging participation, all logistics of administration, analysis of the results, identifying outcomes, disseminating findings, and following through with action plans and reassessments.

The M-SCAIT was designed to be a standalone toolkit that organizations can use independently with minimal researcher or consultant support. Therefore, some pre-existing knowledge about assessment and change management is expected. For additional introductory guidance, organizations can refer to helpful guides.[vii] These can be especially helpful to those who are new to survey administration, and can help prevent common mistakes. Further, this handbook provides helpful tips for ensuring successful assessment and continuous improvement efforts.

Safety Culture: A Primer

Safety culture can be defined as "the shared values, actions, and behaviors that demonstrate a commitment to safety over competing goals and demands".[viii] A related term is safety climate. Although there are academic differences between these two terms, they are interchangeable in practice. Like much of the literature that came before it, this handbook will refer to the terms as simply *safety culture.* Culture is something an organization *is*, whereas climate is something an organization *has* at a particular time, alluding to the transitory nature of climate.[ix] Safety climate provides a snapshot of the overall safety culture of an organization or work group. Whereas safety climate is subject to change depending on operational or economic circumstances, safety culture is comparatively more enduring and consistent.[x]

Safety culture should be viewed as a journey, not a destination.

Culture is inherently present in all organizations, ranging on a continuum from undesirable to desirable; there is no such thing as a "lack of culture." Although safety culture assessments can pinpoint perceptions at a given time, there should be no expectation that culture will remain stable over time or that it will gradually mature toward the better. Contrary to popular understanding, "in reality values and beliefs held by employees about safety may spontaneously wax, wane and in some cases relapse over short periods of time".[xi] Safety culture should be viewed as a journey, not a destination.

Culture, including safety culture, is shaped by many factors, such as the operational environment, technological advances, workforce, and market demands. Many organizations have mission statements that emphasize safety; however, the day-to-day operations may reveal a tug-of-war between safety culture and other performance goals, such as production and profit.[xii] How organizations resolve this tension defines the strength of their safety culture – in this way, a positive safety culture can be characterized as the (a) prioritization of safety, and (b) actions taken to continually and proactively strive for safety.[xiii]

Frequently asked questions about safety culture and the M-SCAIT are answered in Appendix A.

Safety Culture Indicators

Looking across safety-critical industries provides a common set of safety culture indicators.

Safety culture is made up of several moving parts that work together to create safety. It can be difficult to measure directly, and can't be boiled down to a simple numeric score. Instead, it is necessary to look at various indicators of culture and risk; each one says something about how the organization views/values safety. Together, they create a more comprehensive picture of what the

culture is like presently, what positive efforts should be celebrated and encouraged, and what indicators of risk need further attention.

Looking across safety-critical industries such as healthcare, nuclear energy, and transportation, provides a common set of safety culture indicators (See Table 1).

Table 1

Indicators of a Positive Safety Culture and Indicators of Risk

Indicators of a Positive Safety Culture	Indicators of Risk
Adequate resource allocation (e.g., staffing, facilities).[xiv] • Includes adequate allocation of financial resources.[xv]	Ineffective use of resources (financial, staffing, facilities).[xxvi]
Leaders express commitment to safety with words and actions.[xvi] • Leaders are present in the work environment and attention to day-to-day operations.	Procedures are inaccurate, unclear, or otherwise difficult to follow.[xxvii] • Includes tribal knowledge and other group norms of deviance.[xxviii]
Communication across all levels of the organization is clear, frequent, and transparent.[xvii] • There is at least one mechanism for the workforce to report safety concerns. • Safe behavior is rewarded; unsafe behavior is corrected.[xviii]	Failure to communicate safety information across departments within the organization.[xxix] Bureaucracy impedes collaboration and communication across business units.[xxx] Employees provide insincere responses to questions (e.g., during focus groups, surveys).[xxxi]
Decisions prioritize safety (i.e., over business needs).[xix] • Safety information is incorporated in decisions.	Work pressure stemming from competing priorities, lack of resources, etc.[xxxii] Response to safety is events is to blame rather than to look for root causes.[xxxiii] High employee turnover (at any level of the organization).[xxxiv]
Risks are identified, analyzed, and mitigated.[xx] • Includes acknowledgment that operations are high-risk in nature, vigilance for hazards, and a questioning attitude.[xxi]	Leaders and/or workforce within the organization exhibit low respect for the voice of the safety department.[xxxv] The organization experiences rapid growth or downsizing.[xxxvi] The organization has a weak relationship with its regulator.[xxxvii]
Leaders provide fair and consistent responses to safety concerns at all levels of the organization.[xxii]	Failure to oversee operations conducted under the certificate.[xxxviii]

Indicators of a Positive Safety Culture	Indicators of Risk
The work environment is one of mutual trust and respect (including labor relationships).[xxiii]	
The organization has in place a process for resolving conflicts and differing opinions.[xxiv]	
Employees (at all levels of the organization) hold both themselves and others accountable for safety (i.e., safety is a shared responsibility).[xxv]	

These indicators provide a framework for where to probe or look closer at safety culture. Based on this understanding of a positive safety culture (and indicators of risk), we can now focus on the stepwise framework for safety culture assessment and promotion.

Step 1: Prepare Your Organization for Safety Culture Assessment

Safety promotion must begin with a shared vision that safety is the top value at *all* levels of the organization. This vision, beginning with top leadership, should be shared through formal written policies (i.e., the Safety Policy[xxxix] pillar of Safety Management Systems) and frequent communications. The shared central vision should:

- Define safety objectives.
- Recognize safety as an organizational value that requires the commitment and participation of *everyone* in the organization.
- Define responsibility for employee reporting of safety concerns.
- Define unacceptable behavior and conditions for disciplinary action.
- Emphasize the need for continuous improvement and learning.

However, just creating a shared vision is not enough to ensure safety culture will bloom. Leaders and the workforce together must *demonstrate* the commitment to safety and ensure that safety is properly managed throughout the organization. Safety must become part of the everyday culture of the organization and part of day-to-day behaviors.

Who Is Responsible For Safety Culture?

Achieving buy-in across the organization (meaning leaders, the workforce, *and* stakeholders) is critically important for ensuring successful safety culture change. Often, getting buy-in is the most challenging part of improving safety culture. Stakeholders may ask:

1. ***What's in it for me?*** The answers to this question will be different across stakeholders within the organization. For instance, leaders may want to see a demonstrated improvement in KPIs. The workforce may want to see that leaders are committed to safety and provide the necessary resources that help them achieve their work tasks in a safe manner.xl
2. ***What is my role in safety culture?*** Leaders, the workforce, and other stakeholders have a *shared responsibility* for creating and maintaining a positive safety culture. There must be organization-wide commitment, as, "[i]n safety culture transformation, in particular, there is a need for both bottom-up and top-down alignment. While leaders need to establish policies and provide resources to support the policies, all the employees need to participate in the actual transformation effort".[xli]

Ensuring commitment participation and resourcing by all stakeholder groups will be foundational to supporting safety culture change efforts.

Step 2: Assess Safety Culture in Your Organization

The next step is to collect information on safety culture. It is important to note that any assessment method, whether M-SCAIT or another option, can be done well and can yield valuable information; but any method can also be executed poorly. Assessments must be designed and conducted carefully in order to obtain valuable information.

Surveys may be the most effective and efficient way to collect opinions and perceptions from a large number of people.

Surveys may be the most effective and efficient way to collect opinions and perceptions from a large number of people.[xlii] One benefit of a survey is that it provides a proactive, systematic, and inclusive approach to assessment, such that all employees have an opportunity to share their perspectives. Surveys can provide quantitative scores, and results can be compared readily across demographic variables of interest, such as department, location, or job role;[xliii] this helps find culture silos that may require targeted improvements. The quantitative questions in a survey may be supplemented with open-ended questions that allow respondents to provide more detailed information.

However, some cautions include:

- A key limitation of the survey method is "responses are self-reports in response to standard questions that may be interpreted in different ways by different respondents, who may or may not be able (or willing) to report on 'deeper' levels of culture".[xliv]
- Obtaining a representative and sufficiently large sample can be challenging for smaller organizations or for those where trust is low.
- Protecting anonymity is crucial; this can be difficult to achieve for smaller organizations (see *Scoring and Interpreting Survey Results*).

Surveys are useful, but they are not the only method of assessing safety culture available. Different methods have their pros and cons, in terms of the tradeoff between resources required and quality of information obtained. Based on these tradeoffs, a mixed-method approach should be utilized to help ensure any improvement efforts are well-targeted and based upon a thorough understanding of the safety culture. For example, following a survey with focus group interviews can allow stakeholders to discuss results with greater depth and help better-identify potential improvement efforts.[xlv] Other sources of data, such as voluntary reporting systems, can complement the results of a safety culture survey (See Key et al., 2023a, for more information about other safety culture assessment methods). It is recommended that survey responses be verified and corroborated with additional data sources (see *Supplementing Survey Results*).

Choose What to Measure

For an overview of what to measure in safety culture, see International Atomic Energy Agency (2020) and International Air Transport Association (2019). Minimally, these are the fundamental dimensions that should be considered in a comprehensive safety culture assessment: safety behavior (at all levels of the organization), leadership behavior, resource allocation, decision making that prioritizes safety, and communication.[xlvi]

One way to characterize safety culture is to look at the balance of job resources and job demands (Bakker & Demerouti, 2007). Anything the organization can provide to improve job performance and/or safety is considered a job resource (e.g., training, equipment and tools, staffing, and supervision). Job resources give employees the ability to work efficiently and safely. Conversely, job demands are conditions that interfere with successful completion of work tasks in a safe way (e.g., task overload, time pressure, inadequate procedures/processes, resource limitations, and physical environment). See Appendix B for further detail about how the M-SCAIT measures these job demands and job resources.

Customize the Survey

The M-SCAIT is a standalone survey ready for operational use, measuring the major dimensions of a positive safety culture. However, research shows some benefits of customizing surveys such as the M-SCAIT for specific operations.

It may be beneficial to work with leadership and employees who can assist with identifying topics important to the organization (e.g., organizational risk factors, demographics, and other job-specific factors). Within the aviation industry, consider including items about: time pressure (e.g., the conflict between productivity and safety); usability and availability of resources necessary to perform the work, such as work procedures, equipment and tools; and staffing levels.[xlvii]

For further information on customizing and asking new survey questions, texts such as Fink (2003a) can provide useful introductory guidance and help prevent common mistakes. When writing survey items, beware of: double negatives, items that measure more than one topic, leading questions, and reverse scored items (all of which may confuse respondents). Consider the response options, agreement or frequency scales being preferable to a simple yes/no (which provide less information and variance of responses). Finally, we recommend not collecting names or personally identifiable information, to protect anonymity of respondents – which encourages them to share freely.

Exactly how much customization is permissible before a survey loses validity is an empirical question. Thus, caution is warranted when customizing the M-SCAIT, as we can make no claims about the validity of modified instruments.

Find a Survey Platform

Online surveys have an advantage over paper because paper surveys generally require someone to type in all of the data from paper survey forms into a computer so that analyses can be performed. This data-entry step is particularly troublesome because it is where typos and mistakes can be made. With online surveys, what respondents type is what you get; respondents to online surveys enter the data, and the survey platform adds the data directly into an electronic database.

Good online platforms provide either a secure link or a QR code that your respondents can scan (to help prevent outsiders from taking the survey by accident, thus tainting the data). Data should also be password-protected, so that only survey administrators (like you) can log in and see the responses. Along similar lines, it is important to check that the results are in a format that the administrators are prepared to use. It is common for online survey platforms to provide CSV and Excel® file formats as options when downloading response data. Large organizations may prefer a platform that includes features such as: customization of survey items, dashboarding of summary statistics, or templates for reporting. For smaller organizations, these features may be cost-prohibitive and ultimately not needed.

Consider whether the survey should be administered via an anonymous link, or a unique link provided per respondent. An anonymous link may produce higher response rates and encourage free sharing; on the other hand, this precludes the ability to send reminders, and also allows for the potential of ballot-stuffing (i.e., the submission of multiple responses by a single respondent, usually in an effort to skew the results). A unique link per person allows follow-up reminders to be sent only to those who have not yet completed the survey; however, the final dataset will have identifiable information, which must be protected.[xlviii]

Build the Survey Flow

The survey should start with an introductory page welcoming respondents and informing them of what the survey is about. The introductory page, in addition to any invitations sent to potential respondents, should inform them that: (a) participation is voluntary, (b) individual responses cannot be linked back to the respondent, (c) only summary results would be reported, and (d) respondent identity is not identifiable to leaders or regulators.

One important benefit of surveys that they can provide anonymity and freedom to speak, particularly if respondents are allowed to complete the survey in private. Modern best-practices and guidelines say that survey administrators (like you) should provide assurances that survey responses will be anonymous and that all personally identifiable information (PII) is kept safe.

When constructing a survey, place the questions in the order you want them presented and answered in, and review frequently (i.e., take the survey) as it is constructed to ensure that the items flow correctly from one to the next and that no items are accidentally skipped. The final page should thank the respondent and let them know that they have reached the end of the survey.

Prior to launching the survey, trial responses (i.e., from coworkers or team members) can be submitted to ensure the online survey is functioning as intended. A beta-test will allow survey administrators to check the logistics of the survey and ensure that everything is functioning as intended before 'going live'. Check that the downloaded data are provided in a format that can be used, the data appears to be complete with respondents answering all questions, and the survey takes the desired amount of time to complete.

Invite a Representative Sample of Respondents

Participation is critical because research has shown that employees from different workgroups will likely have different perceptions of safety culture.[xlix] Research has found differences in safety culture across: (a) national culture and job/professional culture,[l] (b) job roles, e.g., leaders have more positive perceptions than the workforce,[li] and (c) those of the same job role who work for different units or supervisors, potentially due to differences in leadership characteristics.[lii] More variation signals more divergence in perceptions, allowing more room to align future behaviors to reflect the desired culture.[liii]

How to Choose a Representative Sample with Enough Respondents

- There are enough respondents that individuals' responses are not identifiable in the reporting ($n > 8$ strongly recommended) – this warrants special attention when making demographic comparisons.
- The job role, years of experience, and other key demographics of the sample are similar to the population of eligible respondents in your company. For example, if the organization is comprised of 70% workforce and 30% leadership and administration, try to ensure that the same proportions are surveyed.
- Larger samples are more likely to better represent the perceptions held within stakeholder groups across the organization, providing more stable results.

For further information on how to ensure your survey's respondents are representative of the organization, texts such as Fink (2003c) can provide useful introductory guidance and help prevent common mistakes.

Invite Survey Participation

Utilize a communications campaign to raise awareness about the assessment, build interest, and instruct respondents how to participate. At a minimum, the invitation should explain:

- The survey purpose.
- The voluntary nature of the survey.
- Protections for anonymity/confidentiality and desire for genuine feedback.
- How long the survey will remain open for response. Consider leaving the survey open for 2-4 weeks minimum, with an optional extension to achieve the desired response rate.
- A designated point of contact so respondents know who to reach out to for assistance if anything goes wrong with the survey itself.

This invitation should be sent or endorsed by leadership in the organization, as this allows leadership the opportunity to demonstrate the importance of the survey and their commitment to using the responses to make continuous improvement. After the survey 'goes live', it can be helpful to send regular reminders about participating (e.g., weekly). Often, these reminders will produce a spike in responses.

Step 3: Score, Interpret, and Share the Survey Results

Scoring and Interpreting Survey Results

After collecting the survey data, score and understand employees' responses. This step must be taken with great care; it is essential that data scoring be done by an unbiased person who can be trusted to protect anonymity of responses. Pragmatically, failure to maintain respondent anonymity will hinder future surveys as employees become suspicious, and may contribute to negative perceptions of culture within the organization. A rule of thumb is to not generate reports for groups with fewer than 8 respondents to protect anonymity.

Certain results, such as written comments, do not need much in the way of scoring to become understandable. However, written comments still need to be de-identified, sanitized of any invalid responses or sensitive information, and grouped together into meaningful themes. Numeric data will need more analysis to be interpretable. For "agreement" questions (such as "how strongly do you agree that…", and "frequency" questions (such as "how frequently do you…"), results can be scored by averaging the responses together and calculating the proportion of responses for each response option. These trends can be displayed in bar charts, pie charts, and histograms. Supplemental reporting of demographic breakouts and/or item-level reports can be helpful in identifying cultural silos and targeting improvements.

The M-SCAIT includes a template for data scoring and analysis. This template auto-generates charts depicting the survey responses. It is designed to be user-friendly and easily interpreted. To that end, the template does two things: 1) standardizes all scores from 0-10, where higher scores are always better and 2) standardizes the directionality of items (i.e., reverse scored items).

Items where the question's valence is flipped backwards are called *reverse coded*. For example, an agreement question that asks "I dislike working with groups of people" would be the reverse-coded version of "I like working with groups of people." To avoid confusion (i.e., interpreting a higher score to mean 'good'), the score for this reverse-coded item should be standardized to have the same direction as all other items. For items that are included in M-SCAIT, the template automatically handles data scoring and analysis. For any customized items, beware that manual coding will be necessary. For further information on scoring results, texts such as Fink (1995, 2003b) can provide useful introductory guidance and help prevent common mistakes.

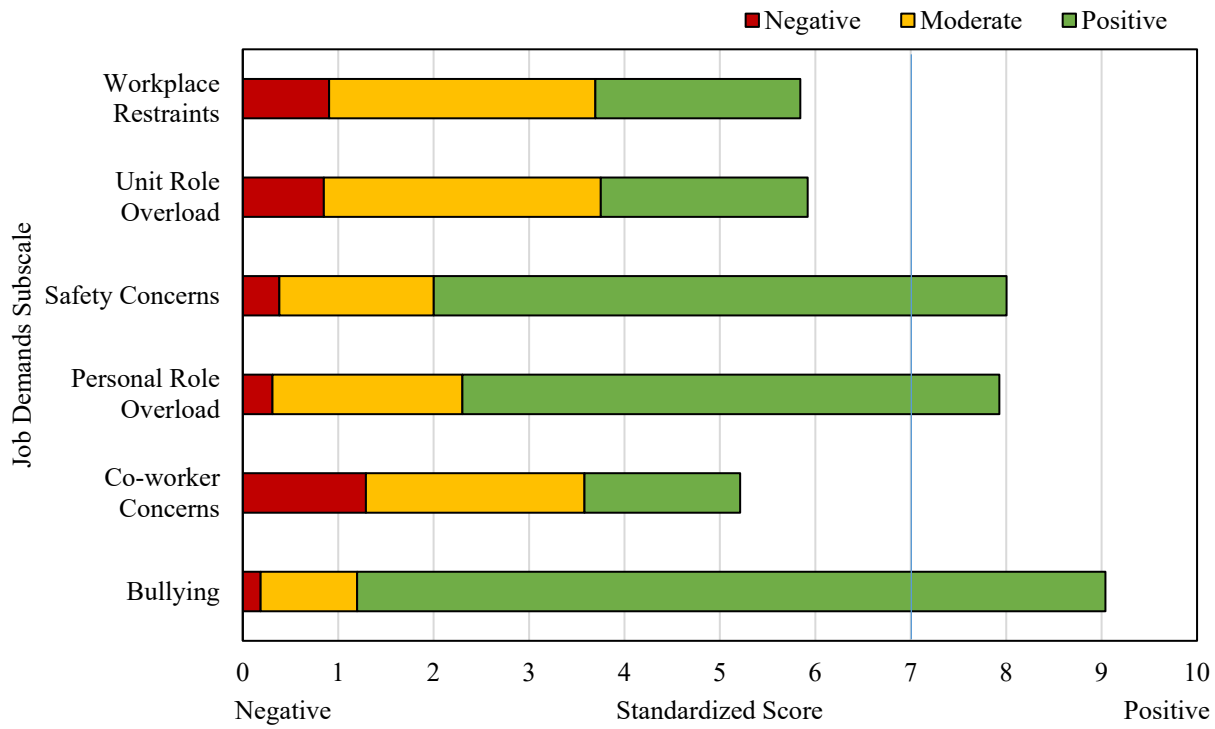
Figure 1 is an example of the graphical displays generated by the M-SCAIT template. The bar chart displays the data from the M-SCAIT validation effort, comprising over 900 respondents from five maintenance organizations.[liv] To interpret the scores, compare the safety culture scores to the target goal (should be tailored to the organization). Aiming for a target score of 7 out of 10, the average for Job Demands has wide variance across subscales and a fairly high

percentage of negative responses. Specific Job Demands subscales of concern are Workplace Restraints (e.g., scheduling practices), Unit Role Overload, and Co-worker Concerns (e.g., equitable allocation of work tasks).

The survey results are mixed, with some areas that need improvement and others that are already acceptable. One thing is clear – no organization is perfect. In each organization, there can be a different pattern or balance of Job Resources and Job Demands. Positive results should be celebrated and rewarded, and areas of improvement should be identified and addressed (Patankar et al., 2012).

Figure 1

Example Bar Chart - Job Demands.



Note, higher averages and higher percentages of Positive scores (green bars) reflect a more positive safety culture. The blue line represents the target score of 7 for the assessment. The data in this chart originally appeared as part of the M-SCAIT's validation.[lv]

Supplementing Survey Results

Remember that safety culture surveys are self-reports provided by respondents, so it is important to supplement the survey with additional information from other data sources. These additional data sources can be used to verify and corroborate survey results, and help ensure any improvement efforts are well-targeted and based upon a thorough understanding of the safety culture.[lvi] Additional data sources include: employee reports of safety concerns, audit findings,

observations of normal operations, and accident/incident/injury data. Other indicators in aviation maintenance include: aircraft damages, flight delays and cancellations, in-flight turnbacks (return to service), in-flight shutdown, rework, ratio of findings per inspection, personnel injuries.[lvii]

These metrics tend to be more objective than survey results, and are important to consider when developing action plans. Acquiring this proprietary data can be challenging, but it is a worthwhile endeavor for understanding issues related to safety culture. These metrics tend to be more objective than survey results, and are important to consider when developing action plans (see Step 4).

Sharing Results

> *The more broadly the results are disseminated, the more useful the information is likely to become and the more likely respondents will feel that taking the survey was worthwhile.*[lviii]

Let the workforce know their voices are heard and that management is actively seeking ways to improve safety.

Communicating the results can produce many benefits, including increased participation in change management activities and trust in leadership.[lix] Thus, after the survey data are scored and analyses completed, they should be shared across stakeholder groups (e.g., through briefings).[lx] Leaders need to know that something useful came from the survey and begin preparing to act on the results. The workforce needs to know their voices are heard and that leaders are actively seeking ways to improve safety. Interpreting and acting on the results will require engagement from all stakeholders working together to identify what aspects of the workplace and safety culture need improvement.

For further information on sharing survey results, texts such as Fink (2003b) can provide useful introductory guidance and help to ensure successful communication.

An Example of Sharing Assessment Results

Leadership prioritized the briefings to be one topic of a regularly-scheduled safety meeting (i.e., Safety Stand Down). To develop this overall briefing, the data was organized into meaningful and easily interpretable sections, then visually displayed in graphs incorporated into PowerPoint® slides. Due to the volume of data and time constraints, only a subset of the data was presented. Key items, notable findings, and items that became more relevant with the addition of trend were prioritized in the briefing. Leaders also did break-out presentations for each department/work unit's results with facilitated discussions.

Finally, one general recommendation is to move quickly from the survey into briefings, then from briefings into action planning. This helps to keep things fresh and at the forefront of peoples' minds, in addition to providing a structured framework for project completion. Longer time periods between each activity will lead to people forgetting what they reported on the survey or thought about the results. Also, quick movement demonstrates an emphasis on the priority of safety culture feedback, which is an important consideration of effective safety management.

Step 4: Improve Your Organization's Safety Culture

Safety culture promotion is an organization-wide change in values and behaviors that emphasize safety, and must be managed as such. Many factors can bring about change in an organization, but safety culture change is an iterative process of continuous improvement, awareness, and dedication to safety goals.[lxi] Real change requires development and implementation of an action plan. The action plan should be evidence-based (based on the results), targeted, and should be co-developed by representatives from all stakeholder groups so there is mutual buy in and support for the change efforts that will follow. When action planning, you should convene a working group consisting of representatives of all stakeholder groups in the organization.

Stakeholders from across the organization should be directly involved in action planning and should champion any change efforts. Why is this important? Remember, the workforce is closest to safety risks in the working environment, so their participation is crucial for helping identify where improvements are needed. If the workforce does not trust that leaders will follow through with the change efforts in the long-run, or that the change efforts will improve the outcomes that employees care about, they may only passively participate or may actively resist the change. Resistance to change is a common stumbling block for any change effort, but it can be managed by: (a) ensuring a high level and quality of communication, (b) ensuring employee understanding of, and confidence in, the success of the effort, (c) management consistency, and (d) employee participation in the process.[lxii]

The workforce is closest to safety risks in the working environment, so their participation is crucial for helping management identify where improvements are needed.

Most organizations will find it useful, perhaps even essential, to have safety champions or a guiding coalition within the organization who are dedicated to change efforts.[lxiii] Responsibilities will include obtaining buy-in for the change initiatives, promoting the change and encouraging participation, defining logistics of the change efforts, implementing and monitoring improvement actions, and identifying and disseminating the outcomes.[lxiv] Importantly, the champions should be strongly committed to the organizational change efforts and be able to motivate participation by others.

Guidelines for Action Planning

Features of successful change efforts may include:

- ***Evidence-based and Data-driven Design.*** Change efforts should be based on a thorough assessment of current culture that identifies strengths, gaps, and opportunities for improvement.
- ***Appropriately Scoped.*** The success of change efforts is to some extent, dictated by the amount and nature of change needed. Similarly, the success of change efforts may be dependent on the approach taken. For some organizations, the change effort will require a multi-pronged or multi-step approach. Breaking up efforts into steps will provide opportunities for organizations to look back and examine whether individual efforts were successful and where adjustments may be needed.
- ***Measurable***. Have a plan for how to measure the effectiveness of the implemented actions. Consider choosing Specific, Measurable, Attainable, Relevant, and Time-bound (SMART) metrics.[lxv]
- ***Well- communicated***. Proactively communicating the organizational values/priorities and the action plan for change has multiple benefits, including improving employee engagement and buy-in, and reducing resistance to change.[lxvi]

Critical features of any successful change management involve: (a) assessing the need for change, (b) developing a shared vision and strategy, (c) involving employees in identifying and implementing the change plan (i.e., all steps of the change process), (d) having effective leadership, (e) engaging communication, and (f) assessing of the outcome.[lxvii] For an overview of change management, see Blackburn et al. (2011).

The change process that begins with safety culture assessment will likely be iterative, which can give a perception that it is time-consuming, difficult, and prone to failure – but the benefits of a positive safety culture outweigh the up-front investments of time and effort. Remember, cultural improvement actions are more effective when they are managed as a significant organizational change. When done properly, they should result in improved KPIs and safety culture when comparing reassessment results with your previous/older assessments.

Evidence-Based Strategies for Improving Safety Culture

The exact improvement strategies will depend on the nature of the areas identified as needing improvement, and should be tailored to the organization. These actions do not need to be expensive or time-consuming, they only need to be consistent and ongoing. The results of the assessment should drive the actions, but as you develop an action plan, consider these evidence-based strategies presented below. These strategies have been tested across safety-critical industries, and produce reproducible benefits for the organizations who implement them.

Allocate Job Resources and Identify Blockers

One area of improvement that the survey and follow-up discussions may reveal is limited job resources. Obviously, it is not actionable to recommend that the organization simply provide more resources across the board. What *is* actionable is to target resources at areas most in need. One method for identifying the target areas is to review existing work processes and identify those that either result in frequent delays or are marked by poor performance. The results of the exercise can then be used to create a checklist of common "blockers" that affect successful completion of work tasks such as: parts and materials, equipment and tools, people resources/manpower, environment, technical documentation, process clarity, communication, etc.[lxviii] Job or task analysis may be needed to help identify particular aspects of a process or procedure that slow the completion of work tasks.[lxix]

Improve Leadership and Communication

Another common improvement area focuses on leadership and communication. Many employees report that while leaders say they care most about safety, they believe that production is incentivized more. Leaders should increase the rate of communication on the importance of safety to employees, and also reconcile the tradeoff between safety and other pressures by encouraging job safety, rather than productivity, as the top goal.

Front-line leaders (e.g., supervisors) bridge information and priorities from management to the frontline workforce, placing them in a central role for empowering safe behavior. Thus, developing front-line leadership skills can be an extremely effective intervention to improve safety culture and safety performance (e.g., accidents and injury rates).[lxx]

One way to promote communication between leaders and employees is through implementing Safety Management by Walking Around (SMBWA). In this practice, leaders and members of the workforce are trained to conduct SMBWA tours in which they observe on-the-job behaviors. Following each tour, reports were made of the number of occasions positive or corrective feedback was provided and when on-the-job training occurred. The tours could be conducted by a leader, member of the workforce, or jointly. SMBWA has been found to result in increases to both positive and corrective feedback over time, along with identification of more hazards being identified and corrected.[lxxi] Notably, SMBWA also serves as a self-assessment of the safety culture *and* any actions taken to improve.

Reward Safe Behavior and Correct Unsafe Behavior

Simply communicating about the importance of safety is not enough – these expectations must be reinforced. This effort is threefold (a) reinforce safe behavior, (b) provide corrective feedback for unsafe behavior, and (c) design incentive structures to emphasize the importance of safety. For an overview of how to change culture by reinforcing expected behaviors, see McSween (2003).

Safe behaviors should be reinforced through incentives such as monetary rewards or social recognition.[lxxii] Several studies illustrate that rewards for safe behavior are extremely effective in promoting safe behaviors and reducing incidents/accidents/injuries in the workplace.[lxxiii] Safety behavior should be rewarded at equal or higher rate to rewards for other incentivized behaviors, such as productivity. As a rule of thumb, try a ratio of 4:1 for rewards versus corrective (negative) feedback.

Similarly, corrective feedback should be provided when unsafe behavior is observed or reported. Cultural norms can arise and shape behavior; these norms are social, adaptive responses to circumstances.[lxxiv] McDonald et al. (2002) suggests that the workforce is doing their best to resolve competing demands – as they are incentivized for doing – by shortcutting what they view as "unimportant steps". These shortcuts are often accepted and may even help operations to run more efficiently. There can be a tendency to 'turn a blind eye' or overlook these shortcuts if operations are running smoothly and no incidents occur. Turning a blind eye can lead to gradual acclimatization to a less and less safe situation and reinforce the unsafe behavior across time, leading to accidents/incidents in the long run.[lxxv] Providing timely and consistent corrective feedback can adjust these cultural norms and proactively manage expectations for safe behavior.[lxxvi] This feedback can be provided by peers in the workforce and/or leadership, as is commonly done in audits/observations of normal operations.[lxxvii]

Finally, incentive structures should be carefully designed with the expectation that safety comes first, always. Organizations should set clear criteria for acceptable behavior.[lxxviii] The expectations for safe behavior should be formalized in organizational policies, rewarded when observed, and included in evaluation metrics for both the workforce *and* the organizational KPIs. Because behaviors align with what is rewarded and incentivized, organizational KPIs should emphasize safety over competing demands. This focus on safety will reduce competing pressures felt by the workforce and front-line leaders, and will in turn reduce risky behaviors such as noncompliance with procedures.

A Cautionary Tale: What Not to Do – And What Works

Because organizations rely on the workforce to perform tasks safely, it can be tempting to expect the workforce to be the primary driver of culture improvement. To that end, 'training' safety culture is an oft-employed action. Training can help enforce the shared vision of the organization's goals and values, so it is almost always a part of action plans. Beware, training alone is insufficient to create sustained safety culture change. Systemic adjustments to organizational systems, technology, and procedures implemented in a coordinated manner over time are more likely to succeed than action plans focused on simply shifting attitudes by training the workforce.

Research has investigated the effectiveness of training on improving safety culture. Early safety-related training efforts focused on shifting individual employee behaviors (e.g., compliance); but did not focus on holistic organizational change. These courses led to passive

(not active) attitude change among employees, and backlash occurred when the workforce felt that the programmatic approach to culture change promised by leadership failed to meet their expectations.[lxxix] A more successful strategy is a behavior-based approach which recognizes that there is a shared responsibility for change.[lxxx]

One success story of shared responsibility for safe performance is the "Wobbly Steps" metaphor.[lxxxi] This metaphor illustrates how the foundation for safe performance is based on resources from both the individual employees (i.e., experience, risk awareness, skills, initiative) and the organization (adequate tools, equipment, documentation, supervision, personnel). If the employee does not have enough resources to complete the task safely, there is a temptation to add some "wobbly steps" (i.e., develop cultural norms of shortcutting) to reach the goal. Thus, it is insufficient to simply train the workforce on safety and expect a positive safety culture to flourish as a result. Instead, actions such as providing adequate job resources, reinforcing behavioral expectations, and improving communication are needed. These evidence-based strategies shown in this handbook have been shown to produce measurable and reproducible benefits.

Benefits of Using Evidence-Based Change Management Strategies

- Process changes that prevent common failures.
- Readily observable behavior changes.
- Changes in perceptions of safety and safety culture across the workforce.
- Improved trust between leadership and employees.

Step 5: Reassess Safety Culture

The final step is to reassess safety culture after a predetermined timeline of implementing improvement strategies. This helps the organization know whether the improvement efforts were successful and/or what additional efforts are needed. It also helps demonstrate leadership commitment to the improvement process. Taking a "baseline" assessment before implementing your improvement actions and an assessment after can help show stakeholders, leadership, and the workforce what has been gained from your change efforts.

Organizations should develop measurable, specific performance goals and a corresponding timeline, and should assess progress routinely.[lxxxii] To compare your results across time and assess your progress toward a healthy safety culture, you will need to administer the same assessments that were used originally.[1] The change can be shown graphically by displaying the results of each assessment next to each other, or by calculating the percentage of

[1] It is considered a best-practice to compare questions of the exact same wording across surveys because it is possible that people will adjust their answers based on small wording changes.

improvement in positive survey responses. An increase in positive responses as small as 5-10% can affect levels of safety for the organization!

Planning Ahead

When saving safety culture results, label the data clearly so that in future years you will be able to identify when the data were collected – and which of the data is the baseline for comparing and tracking periodic progress.

The change process and reassessment timeline should be tailored to organizational needs because there are natural variations in culture that occur as a result of unexpected events, changes in personnel or management, and so on. No matter how positive safety culture is now, organizational culture naturally fluctuates over time. It would be beneficial to reassess safety culture annually or biannually, because there is some evidence that culture change is slow, and that actual improvements to safety culture may lag up to two years after the improvement action begins.[lxxxiii] However, for specific behavioral changes, reassessment could occur more frequently.

Even if your organization shows no improvement (or even a decrease) in safety culture perceptions, never give up! Continue any efforts in-progress because if the plan is stopped prematurely or not followed correctly, then the safety culture may actually decrease: employees may distrust management, provide insincere feedback, and have lowered commitment to safety. Following through with the safety culture promotion plan as intended will also prevent backlash, which can occur if the workforce feels that their organization is not following through with the plan to improve.[lxxxiv]

Conclusion

A positive safety culture does not happen by accident. It requires attention by management and employees, and requires assessment to determine where the organization stands and where improvements can be made. Thus, to support continuous measurement and improvement of a positive safety culture, the FAA developed the M-SCAIT. This toolkit includes: a survey instrument specifically designed to assess aviation maintenance safety culture; data analysis templates; a roadmap for safety culture assessment and improvement; and other supporting materials (e.g., this handbook). These materials are all available on FAA's Human Factors in Aviation Maintenance website.[2]

The M-SCAIT has been validated and is ready for large-scale application. This handbook is designed to empower independent use of the M-SCAIT. It provides a stepwise framework for safety culture change, and was written for the end-user who will be executing each step.

Step 1 is to prepare your organization for safety culture change efforts. Often, this can be the most difficult step because it requires obtaining buy-in from a variety of stakeholder groups who may not readily see what's in it for them. Thus, a key element of this step is to establish a

[2] https://www.faa.gov/about/initiatives/maintenance_hf

shared central vision about the importance of fostering a positive safety culture. The central vision should recognize that safety is a continuous organizational value that requires commitment, flexibility, and participation of everyone in the organization. A positive safety culture also requires a just culture that focuses on learning from safety events. However, it is critical to recognize that safety culture is more than just words. Safety must become part of the everyday culture of the organization and part of day-to-day behaviors.

Step 2 is to assess safety culture in your organization. M-SCAIT is a standalone survey ready for operational use; however, the items may be customized to meet your operational needs and environment. Other assessment activities include defining the logistics of survey administration, developing and implementing a communications plan to raise awareness about the assessment, and conducting a company-wide data collection with a representative sample of employees from all levels of the organization.

Step 3 is to analyze, interpret, and share the assessment results. Critically, this responsibility should be taken by an unbiased party to protect anonymity of the results. First, the data should be de-identified, collated, and analyzed for trends. Next, the trends should be compared to targets in order to identify successes and areas of opportunity. Consider supplementing survey results with more objective indicators of safety performance, such as observations of normal operations, audit findings, employee reports, and others. A combination of a safety culture survey and objective safety measures will provide a holistic view of the safety culture strengths and opportunities. Finally, the results should be shared. Leaders will want to be informed of the new knowledge gained from the assessment and will want to take action. The workforce will want assurance that their voices were heard and that leaders are planning to make improvements where needed. Sharing the results has many benefits, including increased participation in change management activities and trust in leadership - which are important foundations for improvement efforts to build on.

Step 4 is to take action to improve the safety culture, based on the assessment results. Critically, representatives from all stakeholders should be included in the planning and implementation of safety culture change initiatives. This will help ensure buy-in, resource allocation, and commitment from all groups, and will ease resistance to change. Other features of a successful action plan include: evidence-based, targeted and appropriately scoped, and well-communicated. Remember, there is no one-size-fits-all approach to culture change; rather, the efforts should be tailored to your organizational needs.

Finally, Step 5 is to reassess the safety culture after a pre-determined timeline. Periodic reviews should be conducted about the status of improvement efforts and adjust where needed. Even if your organization shows no improvement (or even a decrease) in safety culture perceptions, never give up! There are natural variations in culture that occur as a result of unexpected events, changes in personnel or management, and so on. The most important value is to continue learning from the assessments and continually improving each time. This

commitment to continuous improvement is necessary to maintain the safety culture over time and prevent backlash.

We are hopeful that this review will empower organizations to make continual strides towards a safer, more inclusive, organizational culture through a better understanding of the different assessment methods, change management efforts, and monitoring efforts that are available today.

Suggested Reading

The authors have selected these resources because they provide an excellent overview of safety culture, change management, system safety, and other best practices for organizational assessment.

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Appendix A.

Frequently Asked Questions

What is safety culture? Safety culture can be defined as "the shared values, actions, and behaviors that demonstrate a commitment to safety over competing goals and demands".[lxxxv] Every organization has a safety culture. Safety culture shapes every human interaction in the workplace.

Why should I do a safety culture assessment? Periodic assessment will inform safety promotion efforts and empower proactive management of safety culture evolution across time.

How often should I assess safety culture? Safety culture, just like any other organizational Key Performance Indicator (KPI), should be assessed periodically. The exact timeframe can be tailored to organizational needs.

Can FAA access the M-SCAIT results? The data are collected by each organization for their use. Organizations may choose to release the data to FAA at their discretion.

Why is the M-SCAIT survey so long? Safety culture is complex and multi-dimensional. Many questions are needed to give a full picture of the culture today and where improvements are needed. As explained in the user handbook, modifications (including deletions) are allowed, but the effectiveness and scientific rigor of any changes cannot be guaranteed. As an example, communication is a critical dimension of safety culture, so if you remove communication items from M-SCAIT, the modified survey would no longer be considered to be a complete safety culture assessment. However, users are welcome to use and modify the tools to suit specific organizational needs.

Can M-SCAIT be adapted for other workgroups (beyond maintenance)? Yes, the survey can be customized for other job roles/demographics and specific operational issues that might arise during the course of regular work (e.g., error contributors).

Appendix B.

What does M-SCAIT Measure?

The M-SCAIT measures job demands and job resources which influence the ability to work safely. Outcomes, at the employee and organizational level, are also included.

Job Resources

- *Communication* assesses how well employees communicate across the organization.
- *Autonomy* assesses the degree to which employees believe they have freedom to make their own work-related decisions and are trusted to do their job.
- *Training* assesses whether employees receive sufficient work-related training at appropriate intervals.
- *Supervision* assesses the relationship employees have with their supervisors.
- *Management Commitment* assesses employee perceptions of management commitment to ensuring workplace safety.
- *Fatigue Risk Management* assesses how the organization manages fatigue (adapted from a fatigue instrument used currently by the FAA to assess safety culture within flight operations, developed based on subject matter expertise).
- *Just Culture* assesses whether employees feel that they can report mistakes and that workplace mistakes will be treated fairly.
- *Equipment and Tools* assesses the adequacy, availability, and ease of use.
- *Documentation* assesses the adequacy, availability, and ease of use.
- *Report System* assesses the adequacy, availability, and ease of use (adapted from an instrument used by the FAA to assess safety culture within flight operations, developed based on subject matter expertise).

Job Demands

- *Personal Role Overload* assesses the degree to which employees feel they are overtasked at an individual level.
- *Unit Role Overload* assesses the degree to which employees feel they are overtasked at a team level.
- *Workplace Restraints* assesses common challenges that employees face at work (e.g., scheduling, distractions/interruptions, and competing tasks).
- *Co-worker Concerns* assesses how well employees get along with other employees and are able to coordinate across work teams.
- *Safety Concerns* assesses the challenge of managing competing demands of safety and productivity.

- *Bullying* assesses whether employees are experiencing a persistent, unreasonable form of harassment at work.[lxxxvi]

Employee Satisfaction

- *Job Satisfaction and Morale* assesses whether employees are satisfied with their workplace and whether the morale in the workplace is good.[lxxxvii]
- *Turnover Intentions* assesses employee intent to leave their current organization.[lxxxviii]

Employee Well-Being

- *Strain and Fatigue* assesses employees' strain and fatigue (adapted from a fatigue instrument used by the FAA to assess safety culture within flight operations, developed based on subject matter expertise).
- *General Health* assesses aspects of employees' recent general health and well-being.[lxxxix]

Organizational Outcomes

- *Willingness to Report* assesses the extent to which an employee is willing to report their own mistakes, and whether reporting of mistakes is encouraged by oneself, management, and fellow employees.
- *Compliance* assesses the extent to which unnecessary risk-taking behavior occurs, and whether there is compliance with policies/procedures.
- *Performance* assesses individual and team-level performance on the job.
- *Errors* assesses the frequency of occurrence for contributing factors to errors made in the last 3 months. Severity of errors was not assessed in the survey.

Additional Survey Content

- *Demographics* includes items such as years of experience; job role; certifications; aircraft focus area; shift, work hours; and travel frequency (customized to the organization).
- Participants were asked to indicate whether they experienced any *Injuries* (Y/N) in the last 12 months.
- Open-ended-text entry fields were included at the end of each subscale, offering participants an opportunity to voice their opinions, to raise concerns, and to share general feedback.

[i] These benefits are stable across safety-critical industries and across countries, attesting to their robustness (Zohar, 2014).
[ii] Generally attributed to management consultant Peter Drucker (n.d.).
[iii] Key et al. (2023a).
[iv] Cooper and Fogarty (2015).
[v] M-SCAIT is backed by a theoretical framework of organizational behavior and outcomes (Job Demands-Resources Model [JD-R]; Bakker & Demerouti, 2007, see also Fogarty et al., 2018).
[vi] Key et al. (2023a).
[vii] Fink (1995, 2003a, 2003b, 2003c).
[viii] Morrow and Coplen (2017, p. 2).
[ix] Cole et al. (2013).
[x] Wiegmann et al. (2002).
[xi] Goncalves Filho and Waterson (2018, p. 18).
[xii] Holden (2009); McDonald et al. (2002).
[xiii] Guldenmund (2000, 2018); Zohar (2014).
[xiv] International Atomic Energy Agency [IAEA] (2020).
[xv] FAA (2022).
[xvi] IAEA (2020).
[xvii] IAEA (2020); SMICG (2019).
[xviii] Wiegmann et al. (2002).
[xix] IAEA (2020).
[xx] IAEA (2020); SMICG (2019).
[xxi] Chidester (2016).
[xxii] Chidester (2016); IAEA (2020); Morrow and Coplen (2017).
[xxiii] FAA (2022).
[xxiv] IAEA (2020).
[xxv] IAEA (2020); SMICG (2019).
[xxvi] See IAEA (2020).
[xxvii] IAEA (2020).
[xxviii] Dekker (2001a, 2001b); Holden (2009).
[xxix] See IAEA (2020); SMICG (2019).
[xxx] SMICG (2019).
[xxxi] International Air Transport Association [IATA] (2019); National Academies of Science, Engineering, and Medicine [NASEM] (2016).
[xxxii] Cooper (2018); McDonald et al. (2002); Morrow and Coplen (2017).
[xxxiii] Dekker (2001b); IAEA (2020); Reason and Hobbs (2003).
[xxxiv] FAA (2020).
[xxxv] Baker (1998); Kanki and Hobbs (2018).
[xxxvi] FAA (2020).
[xxxvii] FAA (2020).
[xxxviii] FAA (2020).
[xxxix] 14 C.F.R. § 5.21.
[xl] See Key et al. (2023a).
[xli] Patankar et al. (2012, p. 180).
[xlii] IAEA (2020); NASEM (2016).
[xliii] NASEM (2016).
[xliv] NASEM (2016).
[xlv] NASEM (2016).
[xlvi] IAEA (2020); IATA (2019); Reason (1997).
[xlvii] Reason and Hobbs (2003).
[xlviii] For guidance on conducting online surveys, see Fink (2003a).
[xlix] For reviews, see Zohar (2010, 2014); Zohar and Hofmann (2012).
[l] Zohar and Hoffman (2012).

[lili] Singer et al. (2003); Zohar (2010).
[lii] Zohar (2014); Zohar and Luria (2003).
[liii] NASEM (2016).
[liv] Key et al. (2023b).
[lv] Reported in Key et al. (2023b).
[lvi] NASEM (2016).
[lvii] Boeing Company (2016); International Civil Aviation Organization (n.d.).
[lviii] Sorra et al. (2019; p. 26).
[lix] Armenakis and Harris (2002, 2009); Nytrø et al. (2000).
[lx] Depending on factors such as the size or structure of the organization, consider sharing the results of the survey by convening a subgroup with representation from all parts of the organization.
[lxi] Ward et al. (2010).
[lxii] Erwin and Garman (2010); Furst and Cable (2008).
[lxiii] Patankar et al. (2012).
[lxiv] Note that the role of a safety champion is complementary, but not separate, to that of a survey coordinator or administrator. For some organizations, the same individual may fill these roles.
[lxv] Doran (1981).
[lxvi] Blackburn et al. (2011).
[lxvii] Armenakis and Harris (2002, 2009); Blackburn et al. (2011); Burnes (2004); By (2005); Krause (2005); Nytrø et al. (2000).
[lxviii] Ward et al. (2010).
[lxix] McSween (2003).
[lxx] Kines et al. (2010); Krauss and Casey (2014); Zohar (2002); Zohar and Luria (2003).
[lxxi] Luria and Morag (2012).
[lxxii] McSween (2003).
[lxxiii] Stajkovic and Luthans (2003); Tuncel et al. (2006).
[lxxiv] Holden (2009); Leveson (2004).
[lxxv] Stolte et al. (2010).
[lxxvi] Geller (2005); McSween (2003).
[lxxvii] Klinect (2013); Langer and Braithwaite (2016).
[lxxviii] Hudson (2003).
[lxxix] McDonald et al. (1997, 2000); Taylor and Patankar (2001).
[lxxx] Taylor and Patankar (2001).
[lxxxi] Cromie et al. (2015).
[lxxxii] Patankar et al. (2012).
[lxxxiii] Bergman et al. (2014); Neal and Griffin (2006).
[lxxxiv] As discussed by Taylor and Patankar (2001).
[lxxxv] Morrow and Coplen (2017, p. 2).
[lxxxvi] Fogarty (personal communication, 2018); supplemented with additional items from the Negative Acts Questionnaire-Revised [NAQ-R]; Einarsen et al. (2009).
[lxxxvii] Fogarty (personal communication, 2018).
[lxxxviii] Diener et al. (1985); Hom and Griffeth (1991); Jaros (1997).
[lxxxix] General Health Questionnaire [GHQ-12]; Banks et al. (1980).