Next Generation Air Transportation System
Joint Planning and Development Office

JPDO Paper

Safety Culture Improvement Resource Guide, v1.6

Paper No.: 08-010 **January 12, 2010**

Prepared by: Joint Planning and Development Office (JPDO), Safety Working Group (WG)

This Safety Culture Improvement Resource Guide explains the concepts underlying safety culture and the importance of establishing a strong safety culture. It also provides practical tools for improving safety culture within aviation organizations. Emphasis is placed on fostering an atmosphere of trust, enhancing safety awareness and safe behaviors, and improving communication among employees and between employees and management.

This document was written by the Safety Culture Standing Committee of the JPDO Safety WG. The study team comprised representatives of the JPDO partner departments and agencies, the aviation industry, and academic subject matter experts with experience in aviation safety. The team also reached out to over 20 industry stakeholders and government organizations around the world to gather practical source material for this guide. These organizations contributed valuable information about some of their most effective practices, which were used to help formulate recommendations for strengthening organizational safety culture.

For successful development of the Next Generation Air Transportation System (NextGen), equal attention must be given to establishing a design that will achieve performance and capacity goals and to establishing an effective Safety Management System (SMS) that includes a healthy safety culture. This Safety Culture Improvement Resource Guide is not a mandatory implementation plan; instead, it serves as supplemental guidance to the JPDO SMS Standard. Each JPDO partner department or agency should use the contents of this guide to develop a tailored approach that is suited to its own organizational structure.

This guide is a living document that the Safety Culture Standing Committee will maintain, review, and update frequently during the transition to NextGen. This maintenance will ensure that the appropriate safety focus is aligned with the most current data, and that the most effective approaches towards safety culture improvement are identified, assessed, and implemented.

TABLE OF CONTENTS

1. BACKGROUND AND PURPOSE 1

2. SCOPE AND ASSUMPTIONS 3

3. INTRODUCTION TO SAFETY CULTURE 4

3.1 DEFINITIONS OF SAFETY CULTURE 4
3.2 COMPONENTS OF A HEALTHY SAFETY CULTURE 5
3.2.1 Reporting Culture 7
3.2.2 Just Culture 7
3.2.3 Flexible Culture 7
3.2.4 Learning Culture 9
3.2.5 Informed Culture 9

4. UNDERSTANDING THE CURRENT AVIATION SAFETY CULTURE 11

4.1 SAFETY CULTURE ASSESSMENT 11

5. DESIRED SAFETY CULTURE AND STRATEGY FOR CHANGE 13

5.1 DESCRIPTION OF THE SAFETY CULTURE DESIRED FOR THE AIR TRANSPORTATION SYSTEM IN 2025 13
5.2 TOOLS TO MEASURE AND ASSESS SAFETY CLIMATE 15
5.2.1 Surveys 15
5.2.2 Workshops 16
5.3 TOOLS TO IMPROVE SAFETY CULTURE 18
5.3.1 Training 18
5.3.2 Use of an Ombudsman 19
5.3.3 Inclusion of Safety in Annual Performance Assessment 20
5.3.4 Rewards and Recognition for Safety 20
5.3.5 Tools to Support Risk Awareness and Risk-informed Decisions 20

6. ONGOING MONITORING AND ASSESSMENT 21

7. RECOMMENDATIONS AND SUMMARY 22

APPENDIX A EXAMPLES OF THE CORRELATION BETWEEN ORGANIZATIONAL CULTURE AND SAFETY
APPENDIX B OBJECTIVE CRITERIA FOR SAFETY CULTURE ASSESSMENT
APPENDIX C EXISTING AVIATION INFORMATION-SHARING PROGRAMS
APPENDIX D ADVANCED QUALIFICATION PROGRAM (AQP)
APPENDIX E FAA/ATO SAFETY CULTURE/SAFETY CLIMATE SURVEY
APPENDIX F DEPARTMENT OF THE NAVY CULTURE WORKSHOP
APPENDIX G FAA SAFETY CULTURE ENHANCEMENT ACTIVITIES
APPENDIX H REFERENCES
APPENDIX I ACRONYMS

1. BACKGROUND AND PURPOSE

The Joint Planning and Development Office (JPDO) was created in 2004 and tasked with producing an integrated plan for safely implementing the Next Generation Air Transportation System (NextGen), which must be capable of accommodating a threefold increase in air traffic. If the rate of accidents remains proportional to departures as the amount of air traffic increases, a correspondingly greater number of accidents will occur. This is unacceptable. The success of NextGen relies on both technical solutions and organizational modifications that will enable improvements to the safety of the air transportation system. Factors such as globalization, traffic complexity, business models, public expectations for safety, and funding will require significant changes to the system and corresponding safety measures.

As documented in the Next Generation Air Transportation System Integrated Plan, one mission of the JPDO Safety Working Group (WG) (formerly the Safety Integrated Product Team) is to "establish and track a safety improvement culture where safety and its continuous improvement are seen as the primary goals" (29). The Safety WG is also tasked with creating a comprehensive and proactive safety management approach for NextGen, an important element of which is establishing standardized guidance for developing a Safety Management System (SMS) for use by all JPDO partner departments and agencies, as well as other stakeholders. The proposed SMS requires organizations to "promote the growth of a positive safety culture" and defines safety culture as:

> The result of individual and group values, attitudes, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, the organization's management of safety. Organizations with a positive safety culture are characterized by communications founded on mutual trust, by shared perceptions of the importance of safety, and by confidence in the efficacy of preventive measures (Safety Management System Standard, version 1.4).

The proposed SMS also incorporates safety promotion activities.

Safety culture is a foundational concept supporting both occupational safety and system (or process) safety. Currently available data from organizations such as the Health and Safety Laboratory and experts like Manoj S. Patankar strongly support the link between safety culture and occupational safety. Case studies of several companies with leading occupational safety records show that they exhibit values, attitudes, competencies, and a corporate culture that promote safety. However, there are differences between occupational safety and system safety, and these should be considered when evaluating the implementation of NextGen. Some of these differences are highlighted in the report of a panel that investigated the 2005 BP oil refinery accident in Texas City, Texas. The report noted that a false sense of security can be generated by relying on occupational safety metrics as the main source of safety data; these metrics alone may not indicate the likelihood of major accidents. This underscores the importance of viewing safety culture in the context of system safety as well as occupational safety.

Safety culture is an essential element to improving the safety of Air Traffic Control (ATC) systems and operations. The link between safety culture and safety has been documented

in several studies of air traffic service providers (Gordon 29). Studies of military aviation also indicate a correlation between higher safety culture scores and better safety records (Adamshick 276) (see Appendix A). This correlation should be explored in detail so that the causal factors can be identified and effective mechanisms for improvement can be conclusively demonstrated.

The appendices to this guide contain references to additional published studies that suggest a relationship between improved safety performance and a strong safety culture. In addition to ATC, effective safety culture is essential to all elements of NextGen. The design of NextGen systems should be based on the integrated treatment of hardware, software, human, and management systems.

This guide provides the JPDO partner departments and agencies with information and guidance on improving their organizational safety cultures. It is based on the concept that a strong safety culture and a disciplined safety process will support each other and promote effective control of risks and the achievement of high safety performance for NextGen. The overriding motivation includes the desire to move beyond organizational structures and programs that promote routine compliance to safety standards, to a culture in which individuals place a high priority on operational excellence and safety.

2. SCOPE AND ASSUMPTIONS

This guide provides the background, tools, and recommendations for strengthening the safety cultures in JPDO partner departments and agencies (including oversight organizations). It includes recommendations and identifies tools that will provide the foundation for safety improvements for NextGen. However, this guide is not a mandatory implementation plan. Each JPDO partner department or agency is responsible for developing its own plan for implementing safety culture improvements, including allocating appropriate resources, tailoring the guidance and recommendations contained in this guide, and providing tools to assist stakeholders in strengthening their own safety culture.

This guide is based on the following assumptions:

1. Strengthening the safety culture of air transportation services and equipment providers will lead to improvements in safety performance, enabling the reduction of accident rates and the public acceptance of NextGen.
2. Each JPDO partner department or agency will be responsible for developing detailed guidance and implementing its own SMS, in accordance with SMS standards.
3. A strong safety culture will enable the success of full SMS implementation.

3. INTRODUCTION TO SAFETY CULTURE

The notion of using organizational culture as a management tool gained wide acceptance in the 1980s. Following the Chernobyl nuclear power plant accident in 1986, there was a widespread realization that organizational culture is a key factor in safety and that fostering a culture that supports safety can help reduce the number of accidents that occur in complex systems and organizations. This led to the common use of the term "safety culture." Ironically, although the recognition of safety culture originated in the nuclear industry, the nuclear industry has yet to achieve consensus on how safety culture should be defined and improved. This highlights the importance of a broad, cross-industry approach to enable the effective treatment of safety culture and safety management issues.

Studies of several high-profile accidents conducted over the past few years identified poor safety culture as a contributing factor to the accidents. One telling example is the investigation of the March 23, 2005, Texas City refinery accident. An independent review panel urged companies to "regularly and thoroughly evaluate their safety culture, the performance of their process SMSs, and their corporate safety oversight for possible improvements" (Baker i). More and more frequently, investigations probe beyond specific technical failings to identify underlying organizational weaknesses that contribute to accidents, such as a poor safety culture. However, although safety culture has been recognized as a contributor to many high-profile accidents, it should be recognized that many interacting factors contribute to these accidents. Therefore treatment of safety culture should be addressed as an integral component of a much broader overall program of safety and risk management.

3.1 DEFINITIONS OF SAFETY CULTURE

It is important to consider what safety culture is and why it is important to aviation. There are many different definitions of safety culture. The definition accepted by the United Kingdom Health and Safety Commission was originally adopted by the Federal Aviation Administration (FAA) Air Traffic Organization (ATO) and included in the JPDO SMS Standard:

> The result of individual and group values, attitudes, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization's management of safety. Organizations with a positive safety culture are characterized by communications founded on mutual trust, by shared perceptions of the importance of safety, and by confidence in the efficacy of preventive measures.

Since the original draft of the SMS Standard, there has been considerable study and exploration in both the implementation of the SMS and the incorporation of safety culture as an enabler for a successful SMS. The Safety Standing Committee of the Civil Air Navigation Services Organization (CANSO), of which the ATO is a member, has endorsed the following definition of safety culture as it applies to ATC:

> Safety culture refers to the enduring value, priority and commitment placed on safety by every individual and every group at every level of the organization. Safety culture reflects the individual, group and organizational attitudes, norms and behaviours related to the safe provision of air navigation services.

This guide incorporates elements and ideas from other definitions in addition to the two definitions given above.

It is useful to distinguish between "safety culture" and "safety climate." Wiegmann defines safety climate as "the temporal state measure of safety culture, subject to commonalities among individual perceptions of the organization. It is therefore situationally based, refers to the perceived state of safety at a particular place at a particular time, is relatively unstable, and subject to change depending on the features of the current environment or prevailing conditions" (10). In other words, safety climate is the measure of the common perception of the importance of safety in an organization at a given point in time. Because safety climate is less enduring and more amenable to change than is safety culture, *measuring and assessing the safety climate* is a valuable step in reaching the long-term objective of *understanding and shaping the safety culture*.

3.2 COMPONENTS OF A HEALTHY SAFETY CULTURE

The ultimate objective of a strong safety culture is to prevent accidents. Several researchers (e.g., Reason, Wiegmann, and Zhang) have noted that as the contribution of technical failures to accidents decreases, the relative importance of the human element, including organizational factors, increases. For the most effective treatment, technical and organizational factors should be addressed in an integrated fashion rather than independently. This implies that additional work is needed to understand the linkages between the technical and organizational factors.

Reason stresses that limiting organizational accidents requires an "informed culture," which he equates to a positive safety culture that effectively shares information throughout the organization and actively seeks maximum safety (196). In Reason's model, an informed culture contains the four sub-cultures described below and pictured in Figure 3.2-1.

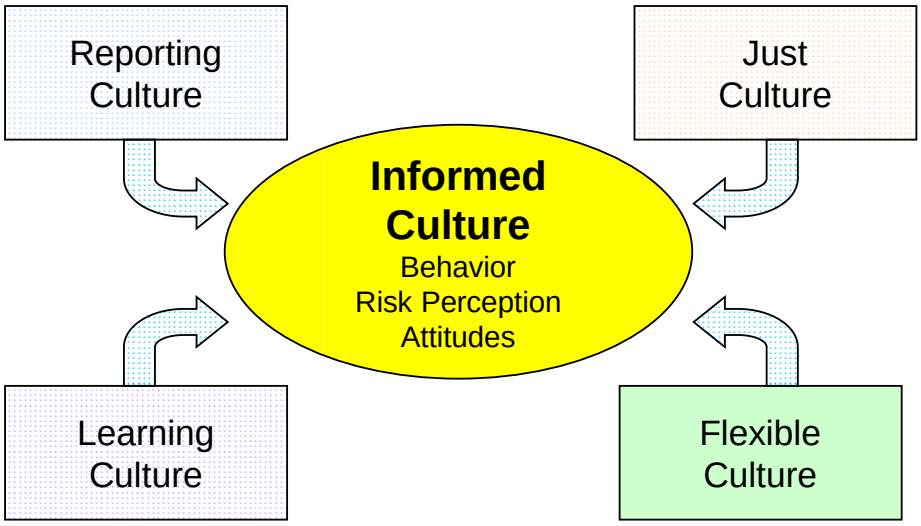

Figure 3.2-1: Components of a Healthy Safety Culture

3.2.1 Reporting Culture

A positive "reporting culture" helps mitigate errors by encouraging employees to divulge information about hazards or safety concerns that they encounter. Reason describes five important factors in determining the quantity and quality of incident reports (197):

- Protection from disciplinary proceedings
- Confidentiality or de-identification
- The separation of the agency or department that collects and analyzes the reports from those with the authority to discipline
- Rapid, useful, accessible, and intelligible feedback to the reporting community
- Ease of reporting

The management of the organization must support the reporting culture by providing the incentives and the tools for continuous reporting of safety issues. In addition, the management must provide the processes and resources to evaluate safety issues as they are identified, and make risk-informed decisions regarding the resolution of the issues. For an example, see Appendix C.

3.2.2 Just Culture

Norman identifies a problem that hampers improvements to organizational safety:

> People make errors, which lead to accidents. Accidents lead to deaths. The standard solution is to blame the people involved. If we find out who made the errors and punish them, we solve the problem, right? Wrong. The problem is seldom the fault of an individual; it is the fault of the system. Change the people without changing the system and the problems will continue (9).

Following an incident or accident, a poor safety culture may assign blame to the individual responsible for the last action prior to the problem. Such a culture discourages the reporting of unsafe conditions and cooperation with incident investigation.

The healthy alternative to a "blaming culture" is a "just culture," in which employees are held accountable for deliberate violations of the rules but are encouraged and rewarded for providing essential safety-related information. A just culture does not tolerate reckless behavior or deliberate malfeasance. Reason identifies the three elements of a just culture as intention, action, and consequences (205). There must be an atmosphere of trust, which is the single most important element in guaranteeing meaningful reporting. Trust is achieved through either negotiated agreements or faith. There must also be a clear line between acceptable and unacceptable behavior and a well-defined process for dealing with rule violations. This process may include the use of a decision tree, such as the one provided by Reason (see Figure 3.2-2), to determine the intent of an employee who has committed an unsafe act (209).

3.2.3 Flexible Culture

Many organizations in highly-regulated industries operate using strictly defined processes for handling operations and incidents. These Standard Operating Procedures (SOPs) include clear lines of authority and responsibility at local, regional, and national levels; some SOPs leave

little room for flexibility and adaptability during non-nominal situations and events. Using a thorough pre-analysis of events that can occur, SOPs formulate guidance for event response. In some circumstances, however, events may not develop in accordance with the assumptions on which the SOPs were based. In such cases, strict compliance with the relevant SOP could aggravate the situation.

To adapt effectively to changing demands, an organization must foster a "flexible culture" that allows quick, smooth reactions to non-nominal events. A flexible culture allows all employees to question procedures and behavior, thus making the safety culture self-correcting on every level. The role of the human, including the inevitability of human error, is acknowledged. When procedures or behavior are questioned, potentially unsafe practices may be interrupted before they result in an actual mishap. In a flexible culture, operational roles and responsibilities become less centralized and more fluid, and all employees feel a shared sense of responsibility for the success of the organization. The result is an organization that is oriented toward goals instead of regulations. Effective safety management requires goals that are clearly defined, understood, agreed to at all levels of the organization and across disciplines, and kept in sharp focus at all times. This necessitates the development of a "common language" that can be used to discuss goals across the organization and across disciplines. For example, the concepts of defense in depth and critical safety functions are sometimes used as a common language across the commercial nuclear power industry.

Building a flexible culture requires a careful balance between thorough pre-analysis, to ensure that SOPs are as accurate and applicable to the intended situation as possible, and allowance for variation when required during a crisis. Guidance for determining whether deviation from the SOPs is justified should enable quick and accurate identification of sound reasons for the deviation (e.g., assumptions underlying the SOPs are found to be inaccurate, continuing on the path prescribed by the SOP will result in unacceptable consequences).

One approach to implementing a flexible culture for emergency response is the critical safety function approach that was developed in the U.S. commercial nuclear power industry following the accident at Three Mile Island (Corcoran). This approach supplements the normal "event based" emergency procedures, under which misdiagnosis of the event could lead to serious consequences. The critical safety function focuses the crew's attention on the health of certain critical safety functions (core cooling, reactivity control) and provides guidance for formulating a flexible response to situations where the critical function is endangered or lost. This approach has been extended to the non–real-time application for safety management in the defense in depth objective tree structure developed by the International Atomic Energy Agency. This approach shows potential to serve as the foundation for the development of a flexible culture within an SMS for NextGen, as well as a "common language" for risk awareness and communication throughout the air transportation community.

Another example that demonstrates the importance of a flexible culture is the FAA's rule (14CFR Sec. 91.3) on pilot authority, which states that "In an in-flight emergency requiring immediate action, the pilot in command may deviate from any rule of this part to the extent required to meet that emergency."

3.2.4 Learning Culture

An organization that demonstrates a strong "learning culture" is willing to change based on safety indicators and hazards uncovered through assessments, data, and incidents. It is essential that remedial action be taken to correct identified deficiencies in systems or procedures. Through proactive observation and evaluation, the organization and its employees and policies allow for continuous learning and improvements to safety. These activities help identify vulnerabilities or weaknesses to organizational safety. Implementing a learning culture can be difficult because it often requires a great deal of coordination, a change in attitudes, and management commitment.

3.2.5 Informed Culture

The four subcomponents—reporting culture, just culture, flexible culture, and learning culture—combine to form a safety-conscious, informed organization with the following characteristics:

- Leadership commitment
- Open communication
- Just environment
- Involvement of everyone at all levels of the organization
- Learning throughout the organization
- Effective decision-making process
- Follow-up, feedback, and reporting

These characteristics typify a vibrant safety culture in which each employee sees his/her role as a critical part of the organization's commitment to safety and achievement of organizational safety goals. In such an environment, every employee will feel comfortable—and feel responsible for—reporting any incident or issue that he/she perceives as being a potential safety risk without fear of reprisal or retribution. A vibrant safety culture is built on trust at all levels of the organization working with each other. It depends on the values and behaviors of every individual. Figure 3-2.2 shows an example of a decision tree that helps determine culpability for unsafe acts (Reason 209).

The informed culture requires systematic processes to ensure that awareness of safety and risk is maintained throughout the organization, and that tools are available to help employees at all levels of the organization to incorporate safety and risk into the decisions they make on a daily basis. Methods and tools for supporting risk awareness and risk-informed decision making are described in greater detail in Section 5.3.5.

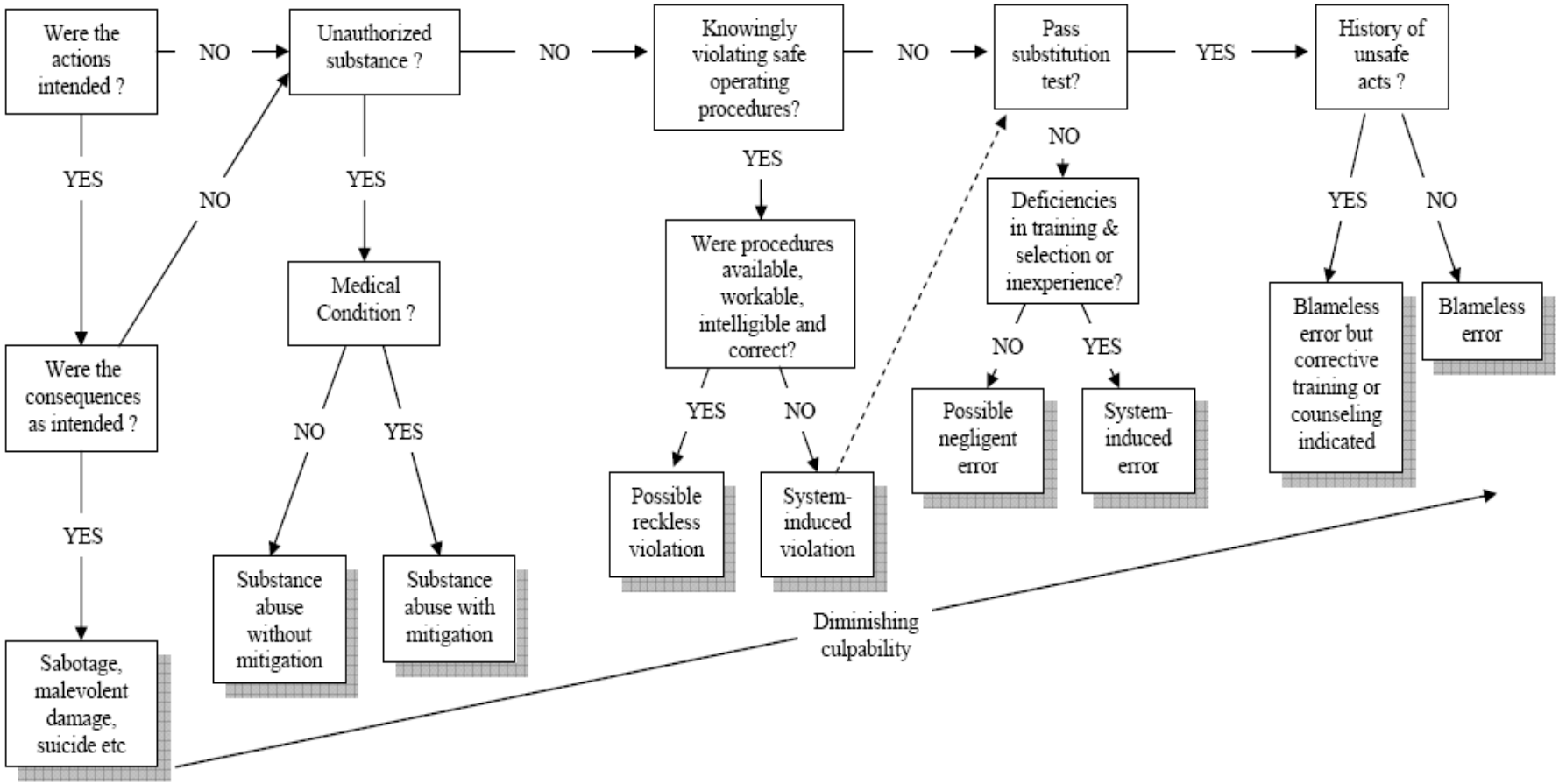

Figure 3.2-2: Just Culture Decision Tree

4. UNDERSTANDING THE CURRENT AVIATION SAFETY CULTURE

Safety culture is a local phenomenon, an organizational attribute that develops over time in response to management policies and external requirements. However, there are some characteristics of safety culture that can be observed industry-wide. Thus, defining the current state of safety in aviation is a daunting task. Aviation encompasses multiple organizations pursuing different business models and missions. Stakeholders range from single-proprietor general aviation operations to multi-national corporations and government organizations with tens of thousands of employees. Each organization's culture shares some common characteristics but is also unique to that organization. There is no single, universally-accepted standard by which to evaluate safety culture. To begin to understand the current aviation safety culture, we can examine:

- Available research results from academia, the government, the military, industry, and other organizations with a stake in aviation safety
- Experience and lessons learned from other industries such as oil and gas, defense, space, nuclear power, etc., which may be applicable to commercial aviation
- The criteria used to measure safety culture
- How the information can be distilled into best practices and lessons learned, which can then be applied to, and tailored for, all classes of stakeholders

Appendix H contains additional references pertaining to safety culture.

4.1 SAFETY CULTURE ASSESSMENT

Safety culture and safety climate cannot be evaluated against standard scales or criteria. The metrics and tools are not precise enough to allow comparisons of different industries or even different parts of one organization. Safety culture can only be assessed, not measured (which would suggest a more exact and quantitative calculation). Since the concept of culture deals with shared values, practices, and beliefs, its components can be determined, but it lacks the rigidity upon which numbers or dimensions can be placed. On the other hand, a safety climate, which is based on perceptions, can be measured. The values of measurement are relative and somewhat subjective; one examines which aspects of a safety climate are weakest or strongest, how they change with time, and how interventions produce changes in organizational climate.

In addition to the challenges of measuring safety climate and safety culture, there is the added complexity of placing those measures within the overall context of aviation safety and risk. In order to maximize confidence in the safety management programs established for NextGen, it is important that the influences of those programs on safety and risk be identified and evaluated. Special care should be taken to ensure that assessment of safety culture is linked to actual performance improvement rather than just functioning as a "circular definition." Thus, safety culture assessment should be performed in the context of the desired outcomes.

Different designers of safety climate measurement methods may use different theoretical constructs that define the aspects of safety climate. This is unavoidable, but appropriate for diverse industries or specialties. It is important to maintain consistency in the factors to allow

relative comparisons across sets of measurements. Once a construct or framework of factors has been identified, specific procedures can be designed to gather data pertaining to each factor. Surveys of the workforce are often thought to be the primary measurement instrument, but Patankar identifies a range of instrument types, which can include:

- Survey instruments;
- Qualitative learning tools, such as incident debriefs; and
- Changes resulting from reporting systems.

Specific survey questions and observation data might evolve as information is gathered and new areas of interest are identified. If the constructs are consistent, the relative value of these factors and elements can be useful in designing and implementing organizational changes and determining where leadership and commitment need to be strengthened.

A list of some objective criteria for safety culture assessment is provided in Appendix B. Additional survey instruments have been developed by other organizations, including the Keil Center (Safety Culture Maturity Model) and Transport Canada. Examples of the use of some of these criteria are provided in Section 5.2. Additionally, a sample of the type of survey items used to measure safety climate is included as Appendix E.

5. DESIRED SAFETY CULTURE AND STRATEGY FOR CHANGE

The optimum safety culture appropriately balances risks against benefits as the organization strives to complete its mission. These risks and benefits should be evaluated in the context of organizational goals, including safety goals. Senior management commitment to safety is essential in establishing and maintaining a strong safety culture. In fact, Adamshick has shown that leadership qualities can be more important to improving organizational safety than specific programs introduced for that purpose (278). However, this does not reduce the critical importance of establishing specific programs for improving an organization's safety culture.

An example of an effective strategy for achieving a strong safety culture involves four steps. These steps may be viewed as the foundation of basic proactive strategy planning:

1. Accurately define the existing culture of safety
2. Assess this definition and formulate a plan to build on its strengths
3. Implement the plan
4. Follow up to ensure that the appropriate change is achieved

The Naval Safety Center Strategic Plan notes that to understand and shape the safety culture, it is valuable to view safety culture improvement as a measurement and assessment of the safety climate. This section includes descriptions of several tools that are used to assess safety climate and culture. Each organization should choose and tailor the tools that are most applicable to its own situation. Several of these tools should be used in combination to more comprehensively assess and manage safety climate and culture. With consistent intervention and dedicated management, the organization will continuously increase the value placed on safety.

5.1 DESCRIPTION OF THE SAFETY CULTURE DESIRED FOR NEXTGEN IN 2025

With the expected substantial increase in air traffic, the need for a strong safety culture in aviation will be even more critical in 2025 than it is today. NextGen stakeholders must make a continuous effort to strengthen the four components of the informed culture discussed in Section 3.2.

Creation of a broad database of incident data will be a key element of a strong reporting culture in aviation. This database will help enable the identification of accident precursors, which will lead to more effective interventions and prevent accidents. However, since incident reporting implies a stable base of operations, there might be a need for a transition period during which new systems and procedures are introduced. After these changes are implemented and assessed for safety, operational incident reporting can begin.

Effective data sharing is not possible without a just culture that emphasizes trust. With a healthy reporting culture and just culture, employees will report all significant hazards that they feel are unknown and will provide additional reports when known hazards are not controlled effectively. Hazard reports will be processed and analyzed promptly, and feedback will be provided at all levels of the organization. Those who report hazards will be provided feedback to show that their efforts really do contribute to improved safety. Some of the information-sharing programs currently used in aviation are described in Appendix C. Users of these programs include pilots, controllers, and maintenance technicians.

The aviation community, and society in general, will accept that open, frank, and honest incident reporting by persons directly involved in these incidents, supported by rigorous investigation to find and correct causes, is the only reliable path to accident prevention. The open reporting of incidents by those involved in them will be encouraged by the existence of a non-punitive culture based on trust. The accountability of those involved in air transportation will be ensured not by way of litigation, retribution, or punishment following individual accidents, but by appropriate ongoing measures of effectiveness of accident prevention. Organizations involved in air transportation will welcome being made accountable by enthusiastically adopting appropriate SMSs, which by definition include robust incident reporting and investigation supported by a just culture.

Increased flexibility will be necessary to deal with the many changes that will be part of NextGen. This flexibility must be balanced with the need to embrace industry standards and best practices, and the wisdom to know when accepted standards should be revisited and possibly modified. With a flexible culture, employees, supervisors, and managers will be knowledgeable about, and take responsibility for, safety. Management will demonstrate its commitment to safety through the authorization of sufficient staffing, training, and safety policies. Employees will be open-minded toward training and accept dynamic roles and responsibilities. Organizations will be oriented toward safety goals, not regulations. This flexibility will allow the entire aviation system to adapt safely to the anticipated increase in activity. An example of flexibility in aviation is the FAA's Advanced Qualification Program (AQP), which is a voluntary regulatory alternative to the traditional training and evaluation requirements for airline pilots, dispatchers, and flight attendants. The AQP is described in Appendix D. Another example of flexibility is the use of delegated certification authorities, such as Certified Design Organizations currently under study by the FAA (see FAA Order 1110.145, Certified Design Organization Aviation Rulemaking Committee). The implementation of the SMS will move organizations to a more flexible culture as risk identification becomes everyone's responsibility.

A strong learning culture will encourage continuous awareness of changes in the air transportation system and ensure that resources are available to assess these changes for hazards and risk. Systematic analyses of lessons learned during implementation of new systems will be conducted continuously. All aviation stakeholders will be ready and willing to learn more from incident data and be proactive about the effects of changes to the air transportation system. This learning culture will lead to increased participation in cross-functional teams. An example of such a team is the Commercial Aviation Safety Team, which is composed of participants from both industry and government and focuses primarily on the reduction of fatal commercial aviation accidents. Another example is the use of a Safety WG, which will be required to assess the risk of changes to the National Airspace System as part of the SMS. A strong learning culture might also lead to increased use of credentialing to certify work skills and enhance safety. A common example of credentialing already in place in aviation is the certification of pilots, mechanics, and air traffic controllers. The FAA's program for credentialing of air traffic controllers is described in FAA Order 8000.90.

Together these four cultural attributes will form an effective informed culture within individual organizations and across the entire commercial aviation industry. All employees will

be aware of their roles and responsibilities regarding safety and risk, and how their activities contribute to the achievement of organization-wide safety goals. Safety and risk will be continuously monitored, and all employees will be aware of the current situation and how their actions could influence safety and risk. A common language will be used to communicate safety and risk concepts across all disciplines and at all levels of the organization. There will be a clear understanding of how safety culture influences the technical components of safety and risk, so any modifications to SMSs can be subjected to a risk-informed process to evaluate their value. Finally, safety culture will be established as an industry-wide value so that all those involved will understand the importance of their actions for maintaining the safety performance that is so essential to preserve the trust of the travelling public.

5.2 TOOLS TO MEASURE AND ASSESS SAFETY CLIMATE

Once the safety culture is understood, the climate can be measured in order to discover the characteristics and behaviors that need modification. Several tools that can be useful in assessing safety climate are described below.

5.2.1 Surveys

The most common way to assess and measure the safety climate of an organization is to administer surveys. While surveys are often useful in uncovering problem areas, they require time and resources, and they need to be repeated to determine changes from the baseline. However, for large organizations, they can provide valuable data about relative movement in the culture.

Online surveys can permit the collection of safety climate information without the need for travel or an on-site presence. A possible disadvantage, however, is that insights may be lost without face-to-face contact and the ability to ask follow-up questions. Periodic collection of survey data, over time, helps develop an overall picture of the organization's culture. Online climate surveys are often used as a precursor or prerequisite to a culture workshop. In order to assure confidentiality, it might be necessary to arrange for an independent group to administer the survey. The Naval Safety Center Web site provides examples of online surveys.

Surveys can be divided into two types: objective and subjective.

5.2.1.1 Objective Criteria for Safety Climate Measurement

As part of the effort that led to the drafting of this guide, the JPDO Safety Culture Study Team developed a list of objective criteria that can be used to assess and measure safety climate. These objective measures check for the presence or absence of certain key elements of a positive safety culture. The criteria include characteristics of a positive safety culture and processes for maintaining a positive safety culture. They were gathered from agencies and companies with successful track records in these areas. The objective criteria are organized into three main areas:

- In-house Hazard Reporting – how safety information is provided by employees and how the organization gathers, uses, and disseminates safety data
- Safety Organization – how safety fits into the company or agency structure
- Training – the safety training and feedback that the organization provides to its personnel

- Senior Management Involvement – involvement of management personnel in safety issues, and inclusion of safety personnel in management processes and decisions

Effective use of objective criteria surveys requires that participants have a general knowledge of the organization. The most knowledgeable responses are likely to come from personnel in the safety organization; however, the most valuable responses may come from individuals with significant experience in the organization but who work outside of the safety network. Appendix B provides objective criteria survey questions. Organizations that want to use objective criteria surveys are urged to select the questions that are applicable to their respective domains. It may be useful to administer the same questions periodically, and after major organizational changes occur.

5.2.1.2 Subjective Surveys for Safety Climate Measurement

Objective surveys are most effective when used in conjunction with subjective surveys and safety culture workshops (see Section 5.2.2). Appendix E contains a survey used by the FAA ATO to study its safety climate, and it can be used as a starting point for other organizations. Not all of the questions provided will pertain to every agency or industry stakeholder; individual organizations should select the questions that are most applicable and modify them as needed. A preliminary review of the results can provide management with baseline data and insight into areas of weakness. Conducting a safety culture workshop will often help determine the cause of the weaknesses.

Subjective surveys over a wide cross section of the organization will provide a better picture of the organizational safety climate. Upper and middle management are sometimes reluctant to participate, perhaps because they do not see a benefit for management. Such an attitude likely indicates a weak safety culture. However, a well-designed survey of management can be effective in identifying cultural weaknesses. For example, a survey conducted by Behavioral Science Technology of senior and mid-level leaders in the ATO revealed that safety roles and responsibilities need to be more clearly defined and that personnel are reluctant to report information that adversely affects safety. The results also identified the need to apply consistent procedures and standards, hold personnel at all levels accountable, and create a positive and supportive environment for reporting safety issues and concerns. Finally, the results indicated that management believed there was a need for more effective safety measurements than merely tallying the number of operational errors and deviations, an “after-the-fact” indicator that has been used for decades in ATC operations.

5.2.2 Workshops

Since culture is a group phenomenon, it is useful to work with groups of people to bring to the surface their perceptions of the underlying culture (Schein 338). A safety culture workshop is a systematic tool for doing this. These workshops are sometimes referred to as focus groups. But they do not involve simply asking questions to generate a group response. Rather, safety culture workshops use a variety of exercises to evaluate the core values, performance, mission, and vision of the organization. Having the group analyze its own results can generate discussion that brings underlying assumptions to the surface.

To eliminate tension and pressure, it is best to use separate peer groups and avoid mixing competing peer groups, such as supervisors and subordinates. This allows for a more open flow of dialogue and less "finger-pointing." The workshop process is typically divided into two phases:

1. Individual interviews with people inside and outside of the organization
2. Facilitated peer group discussions

The purpose of the individual interviews is threefold. First, they help the facilitator(s) gain insight into the operation of the organization. Second, they provide a better understanding of the safety climate. Both successes and shortcomings can be viewed as "symptoms" of the underlying culture. Third, the interviews begin to identify some aspects of the underlying culture that can be validated during subsequent group sessions. It is important to conduct interviews throughout the organization and in some cases outside of the organization (e.g., with contractors). Any group that supports or works directly with the primary organization may provide valuable insight regarding observable characteristics and values.

5.2.2.1 U.S. Navy Culture Workshop

A good example of a safety culture workshop is the one developed and implemented by the Naval Safety Center. Every two years, facilities and organizations conduct Culture Workshops. Having found that the title was not well-received by its younger sailors, the Navy intentionally omits the word "safety" from the title of the workshop. The emphasis is instead placed on the concept of "operational excellence," within which safety is a vital component, or as many believe, a direct result. It is not necessary that every individual participate—the optimum group size was found to be 10 to 15 people—but a broad cross section of the peer group should be utilized. Through an interview and rating process, the facilitators review the organization's communication, integrity, and trust among peers, staff, and management. Although this process may seem involved and lengthy, it is actually quite efficient. The Navy is able to evaluate an entire squadron of 250 people in a day and a half.

To close the workshop activity, facilitators compose a list of areas for improvement based on the online survey tool, interviews, ratings, and workshop data. Results are provided directly to the unit's Commanding Officer, who is then responsible for developing action plans that address deficiencies. In the end, a successful workshop relies on dedicated leadership. The Naval Safety Center has found that units in which the Commanding Officer and junior leadership agree on the mission statement tend to have a lower mishap rate. This emphasizes the importance of agreement on organizational goals as a critical ingredient for maximizing performance and reducing incidents and accidents. This fact has led the Naval Safety Center to schedule Culture Workshops only on the request of the unit Commanding Officer.

Appendix F describes the roles of the facilitator, note taker, and participants in the Navy's Culture Workshops. It also provides sample rating sheets and possible questions for participants.

5.2.2.2 Air Force Organizational Safety Assessment

In 1998, the Air Force Safety Center developed the Organizational Safety Assessment (OSA) tool. Its purpose is to identify known and previously unknown risks and provide possible responses. An OSA is performed only after explicit request by the wing commander.

The process begins with a commercially available survey called the Occupational Stress Inventory, Revised, which measures risks and hazards in a unit's culture. A licensed psychologist interprets the survey results, which are provided to the commander during the in-brief. The in-brief begins an eight-day visit by a multidisciplinary team, typically of about eight members, including an aviation psychologist, a pilot, a maintainer, an air traffic controller, and a safety representative. The team conducts one-on-one interviews with senior leaders, followed by group interviews with personnel assembled by rank and organization. No member is ever interviewed with his or her supervisor in the room.

At the end of the week, the data are analyzed and comments are examined for trends. Recommendations are formulated, and the out-brief is drafted. The commander decides who will attend the out-brief, and the brief and data become the property and responsibility of the commander at the conclusion of the OSA. In a typical OSA, about 75 percent of the reported issues were previously known, and 25 percent are new. It is important to note that the OSA is not a crisis response effort; it is intended for use under normal conditions. Following a major mishap with fatalities, the Air Force Safety Center will generally wait about one year before conducting an OSA.

5.3 TOOLS TO IMPROVE SAFETY CULTURE

5.3.1 Training

Including safety culture concepts in organizational leadership training programs is critical to developing and sustaining a strong safety culture. Many leaders understand the importance of safety culture but are unsure of the best way to shape it. A leadership training workshop may be useful for informing management about the tools available for understanding the existing safety culture and actively managing that culture. Some of the tools involve in-house efforts, while others require outside assistance from either a trained facilitator or third party. The ATO's leadership training program, along with other FAA safety culture enhancement activities, is described in Appendix G.

5.3.1.1 FAA ATO Crew Resource Management Program

Crew Resource Management (CRM), developed and delivered by the ATO Office of Safety, is an ongoing program for the field that promotes daily safety culture behaviors on the front lines. CRM is the intentional use of effective human factors principles, methods, and behaviors to improve individual, team, and system performance in day-to-day operations.

CRM begins with a one-day workshop for all ATC field personnel, including facility managers, support managers and staff, operations managers, front line managers, traffic management coordinators, and air traffic controllers. Major lessons address individual performance, team performance, and Threat and Error Management (TEM).

In jeopardy-free small and large group discussions, participants identify, discuss, and record how they already apply CRM behaviors in their own daily operations, and what they can do better. The CRM behaviors are: provide active operational leadership and support; effectively distribute workload and tasks; clearly communicate operational plans and get acknowledgements from everyone; make and review "safety-first" decisions; brief and plan for known risks and threats; and maintain safety vigilance—speak up, listen, and take effective action.

Participants also identify, discuss, and record individual and team methods to maintain situational awareness, local best practices for working their own positions and sectors, best practices for delivering a good product to the next controller, and how to manage the potential goal conflict between safety and capacity by keeping safety first. The value of routine team debriefs of ATC sessions is emphasized, and team debriefing guidelines are provided.

In TEM, participants identify, discuss, and record local vulnerabilities—including internal risks (inside the facility) and external threats (outside the facility) that may put them in error-prone conditions, as well as potential examples of each of five CRM error types—and how to eliminate or use countermeasures against those vulnerabilities. A method for backing up another controller, when you are not sure that a situation has been resolved, is provided. The more time-critical the situation appears, the more direct the form of communication used should be.

After the workshops, all of the recorded workforce ideas are compiled into a feedback document that is delivered to the local facility management for follow-up and action planning. These proactive data—generated by local people who develop local solutions—are used to improve individual, team, and system performance before things go wrong.

Importantly, the CRM program is systematically designed to generate local ownership in each of the safety culture elements—a reporting culture, an informed culture, a learning culture, a flexible culture, and a just culture. The ongoing use of CRM principles, methods, and behaviors in daily field operations—reinforced by CRM posters, videos, articles, and refresher training—enhances the front-line safety culture in each facility.

5.3.2 Use of an Ombudsman

An organization may want to appoint an independent ombudsman to receive and resolve safety concerns while helping to achieve organizational goals. Ombudsmen are currently used by some large manufacturing organizations in the aviation field to research claims and provide recommendations for resolution. Complaints may or may not be anonymous and can be filed by anyone within or outside an organization. The ombudsman researches claims thoroughly, handles sensitive issues, and maintains confidentiality when necessary. The ombudsman may be accessed through phone, mail, email, or a Web-based form. Regardless of the interface, for the system to be effective, management responses must be timely, and the effectiveness of these responses must be tracked.

An ombudsman's ability to remain impartial creates an atmosphere of trust for employees in a way that management and human resources departments might not. This trust paves the way

for amicable solutions to complex safety problems—solutions that can save money while strengthening safety culture and building trust between the company and employee. While many small organizations cannot afford a full-time ombudsman, this position does not necessarily require a full-time employee. It might also be possible to purchase ombudsman services from an industry professional organization.

Other advantages of using an ombudsman include:

- An ombudsman provides an opportunity for confidential dialogue not afforded by a hotline.
- The process of responding to reported issues, even minor ones, builds trust in management so employees become more comfortable reporting directly to management.
- When trust does not exist, issues can still be reported.
- An ombudsman keeps management aware of employee concerns.

The ultimate goal is to create an environment of trust so that employees are willing to report safety concerns through normal organizational channels without fear of reprisal.

5.3.3 Inclusion of Safety in Annual Performance Assessment

An organization should continually measure its ability to improve its safety culture, as well as achieve its safety objectives and performance targets. While the safety culture is a combination of the efforts of many individuals in an organization, an individual's annual performance assessment can in some cases address the contribution to a positive safety culture. Assessing an individual's contribution to a positive safety culture can be done fairly only if the individual's job description includes specific competencies or values that promote safety. Care should be taken to ensure that the performance criteria are objective and focused on rewarding positive behaviors rather than punitive actions.

5.3.4 Rewards and Recognition for Safety

Desirable behavior is promoted among personnel when it is rewarded. Mishaps (including both accidents and incidents) are now quite rare within many parts of the aviation community. However, caution is necessary because the emphasis on a low incident rate may inhibit the reporting of some potentially unsafe acts. Providing recognition for reporting unsafe conditions that have not yet resulted in accidents or incidents can also help identify hazards. Adamshick (251) has shown that such programs work best when they are considered meaningful and produce highly coveted awards.

5.3.5 Tools to Support Risk Awareness and Risk-informed Decisions

Safety culture on its own will not guarantee safe operations or improved system performance. To ensure that a healthy safety culture results in improved performance and a reduction of accidents, a common awareness of risk needs to be facilitated throughout the organization, and employees need the skills and tools to make effective safety- and risk-informed decisions. It is critical that all employees understand organizational goals for safety and their role in achieving those goals. They must also possess the skills required to incorporate safety and risk awareness into the decisions they make on a daily basis.

One of the most important enablers of an effective safety culture is organization-wide risk awareness. In turn, a healthy safety culture will not automatically lead to overall performance improvement unless effective, risk-informed decisions can be made throughout the organization. The use of well-designed tools can enable both risk awareness and effective risk-informed decisions. Quantitative risk assessment tools such as Probabilistic Risk Assessment are being used in some applications to support risk awareness and risk-informed decisions, but such methods can prove difficult for supporting effective risk communication outside of the professional risk assessment community.

The first step to instilling effective risk awareness and risk-informed decisions is identifying an effective paradigm to be used to evaluate and assess the performance of the system. An example of an effective paradigm is the defense in depth principle used to guide the design and operation of nuclear power plants worldwide. In turn, the concept of safety objective trees developed by the International Atomic Energy Agency shows promise for becoming the foundation of a toolset to enable risk awareness and support risk-informed decision making.

6. ONGOING MONITORING AND ASSESSMENT

As noted in Sections 3.1 and 4.2, organizational safety culture is assessed by making periodic assessments ("snapshots") of the safety climate. An essential feature of an effective safety culture improvement program is ongoing monitoring and assessment. There should be a close relationship between these monitoring activities and the organization's safety assurance function. A successful monitoring strategy will involve as many people as possible within the organization and include an iterative process with the following steps:

- Assess climate through interviews and questionnaires
- Intervene through changes in policy and processes, with input from affected front-line personnel
- Allow time for the interventions to take effect
- Reassess climate

Other considerations in designing an effective monitoring program are outlined below:

- A visual depiction of the organizational structure, including how each component interacts with the larger safety structure, is an important tool for understanding the organization while promoting a learning culture.
- User-friendly tracking tools, data collection vehicles appropriate to the operation, and reporting processes utilized in conjunction with a process map of operations are vital in identifying areas of potential hazards and risks to assess and monitor.
- The assessments should be continuously correlated to safety (including incident and accident rates), and to performance trends, to ensure that changes are leading to positive results.
- Timely feedback from management to staff will encourage increased incident reporting. Making mishap rates and management actions available to all personnel can be helpful.
- Routine safety reviews can identify and evaluate new information, corrective and preventive actions, and recurring hazards. Strong management support of such reviews will help provide rapid feedback on mitigation effectiveness while maintaining awareness and participation in the safety process.

A successful monitoring program should not require extensive additional resources if incorporated into the SMS safety assurance process. Existing data-sharing programs, especially the Line Operations Safety Audit (LOSA) and Normal Operations Safety Survey (NOSS) (see Appendix C), which are based on observations of normal operations, can be helpful in monitoring the safety culture of an organization.

7. RECOMMENDATIONS AND SUMMARY

To ensure that the safety of the air transportation system is improved, the JPDO Safety WG will develop standardized guidance for developing an SMS for use by all JPDO partner departments and agencies, and other stakeholders. The guidance will allow each organization to develop an SMS that is tailored to its specific needs, and to encourage operational excellence rather than blind compliance. To enable this, the Safety WG is working within the framework of the multi-agency JPDO partnership to establish common standards, a more comprehensive data sharing and analysis capability, and a strong safety culture for all NextGen stakeholders. As they move forward with SMS implementation, the Safety WG recommends that each JPDO partner department or agency:

1. Promote safety culture and safety improvements through leadership values, trust, integrity, and open communications;
2. Define what constitutes a healthy safety culture in its organization;
3. Select a tool or combination of tools (see the appendices) to assess the current climate;
4. Provide training at all levels on the importance of safety culture;
5. Initiate (or continue) monitoring and assessment of the organizational safety climate; and
6. If requested, cooperate in research designed to further validate the link between improved safety culture and improved safety performance.

Rather than being treated independently, these recommendations should be integrated within the overall NextGen program, including system design, implementation, and operation. Three actions are critical for the successful treatment of safety culture within NextGen:

- Verify, understand, and if possible measure the links between safety culture and system safety to ensure that genuine safety benefits are gained from organizational changes.
- Successfully integrate all of the components of the SMS to ensure maximum safety performance and an effective safety culture.
- Integrate safety management and safety culture with NextGen system design and implementation so that safety and performance goals can be achieved.

The key to all of these issues is to treat safety culture, system design, and system safety as an integrated whole rather than as independent parts. Such an integrated approach will be essential to achieve the performance and safety goals of NextGen.

In order for NextGen to successfully absorb the anticipated increase in air traffic, JPDO partner departments and agencies must change many current beliefs and approaches. NextGen's computer-enabled air transportation network will stress adaptability by enabling aircraft to adjust quickly to factors such as weather, traffic congestion, and security issues. By 2025, all aircraft and airports in controlled U.S. airspace will be connected to the NextGen network. They will continually share information in real time, improving efficiency and safety.

To enable the successful implementation of the standard SMS, the FAA ATO is working to strengthen the safety culture of all stakeholders in NextGen. Continuous monitoring and assessment of safety culture will be required, as will continued research into the safety implications of innovations, such as shared responsibility for separation, the use of four-dimensional trajectories, and dynamic airspace allocation. This guide is offered to give leaders of JPDO partner departments and agencies an understanding of the elements necessary, and tools

available, to help shape the culture of the national air transportation community and support the NextGen goal of improving the safety of our air transportation system.

APPENDIX A: EXAMPLES OF THE CORRELATION BETWEEN ORGANIZATIONAL CULTURE AND SAFETY

Figure A-1 is taken from an Organizational Culture Diagnostic Instrument (OCDI) study of the culture of 16 manufacturing facilities conducted by Behavioral Science Technology. The study assessed the relationship between the organizational culture and occupational injury rates. The results show that the facilities with sound safety cultures had lower injury rates.

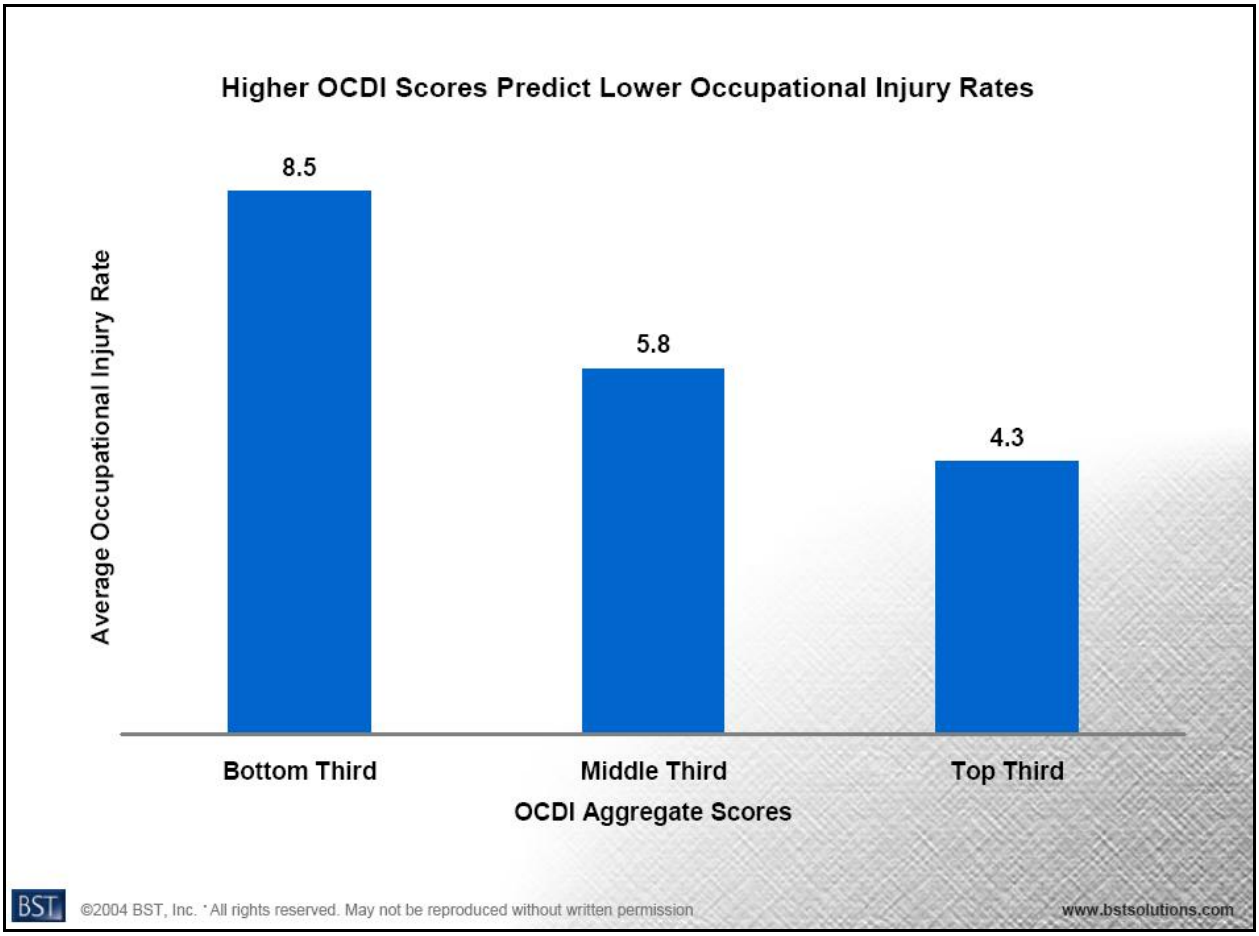

Figure A-1: Relationship between OCDI Scores and Occupational Injury Rates

Figure A-2 shows the results of a study of the U.S. Navy's Maintenance Climate Assessment Survey (MCAS) (Naval Safety Center, "Safety Climate Assessment Survey Brief" 85). It is clear that high climate scores are correlated with low mishap rates.

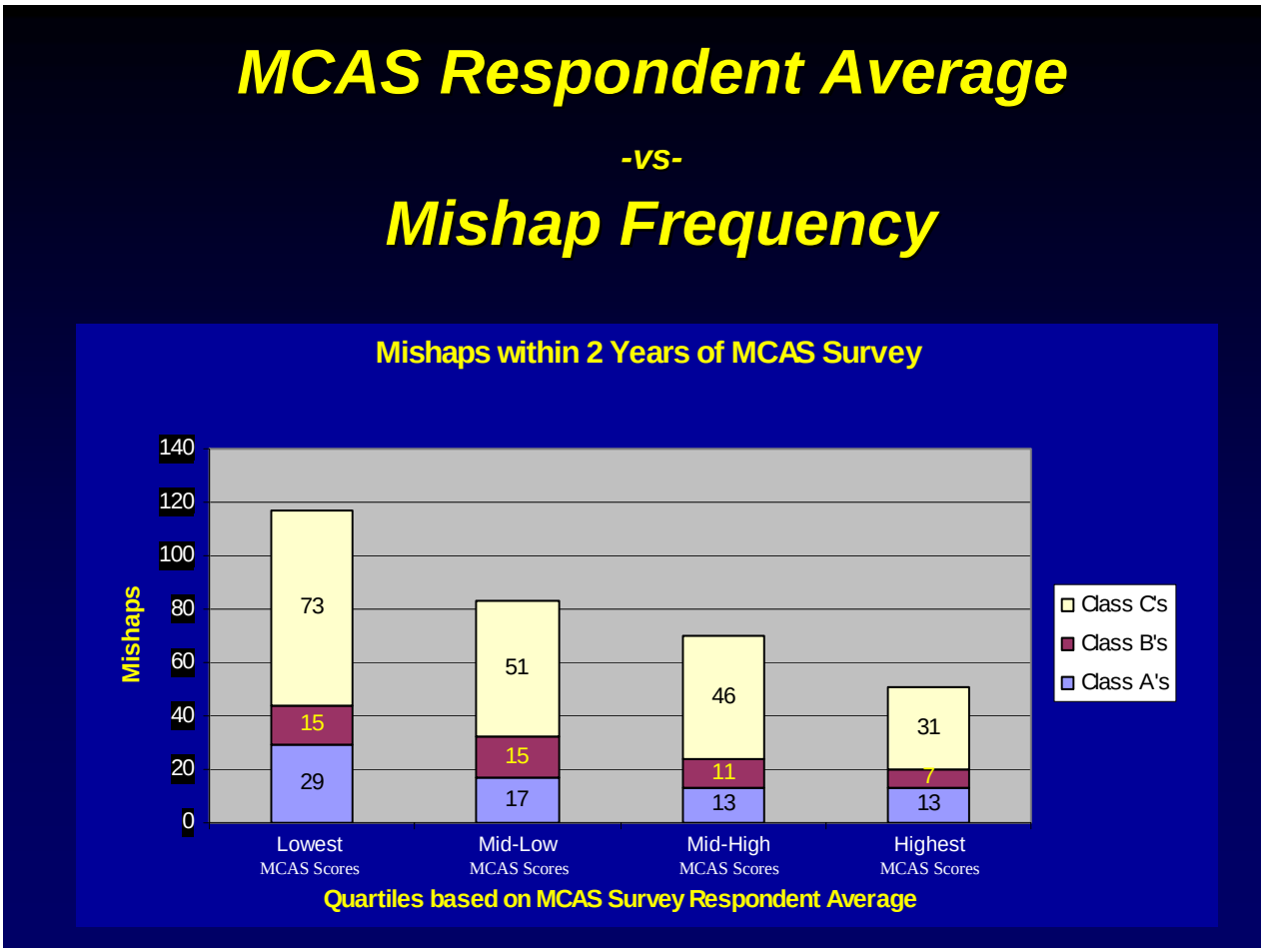

Figure A-2: Mishap Frequency versus Average Scores on an MCAS

APPENDIX B: OBJECTIVE CRITERIA FOR SAFETY CULTURE ASSESSMENT

The following table presents a list of objective criteria developed by the JPDO Safety Culture Study Team that can be used in assessing safety culture. Each criterion is also cross-referenced to the four characteristics of James Reason's safety culture: reporting culture, just culture, flexible culture, and learning culture. This list can be used as a checklist to conduct a self-assessment on the foundational components of organizational safety culture. Not every criterion is applicable to every organization; stakeholders should select those that are most helpful.

		Reporting	Just	Flexible	Learning
1	Hazard reporting				
1.1	Existence of a hazard reporting system	x			
1.2	Confidentiality	x	x		
1.3	Existence of a program to inform employees and encourage them to use it	x			x
1.4	Percentage of employees who know about the hazard reporting system	x			
1.5	Existence of a process to use results to improve safety	x		x	x
1.6	Administration separated from the enforcement organization	x	x		
1.7	De-identification of safety reports before dissemination within the organization	x	x		
1.8	Use of metrics on organizational response to reports	x		x	x
1.9	Frequency of analysis and reporting	x		x	x
1.10	Percentage of reports that are responded to within nominal response time	x			
2	Safety Organization				
2.1	Existence of a separate organization for safety		x	x	x
2.2	Published roles and responsibilities		x	x	x
2.3	Published safety policy		x	x	x
2.4	Existence of Safety Plan			x	x
2.5	Regular Safety Plan updates, and update frequency			x	x
2.6	Performance metrics in Safety Plan			x	x
2.7	Percentage of employees who know about the safety organization				x
2.8	Assignment of safety staff from within or outside the organization			x	x
2.9	Percentage of employees who can correctly name their safety point of contact	x			x
2.10	Assignment of safety points of contact throughout the organization down to the line worker level	x		x	
3	Training				
3.1	Existence of an ongoing safety training program				x
3.2	Types of safety training			x	x
3.3	Percentage of employees who are up to date on recurrent safety training				x
3.4	Systematic tracking of safety training within the organization	x		x	x
4	Senior Management Involvement				
4.1	Frequency of senior management presentation of safety issues to the organization			x	x
4.2	Organizational levels having personal contact with senior management regarding safety issues			x	x
4.3	Inclusion of the Safety Manager in the senior management structure			x	x
4.4	Safety Manager responsibility for or involvement in financial decisions			x	
4.5	Safety criteria used for manager selection and evaluation			x	
4.6	Inclusion of a manager's safety responsibilities in job performance reviews			x	x
4.7	Staff with safety degrees or certification			x	x
4.8	Staff assessed for role in achieving safety goals			x	

Table B-1: Objective Criteria for Safety Culture Assessment

APPENDIX C: EXISTING AVIATION INFORMATION-SHARING PROGRAMS

Data sharing is an essential part of hazard identification and a good reporting culture. Building a broad database of incident data enables the identification of accident precursors, which leads to more effective prevention. However, effective data sharing is not possible without a strong safety culture that emphasizes trust. When designing or joining a data sharing program, it is important to note that:

- Programs should be adapted for the particular discipline, organization, or agency.
- The intended use of the data should be made clear to all participants.
- Data must be protected from misuse, and voluntary submission of data should be encouraged in accordance with the principles of a just culture, as explained in Section 3.2.2.
- Efforts should be made to strengthen communications and data sharing among the different programs, especially where programs overlap in reporting criteria and oversight.

Voluntary programs that encourage the sharing of aviation safety data include:

- Aviation Safety Action Program (ASAP)
- Air Traffic Safety Action Program (ATSAP)
- Aviation Safety Reporting System (ASRS)
- Flight Operational Quality Assurance (FOQA) Program
- Voluntary Disclosure Reporting Program (VDRP)
- Line Operations Safety Audit (LOSA)
- Normal Operations Safety Survey (NOSS)

ASAP

An ASAP provides a vehicle for employees of contracted aviation activities (14 Code of Federal Regulations (CFR), Parts 121, 135, and 91, operators; and Part 145, Certificated Repair Stations) to report safety concerns, including possible violations of regulations by employees. This program is established through a Memorandum of Understanding signed by the FAA, the company, and if applicable, a labor association.

An ASAP focuses on fixing problems, not enforcing compliance through punishment or taking disciplinary action. The program requires that corrective action be taken for all safety issues disclosed under the program. The disposition of each ASAP report is determined by a three-person event review committee composed of representatives from the FAA, the company, and if applicable, front-line labor. The report must be submitted on a timely basis; alleged violations must be inadvertent and not appear to involve intentional disregard for safety; and the reported event must not appear to involve criminal activity, controlled substances, or intentional falsification.

Under FAA policy, enforcement is limited to administrative action. No FAA action is taken if the employee is the sole source of the information. The vast majority of ASAP reports submitted to date have in fact been sole source, meaning that ASAP provides the FAA and participating companies with safety-related information that otherwise would not have been obtained. There

are currently several dozen ASAPs in the United States. The details of the program are described in FAA Advisory Circular 120-66B.

ATSAP

ATSAP is a voluntary safety reporting program for air traffic controllers and other employees within the ATO. It was developed by the ATO in cooperation with its employee labor organizations and is modeled after the very successful ASAPs (described above) used in the aviation industry.

ATSAP provides a systematic approach for controllers, airway transportation system specialists, and other employees to report potential safety hazards. The intent is to identify and report all events that may or did lead to a breakdown in safety, or may increase risk to ATO operations. Through self-reporting of safety events and cooperative follow-up, appropriate actions can be taken to improve flight safety.

ATSAP serves as one leg of a good SMS program and also helps develop strong reporting and learning cultures. The Memorandum of Understanding between the ATO and labor organizations specifies that ATSAP reporting must be non-punitive. An employee cannot be decertified, nor can any credentialing action take place, after an employee reports an event to the ATSAP program. Employees who participate in the program will be provided feedback on actions taken to correct safety threats. By moving beyond a reliance on reactive behaviors, the program and its participants become part of proactive solutions that mitigate risk in advance. More information about ATSAP is available at http://www.atsapsafety.com/.

ASRS

The ASRS collects, analyzes, and responds to voluntarily submitted aviation safety incident reports. The primary goal is to lessen the likelihood of aviation accidents through human factors research and issuing recommendations for future system or process enhancements. Reports may describe any unsafe or hazardous condition and can be submitted by pilots, air traffic controllers, flight attendants, maintenance technicians, and others.

Reports sent to the ASRS are held in strict confidence. More than 600,000 reports have been submitted to date, and no reporter's identity has ever been disclosed. The program removes all personnel and organizational names. Dates, times, and related information that could be used to infer an identity are either generalized or eliminated.

The FAA offers ASRS reporters further guarantees and incentives to report. It has committed not to use ASRS information against reporters in enforcement actions; the agency has also chosen to waive fines and penalties, subject to certain limitations, for unintentional regulatory violations that are reported to ASRS. The FAA's initiation and continued support of the ASRS program and its willingness to waive penalties in qualifying cases demonstrates the value it places on the safety information gathered through incident reporting to the ASRS.

ASRS immunity and confidentiality are explained in further detail in:

- 14 CFR 91.25
- FAA Advisory Circular 00-46D

- FAA Order 7210.3S, Facility Operation and Administration Handbook
- The National Aeronautics and Space Administration ASRS Web site: http://asrs.arc.nasa.gov

FOQA

FOQA is a program for the routine collection and analysis of digital flight data generated during routine operations. FOQA provides objective data not available through other means. The information and insights provided by FOQA can be used to reduce operational costs and significantly enhance training effectiveness, operational procedures, maintenance and engineering procedures, and ATC procedures.

An FAA rule (14 CFR 13.401) establishes FOQA as a voluntary program open to any aircraft operator. Operators are not required to obtain FAA approval to operate such a program. However, an operator who seeks protection from the use of FOQA data for FAA enforcement must obtain FAA approval of its FOQA Implementation and Operations (I&O) Plan. The rule stipulates that the I&O Plan must contain the following elements:

- A description of the operator's plan for collecting and analyzing flight recorded data on a routine basis, including identification of the data to be collected;
- Procedures for taking corrective action that data analysis indicates is necessary in the interest of safety;
- Procedures for providing the FAA with aggregate FOQA data; and
- Procedures for informing the FAA of any corrective action being undertaken based on analysis of FOQA data.

Under 14 CFR 13.401, operators with FAA-approved FOQA I&O Plans are provided with regulatory protection from the use of FOQA data for enforcement, except for criminal or deliberate acts. FOQA is described in detail in FAA Advisory Circular 120-82 and at AQP-FOQA.com.

VDRP

The FAA's VDRP provides a means for certificated air carriers and production approval holders to voluntarily disclose violations of regulations. Following the initial disclosure, the operator is required to submit to the FAA a plan identifying a comprehensive remedy to prevent the recurrence of any further regulatory violations. The FAA office responsible for oversight of the operator will follow up to verify completion of the corrective action. Subject to satisfactory completion of corrective action, the FAA limits enforcement for violations revealed under the VDRP to administrative action (i.e., a Letter of Correction or Warning Notice), which remains on file for only two years. To be accepted under the VDRP, the FAA must determine that the apparent violation is inadvertent. The VDRP does not cover issues pertaining to unqualified certificate holders.

LOSA

The LOSA is a program for the management of human error in aviation operations; it helps develop countermeasures to operational errors. LOSA uses expert and highly trained observers to collect data about flight crew behavior and situational factors on "normal" flights. These audits are conducted under strict no-jeopardy conditions; therefore, flight crews are not held

accountable for any errors that are observed. During flights that are being audited, observers record and code potential threats to safety; how the threats are addressed; the errors such threats generate; how flight crews manage these errors; and specific behaviors that have been known to be associated with accidents and incidents. Evaluators also conduct interviews during and after flights to gain additional insight into how pilots manage safety threats, such as weather issues.

Data from LOSA provide a real-time picture of system operations that can guide organizational strategies with regard to safety, training, and operations. A particular strength of LOSA is that it identifies examples of superior performance that can be reinforced and used as models for training. Data collected through LOSA are proactive and can be immediately used to prevent adverse events.

Although initially developed for the flight deck, the methodology can also be applied to other aviation sectors, including maintenance, cabin crew, and dispatch. More information about LOSA is available at the University of Texas LOSA Web site and in International Civil Aviation Organization (ICAO) Doc. 9803.

NOSS

The NOSS is a safety management tool similar to LOSA, but it is used for ATC operations instead of the flight deck. Like LOSA, NOSS is based on the framework of TEM. Under NOSS, safety data are collected during a series of targeted observations of normal ATC operations. (A normal operation is defined as an operation during which no incident, accident, or other event takes place requiring reporting per current regulations.) Air Traffic management can use NOSS results to help prioritize national and facility safety improvements and investments. NOSS procedures have been developed by ICAO, which is drafting a NOSS manual (Ruitenberg).

APPENDIX D: ADVANCED QUALIFICATION PROGRAM (AQP)

The Advanced Qualification Program (AQP) is an example of the benefits of a flexible culture. AQP is a voluntary regulatory alternative to the traditional training and evaluation requirements for pilots, dispatchers, and flight attendants that appear in 14 CFR, Part 121, Subparts N and O. AQP is a flexible program designed to be responsive to new technology and changing needs. It employs instructional systems design methodology to develop scenario-based training and evaluation that integrates CRM and technical skills. An airline operating an AQP uses data from ASAP, FOQA, incident/accident reporting, and other sources to develop the content of scenarios that reflect timely real world issues. Unlike a traditional training program, AQP requires submission of detailed data from training and evaluation, including line checks, to the FAA. The operator uses data collected under the AQP for curriculum quality control, and the FAA uses the data to verify that AQP flexibility does not compromise safety.

AQP is described in detail in FAA Advisory Circular 120-54A and at AQP-FOQA.com.

APPENDIX E: FAA/ATO SAFETY CULTURE/SAFETY CLIMATE SURVEY

The ATO developed the following survey to assess the safety climate and safety culture of air traffic controllers. Other organizations may use this example as a starting point and remove or tailor the questions as desired. It may be useful to include background questions to collect certain data, such as age, gender, and occupation.

FAA/ATO Safety Culture / Safety Climate Survey

Purpose

In order to measure the safety culture as exhibited by existing safety climates across the FAA's Air Traffic Organization (ATO), the ATO sponsored the MOVES Institute at the Naval Postgraduate School to conduct a safety culture benchmark survey.

Your knowledge and background in ATC is needed to provide useful information concerning the current status of your ATC facility's safety climate, and the state of air control operations and associated operational risks.

The FAA/ATO Safety Climate-Culture Survey should take no more than 30 minutes to complete.

Instructions to Participants:

1. This survey is completely voluntary, and your inputs are provided anonymously, such that no one's responses can be associated in any manner with their individual identity. In accordance with federal law, your name and other personal identification information will not be collected or used as a part of this survey.

2. Please read and respond to each question on the survey. Provide your best judgment regarding safety climate-culture ratings and candidly answer the open-ended questions using the FAA/ATO Safety Climate-Culture Survey (attached).

3. At the end of the survey, please provide limited demographic information about your professional background and experience. The background information is only used for aggregate statistical analysis, with no personal identifying information.

4. **After completing the survey, place the survey in the pre-addressed, postage-paid envelope provided and send it to Center for the Application of Behavioral Sciences (CABS)**, a third party. This group will receive the surveys and populate a database with your responses. This ensures that neither the researchers conducting the survey nor the ATO will have direct access to your hand written responses. The MOVES Institute at the Naval Postgraduate School will then analyze the responses and provide a report to the ATO.

Your participation is considered extremely valuable to our effort, and is sincerely appreciated.

If you have questions about the survey please contact <<NAME>> at <<PHONE NUMBER>> or by e-mail at <<E-MAIL ADDRESS>>

Safety Management System Implementation
Air Traffic Organization, Safety Services

Survey begins on the next page ►

FAA/ATO Safety Culture / Safety Climate Survey

Instructions

Before completing this survey, please be sure that you have read the attached cover letter, which gives details regarding the purpose of this survey, and the sponsoring agency. We very much appreciate your candid answers to the following survey items. Please be assured that this survey is completely anonymous and no attempt will be made to identify particular participants and their questionnaire survey answers. Respond to the rating items by darkening the circle that best represents your level of agreement with a given statement, using the rating scale shown below:

①	②	③	④	⑤	Ⓝ	Ⓓ
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable	Don't Know

1.	I believe that FAA/ATO has a very effective process for reporting safety concerns.	① ② ③ ④ ⑤ Ⓝ Ⓓ
2.	Our facility's method of reporting unsafe conditions is likely to identify any problems that could lead to a serious accident.	① ② ③ ④ ⑤ Ⓝ Ⓓ
3.	FAA-ATC management provides adequate support for preventing personal injury or damage to equipment at our facility.	① ② ③ ④ ⑤ Ⓝ Ⓓ
4.	This facility has an effective process in place to identify any person who may pose a safety hazard on the job due to unsafe behaviors.	① ② ③ ④ ⑤ Ⓝ Ⓓ
5.	We have an informal process in place to report errors that are not serious enough to warrant using a more official process of reporting.	① ② ③ ④ ⑤ Ⓝ Ⓓ
6.	As far as I know, no serious unsafe acts have gone unreported at this facility.	① ② ③ ④ ⑤ Ⓝ Ⓓ
7.	I receive feedback on the resolution of safety issues that I report.	① ② ③ ④ ⑤ Ⓝ Ⓓ
8.	I have an effective means to provide input on safety issues.	① ② ③ ④ ⑤ Ⓝ Ⓓ
9.	I have never observed anyone that failed to comply with important safety procedures at my facility.	① ② ③ ④ ⑤ Ⓝ Ⓓ
10	Supervisors encourage reporting any safety concerns.	① ② ③ ④ ⑤ Ⓝ Ⓓ
11.	I am comfortable reporting safety concerns with no fear of management reprisal.	① ② ③ ④ ⑤ Ⓝ Ⓓ
12.	I believe that there is a reluctance to report errors and potentially hazardous conditions because we still treat such reports in a punitive manner.	① ② ③ ④ ⑤ Ⓝ Ⓓ
13.	All levels of management are actively involved in our safety program.	① ② ③ ④ ⑤ Ⓝ Ⓓ
14.	Working safely is an integral part of all operations in this facility	① ② ③ ④ ⑤ Ⓝ Ⓓ
15.	An employee that intentionally violates procedures or safety rules is given appropriate correction.	① ② ③ ④ ⑤ Ⓝ Ⓓ
16.	Intentional violations of procedures and/or safety rules are rare at my facility.	① ② ③ ④ ⑤ Ⓝ Ⓓ

Continue on Next Page ►

FAA/ATO Safety Culture / Safety Climate Survey

①	②	③	④	⑤	Ⓝ	Ⓓ
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable	Don't Know

17.	The supervisor at my work location encourages all employees to follow the rules.	①	②	③	④	⑤	Ⓝ	Ⓓ
18.	Any employee can stop or delay an operation if he/she believes that an unsafe condition exists.	①	②	③	④	⑤	Ⓝ	Ⓓ
19.	I am comfortable admitting to my supervisor that I have made a mistake.	①	②	③	④	⑤	Ⓝ	Ⓓ
20.	I would not hesitate to ask my supervisor for help when needed.	①	②	③	④	⑤	Ⓝ	Ⓓ
21.	There is genuine commitment to safe work practices at this facility.	①	②	③	④	⑤	Ⓝ	Ⓓ
22.	I am comfortable asking my supervisor to release me from work due to personal problems or illness that may affect my job performance or safety.	①	②	③	④	⑤	Ⓝ	Ⓓ
23.	My facility has a reputation for high-quality work	①	②	③	④	⑤	Ⓝ	Ⓓ
24.	My facility closely monitors work quality and corrects any deviations from standard practices.	①	②	③	④	⑤	Ⓝ	Ⓓ
25.	This facility's best practices are followed in my organization to ensure high quality work.	①	②	③	④	⑤	Ⓝ	Ⓓ
26.	Management clearly communicates the need to maintain high-quality standards.	①	②	③	④	⑤	Ⓝ	Ⓓ
27.	Employees at my location are held accountable for below average work performance.	①	②	③	④	⑤	Ⓝ	Ⓓ
28.	Employees at my location are recognized for above average work performance.	①	②	③	④	⑤	Ⓝ	Ⓓ
29.	Air Controllers at my location routinely assess potentially hazardous situations due to changing air traffic or airport conditions.	①	②	③	④	⑤	Ⓝ	Ⓓ
30.	Supervisors consider safety issues in the day-to-day management of all our work.	①	②	③	④	⑤	Ⓝ	Ⓓ
31.	My supervisor would not ask me to do something against ATO policy just to improve operational efficiency.	①	②	③	④	⑤	Ⓝ	Ⓓ
32.	Safety is a key part of all the operational planning in my organization.	①	②	③	④	⑤	Ⓝ	Ⓓ
33.	Safety personnel at my work location are very influential in promoting safety.	①	②	③	④	⑤	Ⓝ	Ⓓ
34.	I have received specific training on the high-risk elements of my job.	①	②	③	④	⑤	Ⓝ	Ⓓ
35.	I don't feel overly burdened by my daily work assignments.	①	②	③	④	⑤	Ⓝ	Ⓓ
36.	I am never too tired to stay alert on the job.	①	②	③	④	⑤	Ⓝ	Ⓓ

Continue on Next Page ►

FAA/ATO Safety Culture / Safety Climate Survey

①	②	③	④	⑤	Ⓝ	Ⓓ
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable	Don't Know

37.	We have a non-punitive approach to handling any controller, regardless of seniority or status, if he/she appears to be under excess stress or fatigue.	①	②	③	④	⑤	Ⓝ	Ⓓ
38.	In my opinion, changes in the ATO structure and/or policy have not affected focus on the safety of our operations.	①	②	③	④	⑤	Ⓝ	Ⓓ
39.	I don't believe it will be too difficult to achieve a uniform culture across various ATC geographic locations.	①	②	③	④	⑤	Ⓝ	Ⓓ
40.	This facility provides a positive climate that promotes safe operations.	①	②	③	④	⑤	Ⓝ	Ⓓ
41.	The safety goals of my work facility have been clearly communicated to me.	①	②	③	④	⑤	Ⓝ	Ⓓ
42.	My immediate supervisor can be relied upon to keep his/her word.	①	②	③	④	⑤	Ⓝ	Ⓓ
43.	Management is fully committed to safety at this facility.	①	②	③	④	⑤	Ⓝ	Ⓓ
44.	Management ensures that all employees are responsible and accountable for safety.	①	②	③	④	⑤	Ⓝ	Ⓓ
45.	Supervisors willingly provide advice concerning safety matters.	①	②	③	④	⑤	Ⓝ	Ⓓ
46.	I am adequately trained to safely conduct all of my job assignments.	①	②	③	④	⑤	Ⓝ	Ⓓ
47.	I believe that employee morale in this facility is high.	①	②	③	④	⑤	Ⓝ	Ⓓ
48.	Management consistently enforces adherence to procedures for all employees.	①	②	③	④	⑤	Ⓝ	Ⓓ
49.	I get all the resources that I need to perform my job safely.	①	②	③	④	⑤	Ⓝ	Ⓓ
50.	My supervisor knows which employees may pose a greater risk to safe operations, because of low proficiency or poor attitude.	①	②	③	④	⑤	Ⓝ	Ⓓ
51.	My supervisor listens carefully to employees regardless of job title or position.	①	②	③	④	⑤	Ⓝ	Ⓓ
52.	Communication among workers, while performing their jobs, is very good.	①	②	③	④	⑤	Ⓝ	Ⓓ
53.	Senior management (service area or above) can be trusted to keep their promises to employees.	①	②	③	④	⑤	Ⓝ	Ⓓ
54.	Local facility management keeps me informed about important safety matters.	①	②	③	④	⑤	Ⓝ	Ⓓ
55.	Senior management (service area or above) has adequately prepared employees for ongoing changes to operations and organizational structure.	①	②	③	④	⑤	Ⓝ	Ⓓ
56.	I have a clear understanding of my job duties and responsibilities in spite of changes ongoing in ATO policy and organizational changes.	①	②	③	④	⑤	Ⓝ	Ⓓ

Continue on Next Page ►

FAA/ATO Safety Culture / Safety Climate Survey

①	②	③	④	⑤	Ⓝ	Ⓓ
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable	Don't Know

57.	I believe that I am paid fairly for the work that I do.	① ② ③ ④ ⑤ Ⓝ Ⓓ
58.	Good communications flow exists up and down the FAA-ATO organization.	① ② ③ ④ ⑤ Ⓝ Ⓓ
59.	ATO sets very high standards for recruiting, hiring, and controller duty assignments.	① ② ③ ④ ⑤ Ⓝ Ⓓ
60.	Position Relief Meetings are conducted in sufficient detail to ensure that job requirements and safety issues are adequately covered.	① ② ③ ④ ⑤ Ⓝ Ⓓ
61.	All of our facility operations are adequately supervised.	① ② ③ ④ ⑤ Ⓝ Ⓓ
62.	I don't foresee any difficulties recruiting or retaining qualified controllers.	① ② ③ ④ ⑤ Ⓝ Ⓓ
63.	The training standards program is functioning effectively to ensure that all of our personnel meet regulatory and operational requirements.	① ② ③ ④ ⑤ Ⓝ Ⓓ
64.	Supervisors at this facility encourage employees to continually seek improvements that will enhance our performance and safety.	① ② ③ ④ ⑤ Ⓝ Ⓓ

Background Information

1. Service Area ○ Eastern ○ Central ○ Western

2. Discipline ○ Enroute ○ Terminal ○ SYS-OPS

3. Type of facility ○ ARTCC ○ ATCT ○ TRACON ○ FCT ○ TMU ○ FSS

4. Facility Level ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 ○ 11 ○ 12

5. Current Shift ○ Day ○ Evening ○ Midnight

6. Do you work a rotating shift? ○ Yes ○ No

7. Do you work overtime? ○ No ○ Seldom ○ Occasionally ○ Frequency

8. Do you supervise personnel? ○ Yes ○ No **9. If yes, number supervised:** _____

Continue on Next Page ►

FAA/ATO Safety Culture / Safety Climate Survey

Background Information (continued)

10. Sex ○ Female ○ Male

11. Years of service at current facility: _____

12, Total years of service in ATO: _____

13. Job Title: _____

14. Age: _____ **15. Today's Date**: ____/_____/_____
Day / Month / Year

Open Ended Questions

1. In your view, what situation or specific hazards or other factors may lead to an operational error, or a possible accident?

_____

_____

_____

2. The most significant safety actions that this facility, or my organization, can take to reduce the chances of operational errors, or an accident are:

_____

_____

_____

3. What additional training would help you perform your job more effectively?

_____

_____

_____

4. What aspects of ATO policy do you think have had a positive impact on the safety or risk of your operations?

_____

_____

_____

Continue on Next Page ►

FAA/ATO Safety Culture / Safety Climate Survey

5. What aspects of ATO policy do you think have had a negative impact on the safety or risk your operations?

_____

_____

_____

6. Do you have any further comments about operations or safety in ATC or about your own organization or work area? If so, please comment:

_____

_____

_____

7. Do you believe that any programs or procedures now operating elsewhere in the ATC system should be adopted by your own organization? If so, which one(s)?

_____

_____

_____

8. Did you find any part of the survey hard to understand or interpret? If so, tell us how we might improve the survey to make it easier to understand or use:

_____

_____

_____

Any additional comments.

_____

_____

THANK YOU VERY MUCH FOR YOUR PARTICIPATION.
PLEASE USE THE BACK OF THE LAST QUESTIONNAIRE PAGE FOR ADDITIONAL COMMENTS

Enclose your completed questionnaire in the pre-addressed postage-paid envelope provided and drop in the U.S. Mail To:
Center for the Application of Behavioral Sciences
P.O. Box 270298
St. Louis, MO 63127

APPENDIX F: DEPARTMENT OF THE NAVY CULTURE WORKSHOP

This appendix describes some aspects of the Department of the Navy Culture Workshops, including:

- A summary of the workshop process
- The roles and responsibilities of the facilitators, note taker, and participants
- Characteristics of the Navy and Marines that might be shared by civilian organizations or are likely to be unique to the military
- Examples of questionnaires and participant rating sheets

The workshop facilitators interview several groups within an organization. Each group is composed of 10 to 15 people from the same level (e.g., Group 1: maintenance mechanics; Group 2: first-line supervisors). There may be one or several groups interviewed at each level. The only personnel present during the interview sessions are one facilitator, one note taker, and the group participants. At the end of the workshop, the facilitators compile the findings and present them to the unit's Commanding Officer. Participant names are withheld. The findings include an assessment of whether the safety climate is improving or deteriorating. It is up to the Commanding Officer to take action and correct flaws as appropriate. It is not the role of the facilitators to devise an action plan; however, they may provide guidance if asked.

Facilitator roles and responsibilities:

- Assist the group in defining communication, trust, and integrity and how these qualities are reflected in their peers and the unit
- Guide group discussions
- Help the group understand its own processes in order to work more effectively
- Clearly delineate perception versus reality to maintain accuracy of the items discussed
- Use consensus to help the group make decisions that take into account all participants' opinions
- Help the group communicate effectively
- Create an environment in which the participants enjoy a positive, growing experience while they work to attain group goals
- Create trust between the facilitator and the participants
- Create trust between participants (stress confidentiality)
- Maintain confidentiality when leaving the room—do not disclose names to management
- During the session, look for:
    - Trust between the different levels (junior to senior)
    - Integrity of management as well as perceived integrity of peers
    - Relationships up and down the chain of command
    - Effective communication that is created and sustained
    - Signs of ineffective communication
    - Differences in perceptions at different levels and the level at which perceptions change
    - Extreme negativity and chronic complainers
    - Operational problems that can be discussed by the group

Note taker roles and responsibilities:

- Capture key thoughts
- Be aware of trends
- Capture ratings
- Note the general mood of the group

Only the note taker is authorized to take notes. Participants rate the communication, trust, and integrity, both among their peers and between them and their superiors.

Navy characteristics that may differ from civilian organizations:

- Squadron personnel are primarily young and transient, changing units every few years.
- Commanding Officers are in command for a short term. An individual Commanding Officer may only experience a workshop once or twice during his or her tenure with the unit, making it challenging to implement long-term changes.

Navy characteristics similar to civilian aviation organizations:

- There is a need to deliver under tight time pressure.
- High-risk hazards exist.

It is important to note that civilian and military organizations may implement different improvements following a culture workshop. However, these differences do not appear to have much effect on the actual workshop results, as this type of workshop has been found to be effective in identifying similar cultural problems in a variety of industries (Civarelli).

Much of the guidance provided to the facilitators is taken from the book *Facilitating with Ease!* by Ingrid Bens. The following page gives an example of one of the worksheets furnished to workshop facilitators. It is important to note that the facilitators come from an outside organization—the Naval Safety Center—not from the organization that is being assessed.

CULTURE WORKSHOP PARTICIPANT INPUT WORKSHEET

1. What did you learn through your participation in the process? _____

_____

_____

_____

2. What are the top three hazards to operational excellence/mishap prevention in your command? _____

_____

_____

_____

3. In regards to question number 2, what control measures would you recommend to your unit commander? _____

_____

_____

_____

4. What action(s) will you take as a result of your participation? _____

_____

_____

_____

5. What suggestions and ideas do you have for improving the culture of your unit? _____

_____

_____

_____

6. What recommendations do you have for improving today's Seminar? _____

_____

_____

_____

APPENDIX G: FAA SAFETY CULTURE ENHANCEMENT ACTIVITIES

This appendix describes several training and promotion exercises that the FAA's safety organization, the Office of Safety, has created and distributed throughout the ATO, with the objective of strengthening safety awareness and improving the culture in ATC facilities across the United States.

The Office of Safety produced and distributed two safety culture awareness DVDs to all 572 ATC facilities in the United States. They use the Challenger space shuttle disaster and the Überlingen midair collision to illustrate how poor safety culture has contributed to accidents. Using lessons learned from these catastrophes, the remainder of each video explores how every employee is responsible for safety and modeling positive safety culture attributes. These DVDs were used as briefing items for operational personnel.

The Office of Safety also developed posters displaying the "Lessons of Heinrich's Triangle." Using Heinrich's concept (24) and adapting it to the ATC environment, the posters illustrate how an accident is preceded by a large number of known and unknown unsafe acts. These posters are displayed near the operating quarters in each facility as a reminder that seemingly small variances from approved practices can culminate in accidents and incidents.

Terminal Services and the Office of Safety teamed to produce the Tower Best Practices Training videos known as "BASICs," a collaboration that illustrates structural cooperation within the ATO. This effort was initiated to reduce operational errors in the terminal environment by focusing on basic control principles and procedures. BASICs focuses on surface safety (i.e., reducing runway incursions) and consists of a four-DVD series highlighting "best practices" to eliminate some of the common errors. Over 500 Air Traffic Control Towers currently have and are using the DVDs.

In conjunction with periodic audits of normal operations at En Route and Oceanic Services facilities (Air Route Traffic Control Centers), the Office of Safety conducts safety awareness seminars with the middle management team. In these seminars, middle managers first receive a high-level briefing on SMS initiatives. Office of Safety personnel then facilitate a discussion with the managers to empower them and their employees to reduce hazards by minimizing unsafe acts and nonstandard behaviors.

As an interdisciplinary approach to surface safety, the Office of Safety leads Runway Safety Action Teams at airports across the country. With the mission of reducing hazards, runway incursions, and surface collisions, this recurrent workshop includes airport management, operators, pilots, flight standards personnel, and air traffic controllers. Using a systems model and taking advantage of the diverse skills and experiences within the aviation community, airports create innovative solutions to safety hazards. These solutions are accepted more readily because they are developed through consensus decision support. During these workshops, Office of Safety personnel routinely deliver briefings on "Runway 101: System Safety and Safety Culture" to participants. These briefings have helped to raise awareness of individual roles in promoting safety culture across the ATO and the aviation community.

APPENDIX H: REFERENCES

Adamshick, M.H. (2007). *Leadership and safety climate in high-risk military organizations.* (Doctoral dissertation, University of Maryland, College Park, 2007).

Baker, J.A., et al. (2007). The report of the BP U.S. refineries independent safety review panel. Retrieved from http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/SP/STAGING/local_assets/assets/pdfs/Baker_panel_report.pdf

Behavioral Science Technology, Inc. (2006a). *ATO leadership summit safety climate and culture survey: Report of results*. Ojai, California.

Behavioral Science Technology, Inc. (2006b). *Strategic considerations for safety excellence*. Ojai, California.

Behavioral Science Technology, Inc. (2008). *Organizational culture diagnostic instrument (OCDI) is predictive of injury rates*. Retrieved from http://www.bstsolutions.com/insights/research_injuries.shtml

Bens, I. (2005). *Facilitating With Ease!* San Francisco: Wiley.

Bowser, L., and Allen-Tallman, J. (2008). Crew resource management: Human factors in air traffic control.

Ciavarelli, A. (2008). Culture counts. Retrieved from http://www.flightsafety.org/asw/feb08/asw_feb08_p18-23.pdf

Ciavarelli, A. (2007). Safety climate and risk culture: How does your organization measure up? Retrieved from http://www.hfa oses.com/HFA_Research_Background.pdf

Commercial Aviation Safety Team. (2009). Retrieved from http://www.cast-safety.org.

Corcoran, W.R., et al. (1981). Nuclear power-plant safety functions. *Nuclear Safety*, 22, 179-191.

Eurocontrol/FAA Action Plan 15 Safety. (2008). Safety culture in air traffic management: A white paper.

Federal Aviation Administration. (2007). FAA air traffic organization (ATO) safety management system (SMS) implementation plan for fiscal years 2008-2010: Version 1.0.

Federal Aviation Administration. (2006a). Advisory Circular 00-58A. Voluntary disclosure reporting program.

Federal Aviation Administration. (2006b). Advisory Circular 120-54A. Advanced qualification program.

Federal Aviation Administration. (2006c). *Order 8000.90: AOV credentialing and control tower operator certification programs*.

Federal Aviation Administration. (2006d). *Order 1110.145: Certified design organization (CDO) aviation rulemaking committee*.

Federal Aviation Administration. (2004). Advisory Circular 120-82. Flight operational quality assurance.

Federal Aviation Administration. (2002). Advisory Circular 120-66B. Aviation safety action program.

Federal Aviation Administration. (1997). Advisory Circular 00-46D. Aviation safety reporting system.

Gordon, R., et al. (2006). Understanding safety culture in air traffic management. EEC Note No. 11/06. Brussels: Eurocontrol Experimental Center.

Health and Safety Laboratory, Human Factors Group. (2002). Safety culture: A review of the literature. Sheffield, England: Crown.

Heinrich, H.W. (1950). *Industrial Accident Prevention*. New York: McGraw-Hill.

International Atomic Energy Agency. (2005). Assessment of defense in depth for nuclear power plants. Safety Reports Series No. 46.

International Civil Aviation Organization. (2002). Doc. 9803. Line operations safety audit (LOSA)."

Naval Safety Center. (2008a). Culture workshops. Retrieved from http://www.safetycenter.navy.mil/culture

Naval Safety Center. (2008b). Safety climate assessment surveys. Retrieved from http://safetyclimatesurveys.org

Naval Safety Center. (2008c). Safety climate assessment surveys brief. Retrieved from http://www.safetycenter.navy.mil/culture/downloads/Safety_Climate_Assessment_Surveys_Brief_for_CW_5-01-07.ppt

Naval Safety Center. (2008d). Strategic plan 2007-2008. Retrieved from http://www.safetycenter.navy.mil/staffdirectory/NSC_StratPlan06FINAL_1-16-07.doc

Joint Planning and Development Office. (2008). Safety management system standard: Version 1.4. Retrieved from http://www.jpdo.gov/library/InformationPapers/JPDO_SMS_SPC_v1_4.pdf>

Joint Planning and Development Office. (2004). Next generation air transportation system integrated plan: Version 1. Retrieved from http://www.jpdo.gov/library/NGATS_v1_1204r.pdf

Keil Center. (2008). Safety culture maturity model. Retrieved from http://www.keilcentre.co.uk/html/human_factors/safety_culture%20maturity%20model.htm

Patankar, M.S., et al. (2005). *A Comparative Review of Safety Cultures*. St. Louis: Saint Louis University Press.

Reason, J. (1997). *Managing the Risks of Organizational Accidents.* Aldershot, England: Ashgate.

Ruitenberg, B. (2008). The ICAO NOSS manual. Retrieved from http://www.icao.int/anb/humanfactors/noss2/ICAO_3%20.ppt

Schein, E. *Organizational Culture and Leadership*. San Francisco: Wiley, 2004.

Skyguide. (2008). Information regarding the air accident at Überlingen on July 1, 2002. Retrieved from http://www.skyguide.ch/en/Dossiers/DossierUeberlingen/

Transport Canada. (2008). Score your safety culture. Retrieved from http://www.tc.gc.ca/CivilAviation/systemSafety/Brochures/Tp13844/menu.htm

University of Texas, Human Factors Research Project. (2008). Line operations safety audit. Retrieved from http://homepage.psy.utexas.edu/HomePage/Group/HelmreichLAB/Aviation/LOSA/LOSA.html

Wiegmann, D., et al. (2002). Safety culture: A review. Technical Report ARL-02-3/FAA-02-2. Savoy, Illinois: University of Illinois at Urbana-Champaign Press.

Zhang, H., et al. (2002). Safety culture: A concept in chaos? Proceedings of the 46th Annual Meeting of the Human Factors and Ergonomics Society. Santa Monica, California: Human Factors and Ergonomics Society.

APPENDIX I: ACRONYMS

AQP	Advanced Qualification Program
ASAP	Aviation Safety Action Program
ASRS	Aviation Safety Reporting System
ATC	Air Traffic Control
ATO	Air Traffic Organization
ATSAP	Air Traffic Safety Action Program
CANSO	Civil Air Navigation Services Organization
CFR	Code of Federal Regulations
CRM	Crew Resource Management
FAA	Federal Aviation Administration
FOQA	Flight Operational Quality Assurance
I&O	Implementation and Operations
ICAO	International Civil Aviation Organization
JPDO	Joint Planning and Development Office
LOSA	Line Operations Safety Audit
MCAS	Maintenance Climate Assessment Survey
NextGen	Next Generation Air Transportation System
NOSS	Normal Operations Safety Survey
OCDI	Organizational Culture Diagnostic Instrument
OSA	Organizational Safety Assessment
SMS	Safety Management System
SOP	Standard Operating Procedure
TEM	Threat and Error Management
VDRP	Voluntary Disclosure Reporting Program
WG	Working Group

Safety Culture Improvement Resource Guide

Document Revision History

VERSION	DATE	DESCRIPTION
ATOS-JPDSC-PL01-D	October 2, 2007	Draft transmitted to SMS Standing Committee; revisions provided; more guidance material added and terminology better defined
ATOS-JPDSC-PL01-02-D	November 5, 2007	Transmitted to SMS Standing Committee and Safety Working Group; revisions provided; more guidance material added
ATOS-JPDSC-PL01-03-D	December 20, 2007	Transmitted to SMS Standing Committee and Safety Working Group; revisions provided; more guidance material added
ATOS-JPDSC-PL01-04-D	February 28, 2008	Transmitted to JPDO Working Groups and Divisions for final technical edit; references reviewed and corrected, bibliography removed and recommendations incorporated
ATOS-JPDSC-PL01-05-D	March 1, 2008	Document title changed
ATOS-JPDSC-PL01-06-D	April 14, 2008	Formatting changes provided
ATOS-JPDSC-PL01-07-D	May 5, 2008	Formatting changes reviewed and incorporated
Safety_JPDO_SC1G_v1.0.pdf	July 30, 2008	Revised abstract and changed title, published on JPDO Web site
SCIRG_v1.1	July 27, 2009	Incorporates suggestions from Standing Committee members
SCIRG_v1.2	July 29, 2009	Additional review by Standing Committee lead and support; ready for Tech Edit
SCIRG_v1.3	July 31, 2009	Tech Edit
SCIRG_v1.4	July 31, 2009	Tech Edit changes incorporated, ready for Safety Working Group review
SCIRG_v1.5	September 15, 2009	Incorporates some comments from Safety Working Group review

VERSION	DATE	DESCRIPTION
SCIRG_v1.6	January 12, 2010	Removed "Draft" from title of document, updated appendix H, and posted on the JPDO website