



U.S. Department
of Transportation

SAFETY COUNCIL



SAFETY CULTURE

A Significant Driver
Affecting Safety in
Transportation





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The U.S. Department of Transportation Safety Council has identified safety culture as a top priority across the Department. Safety Culture is defined as the shared values, actions, and behaviors that demonstrate a commitment to safety over competing goals and demands.

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SAFETY CULTURE

EXECUTIVE SUMMARY

An organization's safety culture can have a profound impact on safety outcomes. Research and experience show that when safety culture is strong, accidents are less frequent and less severe, and when safety culture is weak, catastrophic accidents can and do occur. As a result, understanding how to build and maintain strong safety cultures should be a top priority across the entire transportation industry. The purposes of this research paper are threefold: 1) to describe the current state of knowledge about safety culture, 2) to identify the most important indicators of a strong safety culture, and 3) to highlight opportunities for developing US DOT's strategy for improving safety culture in transportation.

Many of the critical elements of safety culture not only are applicable to ensuring safe operations, but also reflect basic good business practices. Strong and consistent leadership, open communication, trust, and fair decision making are just some of the factors that foster both strong safety cultures and strong organizational cultures in general. However, the key indicator of a robust safety culture is that ***safety is the priority***. Leaders' attitudes, organizational policies and decision making, and employees' behaviors should consistently demonstrate that safety is prioritized above all other considerations.

The following are the most critical elements of a strong safety culture:

1. Leadership is Clearly Committed to Safety;
2. There is Open and Effective Communication Across the Organization;
3. Employees Feel Personally Responsible for Safety;
4. The Organization Practices Continuous Learning;
5. There is a Safety Conscious Work Environment;
6. Reporting Systems are Clearly Defined and Non-Punitive;
7. Decisions Demonstrate that Safety is Prioritized Over Competing Demands;
8. Mutual Trust is Fostered between Employees and the Organization;
9. The Organization is Fair and Consistent in Responding to Safety Concerns; and
10. Training and Resources are Available to Support Safety.

One of the most important components of safety culture is leadership. As a primary leader, the US Department of Transportation can make a significant difference in improving the safety culture of the transportation industry. For example, by starting internally, US DOT leaders can ensure that employees fully commit themselves to making safety their highest priority and be dedicated to safety in all aspects of their work. Fostering a strong safety culture within US DOT is a first step in asking the same of those that it oversees, collaborates with, and regulates in the transportation industry.

BACKGROUND

Since the nuclear accident at Chernobyl in 1986, safety culture has emerged as a significant factor in many catastrophic accidents. A weak safety culture was highlighted more recently in BP's Texas City refinery explosion in 2005, and the Washington, DC Metro Red Line collision in 2009. Over time, it has become clear that an organization's culture has a strong impact on safety outcomes because it shapes safety attitudes, values, and behaviors.

Safety culture can be a nebulous concept, particularly because it may be defined in different terms depending on whether it is used in the context of a Federal or state agency, a transportation company, or the general public. Each type of "organization" is responsible for safety in different ways. Many Federal agencies are beginning to recognize that they have their own special cases of safety culture, and that understanding their own internal safety culture can be useful for improving safety programs.

Although there may be slight variations in the meaning of safety culture across different industries and in different kinds of organizations, there is value in establishing a shared understanding that can apply across many contexts. This research paper presents a general definition of safety culture and a core set of safety culture indicators, based on a synthesis of documented research across safety-critical industries within and outside of the transportation sector. By developing a common understanding of the elements that comprise a strong safety culture, DOT can have a better basis for improving its safety programs, policies, and strategies in the future.

SAFETY CULTURE DEFINED

Although there are many definitions of safety culture across different industries, the concept is generally defined in terms of shared values, actions, and behaviors that demonstrate a commitment to safety by the individual and collective responsibility of everyone at all levels of an organization. Safety culture is determined by how people feel, what people do, and the policies and procedures that an organization has when it comes to safety (Cooper, 2000). The extent to which attitudes, behaviors, and policies align to prioritize safety over competing goals indicates the strength of an



Figure 1: Three-Part Model of Safety Culture (adapted from Cooper, 2000)

organization's safety culture. The US DOT Safety Council has developed the following definition of safety culture intended to support development of a broader departmental policy on safety culture:

The shared values, actions, and behaviors that demonstrate a commitment to safety over competing goals and demands.

This was developed after extensive review of definitions used in a wide range of industries and organizations over the past two decades (listed in Appendix I) and discussion among Safety Council members.

CRITICAL ELEMENTS OF SAFETY CULTURE

The following elements of safety culture were derived from a review of publications representing a cross-section of industries, including aviation, nuclear power, healthcare, maritime, rail, pipeline, construction, oil and gas, and mining.¹ As expected, there were many variations in models of safety culture, both within and between industries. However, there were also commonalities across models, particularly in more recent publications where investigators used adaptations of the safety culture model developed by James Reason in *Managing the Risks of Organizational Accidents* (1997), and the safety culture factors identified in a 1993 report from the United Kingdom's Health and Safety Commission on the safety of nuclear power operations.

The safety culture elements from each industry publication were compiled into a master list. A subject matter expert reviewed the master list and sorted all of the elements into categories by theme. Each category was labeled and assigned a value of "importance" based on the number of elements that fell into that category. For instance, elements like *safety leadership*, *management commitment*, *high-level safety commitment*, and *management involvement* were sorted into the leadership category, and elements like *learning culture*, *organizational learning*, *questioning attitude*, and *continuous improvement* were categorized together. A total of ten thematic categories emerged from this process, with each category represented by at least two different industry models of safety culture. These categories, presented below, represent the most critical elements of safety culture.

¹ A full list of the publications used can be found in [Safety Culture and Climate Bibliography](http://spsites.volpe.dot.gov/RVT-1/rvt80/SafetyCouncil/SafetyCultureTeam/Shared%20Documents/Safety%20Culture%20and%20Climate%20Bibliography.docx), US Department of Transportation. <http://spsites.volpe.dot.gov/RVT-1/rvt80/SafetyCouncil/SafetyCultureTeam/Shared%20Documents/Safety%20Culture%20and%20Climate%20Bibliography.docx>

1. Leadership is Clearly Committed to Safety

The importance of leadership in fostering a strong safety culture was clearly indicated by the fact that almost all of the safety culture models explicitly included some mention of leadership commitment to safety. Leaders across all layers of an organization must model safety-first attitudes and behaviors. Employees learn what the accepted practices are in an organization by following the examples set by their leaders.

2. The Organization Practices Continuous Learning

Maintaining a strong safety culture necessitates a learning environment where opportunities to improve safety are continuously sought out and implemented. Organizations must be open to learning from accidents when they do happen and willing to make changes to prevent incidents in the future.

3. Decisions Demonstrate that Safety is Prioritized Over Competing Demands

One of the most unique elements of an organization with a strong safety culture is that their decision-making processes clearly demonstrate that safety is prioritized over competing demands. Organizations with a strong safety culture will consistently choose safety over performance when faced with the choice of cutting corners to increase performance.

4. Reporting Systems and Accountability are Clearly Defined

Organizations must ensure that reporting systems and lines of accountability are in place so that safety issues can be promptly identified, fully evaluated, and promptly addressed and corrected commensurate with their significance.

5. There is a Safety Conscious Work Environment

Maintaining a strong safety culture also requires constant vigilance and an elevated awareness of the importance of safety. Employees should be encouraged to raise safety concerns and provided opportunities to raise concerns through reporting systems and procedures.

6. Employees Feel Personally Responsible for Safety

Employees who feel personally responsible for safety take more ownership in following safety procedures and are also more likely to speak up when they see other employees behaving in an unsafe manner. Personal responsibility empowers employees and helps the entire organization identify and correct risks proactively.

7. There is Open and Effective Communication Across the Organization

Employees must feel comfortable communicating to their supervisors about safety issues and communicating with their peers when they see unsafe behaviors. If the organization is not communicating the importance of safety and encouraging their employees to speak up about safety, then safety risks are more likely to develop and less likely to be addressed before an accident occurs.

8. Mutual Trust is Fostered between Employees and the Organization

One of the cornerstones of any positive organizational culture is trust. Trust among managers, labor representatives, government regulators and inspectors can go a long way to support

safety by facilitating open and honest communication and minimizing fears of reprisal. Employees who have developed a relationship of trust with their supervisors may feel more willing to raise safety concerns in novel situations when they are unsure of how the organization might respond.

9. The Organization is Fair and Consistent in Responding to Safety Concerns

Above and beyond having effective reporting procedures and processes in place, the organization must respond to safety concerns in a manner that employees perceive as fair, just, and consistent. Employees should feel free to raise safety concerns without fear of retaliation.

10. Training and Resources are Available to Support Safety

Those who manage and operate the system must have current knowledge about the human, technical, organizational, and environmental factors that determine the safety of the system as a whole, and have the tools and equipment available to perform their job duties in the safest manner possible. In addition, the organization must ensure that the personnel, procedures, and other resources needed to ensure safety are available. Understaffing safety-critical positions or not having formal, written procedures for ensuring safety can be just as detrimental as a lack of physical equipment.

USDOT SAFETY CULTURE STRATEGY

BACKGROUND

In 2008, a DOT Safety Review was conducted in three surface transportation modes (FRA, PHMSA, and FMCSA) to identify weaknesses and vulnerabilities in three broad areas: risk management strategies and approaches, agency safety culture, and internal control systems. As a result of this initiative, safety culture became one of the founding principles of the US DOT Safety Council when it was established in October 2009. All ten operating administrations unanimously agreed that safety culture should be the Safety Council's top priority for action.

US DOT's senior safety leaders selected representatives from each operating administration to serve on the Safety Culture Action Team based on safety culture expertise and experience with safety programs. The Action Team subsequently developed a strategy to improve safety culture, not only within DOT but also in those entities and organizations with which it works directly and the general public. The sections below summarize that strategy.

Problem Statement:

Since the nuclear accident at Chernobyl in 1986, safety culture has emerged as an important factor in many catastrophic accidents. A weak safety culture was highlighted more recently in BP's Texas City refinery explosion in 2005, and the Washington, DC Metro Red Line collision in 2009. Over time, it has become clear that an organization's culture has a strong impact on safety outcomes because it shapes safety attitudes, values, and behaviors. However, *there is no common definition of safety culture, nor a common set of attributes that would describe the safety culture in any organization.*

In light of this problem statement, it is clear that US DOT needs a better understanding of how safety culture affects safety outcomes in the organizations it regulates, among state and local government partners and grantees, and across the general public. Specifically, it is essential to know how US DOT's *actions* influence safety culture in these domains (both positively and negatively), and how the *organizational culture* within US DOT shapes these actions/approaches or otherwise influences these groups. By developing a common understanding of the elements that comprise a strong safety culture, US DOT can have a better basis for improving its safety programs, policies, and strategies, and the outcomes and impacts these have.

STATEMENT OF PURPOSE

The primary purpose of this initiative is to develop strategies for improving US DOT's safety programs and interventions, including development of an internal organizational culture that will support strategies for how US DOT can influence safety culture in organizations with which it works directly and the general public.

CORE EVALUATION QUESTIONS

Evaluation is about asking and answering questions that matter—about programs, processes, products, policies, initiatives, and lessons learned. The core evaluation questions below (and some of the exploratory questions that might help answer them) were developed with input from cross-modal safety professionals within US DOT. They are intended to guide the strategic direction of the safety culture initiative.

1. What is the current understanding of safety culture and its influences on safety outcomes?
2. How can US DOT's safety culture be defined and measured?
3. How can we develop and implement our programs aimed at improving safety culture in US DOT?
4. How do US DOT's actions and organizational culture affect the safety culture of industry, organizations US DOT oversees, state and local government partners, and the general public?

PHASE 1 WORK PLAN: ACTION PLANNING

Phase I tasks were devised to answer the core evaluation questions presented above. This research paper constitutes the product of task 2 below.

1. Develop DOT Safety Culture Conceptual Frameworks

To better understand safety culture as it relates to transportation, we must first develop conceptual frameworks for how US DOT influences safety outcomes through its actions,

safety programs, and safety culture. This task will begin with the identification of different missions and functions within each of US DOT's agencies in order to understand differences and similarities among agencies (e.g., regulatory versus non-regulatory agencies, interactions with state and local governments versus companies or the general public).

2. Synthesize Safety Culture Research Literature

This activity will leverage information from other reviews conducted within and outside of US DOT to provide the Safety Culture Action Team with a concise synthesis of research on safety culture, definitions of safety culture and related terms, the elements of a positive safety culture, and how safety culture relates to safety outcomes.

3. Identify Safety Culture Metrics

One of the goals of the current initiative is to develop and/or adapt measures of safety culture for use by US DOT. This task will directly contribute to the internal implementation plan, providing the Action Team with a list of potential measures that have been used as indicators of safety culture and with recommendations regarding the relevance of each measure for possible use within federal agencies. The overall purpose of this effort is to develop a validated toolbox of measures that can be used to assess the safety culture internal to US DOT and guide program improvements.

4. Review & Conduct Case Studies of Safety Culture Best Practices

In concert with the review of safety culture research, a review of best practices and challenges in transforming safety culture will be performed. Where possible, case studies will be conducted that support each of the conceptual frameworks from Task 1 to document best practice information not readily available from other sources.

5. Develop DOT's Internal Safety Culture Strategic Roadmap & Implementation Plan

The Internal Roadmap and Implementation Plan will complement and support modal agencies' and US DOT's strategic plans. This Plan will also provide direction on the development and implementation of a safety culture survey within US DOT.

6. Develop External Safety Culture Strategic Roadmap & Implementation Plan

Concurrently, the Safety Culture Action Team will lead the development of an external strategic roadmap and implementation and evaluation plan. The plan will identify short-term, mid-term, and long-term changes that could be made to US DOT programs and policies to encourage the development of positive safety cultures in regulated industries, among State and local government partners and grantees, and potentially across the general public.

PHASE 2 WORK PLAN: IMPLEMENTATION AND EVALUATION

Phase 2 will involve two concurrent, but relatively independent projects, each stemming from the corresponding internal and external implementation plans developed during Phase 1.

1. Internal Implementation and Evaluation

The purpose of this task will be to execute and evaluate the strategies described in the Internal Roadmap and Implementation Plan. One of the primary activities anticipated during this phase will be the development of a safety culture survey for use as a diagnostic tool within DOT.

2. External Implementation and Evaluation

The purpose of this task will be to execute and evaluate the strategies described in the External Roadmap and Implementation Plan. The focus will be on short-term, mid-term, and long-term changes that can be made to DOT's safety programs and policies to encourage positive safety cultures in the industries, organizations, state and local governments, and the public DOT oversees and influences.

CONCLUSIONS

At the end of the day, safety culture is about prioritizing safety through attitudes and actions at all levels of an organization. Employees should feel that safety is a personal responsibility, and be willing to communicate concerns to the organization through clearly defined reporting systems and processes without fear of retaliation or reprisal. The most-often cited element needed to foster a safety culture is strong leadership. Leaders need to demonstrate their commitment to safety for their organizations.

Most of the literature on safety culture focuses directly on the companies or organizations that have direct influence on safety outcomes, such as process safety (vs. personal or occupational safety) where there is a potential for catastrophic consequences. However, safety culture is not limited to such front-line organizations. Safety culture can be important for any organized group where safety is a concern. The primary mission of DOT's Safety Council is to ensure a *safe* transportation system for the American people today and in the future. The Department of Transportation can act as a leader in the industry by taking steps to improve its own safety culture internally, and by the actions it takes to influence safety culture externally. Every DOT employee should be dedicated to safety in all aspects of their work, and DOT leadership should ensure that employees can fully commit themselves to making transportation safety their highest priority.

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APPENDIX I

DEFINING SAFETY CULTURE

Safety culture is defined in a variety of ways within the academic research literature and across different industries in the United States and internationally. The following is a snapshot of the definitions of safety culture that have emerged over the past 25 years, since the term's first use following the investigation of the Chernobyl disaster in 1986, beginning with a DRAFT definition of safety culture for the U.S. DOT Safety Council.

U.S. Department of Transportation (2011), DRAFT definition:

The shared values, actions, and norms that demonstrate a commitment to safety over competing goals and demands.

Nuclear Regulatory Commission (2011) Policy statement for US nuclear industry:

The core values and behaviors resulting from a collective commitment by leaders and individuals to emphasize safety over competing goals to ensure protection of people and the environment.

International Maritime Organization (2008), Policy statement for maritime industry:

An organization with a "safety culture" is one that gives appropriate priority to safety and realizes that safety has to be managed like other areas of the business.

Richter and Koch (2004), Theoretical definition:

Shared and learned meanings, experiences and interpretations of work and safety - expressed partially symbolically - which guide people's actions towards risk, accidents and prevention.

Mohamed (2003), Construction industry:

A sub-facet of organizational culture, which affects workers' attitudes and behavior in relation to an organization's on-going safety performance.

Weigmann (2002), Theoretical definition based on synthesis of literature:

Safety culture is the enduring value and priority placed on worker and public safety by everyone in every group at every level of an organization. It refers to the extent to which individuals and groups will commit to personal responsibility for safety, act to preserve, enhance and communicate safety concerns, strive to actively learn, adapt and modify (both individual and organizational) behavior based on lessons learned from mistakes, and be rewarded in a manner consistent with these values.

Pidgeon (2001), Theoretical in context of driver behavior:

The set of assumptions, and their associated practices, which permit beliefs about danger and safety to be constructed.

Cooper (2000), Theoretical definition:

Safety culture is that observable degree of effort by which all organizational members directs their attention and actions toward improving safety on a daily basis.

Guldenmund (2000), Theoretical definition:

Those aspects of the organizational culture which will impact on attitudes and behavior related to increasing or decreasing risk.

Hale (2000), Theoretical definition:

The attitudes, beliefs and perceptions shared by natural groups as defining norms and values, which determine how they act and react in relation to risks and risk control systems.

Minerals Council of Australia (1999), AU mineral industry:

Safety culture refers to the formal safety issues in the company, dealing with perceptions of management, supervision, management systems and perceptions of the organization.

Eiff (1999), US aviation industry:

A safety culture exists within an organization where each individual employee, regardless of their position, assumes active role in error prevention and that role is supported by the organization.

Cox & Flin (1998), Theoretical definition:

The product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization's health and safety management.

Also used by Lee (1998), Wilpert (2000)

Mearns, Flin, Gordon, & Fleming (1998), UK offshore oil and gas industry:

The attitudes, values, norms and beliefs which a particular group of people share with respect to risk and safety

Helmreich & Merritt (1998), US aviation industry:

A group of individuals guided in their behavior by their joint belief in the importance of safety, and their shared understanding that every member willingly upholds the group's safety norms and will support other members to the common end.

Flin, Mearns, Gordon, & Fleming (1998), UK offshore oil and gas industry:

Safety culture refers to entrenched attitudes and opinions which a group of people share with respect to safety. It is more stable [than safety climate] and resistant to change.

Carroll (1998), US nuclear power industry:

Safety culture refers to a high value (priority) placed on worker safety and public (nuclear) safety by everyone in every group and at every level of the plant. It also refers to expectations that people will act to preserve and enhance safety, take personal responsibility for safety, and be rewarded consistent with these values.

Meshkati (1997), US nuclear power industry:

The assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance.

Ciavarelli & Figlock (1996), US naval aviation industry:

The shared values, beliefs, assumptions, and norms which may govern organizational decision making, as well as individual and group attitudes about safety.

Health and Safety Commission (1993), Nuclear power industry:

The product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organisation's health and safety management.

Cox & Cox (1991), European industrial gas industry:

Attitudes, beliefs, perceptions, and values that employees share in relation to safety.

Pidgeon (1991), Theoretical definition:

The set of beliefs, norms, attitudes, roles, and social and technical practices that are concerned with minimizing the exposure of employees, managers, customers, and members of the public to conditions considered dangerous or injurious.

Also used by McDonald & Ryan (1992), Mearns & Flin (1999), Pidgeon & O'Leary (1994)