SPECIAL ADVISORY REPORT

Organizational Safety Culture

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SUMMARY

Special Advisory Reports (SAR) provide information based on a limited review or time-critical assessment, investigation or evaluation as requested by City management. While not in full compliance with audit standards, SARs are non-audit services that further the accountability of the City by providing a reporting vehicle that is flexible, timely, and focused on a singular issue.

KEY ISSUE

The purpose of this non-audit service is to provide an objective analysis of effective approaches to improve the City's organizational safety culture. The information provided in this review was developed during a performance audit of the Department of Aviation's safety culture.

BACKGROUND

Safety culture can be a difficult concept to define. There is a considerable debate among researchers and subject matter experts in the field of safety on the definition of *safety culture* versus *safety climate* and how these concepts are related. However, *safety culture* generally concerns more fundamental aspects of how an organization addresses the issue of safety in daily operations, while *safety climate* typically relates to behaviors and attitudes toward safety. This report uses the term *safety culture* to emphasize the importance of a holistic approach to safety, and defines safety culture as "those aspects of the organizational culture which will impact on attitudes and behavior related to increasing or decreasing risk."[1]

METHODOLOGY

Auditors reviewed literature on *safety culture*, including relevant journal articles, research papers, government information, and credible websites (See Bibliography, p. 8). Auditors also discussed *safety culture* development with experienced subject matter experts, who are researchers and educators in the area of health and safety.

CONCLUSION

Auditor research illuminated two critically important elements for establishing an effective *safety culture*. First, it is vital that senior management embrace and make a long-term commitment to safety. Second, employees are an important source of safety information, and their participation in developing safety ideas and maintaining the safety culture is crucial. In addition, research revealed insights into the importance of training, the best ways to develop leading indicators of safety performance, and how the organizational structure should reflect a commitment to safety.

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[1] Guldenmund, F.W. 2000. The nature of safety culture: a review of theory and research. *Safety Science*, 34(1-3), 215-257, 251.

A Poor Safety Culture Can Have Catastrophic Consequences

Three high profile accidents in the past seven years illustrate the importance of establishing an effective organizational safety culture.[2] As these tragedies attest, management is critical to developing an effective culture. When management fails to develop safety culture, the results can include significant property loss and the irreplaceable loss of life.

> *Nationally, poor safety culture has contributed to three noteworthy accidents killing 31 people in the years 2003 to 2009*

2009 Washington, D.C. Metro collision – On June 22, 2009, Washington (D.C.) Metropolitan Area Transit Authority (WMATA) Metrorail Train 112 struck the rear of a Metrorail train that had stopped on the track. The accident cost the lives of the train's operator and eight passengers, and a total of fifty-two people were transported to hospitals due to injuries suffered in the crash.

The National Transportation Safety Board (NTSB) conducted an investigation into the accident, and determined that among the causes of the accident were WMATA's poor safety culture and the failure of an automatic train control system. The NTSB chairman characterized the WMATA safety culture as *anemic* at a public hearing regarding the crash.[3] The poor safety culture was exemplified in part by WMATA Metrorail managers' failure to address problems with the train control system.

Consequently, the NTSB report concluded that management's failure to appropriately prioritize safe operations "likely influenced the inadequate response to such malfunctions by automatic train control technicians, operations control center controllers, and train operators."[4]

2005 BP refinery explosion—On March 23, 2005, explosions and fires at the BP refinery in Texas City, Texas, the third-largest oil refinery in the U.S., killed fifteen people and injured another 180.

The U.S. Chemical Safety Board (CSB) investigated the causes of the accident, and identified systemic organizational causes in addition to the specific technical causes. Among these organizational causes were significant management failures, including the failure of BP executive management to "implement adequate safety oversight, provide needed human and economic resources, or consistently model adherence to safety rules and procedures."[5] Further, BP executive management and refinery management did not create a positive learning and reporting culture, which emphasizes the importance of reporting safety threats and effectively investigating accidents.[6]

2003 Columbia breaks up—On February 1, 2003, the Space Shuttle *Columbia* broke up upon re-entry into the Earth's atmosphere, killing Columbia's seven-member crew. In response to the accident, more than 25,000 individuals worked to recover debris from the accident, which was strewn across several Western states. Two

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[2] An effective safety culture is one that mitigates or overcomes risks to safety and wellness.
[3] National Transportation Safety Board. July 27, 2010. Chairman's Opening Remarks for Accident Report - Collision of Two Washington Metropolitan Area Transit Authority Metrorail Trains Near Fort Totten Station, Washington, D.C, June 22, 2009. http://www.ntsb.gov/events/2010/Washington-DC-Metro/opening-statement.htm.

[4] National Transportation Safety Board. July 27, 2010. Synopsis for Accident Report - Collision of Two Washington Metropolitan Area Transit Authority Metrorail Trains Near Fort Totten Station, Washington, D.C, June 22, 2009. Conclusion No. 27. http://www.ntsb.gov/Publictn/2010/RAR1002.htm.
[5] U.S. Chemical Safety Board. *Investigation report: Refinery explosion and fire (15 Killed, 180 Injured).* (Washington, D.C.: U.S. Chemical Safety Board, 2007), 179. http://www.csb.gov/assets/document/CSBFinalReportBP.pdf
[6] *Ibid.*

of these individuals perished in a helicopter crash while searching for debris.

In response to the Space Shuttle disaster, the Columbia Accident Investigation Board (CAIB) was convened to ascertain direct and indirect causes. CAIB reported that while the physical cause of the disaster was a breach in Columbia's Thermal Protection System, there were important organizational causes as well. Specifically, the Board reported that "[c]ultural traits and organizational practices detrimental to safety were allowed to develop."[7] These included: "organizational barriers that prevented effective communication of critical safety information and stifled professional differences of opinion; lack of integrated management across program elements; and the evolution of an informal chain of command and decision-making processes that operated outside the organization's rules."[8]

Each of these failures is directly linked to poor management safety practices. Management should be enhancing communication regarding safety, ensuring that project management is appropriately integrated, and that organizational rules are followed. Management has to ensure that it clearly prioritizes safety, and works to prevent informal processes that circumvent safe operations.

Senior Management Commitment Is the Cornerstone of an Effective Safety Culture

As suggested by these three incident profiles, auditors' research into elements of an effective safety culture yielded a clear message that without sincere, long-term commitment from senior management there will be no effective safety culture. All four subject matter experts that auditors interviewed and a significant majority of

safety literature reviewed stressed that management commitment is an indispensible aspect of developing a safety culture.

Senior management commitment can be expressed in myriad forms. First, commitment must begin with the highest authority in an organization. The correct *tone at the top* is critical, and an effective safety culture requires an organizational philosophy oriented toward a high standard of safety performance. When the organization's senior manager articulates and emphasizes the importance of safety, it ensures that there is no ambiguity about the organization's values. Emphasizing safety can be done in a variety of ways, such as in periodic messages to employees or a safety newsletter. Management could also communicate how it values safety by rewarding employees who make substantive contributions to the organization's safety culture, such as ideas for how to improve the safety of a hazardous process.

> *Without strong senior management commitment an organization will not have an effective safety culture*

Further, the senior manager can make sure that safety programs receive adequate resources. The NTSB report on the collision of the Metrorail trains concluded that "the position of chief safety officer lacked the necessary resources and authority within the organizational structure of WMATA to adequately identify and address system safety issues."[9] If the safety program's resources are inadequate to implement management rhetoric, the emphasis on

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[7] Columbia Accident Investigation Board, *Report, Vol. 1.* (Washington, D.C.:GPO, 2003), 9. http://caib.nasa.gov/news/report/volume1/default.html.
[8] *Ibid.*

[9] National Transportation Safety Board. July 27, 2010. Synopsis for Accident Report - Collision of Two Washington Metropolitan Area Transit Authority Metrorail Trains Near Fort Totten Station, Washington, D.C, June 22, 2009. Conclusion No. 33.
http://www.ntsb.gov/Publictn/2010/RAR1002.htm.

safety may be viewed as merely a token effort. A failure to *walk the walk* will quickly undermine management effort to improve safety culture.

Another way that senior management demonstrates its commitment is by explicitly incorporating safety into organizational strategy. The safety program should be fully integrated into the overall organization, rather than being a mere add-on. Specifically, safety should be represented in items including the strategic plan, performance objectives, and performance evaluations.

Management commitment is also expressed by ensuring that safety concerns do not have a lower priority than productivity. The tension between safety and productivity is a classic management dilemma, especially

> *When productivity pressures reduce safety efforts dire consequences can ensue*

when a marginal decline in productivity makes a difference in profitability. The CSB investigation into the Texas City refinery explosion revealed that production pressures from BP Executive Group management led to impaired safety processes. The finding of production pressures was cited among the organizational causes of the refinery explosion and fire.[10] Among the factors driving BP management's focus on productivity were performance contracts, which impacted managers' compensation and weighted financial outcomes and cost reduction more heavily than safety.[11]

Finally, management's efforts must be continuous. Creating a positive and effective safety culture requires a long-term

commitment; in some organizations it may take four or five years before positive safety outcomes are realized. Since developing an effective safety culture over the long-term can seem like a monumental task, one subject matter expert stressed that an incremental approach could be helpful. Consequently, when looking to develop safety culture, management should identify areas where timely, clear safety improvements can be made. These quick wins help to build credibility and momentum for the safety program, thus leading to larger safety culture initiatives.

Collaboration between Management and Employees Can Ensure Organizational Buy-In

While management commitment is the most critical element of an effective safety culture, management must also gain buy-in from employees to develop an effective safety culture. Without buy-in from the whole organization, safety initiatives will fail. Research indicates that one of the best ways of establishing employee buy-in is to ensure that employees are involved in safety culture development and safety solutions. All four of the subject matter experts and a majority of safety literature reviewed stressed the importance of collaboration between senior management and employees.

An essential element of collaboration is effective communication. Management is accustomed to communicating with employees, but it

> *Effective communication between employees and management can reveal safety risks before accidents happen*

must continually assess the effectiveness of communications. Joint safety committees can be a good tool to test and refine this communication. One article found that the presence of a joint safety and health

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[10] U.S. Chemical Safety Board. *Investigation report: Refinery explosion and fire.* (Washington, D.C.: U.S. Chemical Safety Board, 2007), 25.
http://www.csb.gov/assets/document/CSBFinalReportBP.pdf
[11] *Ibid*, at 153.

committee was linked to lower injury rates in multiple studies.[12] However, a subject matter expert cautioned that the management representative(s) on the committee should have authority to make decisions. This helps turn employee feedback into concrete action. Further, if management representatives serve on the committee, and help make the employee comfortable to speak openly, management can use the discussion to gauge how effective its communication regarding safety values and initiatives has been.

Further, management must find ways to solicit employee feedback regarding safety issues. Employee feedback is important; often employees are on the leading edge of threats to safety and can report these threats before safety accidents occur. Failure to proactively solicit, listen to and act upon employee feedback can lead to disaster. For example, the CAIB determined that shuttle program management resisted employee efforts to take images of the still-orbiting Columbia to determine whether threats to the Thermal Protection System were critical, instead preferring to wait for the post-flight analysis.[13]

To enhance its ability to communicate effectively, management should identify and obtain an understanding of the mini-cultures within the organization. Different cultures may exist within an organization according to factors such as type of work performed, ethnicity and other aspects. These different cultures may have different social mores, and require different communication and collaborative approaches. For example, one subject matter expert identified a work group whose most respected member and informal leader was the most tenured worker, regardless of the worker's position

within the hierarchy. To address this dynamic, management might consider whether it would be helpful to have a third party expert facilitate communication between management and different cultural units within the organization.

Effective collaboration and communication cannot occur if management and employees perceive one another as having divergent interests regarding safety. Consequently, management should avoid creating an environment

> *A punitive culture creates distrust among employees and stifles safety risk reporting*

that focuses on punishing poor safety practices at the employee level. A punitive approach for ensuring safety will sabotage safety culture and create distrust of management among employees. According to one subject matter expert, punitive approaches may end bad safety behavior briefly, but will not have a long-term positive impact. Further, focusing on operator error leads to a false sense of security because management attributes the safety issue to an individual rather than exploring possible systemic causes for the issue.

Punitive approaches inhibit employees from fully reporting safety problems, including near-misses. Impediments to employee reporting reduces management access to leading indicators of safety threats, and makes critical assessment and learning more difficult. In the absence of leading indicators of safety problems, management must rely on lagging indicators, such as accident rates. This reliance prevents management from addressing safety risks in a timely manner. The CSB report on the Texas City refinery explosion and fire notes that BP's "punitive culture" creates an atmosphere of distrust that inhibited safety reporting. Consequently, BP management

[12] Shannon, H.S.; J. Mayr; and T. Haines. 1997. Overview of the relationship between organizational and workplace factors and injury rates. *Safety Science* 26(3): 201-217.
[13] Columbia Accident Investigation Board, *Report, Vol. 1*. (Washington, D.C.:GPO, 2003), 180. http://caib.nasa.gov/news/report/volume1/default.html.

was not able to learn from near–misses, and improve plant safety processes. [14]

Finally, collaboration can be increased through the use of incentive programs that encourage safety reporting. Incentive programs that reward employees for performing safely or that identify ways to improve safety enhance employee perceptions that management values safety. Incentive programs do not have to be elaborate, but should be meaningful. Plaques, public recognition, or small monetary rewards can be effective tools.

Safety Training Is Important, but Is Not a Panacea

Properly reinforced safety training is beneficial; however, mandatory safety training may contribute to a perceived punitive organizational culture

Safety training can be an effective part of an organization's safety management system. The *Engineering Hierarchy of Control*, which illustrates a progression of risk mitigation approaches, shows that training is critical when hazards cannot be engineered out of a process. [15] Auditors' literature review clearly indicates the benefits of training, including decreased injury rates. In addition, subject matter experts interviewed by the audit team noted that safety training can:

- Provide on-going support in a safety culture
- Contribute to employees' perception of management commitment
- Ensure that everyone has access to the same critical information

However, certain subject matter experts noted that the impact of safety training by itself is fairly low. Accordingly, additional efforts, like the one's identified throughout this report, need to be made to ensure that the benefit of training is sustained.

Further, three of the four subject matter experts believed that instituting mandatory training early in the safety culture development process could erode employee buy-in, by making it seem as if management is blaming employees for safety problems. An alternative approach to mandatory training is to create incentives for attending training, such as making certain levels of training a requirement for promotion within the organization. One SME also suggested creating an internal certification program that includes a variety of training, tailored to different functional areas. This internal certification can be made a requirement for advancement.

Employees are not the only personnel who should participate in safety training. Senior and mid-level management should also commit to being trained. Training at the management level can help address problems specific to management, such as how to stay committed to a safety culture or how to effectively communicate safety matters to different cultures. Undergoing training can also illustrate to employees that management takes safety seriously.

Two subject matter experts noted the importance of utilizing effective training methods for promoting cognitive employee retention of safety information. Specifically, passive learning techniques, such as lectures, PowerPoint presentations, and

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[14] U.S. Chemical Safety Board. *Investigation report: Refinery explosion and fire.* (Washington, D.C.: U.S. Chemical Safety Board, 2007), 181-2.
http://www.csb.gov/assets/document/CSBFinalReportBP.pdf
[15] Scharf, T., *et. al.* 2001. Toward a typology of dynamic and hazardous work environments. *Human and Ecological Risk Assessment*, 7(7), 1835. The Engineering Hierarchy of Control lists the possible responses to risk, in order of preference: 1) eliminate the hazard; 2) substitute with a different material, equipment, or process; 3) isolate the hazard (e.g., with barriers); 4) ventilate airborne contaminants; 5) reduce work hours; 6) provide employee education and training, to improve hazard recognition and work practices; and 7) personal protective equipment.

videos, are less effective than active learning, which uses a hands-on approach. For example, using people's own job situations as a training model can be impactful. Another benefit of integrating employee job case studies within training is the potential for learning information about safety risks or hearing ideas for improving safety from employees related to their specific work areas.

Leading Indicators Are Better Measures of an Effective Safety Culture

Accident rates, injury rates, and workers compensation claims are common measures of assessing an organization's safety culture. However, these are lagging indicators, indicative of safety issues that occurred much earlier in the process. Instead of solely relying on such lagging indicators, management should use leading indicators to assess the organization's safety culture.

Subject matter experts stressed the importance of leading indicators, which help to identify safety risks before they result in

Leading indicators can help identify safety risks before accidents occur

safety problems. Developing these indicators requires more insight into ongoing processes, including increased time in the field and more communication with employees who observe safety processes and hazards every day.

Examples of leading indicators that should be incorporated into safety performance measurement include: reviewing the elapsed time from when a safety issue is first reported to when it is addressed; collecting information developed through hazard audits; and employee surveys. Employee surveys can be good instruments for gathering data, provided they are well-constructed and have a high response rate.

However, one SME cautioned that results of these surveys should be used in conjunction with other data to provide more information about safety risks in specific functional areas.

In addition, collecting and reviewing information about narrowly-avoided accident, known as *near misses*, can be a great tool for addressing a safety risk before an accident occurs. The organization's safety culture should encourage reporting of near misses. One

Hazard audits, employee feedback to executives, and near-miss reports are excellent sources for leading indicators of safety

way of encouraging this type of reporting is by instituting a no-fault reporting mechanism for near misses.

The Location of the Safety Office in the Organization Is Not As Important As Ensuring Feedback to Management

As discussed, safety culture research clearly indicates that management must ensure it receives open feedback from employees regarding inadequate safety processes and other safety risks. However, there is no clear consensus regarding the position of the safety office in the organization. It has been suggested that raising the profile of safety office in the organization will illustrate management commitment to safety. However, literature reviewed did not advocate for the elevation of the safety office within the organization. In fact, one article suggested that there should not be a safety department and that safety professionals should serve as resources for capability development, coaching, and mentoring.[16]

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[16] Gaddis, S. 2007. How to Establish a Safety-Based Culture Creating a Workplace Free of Illness and Injury Must Start at the Top. *Global Occupational Safety and Health Kimberly-Clark Professional.*

Further, there was mixed feedback from the subject matter experts regarding this concept. One thought that the safety office should report directly to the organization's senior manager, while another thought that elevating the safety office risked safety initiatives being perceived as management dictates. The two other subject matter experts thought that elevating the safety office might have some positive impact but could not conclude such an organizational placement would make a significant difference.

> *If elevating the Safety Office in an organization does not assist management to better receive safety information then it will not be a useful change*

Since there is no consensus as to the existence of a safety office or as to the placement of such an office, management should place more emphasis on establishing processes for receiving important safety information from employees than on how the safety office will be structured and where it will reside. If elevating the safety office aids this pursuit, then such a change would be helpful. However, if elevating the safety office in an organization is a cosmetic change then it can create cynicism and undermine efforts to improve safety culture.

Summary

Attention to promoting a strong *safety culture* is a core task for organization leaders. Thoughtful safety planning will assist organizations to avoid catastrophic and costly incidents and will demonstrate to employees and customers that management truly cares about their well-being.

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http://www.kcprofessional.com/us/download/product%20literature/K1095-07-01Safety.pdf.

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Subject Matter Experts Consulted

Peter Chen—Dr. Peter Chen is Professor of Psychology at Colorado State University, and Director of the Occupational Health Psychology training program in the Mountain and Plains Education and Research Center. His primary research programs are training, evaluation, and safety and health management. He is currently the Principal Investigator of the projects "*Enhancing Safety through leadership*," "*Tony Grampsas Youth Services Evaluatio*n," and "*Statewide Strategic Use Funds Evaluation*," and Co-Principal Investigator of the projects: "*Project Safety Net*," "*Performance Metrics for Safety and Health in Construction*," "*Mountain & Plains Education and Research Center*," and "*Enhancing translation and dissemination through agricultural partnership*."

Joe McFadden—Joe McFadden has over 26 years of experience as an employee/director, a full-time consultant, an educator/trainer, a guest lecturer, and a community college instructor in many industrial hygiene, toxicology and occupational health and safety areas. Joe holds a BA in Medical Technology with minors in Chemistry and Biology, has completed graduate studies in Industrial Hygiene, Toxicology, and Occupational Health and Safety, and holds several certifications. In 1994 he became one of the first instructors in the Rocky Mountain Education Center's OSHA Training Institute at Red Rocks Community College.

Lynda Robson—Dr. Lynda Robson is an associate scientist at the Institute for Work & Health in Toronto, where she has worked since 1997. Her main areas of interest at the Institute are prevention program evaluation, occupational health and safety (OHS) performance measurement, OHS management systems and audits, and systematic literature reviews. She is lead author of the Institute's *Guide to Evaluating the Effectiveness of Strategies for Preventing Work Injuries*.

Ted Scharf—Dr. Ted Scharf is a Research Psychologist with the National Institute of Occupational Safety and Health's Work Organization and Stress Research Team. His research area is workload, stress, and risks for injury in hazardous work environments. His current projects include "Hazard recognition: Preventing falls and close calls" with the Ironworkers Union and CPWR - the Center for Construction Research and Training.