Final Report for LODD Project: Phases I – II
Funded by
National Fire Fighters Foundation
and
Public Entity Risk Institute

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Introduction

The rationale for the first two phases of this project stems from the generally accepted belief that fire leadership and management can make a difference in reducing line of duty deaths and injuries (LODDs/Is). Strategic policymakers such as fire chiefs, deputy chiefs, and assistant chiefs establish a safety management system that helps define the organizational safety culture within a fire and rescue department. At the operational level, district chiefs/battalion chiefs along with safety officers ensure that safety management systems are enforced as they manage incidents. Finally, at the tactical level the key role that the company officer plays as a leader and manager of safety is pivotal. They ensure "safety related behavior" by what they say ("buckle-up so we can roll") and by leading by example (wearing their personal protective equipment and self contained breathing apparatus). **Our research shows that the COMPANY OFFICER plays THE critical role in defining on a day-to-day basis the nature of the organizational safety culture in a fire department.**

This research project has evolved over the past two years as a result of the change in principle field researchers. But, the goal of the research has remained the same--to find ways to reduce firefighter line of duty deaths and injuries. Toward this goal, the purpose of Phase I of the project was to establish a list of "best practices" (called "good practices" in the United Kingdom) designed to minimize the line of duty death and injury (LODD/I)

rate of both career and volunteer firefighters by improving their health and operating safety through more effective leadership, management, and supervisory practices. The initially obtained practices enumerated in the list derive from the contributions of a panel of US fire experts; UK health, safety, risk management experts; National Institute for Occupational Safety and Health incident investigation recommendations; and a literature search of relevant US and UK fire periodicals and health-safety documents. This Phase of the research was completed under the direction of Dr. John Granito and the final report was submitted in December 2006.

As the research moved into Phase II, Chief William (Bill) Pessemier replaced Dr. John Granito as the principal field researcher. While the purpose of the research remained the same, to better understand the nexus between fire leadership and management and reducing LODDs/Is, the research was placed in the theoretical context of organizational safety culture literature. Several months were devoted to developing a methodology that would allow the variables associated with this model to be operationalized within the context of four of the major domains associate with line of duty deaths—health and wellness, vehicle safety, training; and structural firefighting. As specified in the original grant, Alpha departments were identified to "test" the newly developed Organizational Safety Culture Model. With permission from officials at NFFF and PERI, three instead of six Alpha fire and rescue departments were visited-- Belleview, Washington; Tempe, Arizona; and Aurora, Colorado. With a change from the original grant's focus of comparing high and low safety performing organizations to developing a methodology that allows all fire departments in the United States, regardless of size and type

(volunteer, combination, career paid), to assess and improved their organizational safety culture, the change from three to six Alpha departments had no impact on the goals of the research. The next section provides a summary of the findings of Phase II of the project. Completion of this phase of the project concludes promised research under the original $125,000 NFFF and PERI funding. Currently we are engaged in Phase III of the larger project, which is funded under a separate grant from the NFFF.

Phase II Research

Introduction

Phase II of this larger LODD study attempts to add to the current nationwide initiative to reduce firefighter line of duty deaths and injuries (LODDs/Is) by introducing the concept of *organizational safety culture* (OSC) to the day-to-day vernacular of the American fire service. OSC as a concept plays a prominent place in the standard operating procedures of such industries as nuclear power generation, aviation, mining, off-shore drilling, and shipping (particularly in Commonwealth nations). These organizations are called "high reliability organizations" (HROs) due to their high risk but low death and injuries rates. As noted above, the terminal purpose of the research thrust is to develop a systematic methodology to assess *organizational safety culture* that will be applicable to all types (volunteer, combination, and paid) and sizes of American fire departments. In doing so the hope is that *safety management systems* and *safety related behaviors* will lead to safer working environments that allow ALL firefighters to come home and result in fewer injuries. The theoretical foundations of the study is presented in an article entitled "Developing a Safety Culture in the Fire Service" found in Appendix A. It is hoped that officials at NFFF and PERI will post this article at their respective websites to enhance

broader understanding of the concepts *organizational safety culture*, *safety management systems*, and *safety related behaviors* within the context of *high reliability organizations*. This early phase of the larger research initiative represents, to our knowledge, the first attempt to apply the concept of *organizational safety culture* to the fire service. A profession defined by high risk and over 100 annual deaths.

Research Questions

Based on the literature related to the concept of *organizational safety culture,* defined as the assumptions, values and beliefs associated with safety and risk, the study attempts to answer the following research questions:

1. What is the present nature of *safety management systems* (SMS), *safety related behaviors* (SBR), and *organizational safety culture* (OSC) in American fire departments?

2. After a comprehensive "safety audit," do improvements in *safety management systems* impact *safety related behaviors* that result in positive changes in *organizational safety cultures* in U. S. fire and rescue departments.

Data and Methods

To address these research questions, using Expert Panels in the United States and Great Britain "best practices" that reduce firefighter deaths and injuries were identified in Phase I of this project. In the present study these best practices represent *safety related behaviors* that should positively correlate with a stronger *organizational safety culture*. But, the literature also reminds us that such behaviors do not simply appear, they must be nurtured and acculturated in a profession defined by accruing social benefits for taking risks, even if such risks put firefighters in harms way. In order to insure best practice safety behaviors are observed in an organization, *safety management systems* are required. Components of these systems are defined by international standards and represent, if you will, best practices in terms of management (private, non-profit, and

public) and at all levels in an organization (strategic, operational, and tactical). These standards are identified by ISO (9001-2000), the HSE (19), and BS (8800). Appendix B shows the survey that was developed based on these standards to measure attitudes about the nature of *safety management systems* in the fire departments studied. Each member of a fire and rescue department, the population statistically speaking, is asked to complete the *safety management systems* survey. In addition, each member of the fire department is asked to complete the safety related behaviors survey shown in Appendix C. Finally, to determine attitudes about the current safety climate in the fire department, respondents will complete an *organizational safety climate* survey (see Appendix D).

In addition to surveys, a comprehensive safety audit also requires direct observations, interviews, and document reviews (see Appendix E). Appendix F shows the semi-structured interview instrument used to gather qualitative data from members of the fire department at all levels in the organizational hierarchy (operational—firefighter, paramedic, company officer; tactical—battalion chiefs, shift commanders; and strategic – fire chief, chief officer). About 15 one hour interviews are administrated at each site. The primary purpose of the interviews is to gather perspectives about *safety management systems* and *safety related behaviors* and probe for discrepancies between what people say and actual behavior. For example, official *safety management systems* policies may require firefighters to wear seat belts when responding to incidents but in reality this *safety related behavior* is not enforced at the operational level. We would probe in the interview to find the reason for the "slippage" in policy and behavior.

As Appendix E shows, a comprehensive safety audit requires direct observation of safety performance in the organization. The current study provides for such observations in what is called *Beta* fire departments, but not in the initial three fire departments in which instruments are tested and assessed (our Alpha departments). The rationale for this decision is straightforward, time spent in Alpha (test) departments (two days) did not allow for meaningful observations. Once the research moves to the three Beta (intervention) departments, "train the trainer" seminars will be held so (1) safety related behavior performance data that must be gathered can be identified and (2) designated organizational personnel who will gather the data are identified and trained.

Research Sites

As noted above, all instruments were tested in so-called Alpha departments. Three departments volunteered to participate: Bellevue, Washington; Tempe, Arizona; and Aurora Colorado. After an initial meeting with departmental officers, surveys were distributed and approximately 15 interviews were conducted with strategic, operational, and tactical personnel. Except for the fire chief, of course, other interviewees were randomly selected from the shift (A, B, or C) on duty. To protect the rights of research participants, the study was submitted for Institutional Review Board (IRB) approval at Oklahoma State University. Appendix G shows the IRB form provided each survey participant and interviewee. A brief outline of the overall results of the surveys is provided as a summary of the statistical results. This was done in order to provide the anonymity in the results that the participating organizations had requested.

Survey Instruments

The Safety Culture Model includes three variables: Organizational Safety Culture, Safety Management Systems, and Safety Related Behaviors. Each of these variables was operationalized into three separate survey questionnaires.

Organizational Safety Culture

Development of the Organizational Culture Survey was based on the Safety Questionnaire included in the Safety Climate Assessment Toolkit developed by the Health and Safety Executive of the United Kingdom. While the safety questionnaire was initially developed for use in the context of offshore oil drilling operations, it has been used by a number of other organizations in several other industries, including the UK fire service (HSE, 2002).

Several dimensions of safety attitudes are included in the safety questionnaire, including organizational context, social environment, individual appreciation, and the work environment. Each of these dimensions is made up of one or more specific elements as listed below.

Organizational Context

1. Management Commitment - Perceptions of management's overt commitment to health and safety issues
2. Communication - The nature and efficiency of health and safety communications within the organization
3. Priority of Safety - The relative status of health and safety issues within the organization
4. Safety Rules and Procedures - Views on the efficacy and necessity of rules and procedures

Social Environment

5. Supportive Environment - The nature of the social environment at work, and the support derived from it

6. Involvement - The extent to which safety is a focus for everyone and all are involved

Individual Appreciation

7. Personal Priorities and Need for Safety - The individual's view of their own health and safety management and need to feel safe

8. Personal Appreciation of Risk - How individuals view the risk associated with work

Work Environment

9. Physical Work Environment - Perceptions of the nature of the physical environment

A five point Likert-type scale was used to allow respondents to indicate their level of agreement with each statement in the questionnaire. The range of agreement in the survey includes the following choices: Strongly Agree, Agree, Neither Agree or Disagree, Disagree, Strongly Disagree. Participants completed the survey by making a check in the box that they believe provides the best answer to the question.

Scoring the items in the survey was also based on the guidelines provided in the HSE Safety Climate Assessment Toolkit. The values of the responses range from 5 for Strongly Agree to 1 for Strongly Disagree. Some of the questions are negatively worded, so these scores are reversed in the calculations. After correcting for negatively worded questions, any low scores indicate areas for potential improvement in the organizational safety culture, while high scores indicate areas of a strong organizational safety culture.

The following matrix provides the formulas used for the calculation of the scores for the dimensions and elements of the Organizational Safety Culture survey results.

Organizational Safety Culture

1) Organizational Context (a+b+c+d / 40 * 10 = OSC 1)

    a) Management Commitment

$$v17+(6-v24)+(6-v27)+v34+v41+v46+v50 / 35 * 10 = OSC\ 1A$$

    b) Communications

$$v9+v18+(6-v33)+(6-v36)+v39 / 25 * 10 = OSC\ 1B$$

    c) Priority of Safety

$$v12+v13+(6-v28)+v48 / 20 * 10 = OSC\ 1C$$

    d) Safety Rules and Procedures

$$(6-v25)+(6-v29)+(6-v43) / 15 * 10 = OSC\ 1D$$

2) Social Environment (a+b /20 * 10 = OSC 2)

    a) Supportive Environment

$$v11+v23+(6-v30)+v37+(6-v40)+v49 / 30 * 10 = OSC\ 2A$$

    b) Involvement

$$v16+v21+(6-v47) / 15 * 10 = OSC\ 2B$$

3) Individual Acceptance (a+b /20 * 10 = OSC 3)

    a) Personal Priority and Need for Safety

$$v10+v19+v20+(6-v31)+v44 / 25 * 10 = OSC\ 3A$$

    b) Personal Appreciation of Risk

$$(6-v14)+v26+(6-v32)+v42 / 20 * 10 = OSC\ 3B$$

4) Work Environment

$$(6-v15)+v22+(6-v35)+(6-v38)+v45+(6-v51) / 30 * 10 = OSC\ 4$$

Safety Management Systems

Several different sources were used in the development of the Safety Management System Survey. These include the Health and Safety Executive of the UK; the International Labour Office of Geneva, Switzerland; the AS 4801 Occupational Health and Safety Management Systems Requirements, used in Australia and New Zealand;

British Standard 8800:2004, Occupational health and safety management systems – guide; British Standard, Occupational Health and Safety Assessment Series OHSAS 18001:1999, Occupational health and safety management systems-Specifications; BS Occupational Health and Safety Assessment Series, OHSAS 18002:2000, Occupational health and safety management systems – Guidelines for the implementation of OHSAS 18001; ISO 9001, Quality management systems – Requirements, and IWA 4, Quality management systems – Guidelines for the application of ISO 9001:2000 in local government.

The basic structure of the survey was based on the dimensions described in HSG 65, Successful Health and Safety Management and HSE 19, Health and Safety Information Sheet on Audit and Review. The purpose of HSG 65 is to provide guidance on the development of best practice with regard to safety management. HSE 19 provides a list of standard questions in the form of an Audit Proforma. Within these two documents, Safety Management Systems are divided into five dimensions: effective health and safety policy; organizing for heath and safety; planning and implementing; measuring performance; and reviewing performance. For the purposes of this study, the dimensions of measuring and reviewing performance were combined into a single dimension, which in consistent with BS 8800 and OHSAS 18001. Therefore, the dimensions of Safety Management Systems used in this study include Policy, Organizing, Planning and Implementing, as well as Measuring and Reviewing Performance. Each of the major dimensions of the Safety Management System were further categorized into one of more elements, as listed below.

Safety Management Systems

1) Policy

2) Organizing

    a) Structure

    b) Cooperation

    c) Communication

    d) Competence

3) Planning and Implementation

    a) Performance Standards

    b) Risk Assessment and Control

    c) Hazard Identification

    d) Planning

4) Measuring and Reviewing Performance

    a) Active Monitoring

    b) Reactive Monitoring

    c) Remedial Action

    d) Reviewing Performance

Although all of the above mentioned documents were reviewed for potential survey questions, it was determined that the ISO 9001:2000, HSE 19, and BS 8800 documents provided the most detailed information on potential questions. Each of these documents was reviewed again and a list of potential survey questions was compiled. The list of potential questions was compared and evaluated for duplicate questions. Obviously, one of the duplicate questions would be eliminated. However, in some cases, questions that were similar but not identical were combined into one question.

Scoring of the SMS survey was also based on a Likert-type scale, but with a different set of responses available to the respondents. These ranged from No Evidence, Little

Evidence, Reasonable Evidence, Significant Evidence, to Full Evidence. This is the typical scale used to evaluate safety management system related questions during the course of safety audits, so the same response set was used for this study. Scoring of the responses was calculated using the same method used for the OSC survey so that the numeric range is the same for each of the surveys.

The following matrix provides the formulas used for the calculation of the scores for the dimensions and elements of the Safety Management System survey results.

Safety Management Systems
1) Policy
   a) 230+150+199+139+140+174+142+143+188+145+170+147+148+196+138+203
        / 80 * 10 = SMS 1
2) Organizing (a+b+c+d / 40 * 10 = SMS 2)
   a) Structure
        152+153+154+155+156+270+159 / 35 * 10 = SMS 2A
   b) Cooperation
        160+161+162+163+164+165+166+167+168 / 45 * 10 = SMS 2B
   c) Communication
        169+146+171+172 / 20 * 10 = SMS 2C
   d) Competence
        193+173+141+175 / 20 * 10 = SMS 2D
3) Planning and Implementation (a+b+c+d / 40 * 10 = SMS 3)
   a) Performance Standards
        178+179+180+181 / 20 * 10 = SMS 3A
   b) Risk Assessment and Control
        182+183+158+184 / 20 * 10 = SMS 3B
   c) Hazard Identification

(a) 185+186 / 10 * 10 = SMS 3C

d) Planning

187+144+189+190+191+192+194 / 35 * 10 = SMS 3D

4) Measuring and Reviewing Performance (a+b+c+d / 40 * 10 = SMS 4)

a) Active Monitoring

149+197+198+200+201+202+151+204+205 / 45 * 10 = SMS 4A

b) Reactive Monitoring

231+206+207+208+209+210+211+212+213+214 / 45 * 10 = SMS 4B

c) Remedial Action

215+216+217+218+219+157+221 / 35 * 10 = SMS 4C

d) Reviewing Performance

222+223+224+225+226+227+228+229+137 / 45 * 10 = SMS 4D

Safety Related Behaviors

The Safety Related Behaviors designated as critical behaviors for the purpose of this study include four of the major domains specified in the National Fallen Firefighters Summit Initial Report (NFFF, 2004). The four chosen for inclusion in the study are Health/Wellness/Fitness/Medical, Vehicle Safety, Training, and Structural Firefighting. These domains were selected because of the need to limit the scope of the initial study to a manageable number of behaviors, to select behaviors that could be evaluated within the context of municipal fire departments, and to include behaviors that are significant in terms of their potential impact on reducing line of duty deaths and injuries.

Fireground Operations was chosen for including in the study because firefighter deaths that occur during the course of fireground operations make up 37 percent of Line of Duty Deaths. Responding to and returning from alarms accounts for 23 percent of firefighter deaths, and 14% of firefighter deaths occur during training exercises. These three

domains account for 74 percent of the total Line of Duty Deaths, as shown in the following table.

DOMAIN	% of LODD
Fireground Operations	37%
Responding and Returning to Alarms	23%
Training	14%
Total	74%

Health/Wellness/Fitness (Cardiac)	44%

Cardiac related deaths account for 44% of the total number of firefighter line of duty deaths. Cardiac related deaths are included in each of the other three domains, but are included separately in the study because it is the largest single largest factor contributing to line of duty deaths.

Several sources were used to develop the questions for each of the domains. During that process, the SRB domains were further divided into smaller elements or grouping of questions. The references used to develop the questions and elements for the Health, Wellness, Fitness and Medical dimensions included NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, 2007 Edition; NFPA 1583, Standard on Health-Related Fitness Programs for Firefighters, 2000 Edition; and NFPA 1582, Standard on Comprehensive Occupational Medical Program for Fire Departments, 2007 Edition. Development of the questions and elements of the Vehicle Safety dimension were based on NFPA 1451, Standard for a Fire Service Vehicle Operations Training Program, 2007 Edition; and the FEMA Emergency Vehicle Safety Initiative,

published in August of 2004. The questions and elements of the Fireground Operations were developed from NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, 2007 Edition. The report by the University of Maryland, Center for Firefighter Research and Development, on Health and Safety Guidelines for Firefighter Training was used to develop questions and elements for the training dimension. After the review of these documents was complete, the dimensions of the Safety Related Behaviors domain were divided into the elements that became apparent in the documents, and specific questions were formed for each element. The final dimensions and elements for the SRB domains are listed below.

Safety Related Behaviors
1) Health, Wellness, Fitness and Medical
    a) Fitness Program
    b) Medical Evaluation
2) Vehicle Safety
    a) Seat Belt Use
    b) Response Policy and Procedures
    c) Training
    d) Supervision
3) Structural Firefighting
    a) Command and Control
    b) Communications
    c) Accountability
    d) Operational Risk Management
4) Training
    a) Instructors
    b) Planning
    c) Facilities
    d) Safety Requirements

Scoring of the SRB survey was also based on a Likert-type scale, but with a different set of responses available to the respondents. These ranged from No Evidence, Little Evidence, Reasonable Evidence, Significant Evidence, to Full Evidence. This is the typical scale used to evaluate safety management system related questions during the course of safety audits, so the same response set was used for this study. Scoring of the responses was calculated using the same method used for the OSC survey so that the numeric range is the same for each of the surveys.

The following matrix provides the formulas used for the calculation of the scores for the dimensions and elements of the Safety Related Behaviors survey results.

Safety Related Behaviors
1) Health, Wellness, Fitness and Medical (a+b /20 * 10 = SRB 1)
    a) Fitness Program

        121+87+123+124+60+97+127+128+76+78+82+85+133

        / 65 * 10 = SRB 1A

    b) Medical Evaluation

        134+99+136+64+65+66+89+93+69+70+94+72 / 60 * 10 = SRB 1B

2) Vehicle Safety (a+b+c+d / 40 * 10 = SRB 2)
    a) Seat Belt Use

        74+75 / 10 * 10 = SRB 2A

    b) Response Policy and Procedures

        73+129+54+55+114+103+104+107+102 / 45 * 10 = SRB 2B

    c) Training

        36+106 / 10 * 10 = SRB 2C

    d) Supervision

        108+109 / 10 * 10 = SRB 2D

3) Structural Firefighting (a+b+c+d / 40 * 10 = SRB 3)

   a) Command and Control

      132+86+122+119+67+61+59+63+64+62+77 / 55 * 10 = SRB 3A

   b) Communications

      135+100+84+57 / 20 * 10 = SRB 3B

   c) Accountability

      90+112+92+68+71+95+96+126+98+52+53 / 55 * 10 = SRB 3C

   d) Operational Risk Management

      110+111+91+113+101+115+116+117+118+88 / 50 * 10 = SRB 3D

4) Training (a+b+c+d / 40 * 10 = SRB 4)

   a) Instructors

      120+83 /8 10 * 10 = SRB 4A

   b) Planning

      130+79 / 10 * 10 = SRB 4B

   c) Facilities

      63 / 5 * 10 = SRB 4C

   d) Safety Requirements

      80+81+131+56 / 20 * 10 = SRB 4D

Analysis of Results

Phase one of this project is intended to evaluate the nature of the relationship between safety culture, safety management systems, and safety behaviors and to determine whether improvements in safety management systems and changes in safety related behaviors are likely to result in changes in organizational safety culture. While the response rates for this phase of the project limit the statistical power of the results, it does appear that both Safety Management Systems and Safety Related Behaviors have a linear relationship with Organizational Safety Culture. Therefore, it would be anticipated that a larger number of cases, relative to the number of variables in the study, would result in a

higher level of statistical power, and that the linear relationship between the independent and dependant variables would be strengthened.

Descriptive Statistics

Exploratory data analysis was conducted with the data from the first phase of the study, which included examination of the raw data in order to detect and correct for errors, such as minimum or maximum values outside of the expected range of values after calculating the scores for the dimensions and elements of each variable.

Descriptive statistics are provided in Figure 1. Each variable, element, and dimension has a possible range of scores from 1 to 10. The scores for Organizational Safety Culture in the first phase of the study actually range from 5.28 to 10.00. This seems relatively high, but was expected since the departments involved in the first phase of the study have a reputation for effectively managing safety. The standard deviation for safety culture is lower than the standard deviation for the independent variables, indicating that there is less variation with regard to culture and more variation in the scores for safety management and safety behaviors.

The data appear to be normally distributed, since the scores for Skewness and Kurtosis are less than +/- 1.0, indicating that each of the variables is approximately normally distributed.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
OSC	163	5.28	10.00	7.3194	.86550	.285	.190	.073	.378
SMS	138	3.78	10.00	6.7642	1.29013	.196	.206	-.127	.410
SRB	139	3.93	10.00	7.4552	1.18397	-.022	.206	-.490	.408
Valid N (listwise)	121								

Figure 1: Descriptive Statistics

Plots

Scatter plots were run for both independent variables, as indicated in Figure 2 and Figure 3. Both independent variables appear to have a relatively linear relationship with the dependant variable.
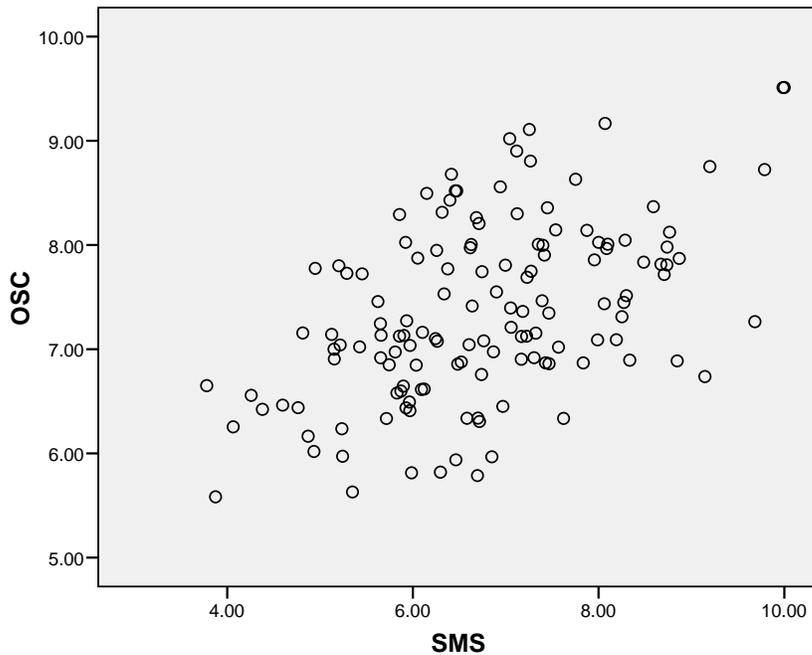
Figure 2: Scatter Plot for SMS and OSC
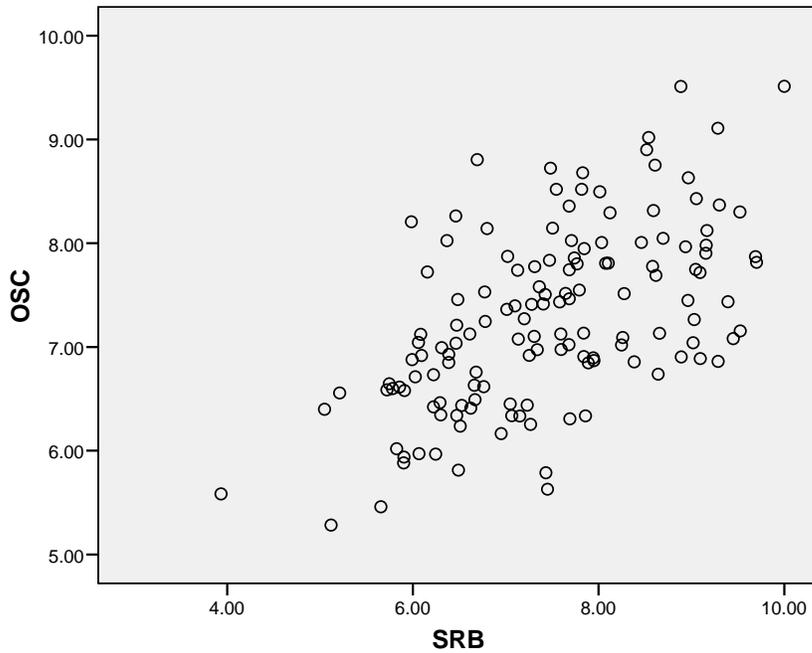
Figure 3: Scatter Plot for SRB and OSC

Reliability

Since each of the scales used in the surveys is a Likert-type scale, Cronbach's alpha was run to assess the reliability of the dimensions used in the model. As indicated in Figure 4 and Figure 5, the alpha coefficient for the measures is over .70 for both the Safety Management System dimensions and the Safety Related Behavior dimensions, indicating that the variables are reliable measures of the concepts of Safety Management Systems and Safety Related Behaviors, and that they can be reliably summated into the SMS and SRB variables.

SMS Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.954	.955	4

Figure 4: Cronbach's alpha for SMS measures

SRB Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.906	.909	4

Figure 5: Cronbach's alpha for SRB measures

Correlations, Regression, and Coefficients

Multiple regression indicates that while a relatively high level of correlation exist between the predictor variables (SMS and SRB), both of these variables are significant predictors for Organizational Safety Culture (OSC), $F_{(2,118)} = 30.078$, $p < .001$, with both variables significantly contributing to the prediction, as presented in Figure 6 and Figure 9 The beta weights, presented in Figure 7, suggest that both safety management systems and safety related behaviors contribute almost equally to predicting organizational safety culture. As shown in Figure 8, the adjusted R squared value was .326, indicating that 33% of the variance in organizational safety culture is explained by the model. This is a moderate effect, which may be limited by the relatively small sample size.

Correlations

		OSC	SMS	SRB
Pearson Correlation	OSC	1.000	.521	.525
	SMS	.521	1.000	.621
	SRB	.525	.621	1.000
Sig. (1-tailed)	OSC	.	.000	.000
	SMS	.000	.	.000
	SRB	.000	.000	.
N	OSC	121	121	121
	SMS	121	121	121
	SRB	121	121	121

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta	Tolerance	VIF	B	Std. Error
1	(Constant)	4.073	.436		9.346	.000		
	SMS	.211	.064	.318	3.328	.001	.615	1.627
	SRB	.241	.070	.328	3.428	.001	.615	1.627

a Dependent Variable: OSC
Figure 7: Coefficients

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.581(a)	.338	.326	.70429

a Predictors: (Constant), SRB, SMS
Figure 8: Model Summary

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.839	2	14.919	30.078	.000(a)
	Residual	58.532	118	.496		
	Total	88.370	120			

a Predictors: (Constant), SRB, SMS
b Dependent Variable: OSC
Figure 9: ANOVA

Informational Charts

In addition to the statistical analysis conducted with the data from Phase II of the study, several other informative charts are presented as examples of how the data from the analysis can be presented for use in the development of the intervention strategies included in Phase III of the study. These charts can be used to present overall scores from the pre-intervention phase, and can then be updated with the post-intervention

scores for the purpose of making comparisons between the various dimensions and elements of the variables.

The first set of charts provides examples of the radar charts that can be used to display information on the overall or average score for each of the elements of the variables for each department. As can be seen from these charts, the three departments involved in the first phase of the study share some similarities and differences in terms of their scores for Safety Management Systems (SMS), Safety Related Behaviors (SRB), and Organizational Safety Culture. For example, all three departments score relatively high in Reactive Monitoring, and relatively low in Reviewing Performance.

The next set of bar charts are examples of how the low scores for SMS and SRB variables can be displayed and organized by element or dimension. These charts include all SMS and SRB variables that have an average score below 3.0 on the scale of 1 to 10, indicating a relatively low score. Variables with low scores may be considered important in the development of the intervention, since they represent areas that are in need of improvement.

Low scores are identified and the corresponding variable description is provided below the chart. These are then grouped by the different dimensions and elements of the variables. Groups of low scoring variables may indicate dimensions or elements of the overall SMS or SRB variables. For example, the lowest SMS scores for Group 1 indicate

the need to improve the Fitness Program and Medical Evaluations, as well as the need to improve the organizations ability to Measure and Review Performance. T

The same type of bar chart can be used to display and group the lowest scores for Organizational Safety Culture. In the first phase of the study, most of the lowest scores are associated with the dimensions of Organizational Context and Social Environment.

Safety Management Systems: Comparative Graphs
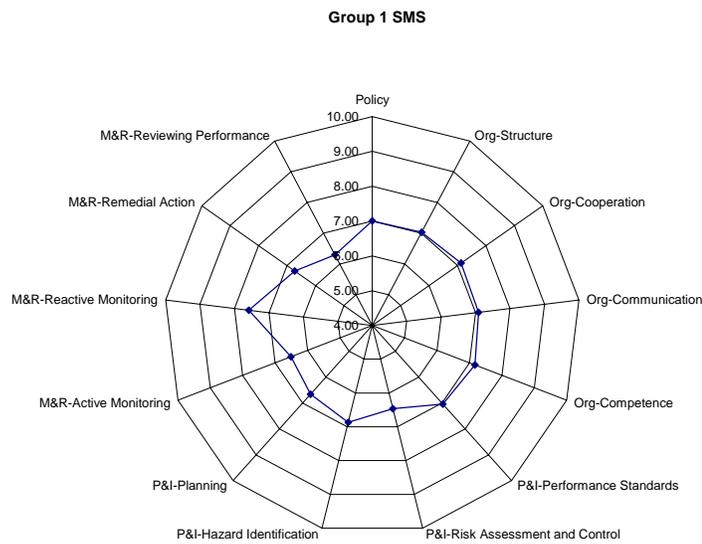
Group 1 SMS
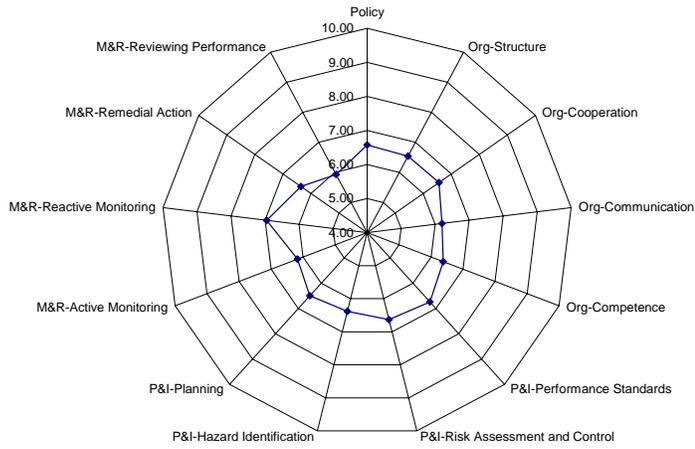
Group 2 SMS

Group 3 SMS

Safety Related Behaviors: Comparative Graphs

Group 1 SRB

Group 2 SRB
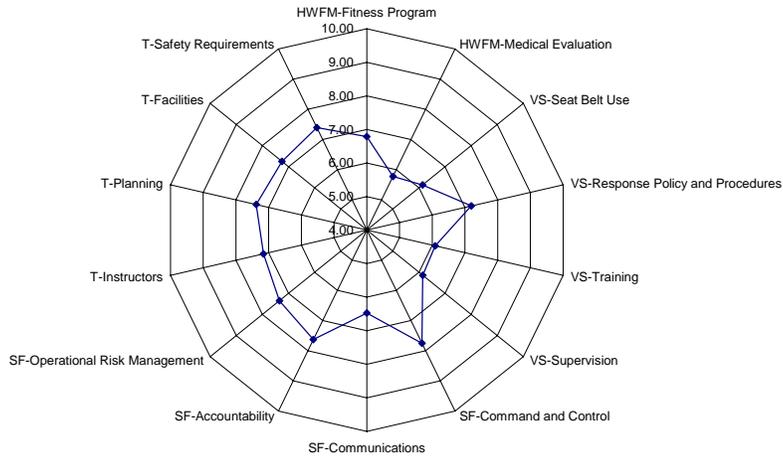
Group 3 SRB
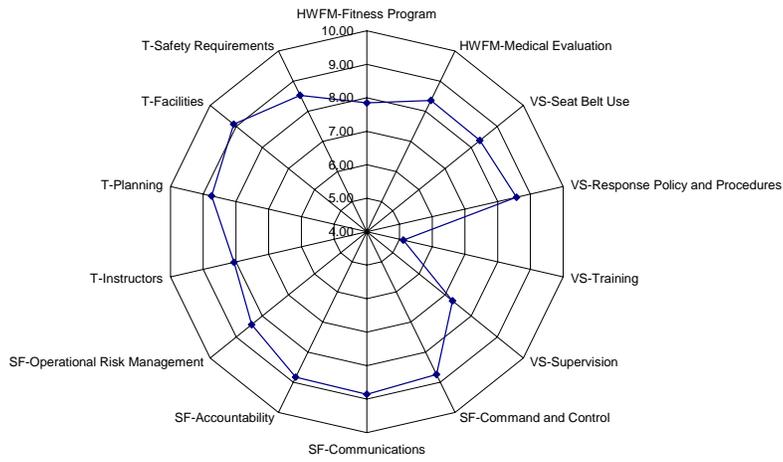
Organizational Safety Culture: Comparative Graphs

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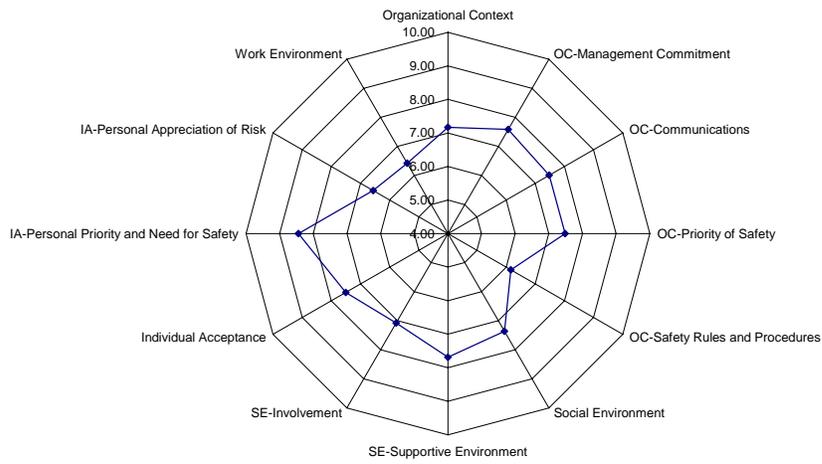
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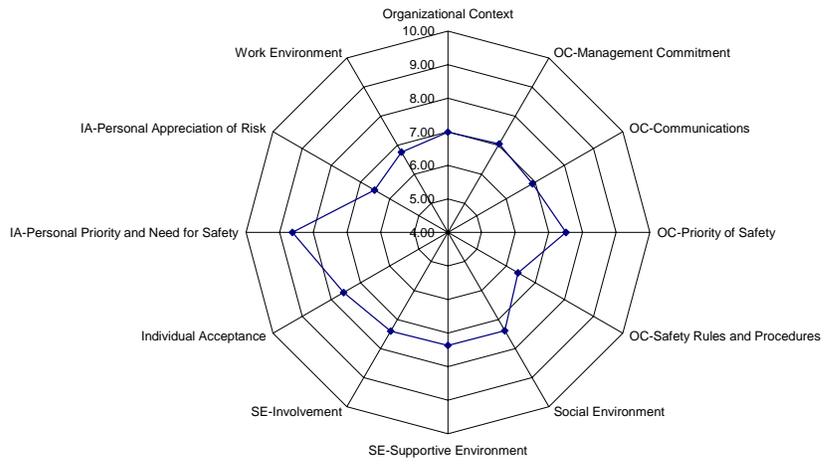
Group 3 OSC
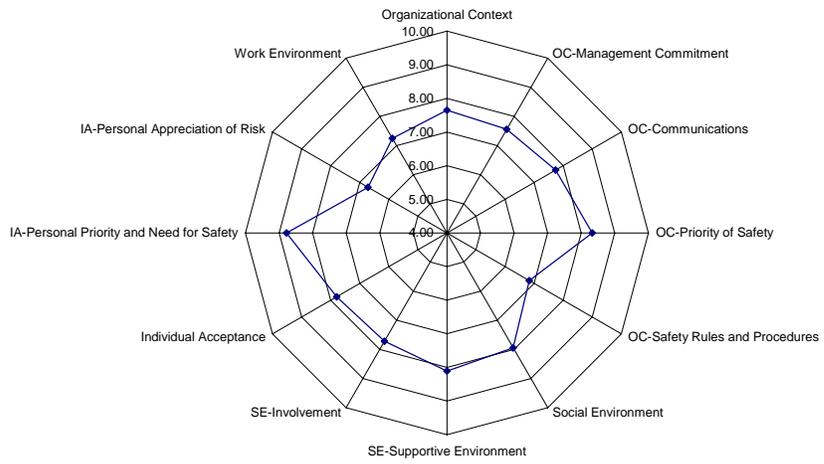
Group 1 Lowest Scores SMS & SRB: < 3.0
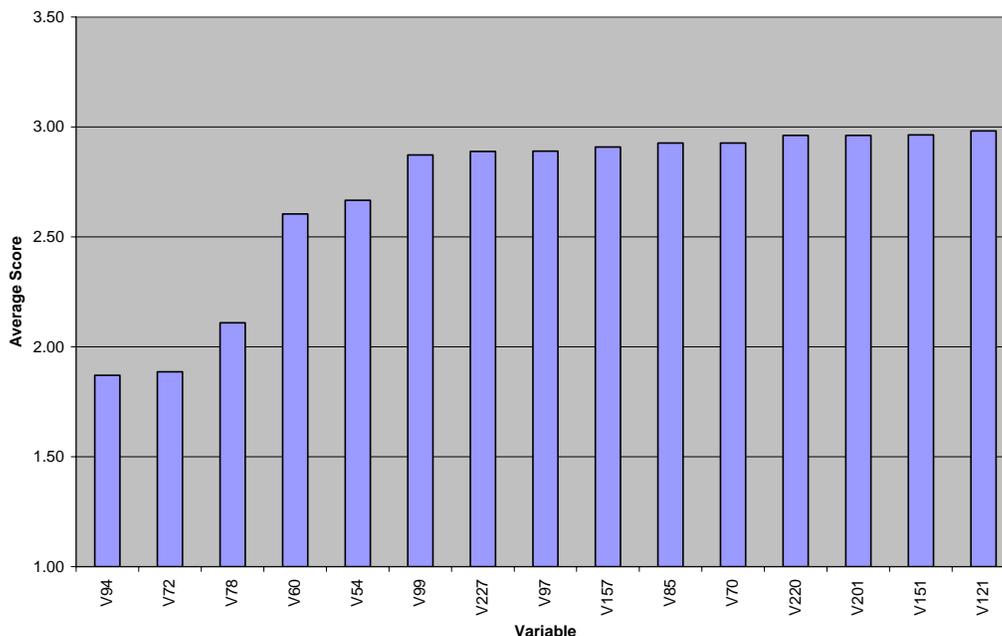
Lowest Scores by Variable

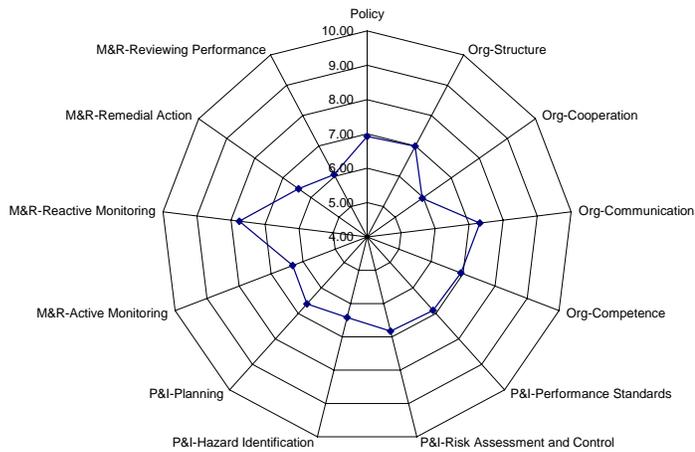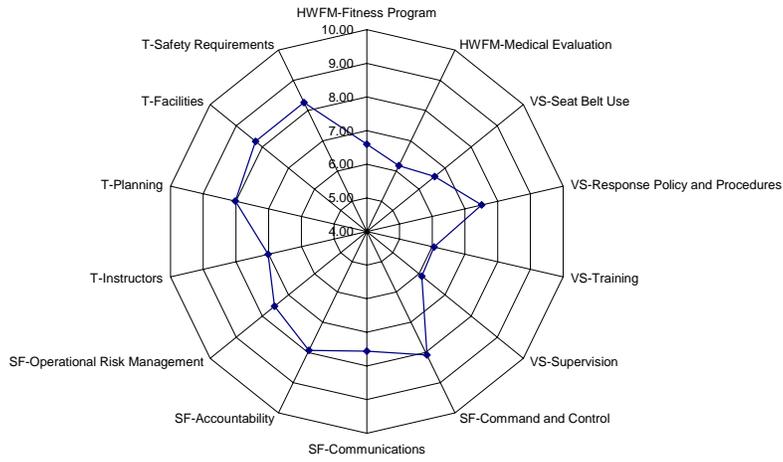| Variable Number	Variable Description	Level 3	Level 2	Domain
94	The annual medical evaluation includes a stress EKG		Medical Evaluation	SRB
72	The annual medical evaluation includes blood tests for total cholesterol, HDL and LDL		Medical Evaluation	SRB
78	Fitness assessments include a component for body composition		Fitness Program	SRB
60	Every member of the department cooperates, participates, and complies with the requirements of the fitness program		Fitness Program	SRB
54	Drivers never exceed a speed that is safe and prudent based on road conditions and vehicle capabilities	Response Policy and Procedures	Vehicle Safety	SRB
99	The medical program includes medical evaluation of current members		Medical Evaluation	SRB
227	The process reviews the results of audits	Reviewing Performance	Measuring and Reviewing Performance	SMS
97	The department requires structured participation of all members in the fitness program		Fitness Program	SRB
157	Safety and health measurement information is used to provide feedback and motivation	Remedial Action	Measuring and Reviewing Performance	SMS
85	Fitness assessments include a component for muscular endurance		Fitness Program	SRB

70	The medical evaluation is able to identify any conditions that interfere with a members physical or mental ability to safely perform their essential job tasks without undue risk to themselves or others		Medical Evaluation	SRB
220	Safety and health are a standing agenda item at senior management meetings	Structure	Organizing	SMS
201	Safety performance inspections check whether performance standards are being implemented	Active monitoring	Measuring and Reviewing Performance	SMS
151	The achievement of safety and health objectives is measured during inspection	Active monitoring	Measuring and Reviewing Performance	SMS
121	The department has established a health related fitness program that enables members to develop and maintain a level of health and fitness to safety perform their assigned functions		Fitness Program	SRB

Lowest Scores by Level

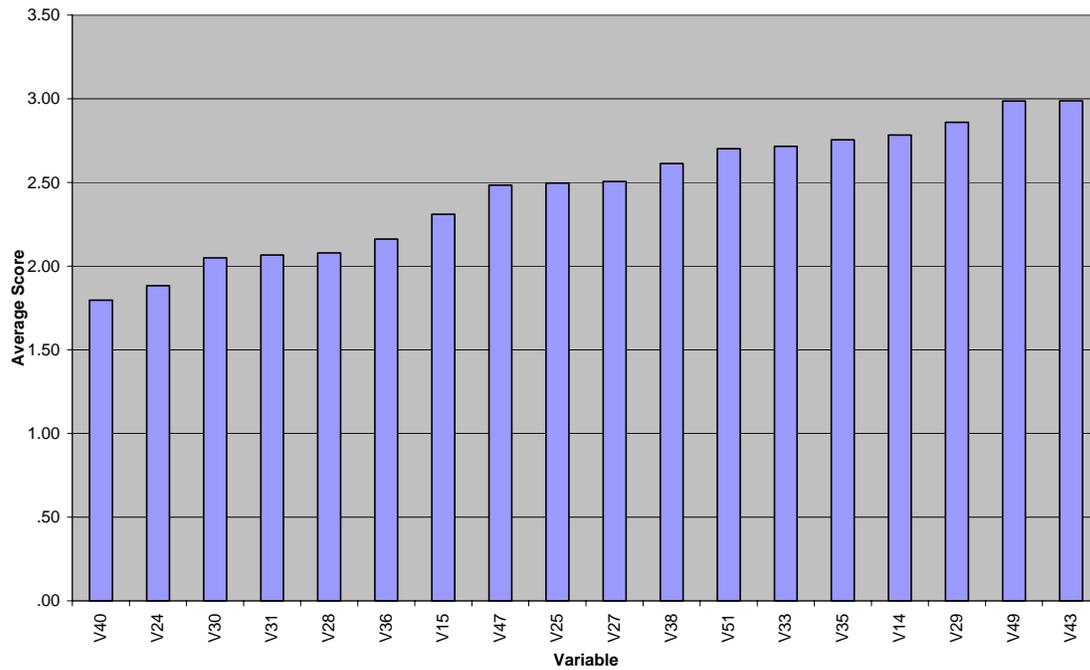| Variable Number	Variable Description	Level 3	Level 2	Domain
78	Fitness assessments include a component for body composition		Fitness Program	SRB
60	Every member of the department cooperates, participates, and complies with the requirements of the fitness program		Fitness Program	SRB
97	The department requires structured participation of all members in the fitness program		Fitness Program	SRB
85	Fitness assessments include a component for muscular endurance		Fitness Program	SRB
121	The department has established a health related fitness program that enables members to develop and maintain a level of health and fitness to safety perform their assigned functions		Fitness Program	SRB
94	The annual medical evaluation includes a stress EKG		Medical Evaluation	SRB
72	The annual medical evaluation includes blood tests for total cholesterol, HDL and LDL		Medical Evaluation	SRB
99	The medical program includes medical evaluation of current members		Medical Evaluation	SRB
70	The medical evaluation is able to identify any conditions that interfere with a members physical or mental ability to safely perform their essential job tasks without undue risk to themselves or others		Medical Evaluation	SRB
201	Safety performance inspections check whether performance standards are being implemented	Active monitoring	Measuring and Reviewing Performance	SMS
151	The achievement of safety and health objectives is measured during inspection	Active monitoring	Measuring and Reviewing Performance	SMS
157	Safety and health measurement information is used to provide feedback and motivation	Remedial Action	Measuring and Reviewing Performance	SMS

227	The process reviews the results of audits	Reviewing Performance	Measuring and Reviewing Performance	SMS
220	Safety and health are a standing agenda item at senior management meetings	Structure	Organizing	SMS
54	Drivers never exceed a speed that is safe and prudent based on road conditions and vehicle capabilities	Response Policy and Procedures	Vehicle Safety	SRB

Lowest Scores OSC: <3.0

Lowest Score by Variable

Variable Number	Variable Description	Level 3	Level 2	Domain
40	When people ignore safety procedures here, I feel it is none of my business	Supportive Environment	Social Environment	OSC
24	In my workplace management turns a blind eye to safety issues	Management Commitment	Organizational Context	OSC
30	Employees are not encouraged to raise safety concerns	Supportive Environment	Social Environment	OSC
31	Personally I feel that safety issues are not the most important aspect of my job	Personal Priorities and Need for Safety	Individual Appreciation	OSC
28	I believe that safety issues are not assigned a high priority	Priority of Safety	Organizational Context	OSC

36	My line supervisor does not always inform me of current concerns and issues	Communication	Organizational Context	OSC
15	Sometimes I am not given enough time to get the job done safely		Work Environment	OSC
47	I am never involved in the ongoing review of safety	Involvement	Social Environment	OSC
25	Some safety rules and procedures do not need to be followed to get the job done safely	Safety Rules and Procedures	Organizational Context	OSC
27	Management acts only after accidents have occurred	Management Commitment	Organizational Context	OSC
38	Sometimes conditions here hinder my ability to work safely		Work Environment	OSC
51	I cannot always get the equipment I need to do the job safely		Work Environment	OSC
33	I do not receive praise for working safely	Communication	Organizational Context	OSC
35	Operational requirements and activities often conflict with safety measures		Work Environment	OSC
14	I am sure it is only a matter of time before I am involved in an accident	Personal Appreciation of Risk	Individual Appreciation	OSC
29	Some health and safety rules and procedures are not really practical	Safety Rules and Procedures	Organizational Context	OSC
49	A no-blame approach is used to persuade people acting unsafely that their behavior is inappropriate	Supportive Environment	Social Environment	OSC
43	Sometimes it is necessary to depart from safety requirements in order to achieve operational objectives	Safety Rules and Procedures	Organizational Context	OSC

Lowest Score by Level

Variable Number	Variable Description	Level 3	Level 2	Domain
31	Personally I feel that safety issues are not the most important aspect of my job	Personal Priorities and Need for Safety	Individual Appreciation	OSC
14	I am sure it is only a matter of time before I am involved in an accident	Personal Appreciation of Risk	Individual Appreciation	OSC
24	In my workplace management turns a blind eye to safety issues	Management Commitment	Organizational Context	OSC
28	I believe that safety issues are not assigned a high priority	Priority of Safety	Organizational Context	OSC
36	My line supervisor does not always inform me of current concerns and issues	Communication	Organizational Context	OSC

25	Some safety rules and procedures do not need to be followed to get the job done safely	Safety Rules and Procedures	Organizational Context	OSC
27	Management acts only after accidents have occurred	Management Commitment	Organizational Context	OSC
33	I do not receive praise for working safely	Communication	Organizational Context	OSC
29	Some health and safety rules and procedures are not really practical	Safety Rules and Procedures	Organizational Context	OSC
43	Sometimes it is necessary to depart from safety requirements in order to achieve operational objectives	Safety Rules and Procedures	Organizational Context	OSC
40	When people ignore safety procedures here, I feel it is none of my business	Supportive Environment	Social Environment	OSC
30	Employees are not encouraged to raise safety concerns	Supportive Environment	Social Environment	OSC
47	I am never involved in the ongoing review of safety	Involvement	Social Environment	OSC
49	A no-blame approach is used to persuade people acting unsafely that their behavior is inappropriate	Supportive Environment	Social Environment	OSC
15	Sometimes I am not given enough time to get the job done safely		Work Environment	OSC
38	Sometimes conditions here hinder my ability to work safely		Work Environment	OSC
51	I cannot always get the equipment I need to do the job safely		Work Environment	OSC
35	Operational requirements and activities often conflict with safety measures		Work Environment	OSC

Phase III Research

While not funded under this grant, this section provides a brief synopsis of the next phase of the research project. After testing and validation of all research instruments in Phase II Alpha departments, the research has now moved to Beta departments. Three Beta fire and rescue departments will take part in a three-part quasi-experimental study. The three parts of the study include assessment, intervention, and reassessment. The assessment phase is similar to what took place in Alpha cities using the refined instruments developed in Phase II of the study. Based on the Comprehensive Safety Audit methodology shown in Appendix E, which includes safety document reviews, survey data, and interviews, the strengths and weaknesses of each department's safety management systems, safety related behaviors and organizational safety culture are presented to department members. **Fire department personnel then decided the scope and breadth of intervention**. Based on their decisions, an intervention plan is formulated. During this phase of the research we "train the trainers" in all phases of intervention strategies, data collection, monitoring, etc. The trainers (e.g., safety officers, company officers, battalion chiefs, etc), then, instruct other organizational members how to enhance the organizational safety culture using self-defined improved safety management systems and safety related behaviors. Three to six moths later a reassessment of the organization using the same three surveys used in the initial assessment are administered and changes in the various dimensions of the three organizational safety-related variables (organizational safety culture, safety related behaviors, and safety management systems) are discussed with departmental members.

The organizational safety culture methodology outlined above (1) is comprehensive in terms of four of the six major LODD domains (training, structural firefighting, heath and wellness, and vehicle safety); (2) is scalable to any size of fire and rescue department; (3) is applicable to any type of fire and rescue department (volunteer, combination, paid career); and (4) can be self-administered or facilitated by outside consultants.

To date, the assessment first phase has been administered in Anchorage, Alaska and Shreveport, Louisiana. A third Beta fire and rescue department will be included in the study. Under the direction of Chief Richard Anderson at the National Fallen Firefighters Foundation, the Organizational Safety Model outlined above is being discussed as a national model that can be used across the United States to improve organizational safety culture and reduce line of duty deaths and injuries.

APPENDIX A

"Developing a Safety Culture in the Fire Service"

by

Chief William Pessemier

William Pessemier, Department of Political Science and Fire Protection Publications, Oklahoma State University

Developing a Safety Culture in the Fire Service

Abstract
Firefighter deaths and injuries in the line of duty continue to occur at an unacceptable level. Despite changes and improvements in protective clothing, equipment, apparatus, standards, procedures, and practices the rate of firefighter deaths in the United States has actually increased by approximately 34 percent, from 4.94 firefighter deaths per 100,000 fires in 1995, to 6,64 firefighter deaths per 100,000 fires in 2004. The purpose of this paper is to provide a summary of the concepts associated with the construct of safety culture. The Reciprocal Determinism Model is used as the basis for the construct of safety culture within the context of the fire service. In addition, an overall framework is proposed that provides a basis for understanding the relationship between safety culture and organizational identity and how organizational identity can influence the adaptive response of an organization to pressure for change in its safety culture.

Introduction

The relatively high rate of firefighter deaths and injuries in the United States fire service continues to be problematic. Various procedural, technical, structural and behavioral changes and improvements have been made in the last few decades with the intention of improving firefighter safety. However, the rate of firefighter deaths per 100,000 fires has actually increased by 34% from 1995 to 2004, from 4.94 to 6.64 respectively. The methods and approaches used so far have not been effective or successful in reducing firefighter deaths.

Other industries are also concerned with safety and the potential for death and injuries and have been able to demonstrate significant improvements in safety performance. These include the nuclear power, mining, shipping, hospital, air transportation, and chemical industries. The military also has been able to develop highly reliable organiztions in high-risk environments, such as aircraft carrier flight deck operations. These industries have used the concepts and principles of a *safety culture* to help improve their safety performance. The thesis advanced in this paper is that it is time for the fire service to do the same.

The purpose of this paper is to provide a summary of the concepts associated with the construct of a safety culture for the fire service. A description of the concepts of organizational and safety culture is provided and the relationship between safety culture and organizational performance is explored. In addition, the concept of organizational identity is developed, of which culture is one component. The

concept of identity carries with it some dysfunctional aspects, and these are also discussed in the context of the development of a safety culture. A model of the relationship between organizational identity, self identity, and adaptive response to change is proposed in the context of safety, and recommendations are mode for developing a safety culture in the fire service.

The Safety Problem in the US Fire Service

In the US, over the period from 1995 to 2004, the firefighter death rate has actually increased per 100,000 fires from five firefighters per 100,000 fires to almost seven firefighters per 100,000 fires (NFPA, 2004). In comparison, the number of firefighter deaths in both the United Kingdom and New Zealand over this same period is less than one firefighter per 100,000 fires (ODPM, 2004; NZ Fire Service, 2004). Despite differences between how the US and these other countries determine whether a firefighter death is fire related or not, this is an astonishing difference in the number of firefighters who die in the line of duty.

Over the last several decades, a number of changes have occurred in the fire services that have been intended to increase firefighter safety and to reduce firefighter deaths and injuries. Improvements have been made in protective clothing and equipment, apparatus, procedures, standards, codes and ordinances, as well as in the process of command, control and communications. Despite these improvements, the firefighter death rate has continued to increase. These changes have been directed at the procedural and technical aspects of safety, without much success. It may be time to take another approach to reducing line of duty deaths. One approach that has been used successfully in other high-risk industries is based on efforts to change the culture of the organization.

Safety in the Context of Organizational Culture

Developing the Concept of Safety Culture

The term *safety culture* was first used in the accident investigation of the Chernobyl nuclear power plant incident of 1986. It has since been used in other accident reports, including those involving aviation accidents and the Columbia space shuttle disaster. The concept of safety culture is the most recent stage in the development of safety management thinking and theories of system failures and accident causation. Over the last few years, these stages have included the technical period, the human error period, the socio-

technical period, and the current period focusing on organizational culture (Weigmann et al., 2004). In each of these stages, a different approach was taken towards accident investigation and analysis. In the technical period, the focus of accident causation was on technical and mechanical systems and the design, construction, and reliability of equipment. For the fire service, this might include efforts to improve the safety-related features of building construction and the reliability or functionality of fire fighting equipment.

The focus of the human error period was on the faults or mistakes of human operators rather than mechanical or technical failures. Cognitive limitations of individuals were the focus of these efforts, for the purpose of assigning blame or responsibility to the people most directly involved in the unsafe act. Examples from the fire service might include accident investigation reports that point out the failure of decision making by command officers or individual firefighters that lead to unnecessary casualties on the fireground.

Socio-technical errors were the next stage in the progression. In this period, errors were viewed as the result of a combination of human and technical failures or breakdowns. Current literature on safety management has focused on the concept of organizational culture as a critical factor in organizational safety. People in organizations operate within the context of a particular culture that influences the attitudes and behaviors of those individuals with regard to safety issues.

Organizational Culture

In much of the safety management literature, safety culture has been described as a component of organizational culture. Organizational culture is defined by Schein (1992) as:

> a pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problems (p.12).

While there is no consensus on the exact definition of organizational culture, the common theme is that organizational culture reflects behaviors, values, beliefs and assumptions that are shared by members of the organization about the organization's mission, goals, practices and procedures. This does not

preclude the existence of subcultures within organizations, which are groups of members who hold different values and assumptions from those that are used to characterize the organization as a whole. However, the assumption is that for most organizations, a single dominant culture is present that provides the basis for how people in the organization think and behave.

Based on what has been learned from the research on organizational culture, Guldenmund (2000) provides a summary of the relevant characteristics of organizational culture. He proposes that organizational culture is an abstract social construct, which results in some difficulty in how to define and operationalize the variables associated with the construct. While the characteristics of culture are relatively stable within organizations over a period of several years, they are also multidimensional. That is, a number of different dimensions or variables can be used to define and measure culture.

Organizational culture is shared by members of the organization, but the dominant characteristics may vary with the level of analysis or the level of the organization, which gives rise to the possibility of sub-cultures within larger organizations. Organizational culture can be differentiated into different categories or types, such as safety culture or service culture, which are manifested through practices and behaviors that reflect organizational norms, values, and beliefs. The functional purpose of these practices is to provide a behavioral frame of reference for members of the organization. This frame of reference is used to deal with problems of external adaptation and internal integration.

Schein (1992) provides a framework for analyzing culture through observable elements that are organized on three levels. The first or outermost level is that of artifacts. These are the visible organizational structures, processes and practices. The second level is that of espoused values. These include the shared values, beliefs, strategies, goals, mission and philosophies of the organization. At the deepest level are the basic assumptions that form the values and beliefs upon which behaviors are based. Basic assumptions are unconscious, taken-for-granted perceptions, thoughts and feelings.

It is the basic assumptions developed within the context of organizations that tell members how to perceive, think, and feel about the issues confronting the organization. Once these assumptions have been established, organizational members will defend them rather than allow them to be challenged and changed. Schein (1992, 22) states that rather than tolerate the anxiety associated with changing our basic assumptions, people will want to perceive events as consistent with these basic assumptions, even if this

means "distorting, denying, projecting, or in other ways falsifying to ourselves what may be going on around us." This is the reason it is so important for the fire service to understand the concept of safety culture. One of the reasons that the US fire service may be suffering from such high rates of casualties in terms of line of duty deaths is because we may be distorting, denying, or falsifying to ourselves what has been happening with regard to firefighter deaths. As a result, safety culture may be the most important and most overlooked factors influencing safety performance in the fire service.

Safety Culture

Safety culture exists within the broader context of the organization. Several studies use Schein's work on organizational culture as the framework for the development of the concept of safety culture (Guldenmund, 2000; Wiegmann et al., 2004; Hopfl, 1994; Glendon et al., 2000; Cooper, 2000). Based on the overarching definition of organizational culture provided by Schein (1992), safety culture has been defined in several ways. Pidgeon (1991) defines safety culture as those beliefs, norms, attitudes, roles and practices that are concerned with minimizing the exposure of employees and members of the public to dangerous conditions. Guldenmund (2000) defines safety culture as the aspects of organizational culture that impact on attitudes and behaviors that are related to increasing or decreasing risk. Parker et al. (2006) define safety culture as a subset of organizational culture, specifically those beliefs and values that involve safety and that relate to the ability of individuals in organizations to make decisions about risk and hazards so that damage and loss are avoided while still achieving their goals.

While no consensus has been reached on the specific definition of a safety culture, a number of common elements have been identified in the literature. Safety culture is a construct that involves shared values among groups of organizational members. Establishment of a safety culture involves the development of a formal management and supervisory system for dealing with safety issues. Also, the organizational approach toward the concept of safety involves shared responsibility throughout the organization. A safety culture becomes apparent in an organization through its effects on the behavior of members in the work environment. Within a safety culture, organizational rewards are contingent upon safety performance, while at the same time, the organization is willing to learn from errors, incidents, and accidents. Lastly, a safety culture is enduring and stable within the organization (Wiegmann et. al, 2004).

Establishing a definition of safety culture provides the framework for delineating the purpose of a safety culture. Cooper (2000) provides a summary of the purposes of a safety culture, which includes the following: establish behavioral norms; reduce accidents and injuries; prioritize safety commensurate with its significance; develop shared ideas and beliefs about risks, accidents and injuries; increase members' commitment to safety; and determine the effectiveness of the organizational safety management system. Analysis of an organization's safety culture provides the means for measuring whether these purposes have been accomplished.

Safety culture can be analyzed in the same way as organizational culture, by examining safety-related behaviors and practices, determining safety-related values and beliefs, and uncovering the underlying assumptions related to organizational safety (Cooper, 2000). Safety behavior and practices can be measured using checklists, peer observation, self-reports, or safety outcome measures. Values and beliefs can be measured using any of a number of safety climate questionnaires or surveys. Underlying assumptions are difficult to examine because they are unconscious. However, these assumptions are manifest through the values, beliefs, behaviors and practices that are held by organizational members or that occur within the organizational context. Representations of the underlying assumptions of the safety culture are reflected in the policies, structure, control systems, and management practices of the organization.

Problematic Aspects of Culture

Development of a distinct and strong organizational culture clearly has benefits for organizations. However, organizational culture also carries a specific set of problems, conflicts and contradictions that have been identified in the safety-related literature.

The fire service operates in an unusual context. In most industries, the higher the level of safety of organizational members, the higher the level of safety for others. In the fire service, there is a perception that the higher the level of risk that is taken by firefighters, the higher the level of safety of those who might otherwise perish in a fire. However, many professions and industries operate near the edge of safety: that point between the greatest risk and the greatest reward (Reason, 2000).

Operating near the edge of safety represents a conflict between two competing goals. The first is to provide effective service delivery, which means being able to rescue civilian casualties in a fire. The second is to provide for firefighter safety. Operational safety is a tradeoff between an appropriate and acceptable level of risk taken by firefighters to extinguish fires and rescue or protect civilians and the level of safety required to prevent firefighters from becoming casualties themselves.

How does culture influence the decision-making process and the ability of decision makers to weigh the level of risk against the level of safety? Culture is based on shared assumptions, beliefs, values, and norms as a way of establishing common meaning among the members of the organization. Culture also serves to establish, regulate and reinforce the structure, processes and practices that occur within the organization. This results in standardized patterns of behavior. Shared meanings have the effect of strengthening each member's beliefs in their own social constructions. This can become problematic for safety when members of the organization begin to unquestioningly believe their own messages about their current thinking about safety and the effectiveness of safety practices. Within the context of common social constructions and shared meanings, such thinking limits the search for information that is not consistent with current social constructions and shared meanings (Hopfl, 1994).

In pursuit of consensus, culture functions to hide information and to conceal dysfunctional practices. As conflicts arise between performance and safety, many organizations choose to take a bureaucratic approach to safety and establish rules and procedures. A relatively high standard of safety is developed on paper, but what happens in actual practice may be quite different. If safety practices and procedures are not considered to be relevant to performance, then actual behaviors may produce the appearance of conformity to safety standards while actually neglecting safety practices. Therefore, it is important to not only understand what is revealed by organizational culture, but also what is concealed.

Dimensions/Elements of Safety Culture

A number of different elements or dimensions have been used in the literature on safety culture to describe a good safety culture, and effective safety culture, and the main elements or general components of a safety culture. General concepts that have been used to describe safety culture include the development of norms

and values for dealing with hazardous conditions, the presence of appropriate attitudes towards safety, and a learning process associated with safety (Pidgeon, 1991).

Norms and values shape the perceptions of organizational members about what represents a significant risk and what the appropriate response to such risks should be in terms of individual behavior and acceptable organizational practices. Collective beliefs about the nature of occupational hazards and the importance of safety and safety practices form the organizational attitudes toward safety. Risk usually involves some degree of uncertainty and ambiguity that results in errors or mistakes. A willingness to learn from mistakes by applying that learning to change practices and beliefs in order to improve safety performance is also an essential component of a safety culture.

More specific dimensions of safety culture are described extensively in the literature on safety culture, and so are only listed briefly here. Wiegmann et al. (2004) describe these as organizational commitment, management involvement, employee empowerment, reward systems, and reporting systems. Elements of an effective organizational safety culture have been described by Reason (1997) and include the following: a culture that supports the collection of safety information from incidents, near misses, and proactive safety checks; a reporting culture where people report their own errors and mistakes; a culture of trust where people are encouraged to provide important safety information and where clear delineations exist between acceptable and unacceptable behavior; a flexible, dynamic organization open to change in response to external demands; a competent organization that is able to develop logical and objective conclusions from safety information and is willing to implements change when required.

Safety Culture and Safety Performance

Establishing a definition of safety culture, understanding the framework for analyzing safety culture, and describing the elements or dimensions of safety culture are all necessary in order to provide the foundation for changing the culture within the fire service so that significant improvement can be made in safety performance. The purpose behind a greater understanding of the construct of safety culture is to be able to change the underlying assumptions associated with safety in the fire service so that safety-related values, beliefs, and behaviors can also be changed. The consequence of the current culture in the fire service has been what could arguably be called the unnecessary deaths of hundreds of firefighters. It can be anticipated

that the consequences of establishing a safety culture in the US fire service will be a significant reduction in the number of firefighters who die in the line of duty.

Safety performance depends on psychological, behavioral, and situational variables (Cooper, 2000). The interaction between these variables can also influence safety performance. The concept of reciprocal determinism is drawn from Social Learning Theory and Social Cognitive Theory, and is represented graphically in Figure 1. This model is based on Bandura's (1986) explanation of how these variables interact bi-directionally in a triadic reciprocal relationship.
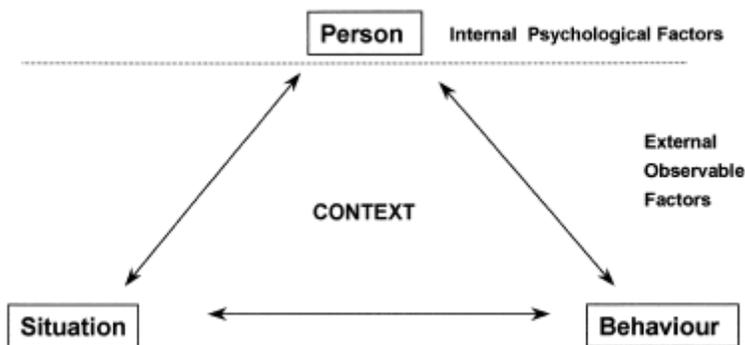
Figure 10: A Model of Reciprocal Determinism

Psychological variables include the values, beliefs, and attitudes that people have about safety-related issues, as well as their knowledge, motives, and personalities. Behavioral variables are the competencies of individuals and patterns of action and behaviors. Situational variables include the organizational structure, processes and systems, as well as external variables such as the complexity, context and nature of work performed, as well as the equipment, tools and machines used in task performance.

In this model, safety performance is the dependant variable and the psychological, behavioral and situational factors are the independent variables. It is important to understand the dynamics of the relationship between safety culture and organizational performance and how modifying organizational culture affects performance. Organizational culture influences the development of a safety culture within an organization. Safety culture is influenced by psychological, behavioral, and situational variables. Safety

culture affects safety performance and safety performance has a significant impact on overall organizational performance.

In the fire service, for example, if firefighters become casualties because of unsafe acts, then resources are directed toward the rescue and care of these firefighters. If resources are being directed toward the rescue of firefighters, they must either be drawn away from operations directed at rescuing civilians, or become unavailable for that purpose if they should be needed. This can have a significant impact on organizational performance. If resources are drawn away from the rescue of civilian casualties in order to rescue firefighters who have become casualties as a result of unsafe acts, then it would be anticipated that civilian injury and death rates would be higher than if these firefighters had not become casualties.

It is interesting to point out that the US has not only a high firefighter casualty rate, but also a high civilian casualty rate; whereas other industrialized nations that have a low firefighter casualty rate also have a low civilian casualty rate. As firefighters change their assumptions, values, beliefs and practices with regard to safety by establishing a strong safety culture, then fewer firefighters would be expected to become casualties due to unsafe acts. This allows more resources to be used for or to be available for the rescue of civilian casualties, thereby improving the performance of the fire service by reducing civilian casualty rates.

Culture, Identity and Image

Modifying or changing the safety culture within an organization involves changes in the psychological and behavioral aspects of the members of the organization. In addition, because organizational culture also conveys a sense of identity (Wiegmann, 2004), a change in culture also involves a change in the image of the organization and its members. Therefore, it is important to understand the relationship between culture, identity, and image and how these factors influence the development of a safety culture.

Organizational culture is viewed by some researchers as one of the two essential components of organizational identity. Theoretical development of the construct of organizational identity postulates that culture and image are the two components of organizational identity (Hatch & Schultz, 2002). Within this

framework, culture is the internal element and image is the external element of identity. This has been described as the organizational identity dynamics model, and is represented in Figure 2.
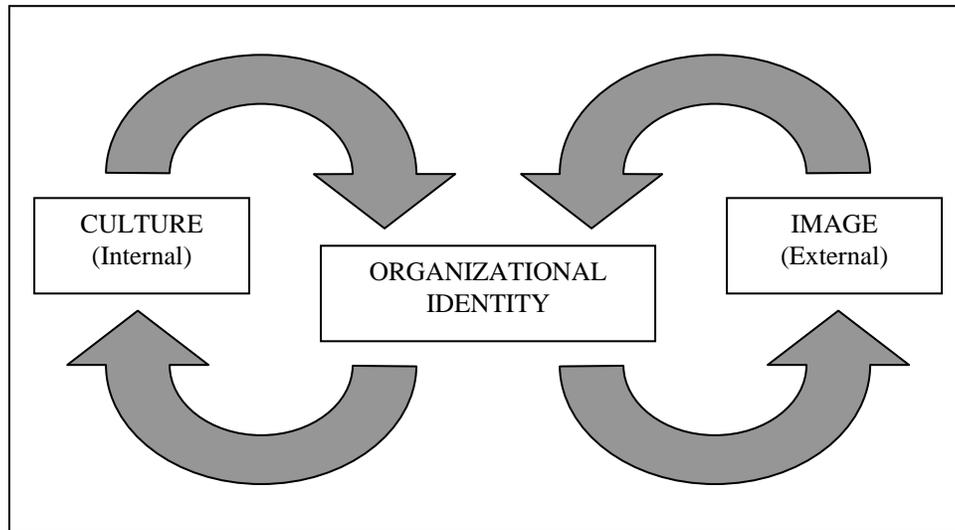
Figure 11: Organizational Identity Dynamics Model

Within this model, identity in organizations involves the interaction of both the internal and the external definition of the organization. Organizational culture has been previously defined as the assumptions, values, beliefs and norms that provide meaning to members of an organization, which includes the establishment of an internal self-definition. Organizational image is the set of beliefs about the organization held by those who are not part of the organization but who are relevant stakeholders or constituents. These form the external definition of the organization. For members of an organization, culture provides a sense of who we are, and image provides a sense of how others see us (Hatch & Schultz, 2002). These two approaches provide a comprehensive perspective on organizational identity.

Dysfunctional Aspects of Identity

A healthy identity results from the capacity of an organization to integrate and balance the various aspects of culture and image. A dysfunctional identity can result from a process that involves two stages. First, a disassociation occurs between the internal and external definition of the organization. Secondly, the concept of identity becomes dominated by either the internal or external definition of identity to the

exclusion of the other. When the identity of an organization is constructed solely on the basis if its culture, it is vulnerable to a dysfunctional condition that has been called organizational narcissism. When its identity is constructed exclusively by the organization's image, then it is vulnerable to the condition of organizational hyper-adaptation (Hatch & Schultz, 2002).

Organizational narcissism may be an important factor in explaining why the US fire service has not adapted more effective safety management systems. Identity plays a critical role in how organizations adapt to change (Dutton, 1991). Identity influences how issues such as safety are interpreted and how individuals and organizations respond to issues. If an organization or a profession suffers from a condition of narcissism, then this is likely to have a dramatic effect on whether or not changes in safety management systems will be developed and sustained. Therefore, it is important to understand the effect of organizational narcissism and how identity influences the organizational adaptation process.

When a state of narcissism is present in an organization, the members of the organization make inferences about their identity on the basis of how they express themselves to others. This means that the identity of the organization is really just a reflection of their own self-understanding which is being mistaken for the expressions of others. The process of forming and sustaining organizational identity becomes internally focused and self-contained. The needs and interests of external stakeholders and constituents are ignored, and the organization becomes unable and unwilling to respond to pressures for change from those who are external to the organization. In essence, narcissism becomes an effort to maintain self-esteem that has been taken to extremes (Hatch & Schultz, 2002).

Efforts to maintain self-esteem and organizational identity result in the use of defense mechanisms that are intended to maintain those features of the organization that are viewed by members as the central, enduring and distinctive characteristics of the organization's identity. Individual self-esteem and organizational identity are linked when an individual's self-esteem is based in part on the identity of the organization of which that individual is a part. The desire to protect individual and collective self-esteem can be a powerful ego defense mechanism that can limit the ability and willingness of organizations to search for new information or interpret and evaluate information in ways that may not be consistent with the currently held concepts of individual or collective identity (Brown & Starkey, 2000). Such defense mechanisms reduce the capacity for organizational learning and change.

Specific behaviors have been associated with the construct of organizational narcissism. These include denial, rationalization, attributional egotism, a sense of entitlement, and self-aggrandizement (Brown, 1997). Denial is used as a way of coping with conflict, anxiety and distress that would otherwise be extremely difficult if not impossible to deal with. Research has suggested that people who engage in denial do so in order to conceal disagreeable truths from themselves and others as an unconscious attempt to maintain individual and collective self-esteem (Straw et al., 1983). Rationalization involves the development of justifications for actions that are consistent with the current self-concept. This may include what has been called retrospective sense making, which occurs when individuals provide explanations of their past actions in order to preserve their self esteem. For example, a fire chief may provide an explanation of why several firefighters died in the line of duty, and then state that if they were in the same situation, they would make the same decisions and take the same actions.

Rationalization may sometimes be used along with the concept of attributional egotism, which occurs when people provide self-serving explanations for incidents. These explanations may be self-serving in that unfavorable outcomes are attributed to external factors, while favorable outcomes are attributed to the efforts of the members of the organization. If attributional egotism is present, then self-aggrandizement may not be far behind. This refers to the propensity for people to overstate their accomplishments. Self-aggrandizement can also be accompanied by self-absorption, claims to uniqueness, and feelings of invulnerability (APA, 1986). An example of a sense of entitlement would be apparent in demands for additional resources or compensation by members of the fire department based on the level of risk inherent in fire fighting and the potential for injury, without any other justification.

The Influence of Identify on Organizational Adaptation

In a study of organizational adaptation to change, Dutton (1991) provides strong evidence that organizational identity has a significant influence on how issues are interpreted by members of an organization and on what actions are considered to be a legitimate response. He argues that the process of adaptation begins with the recognition of a current development, event or trend that has some consequence for the organization. In other words, adaptation begins with the recognition of a significant issue, such as the issue of safety. Organizational identity lays the foundation for how an issue is interpreted by members

of the organization, the direction and level of emotional response to an issue, and the pattern of actions that are taken in response to an issue. The proposition made in the study conducted by Dutton is that organizational identity influences how organizations adapt to issues by affecting the interpretations, emotions, and actions associated with the issue.

Issue interpretation is the initial cognitive response to the issue. The interpretation of issues involves making determinations on the importance of the issue and whether the issue represents a threat to individual or collective identity. These initial interpretations begin to develop the meaning of the issue and to limit and shape the criteria for a legitimate solution by limiting what is conceived of as a legitimate interpretation. The importance of an issue also sets the stage for the level of emotional response to the issue: the higher the importance, the higher the potential emotional response.

Issue-related emotions are the affective response to the issue. The emotional response of members of an organization is expected to be negative when the issue and related actions are interpreted as inconsistent with the identity of the organization and its members. When an issue and related actions are interpreted as consistent with the organization's identity, the emotional response would be expected to be positive. As a fire service example, in some organizations, any attempt to change the mission of the department from emergency response to injury and accident prevention would be met with a very strong negative response because this issue would be interpreted as very important and highly inconsistent with the current identity of the organization and its members.

Issue-related actions represent the behavioral response to an issue. Identity serves to restrict the use of information, to limit the criteria that are used to form an acceptable and legitimate solution, and to control what measures are used to assess effective performance. It is at this point where identity is most closely associated with organizational traditions. The traditions of the organization or the profession of which it is a part establish preconceived ideas about what should be done to deal with issues, and what constitutes appropriate action. For example, if denial, rationalization, self aggrandizement, attributional egotism, and an attitude of entitlement have been successful in defending individual and collective identity in the past, these behaviors would be expected to continue to be used to defend against any future challenge to organizational identity.

The research conducted by Dutton (1991) supports the assertion of other previous research that organizational identity has a strong influence on how organizations adapt to change through the influence that identity has on how issues are interpreted. The constructs of individual and organizational identity are used as reference points to determine if the actions taken in relation to an issue are consistent with individual and collective identity or not. The determination of consistency or inconsistency precedes the motivation to support or resist an issue. If an issue is consistent with identity, it is likely to be supported. If an issue is inconsistent with identity, it is likely to be resisted.

Organizational Identification

Discussion thus far has defined and described the elements of organizational identity, which includes the internal attributes of culture and the external attributes of image. The concepts of organizational adaptation have also been discussed. But organizations are made up of people, and it is important to understand how the concept of identity affects people in order to modify the identity of the fire service to one that is more supportive of safety management systems. While organizational identity relates to the construction of the internal and external attributes of organizations, the concept of organizational identification relates the identity of the organization to the self-concept of the individuals that are a part of the organization.

Individuals are connected to the organization of which they are a part when their self-concept contains the same attributes that are ascribed to the organization. This connection has been defined as organizational identification (Dutton et. al., 1994). As individuals integrate more of an organization's characteristics and attributes into their self-concepts, they become increasingly attached to the organization. At the same time, the level of congruence between the practices, values, beliefs and norms of the organization and the individual increases. The strength of the individuals' identification with the organization increases with the level of fit or congruence between the identity of the organization and the self-concept of the individual. What this means in practical terms is that if an individual finds the culture and image of an organization to be consistent with the way they define themselves, they are likely to have a high affinity for that organization.
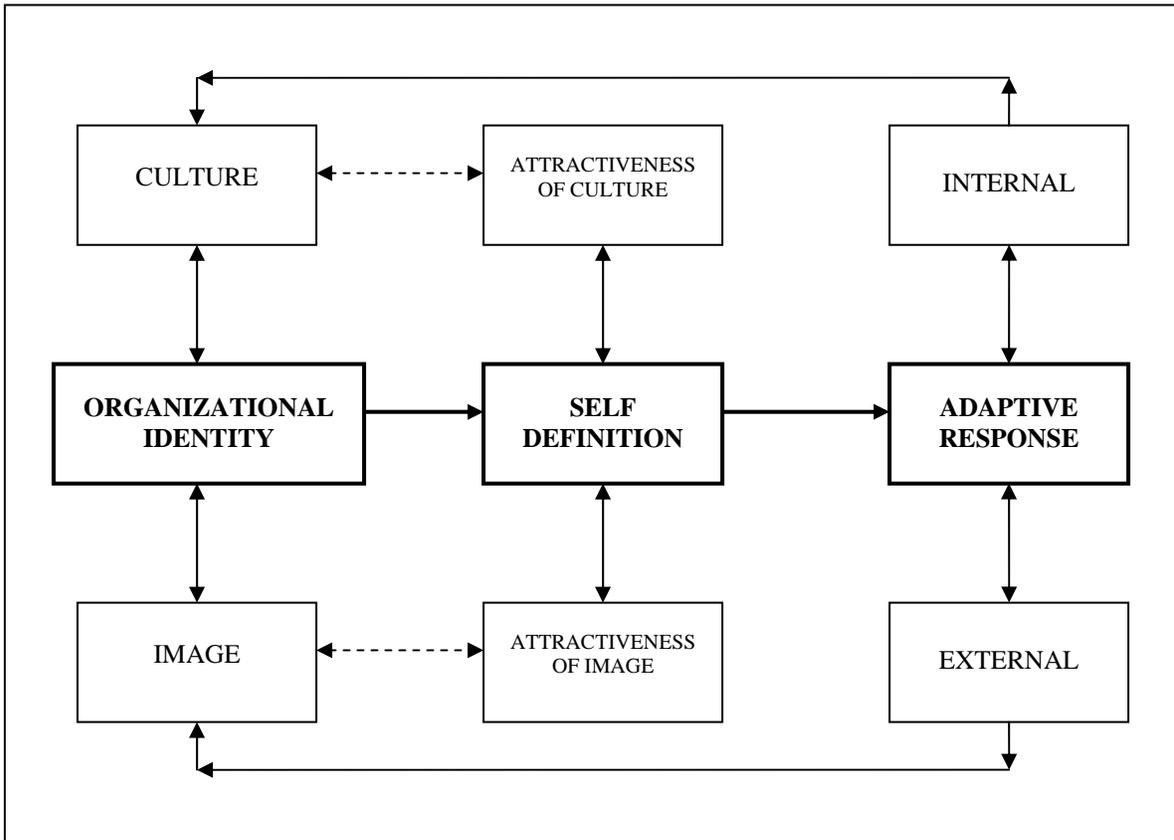
Three principles have been established in other research to define the construct of self-definition. These are self-continuity, self-distinctiveness, and self-enhancement (Dutton et. al., 1994). The concept of

self-continuity recognized the desire for people to be able to maintain a consistent self-concept over time and in different contexts. When an organization provides the opportunity for self-expression and is relevant to their self-concept, that organization will be more attractive than others that do not provide the same opportunity for self-fulfillment. The distinctiveness of on organization can also accentuate the distinctiveness of the individuals associated with that organization because the individual shares in the distinctiveness of the values and practices of the organization. When individuals are a part of on organization that has a positive or attractive organizational identity, their personal self-esteem is increased because these individuals see themselves as having the same positive qualities and attributes as the organization of which they are a part. An important point to make about the concept of self-definition is that the relationship between organizational identity and self-concept is something that people experience on a very personal level. This means that any increase or decrease in the attractiveness of organizational identity has the potential to have a significant impact on the cognitive and affective perception of self within the individual.

Another important aspect of organizational identification is the positive social identity that individuals gain from affiliation with organizations that have a positive identity and a high level of social value, like the fire service. Empirical studies have demonstrated that affiliation with such organizations provides individuals with a number of personal social benefits. These include the creation of self-gratifying social opportunities, heightened social prestige, the facilitation of social interactions, and the creation of social credits (Dutton et. al., 1994).

A Model of Organizational Identity, Self-Definition, and Adaptive Response

The relationship between organizational identity, self-definition and the adaptive response to issues is represented in Figure 3. This model assumes an initial steady state of equilibrium where the organization's identity has a high level of congruence with the self-definition of the members of the organization. No adaptive response is necessary when a high level of fit exists between the attributes of the organization and those of the individual members. When a significant issue is recognized, such as the level of safety within the organization, this initiates the adaptive cycle. Significant issues are defined as those that have the potential to result in a significant change in either the culture or image of the organization.

CULTURE

ATTRACTIVENESS
OF CULTURE

INTERNAL

**ORGANIZATIONAL
IDENTITY**

**SELF
DEFINITION**

**ADAPTIVE
RESPONSE**

IMAGE

ATTRACTIVENESS
OF IMAGE

EXTERNAL

Figure 12: Organizational Identity, Self Definition, and Adaptive Response

In this process, the issue is interpreted, an emotional response is formed, and adaptive actions are taken. The level of emotional response will be on the same scale as the level of importance of the issue or the potential threat to identity. If an issue is interpreted to have the potential to increase the level of congruence or fit between the organizations identity and the self definition of its members, then the adaptive response will be supportive. If the issue is interpreted to have the potential to decrease the level of congruence or fit between the organization's identity and the self-definition of its members, then the members will either change their self-definition and support the change in identity of the organization, or resist the change in identity of the organization in order to preserve their own self-definition.

A hypothetical example of how this model works may be helpful. Take the issue of safety in the fire service. The identity of the fire service could be described as one that includes a culture and image based on the values, beliefs, and practices resulting from the idea that members are willing to risk their

lives to save others. Because firefighters are willing to take this kind of risk, they receive a very positive social identity as part of the image that the public carries about firefighters and the profession. In fact, it would not be irrational to propose that the level of risk firefighters may potentially take has become the measure of value for the fire service. Individuals join the fire service because the internal cultural values of the organization are consistent with their self-definition.

The positive social identity that results from the image of the fire service also provides personally satisfying rewards and consequences in terms of social opportunities, social prestige, social interactions, and social credits. For example, when a firefighter tells people in a social setting about what they do, they are immediately identified as a person who has the same bravery and courage they associate with the fire service, which provides a higher level of social prestige than other occupations. An example of social credits occurs when a firefighter is pulled over by a police officer for speeding, and is let go without a ticket because of the union or departmental sticker in the back left corner of the rear window. The police officer gives the firefighter a break because of the bravery and courage that firefighters may be called upon to demonstrate in the course of their work. The point is that the image and the culture of the fire service are highly attractive to the individual because they are consistent with the way the individual defines him or herself.

What happens, however, when an issue arises that may change the culture and image of the fire service? Part of the identity of the fire service is based on the bravery and courage of firefighters, which is demonstrated in part by the number of firefighters killed and injured in the line of duty. Fire fighting is perceived as a dangerous occupation, which is one of the reasons for the high level of identification members have with the service, and for the high level of positive social identity the fire service has in the eyes of the public. Safety has the potential to change the culture and image of the fire service by changing the criteria used to establish the social value of what the fire service does for the public. How would firefighters think of themselves and the value they provide to their communities if not one firefighter died in the line of duty? What would the public think of firefighters and the profession if not one firefighter died in the line of duty? If fire fighting is no longer perceived to be a dangerous occupation, what criteria will be used to demonstrate the value of fire service organizations and their members? If bravery and courage,

risk and danger, are no longer used as the measure of value, what will happen to the social identity of firefighters? Will they have the same level of social opportunities, social prestige, and social credits?

The issue of safety has the potential to change the way the fire service as a profession thinks of itself and to change the way others think of the fire service. Safety has the potential to shatter the self-definition of the members of fire service organizations by changing how they see themselves and how they measure their value and worth in society. Increasing the level of safety also has the potential to decrease the level of positive social identity associated with being a member of the fire service. Bravery, courage, risk and danger are part of the foundation of the culture and image of the fire service. The practices, values, beliefs and assumptions of the value and worth of the fire service are based largely on these concepts.

If the fire service was to change to a safety-based identity, what might be expected in terms of the adaptive response of fire service organizations and their members? Because the issue of safety has the potential to change the culture and image of the fire service, it is clearly a significant issue. If efforts are made to change the identity of the fire service to an identity based on safety rather than risk, these efforts will be interpreted, emotional responses will be formed, and actions will be taken in response. In some if not most instances, these changes will be interpreted as inconsistent with the current identity of the organization, and as inconsistent with the self-definition of its members. A safety culture has the potential to change many of the practices, values, beliefs and underlying assumptions upon which the organization is currently formed. In addition, a safety culture has the potential to decrease the social identity associated with the affiliation of individuals with fire service organizations. For members of the fire service, their level of social prestige will decrease, their social opportunities will be more limited, and they may not receive the same level of social credits they previously enjoyed. Given the potential negative effects on organizational identity resulting from a change in organizational culture from a risk-based culture to a safety-based culture, it might be expected that the adaptive response would be strongly resistive to such a change.

Resistance to a change in organizational identity is likely to result in defensive behaviors such as denial, rationalization, self-aggrandizement, and attributional egotism. These behaviors may be used internally in an attempt to resist or minimize a change in culture, or externally to maintain the image and positive social identity of the organization. With regard to this hypothetical example, denial might take the

form of avoiding personal responsibility and accountability for incidents that result in firefighter deaths or injuries. Biased or predetermined explanations are provided that deny, omit or conceal information that might tarnish the image of the organization or the profession. These types of explanations are intended to limit personal and organizational responsibility for negative or controversial outcomes.

When an incident results in a firefighter casualty, organizational representatives are usually quick to develop some type of rationalization for what happened. The purpose of this rationalization is to justify the motives, actions and consequences surrounding the incident. These are sometimes efforts to rationalize actions through retrospective sense-making. The rationalization may be based on nothing more that a best guess of what the motives and actions were that resulted in the casualty. However, pressure for some type of rational explanation for what has happened puts pressure on the organization to provide some kind of explanation. What is typically provided in these circumstances is an explanation or rationalization that attempts to sustain organizational self-esteem (Brown, 1997).

This example is intended to provoke a different way of thinking about the problem of safety in the fire service. The relationship between organizational identity and self-definition clearly has benefits, but it is the problems associated with this relationship that are the most important aspect of the relationship to understand from a safety perspective. It is the problems associated with organizational identity that may be getting in the way of improving the safety performance of the fire service

Developing a Safety Culture in the Fire Service

The argument advanced here is that the first requirement for the successful development of a safety culture is to provide an understanding of organizational identity as defined by culture and image. The second requirement is to understand the adaptive process involved in dealing with significant issues. The third requirement is to recognize the defensive behaviors that result from a resistive response to a significant issue. The successful achievement of these requirements is much more likely when attempted within a context of psychological safety and trust so that these issues can be discussed openly within the organization. If these issues can be discussed openly, and the underlying assumptions of the currently held values and beliefs explored fully, it will be possible to introduce the elements of a safety culture within the organization and to begin working toward making these elements a part of the organization's identity. Once

these elements have been accepted as part of the culture and image of the organization, the next requirement is to be vigilant in sustaining an attitude toward safety as a never-ending process. Safety is not a final destination, but a constant process of inquiry, analysis, and change.

Changing the culture of any organization is a transformation process that requires a comprehensive understanding of the underlying issues involved with organizational identity. Much of this paper has been directed at providing a preliminary overview of the issues involved in a change of organizational identity from a risk based identity to a safety-based identity. A transformational change of this magnitude involves not only individual fire service organizations, but the profession as a whole. Individual departments attempting to make this transition will need all the support they can get from other organizations and institutions involved in fire protection. If the fire service is to be successful in reducing firefighter casualties, there must be a determined and sustained effort by those individuals and organizations that care about the fire service to change the way we think about who we are, how we measure the value of what we do for the communities we protect, and how our constituents think of the fire service. A transformation change like this requires a deep understanding of the issues and problems that surround a change in the identity of the fire service.

Development of a safety culture within the fire service will require a change in many of the behaviors, practices, values, beliefs and underlying assumptions that make up the current culture of many fire service organizations. Previous efforts over the last few decades to improve the level of safety within the fire service have been largely unsuccessful, as represented by the data on firefighter death rates. One of the reasons for the lack of success in improving the safety performance of the fire service in the US may be the due to a lack of understanding about how changing the safety performance of the fire service affects the culture and image of the fire service. People may be reluctant to attempt to raise these issues because they are difficult issues to talk about, and dealing with some sort of technological fix is much easier that dealing with people.

Dealing with changes in the underlying assumptions upon which the current thinking and practices regarding safety performance are based is a difficult process because it involves discussion and disagreement about deeply held values and beliefs. It is a process that is sure to generate high levels of conflict. However, with a solid understanding of how change influences the identity of organizations, in

terms of internal culture and external image, people will at least have a point from which to begin discussions about how to make significant and lasting improvements in safety performance. The purpose in developing a safe and open discussion of underlying assumption, values, beliefs and practices associated with the issue of safety is to open up the opportunity for successful identity change.

It is also important to have an understanding of the adaptive process. The process presented earlier involves the recognition of a significant issue that must be dealt with by members of the organization. The issue of interest in this paper has been that of firefighter safety. This issue will be interpreted by members of the fire service through the filter of organizational culture and image. Members will develop an emotional response to their interpretation of the issue, which will then form their adaptive response in terms of a supportive or resistive approach to the issue.

A resistive response to the issue of safety will include a number of different defensive behaviors. These have been previously identified as denial, rationalization, attributional egotism, a sense of entitlement, and self-aggrandizement (Brown, 1997). Even after creating a safe environment for discussions about how identity might be changed by the initiation of a safety culture, some level of defensive behavior can be anticipated. These behaviors need to be recognized so that the underlying assumptions, values and beliefs driving these defensive behaviors can be dealt with openly and constructively.

Organizations will be prepared for change when the members of the organization understand the attributes of organizational identity and the process of adaptive response, and can recognize the defensive behaviors used to resist change. The process of change then shifts to the introduction of the elements of a safety culture as an attribute of the identity of the organization. Every though fire departments are all part of same profession, each is slightly different in terms of the attributes of their culture and image. As a result, the application of the elements of a safety culture within each organization may also be slightly different as well. These differences are minor compared to the importance of being able to plan for and implement the appropriate elements of a safety culture within the specific context of each organizations culture and image. These elements include organizational commitment, management involvement, employee empowerment, reward systems, and reporting systems. Each of these is described and explained in more detail in the literature on the development of a safety culture (Wiegmann et al., 2004).

Conclusion

The development of a safety culture in the US fire service will be a difficult transformation. These fire service organizations are controlled by local government, making regional or national change more difficult to accomplish. National-level associations and institutions appear to have little influence on changing the culture of the profession. In addition, some may have even less desire to promote and support the change to a safety culture, either because it is too radical a change from the current identity of the fire service, or because it is such a daunting task. This is clearly a high-risk operation.

Those who choose to embark on the effort to change the identity of their organization, and to begin to change the identity of the fire service, will face a highly emotional and defensive response. They will have to rely on the same bravery and courage that they have demonstrated on the fireground in order to survive the challenges involved in a transformational change of identity in the fire service. But the opportunity for making a significant improvement in the safety performance of the fire service is a tremendous reward and well worth the effort.

Safety is not about how many firefighters are riding on the fire engine, it is about the values, beliefs and assumptions that firefighter make about what it means to be riding on the fire engine. An optimal safety culture maximizes the effectiveness of available resources within reasonable and acceptable limits of risk. The value and worth of the fire service should not be measured by the level of risk and danger to firefighters, but other measures of value and performance are lacking for the fire service.

As the culture of the fire service shifts from an identity based on risk to an identity based on safety, it may be imperative to develop valid and reliable measures of performance to demonstrate the value and worth that the fire service provides for our communities. Although this is separate issue, just like the issue of safety, the development of more comprehensive measures of performance has the potential to challenge the current identity of the fire service.

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APPENDIX B

Safety Management System Survey

Safety Management Systems Survey

We would like to find out how you feel about your department's safety management systems. In order to do this, we would like you to complete this questionnaire. ***All responses will be held in strict confidence.* Do not put your name on the questionnaire.**

Before you begin the survey, please enter the requested demographic information, which includes department, job function or rank, total number of years of service in the fire service, and indicate if you have ever been involved in a safety related incident/accident (answer yes or no).

(V1) Name of Fire Department	
(V2) Job Function	
(V3) Total years of service	
(V4) Involved in a safety-related incident or accident	Yes _____ No _____

In the following questions, you will be presented with a series of statements concerning safety management systems in your department. You should indicate your response by assessing the degree to which in your opinion evidence suggests that there is no evidence, little evidence, reasonable evidence, significant evidence, or full evidence to support the statement. The numerical scores are intended to provide a percentage comparison of the different degrees of evidence used in the ratings. This will allow us to measure quantitatively the intensity of your attitudes and provide a measure for the difference between the ratings. Please "'check" the box that best represents your feeling about the question. ***Check only one box for each question.*** For example, if you believe that there is little evidence to support the statement, "Risk assessments are derived from hazard identification in your department," you would place a check mark in the "little evidence" box, as in the example:

Please check the appropriate box to indicate your level of agreement	No Evidence	Little Evidence	Reasonable Evidence	Significant Evidence	Full Evidence
	0	**25**	**50**	**75**	**100**
Risk assessments are derived from hazard identification		✔			

Please notice that all surveys are printed front and back.

Thank you for your co-operation!

95-ITEM SAFETY MANAGEMENT SYSTEMS SURVEY

Please check the appropriate box to indicate your level of agreement	No Evidence	Little Evidence	Reasonable Evidence	Significant Evidence	Full Evidence
	0	**25**	**50**	**75**	**100**
(V137) Performance review is used as a means to identify and implement best practices and performance within the public safety sector and other appropriate sectors relevant to the organization					
(V138) Safety and health policy is recognized and implemented as an integral part of improving organizational performance					
(V139) Senior management takes an active role in the safety management of the Fire Department					
(V140) The safety and health policy establishes a commitment to treat safety and health as a core management function					
(V141) Training is aimed at enabling compliance with safety performance standards					
(V142) The safety and health policy expresses a commitment to maintaining effective systems of communication on safety and health matters					
(V143) The safety and health policy expresses a commitment to ensuring the competence of employees					
(V144) Appropriate and specific safety and health objectives have been established					
(V145) The safety and health policy makes a commitment to measure safety and health performance					
(V146) Staff are aware of the appropriate safety standards which apply to their work activities					
(V147) The safety and health policy expresses a commitment to review and develop policy					
(V148) The safety and health policy establishes the responsibilities of managers in policy implementation					
(V149) The department has an effective program of safety and health performance inspections					

Please check the appropriate box to indicate your level of agreement	No Evidence	Little Evidence	Reasonable Evidence	Significant Evidence	Full Evidence
	0	25	50	75	100
(V150) The safety and health policy identifies who has overall responsibility for safety within the Fire Department					
(V151) The achievement of safety and health objectives is measured during inspection					
(V152) The safety management system provides an effective safety and health organizational structure to implement safety related policy and achieve managerial control					
(V153) Responsibility, authority, and accountability for safety and health are delegated appropriately through a management structure from the department head to line supervisors					
(V154) The Head of the Department takes an active role in safety management					
(V155) The duties of persons with safety management responsibilities is well defined and documented					
(V156) Persons who are delegated responsibility and authority for safety are appraised on their safety and health performance					
(V157) Safety and health measurement information is used to provide feedback and motivation					
(V158) Risk assessments are used to define skills needed to carry out tasks safely					
(V159) Effective arrangements are in place to identify, eliminate, or control safety and health hazards and risks					
(V160) Arrangements are in place for the involvement and participation of all employees in developing health and safety policies					
(V161) A safety and health consultative group or committee has been established					
(V162) This group involves representative from all employee groups					
(V163) This group contributes to setting safety and health objectives					

Please check the appropriate box to indicate your level of agreement	No Evidence	Little Evidence	Reasonable Evidence	Significant Evidence	Full Evidence
	0	25	50	75	100
(V164) All members of this group are involved in establishing and maintaining performance standards					
(V165) The group is involved in devising procedures for the control of risk					
(V166) The group takes part in measuring performance					
(V167) The group takes part in reviewing performance					
(V168) Other, less formal, means exist to encourage employee participation					
(V169) The department has satisfactory arrangements for the dissemination of information or guidance relating to safety and health					
(V170) The safety and health policy expresses commitment to progressive improvement in safety and health performance					
(V171) Arrangements are in place for obtaining up-to-date safety and health information on hazards, risks and preventative measures					
(V172) Written information on hazards, risks and preventative measures is communicated throughout the organization					
(V173) Line and staff personnel are provided with adequate and appropriate safety and health training					
(V174) The safety and health policy commits senior managers to the provision of adequate and appropriate resources					
(V175) Access is provided to competent safety and health advice for both line and staff personnel					
(V176) All the main hazards have been identified and the risks from these controlled					
(V177) An effective, dynamic safety and health planning process is used to implement safety and health policy					

Please check the appropriate box to indicate your level of agreement	No Evidence	Little Evidence	Reasonable Evidence	Significant Evidence	Full Evidence
	0	**25**	**50**	**75**	**100**
(V178) Written performance standards are used for the control of risk					
(V179) Performance standards identify who is responsible for action					
(V180) Performance standards identify when the action must be taken					
(V181) Adequate safety precautions have been designed, developed and implemented for specific work related activities and are proportionate to the needs, hazards and risks of the organization					
(V182) Risk assessments have been carried out for specific departmental activities					
(V183) Risk control measures have been derived from risk assessments					
(V184) Risk assessments are derived from hazard identification					
(V185) Hazard identification is based on critical appraisal of all activities					
(V186) Hazard identification is based on accident, ill health and incident data					
(V187) A written safety and health plan has been established					
(V188) The safety and health policy makes a commitment to planning for safety					
(V189) Safety and health objectives are measurable					
(V190) Safety and health objectives are to be achieved in a specified time or during specific activities					
(V191) Priorities are set based on the outcome of risk assessments					
(V192) Plans have been developed covering the management of change of either a permanent or temporary nature					
(V193) The Department has satisfactory arrangements for the identification of safety training needs for line and staff personnel and for the provisions of that raining					

Please check the appropriate box to indicate your level of agreement	No Evidence	Little Evidence	Reasonable Evidence	Significant Evidence	Full Evidence
	0	25	50	75	100
(V194) Plans have been established for implementing corrective actions					
(V195) Safety and health performance is effectively monitored					
(V196) The safety and health policy establishes the contribution that employees can make to policy implementation					
(V197) Safety and health performance are measured against pre-determined plans					
(V198) Safety and health performance are measured against performance standards					
(V199) The safety and health policy communicates a commitment to safety and health by the Fire Chief					
(V200) Monitoring of safety and health performance is a specified line management responsibility					
(V201) Safety performance inspections check whether performance standards are being implemented					
(V202) Safety performance plans specify frequency of inspection					
(V203) The safety and health policy recognizes the importance of minimizing risk and the prevention of injury, ill health, disease, and incidents					
(V204) Records are kept for each inspection with details of both positive and negative findings					
(V205) All injuries, accidents, and incidents are reported					
(V206) Arrangements are in place for reporting hazards					
(V207) A procedure is in place for reporting accidents and injuries					
(V208) A procedure is in place for reporting ill health					
(V209) A procedure is in place for reporting near misses and other losses					
(V210) Arrangements are in place for carrying out accident investigations					

Please check the appropriate box to indicate your level of agreement	No Evidence	Little Evidence	Reasonable Evidence	Significant Evidence	Full Evidence
	0	**25**	**50**	**75**	**100**
(V211) Both immediate and underlying causes of negative findings are identified in inspections and investigations					
(V212) Line managers are involved in investigations					
(V213) There is a mechanism for ensuring that Senior Management becomes involved in the investigation of serious incidents					
(V214) The results of investigations are recorded					
(V215) Arrangements are in place for implementing remedial action following hazard, inspection and accident reports					
(V216) These arrangements specify who is responsible for taking remedial action					
(V217) Arrangements are in place to ensure that the remedial action has been taken					
(V218) The Head of Department receive written reports on monitoring activities					
(V219) Safety and health performance measurement information is used to identify areas where corrective action is necessary					
(V220) Safety and health are a standing agenda item at senior management meetings					
(V221) Arrangements are in place to ensure a consistent response to, and thorough investigation of, substandard performance including accidents					
(V222) Safety and health performance is effectively reviewed to ensure progressive improvement					
(V223) Periodic reviews of safety and health performance are undertaken					
(V224) These periodic reviews examine the entire safety and health plan, including the achievement of objectives					
(V225) Periodic reviews of safety include risk assessments					

Please check the appropriate box to indicate your level of agreement	No Evidence	Little Evidence	Reasonable Evidence	Significant Evidence	Full Evidence
	0	**25**	**50**	**75**	**100**
(V226) Periodic reviews of safety examines inspection reports which are used to identify common trends and weaknesses					
(V227) Periodic reviews of safety examine the results of audits					
(V228) The findings of periodic reviews of safety are implemented					
(V229) The outcome of the periodic review process is used to revise the safety and health policy					
(V230) The safety and health policy is effective					
(V231) The department maintains satisfactory records of accidents, incidents, dangerous occurrences and records of ill health. These are analyzed with a view to identifying causes so possible remedial measures can be identified					

APPENDIX C

Safety Related Behaviors Survey

We would like to find out how you feel about your department's safety related behaviors. In order to do this, we would like you to complete this questionnaire. *All responses will be held in strict confidence.* **Do not put your name on the questionnaire.**

Before you begin the survey, please enter the requested demographic information, which includes department, job function or rank, total number of years of service in the fire service, and indicate if you have ever been involved in a safety related incident/accident (answer yes or no).

(V1) Name of Fire Department	
(V2) Job Function	
(V3) Total years of service	
(V4) Involved in a safety-related incident or accident	Yes _____ No _____

In the following questions, you will be presented with a series of statements concerning safety related behaviors in your department. You should indicate your response by assessing the degree to which in your opinion evidence suggests that there is no evidence, little evidence, reasonable evidence, significant evidence, or full evidence to support the statement. The numerical scores are intended to provide a percentage comparison of the different degrees of evidence used in the ratings. This will allow us to measure quantitatively the intensity of your attitudes and provide a measure for the difference between the ratings. Please "'check" the box that best represents your feeling about the question. *Check only one box for each question.* For example, if you believe that there is little evidence to support the statement, "Risk assessments are derived from hazard identification in your department," you would place a check mark in the "little evidence" box, as in the example:

Please check the appropriate box to indicate your level of agreement	No Evidence	Little Evidence	Reasonable Evidence	Significant Evidence	Full Evidence
	0	**25**	**50**	**75**	**100**
Risk assessments are derived from hazard identification		✔			

Please notice that all surveys are printed front and back.

Thank you for your co-operation!

85-Item Safety Related Behaviors Survey

Please check the appropriate box to indicate your level of agreement	No Evidence	Little Evidence	Reasonable Evidence	Significant Evidence	Full Evidence
	0	**25**	**50**	**75**	**100**
(V52) The personnel accountability system is based on the size, complexity, type and needs of the incident					
(V53) Systematic rest and rehabilitation is provided for responders operating at the scene of an emergency					
(V54) Drivers never exceed a speed that is safe and prudent based on road conditions and vehicle capabilities					
(V55) The department has a policy for non-emergency response to incidents classified as non-urgent					
(V56) Fuel load and potential exposure to high temperatures is monitored during live fire training evolutions					
(V57) The communications system provides the capability to communicate with mutual aid resources					
(V58) The incident management system provides a series of supervisory levels to be implemented to create a command structure					
(V59) The command structure utilized during incidents is appropriate based on the nature of the incident, as well as the scale and complexity of operations					
(V60) Every member of the department cooperates, participates, and complies with the requirements of the fitness program					
(V61) The command structure for each incident is developed so that an effective span of control is maintained					
(V62) An effective span of control is maintained throughout the incident management system so that supervisors are able to monitor the activities of assigned subordinates					
(V63) Fire department training faculties used for the purpose of live fire training are designed, built, and/or used in a way that ensures a safe training environment					
(V64) Medical requirements are based on essential job tasks which are developed from an assessment of the types and levels of service provided by the department					
(V65) The department ensures the privacy and confidentiality of medical information					
(V66) Alternative duty positions are available for those who are on temporary work restrictions					

Please check the appropriate box to indicate your level of agreement	No Evidence	Little Evidence	Reasonable Evidence	Significant Evidence	Full Evidence
	0	**25**	**50**	**75**	**100**
(V67) Adequate and appropriate training and familiarization on the incident management system is provided					
(V68) Tactical level supervisors are able to maintain accountability for the resources operating under them					
(V69) Members report any medical condition that could interfere with their ability to safety perform essential job tasks					
(V70) The medical evaluation is able to identify any conditions that interfere with a members physical or mental ability to safely perform their essential job tasks without undue risk to themselves or others					
(V71) Accountability is maintained when units are relocated during the course of an incident					
(V72) The annual medical evaluation includes blood tests for total cholesterol, HDL and LDL					
(V73) Our response procedures minimize travel times while also maximizing response safety					
(V74) Drivers do not move vehicles until all persons on the vehicle are seated and secured with seat belts					
(V75) All persons riding in or on vehicles are always seated and secured by seat belts when the vehicle is moving, with the exception of momentarily providing medical care to patients in ambulance type vehicles					
(V76) Fitness assessments include a component for aerobic capacity					
(V77) An effective span of control is maintained throughout the incident management system so that supervisors are able to communicate effectively with assigned subordinates					
(V78) Fitness assessments include a component for body composition					
(V79) The safety plan for training evolutions includes the method of communications, evacuation signals, a designated safety officer, protective backup lines, rapid intervention teams, accountability, and incident management					
(V80) All personnel participating in practice training evolutions are required to wear the appropriate personal protective equipment					

Please check the appropriate box to indicate your level of agreement	No Evidence	Little Evidence	Reasonable Evidence	Significant Evidence	Full Evidence
	0	25	50	75	100
(V81) A qualified and experienced safety officer is designated for all live fire training evolutions					
(V82) Fitness assessments include a component for muscular strength					
(V83) Fire department instructors provide instruction on proper hydration prior to emergency training					
(V84) The communications system provides for an adequate number of separate dispatch, tactical, and command channels					
(V85) Fitness assessments include a component for muscular endurance					
(V86) The incident management system is able to meet the characteristics of incidents based on the size, type, complexity, and operating environment of the incident					
(V87) Fitness assessments are conducted annually					
(V88) Incident commanders mange safety by constantly monitoring the situation and reviewing the effectiveness of existing control measures					
(V89) Members cooperate, participate and comply with the medical evaluation process					
(V90) A system of resource accountability has been adopted and is defined and documented in writing					
(V91) The department provides the support necessary to ensure that personnel remain safe in hostile operational environments					
(V92) Supervisors maintain constant awareness of the position and function of all resources assigned to operating under them					
(V93) Members provide accurate and complete information during the course of their occupational medical evaluation					
(V94) The annual medical evaluation includes a stress EKG					
(V95) Accountability is maintained when units are evacuated from an area as a result of imminent threat					
(V96) A personnel accountability system has been adopted and is defined and documented in writing					
(V97) The department requires structured participation of all members in the fitness program					

Please check the appropriate box to indicate your level of agreement	No Evidence	Little Evidence	Reasonable Evidence	Significant Evidence	Full Evidence
	0	25	50	75	100
(V98) Members remain under the supervision of their assigned supervisor					
(V99) The medical program includes medical evaluation of current members					
(V100) The communications system is able to meet the demands of large scale emergencies					
(V101) The department provides adequate and useful information about operational hazard identification, risk assessment, and risk control					
(V102) Emergency vehicles come to a full stop before entering a negative right of way intersection, blind intersection, or whenever the driver cannot account for traffic in all oncoming lanes					
(V103) The department has established procedures for safety driving, riding within, and operating emergency vehicles during an emergency response					
(V104) Procedures for emergency response emphasize the importance of the safe arrival of vehicles and personnel and the emergency scene as the first priority					
(V105) The departments driver training program is adequate and appropriate for the purpose of preventing vehicular accidents, deaths, and injuries to members and the public					
(V106) The department provides driver training and education commensurate with the duties and functions they are expected to perform					
(V107) Members perform their driving duties and functions in a manner that does not pose a hazard for themselves, other members, or the public					
(V108) Violations of safe driving practices and procedures are reported immediately to personnel with the authority and responsibility to take corrective action					
(V109) Supervisors take corrective action whenever a violation of safe driving practices or procedures occurs					
(V110) Operations level personnel are able to identify the hazards encountered during various operations, assess those risks, and take action to control risks					
(V111) Incident commanders are able to identify hazards, assess risk, and make appropriate judgments about using resources effectively and within an acceptable level of safety during operations					

Please check the appropriate box to indicate your level of agreement	No Evidence	Little Evidence	Reasonable Evidence	Significant Evidence	Full Evidence
	0	25	50	75	100
(V112) A system of resource accountability is used at the scene of emergencies involving multiple units					
(V113) Individuals are able to make professional judgments about the appropriate use of resources in order to control the risks inherent in operational environments					
(V114) Warning lights and audible warning devices are used whenever emergency vehicles are operating in the emergency response mode					
(V115) Safe procedures and systems of operational work have been developed and are used at incidents					
(V116) Members are self disciplined and work within accepted procedures and systems of operational work					
(V117) Members are vigilant for their own safety and the safety of others					
(V118) Incident commanders, supervisors, and team leaders engage in the continuous assessment and control of risk in the rapidly changing circumstances or operational incidents					
(V119) The incident management system is implemented and used for unusual or large scale incidents					
(V120) Fire department instructors have the required knowledge and skill in the areas of instructional methods, training applications, and safety					
(V121) The department has established a health related fitness program that enables members to develop and maintain a level of health and fitness to safety perform their assigned functions					
(V122) The incident management system is implemented and used for routine incidents					
(V123) An exercise training program is available to all members					
(V124) Education and counseling regarding health promotion is available for all members					
(V125) Only those elements of the incident management system that are necessary for the effective control of the incident are activate or applied					
(V126) The personnel accountability system is effective					
(V127) The department provides the opportunity and means for implementing the fitness program					

Please check the appropriate box to indicate your level of agreement	No Evidence	Little Evidence	Reasonable Evidence	Significant Evidence	Full Evidence
	0	25	50	75	100
(V128) The department provides the opportunity and means for regular exercise training					
(V129) The department has established clear policies and procedures for emergency response driving					
(V130) A safety plan is developed for all training evolutions, including live fire training					
(V131) Fire department instructors monitor weather and environmental conditions (heat/cold) throughout the course of training evolutions					
(V132) The department has a formally adopted incident management system that is defined and documented in writing					
(V133) Fitness assessments include a component for flexibility					
(V134) The medical program includes medical evaluation of potential candidates					
(V135) The communications system is able to meet the demands of routine emergencies					
(V136) The department has designated a fire department physician to direct the occupational medical program					

APPENDIX D

Organizational Safety Culture Survey

Organizational Safety Culture Survey

We would like to find out how you feel about your department's safety culture. In order to do this, we would like you to complete this questionnaire. *All responses will be held in strict confidence.* **Do not put your name on the questionnaire.**

Before you begin the survey, please enter the requested demographic information, which includes department, job function or rank, total number of years of service in the fire service, and indicate if you have ever been involved in a safety related incident/accident (answer yes or no).

(V1) Name of Fire Department	
(V2) Job Function	
(V3) Total years of service	
(V4) Involved in a safety-related incident or accident	Yes _____ No _____

In the following questions, you will be presented with a series of statements concerning health and safety in your department. You should indicate your response by "checking" the appropriate box. For example, if you agreed with the following statement you would check under the "Agree" category, as shown in the following example:

Please check the appropriate box to indicate your level of agreement	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
Health and safety issues are very important		✔			

Please notice that all surveys are printed front and back.

Thank you for your co-operation!

43-Item Organizational Safety Culture Survey

Please check the appropriate box to indicate your level of agreement	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
(V9) Management operates an open door policy on safety issues					
(V10) Safety is the number one priority in my mind when responding to and working at the scene of an emergency					
(V11) Co-workers often give tips to each other on how to work safely					
(V12) Safety rules and procedures are carefully followed					
(V13) Management clearly considers the safety of employees of great importance					
(V14) I am sure it is only a matter of time before I am involved in an accident					
(V15) Sometimes I am not given enough time to get the job done safely					
(V16) I am involved in informing management of important safety issues					
(V17) Management acts decisively when a safety concern is raised					
(V18) There is good communication here about safety issues which affect me					
(V19) I understand the safety rules for my job					
(V20) It is important to me that there is a continuing emphasis on safety					
(V21) I am involved with safety issues at work					
(V22) This is a safer place to work than other departments I have worked for					
(V23) I am strongly encouraged to report unsafe conditions					
(V24) In my workplace management turns a blind eye to safety issues					
(V25) Some safety rules and procedures do not need to be followed to get the job done safely					
(V26) I am rarely worried about being injured on the job					
(V27) Management acts only after accidents have occurred					

Please check the appropriate box to indicate your level of agreement	**Strongly agree**	**Agree**	**Neither agree or disagree**	**Disagree**	**Strongly disagree**
(V28) I believe that safety issues are not assigned a high priority					
(V29) Some health and safety rules and procedures are not really practical					
(V30) Employees are not encouraged to raise safety concerns					
(V31) Personally I feel that safety issues are not the most important aspect of my job					
(V32) In my workplace the chances of being involved in an accident are quite high					
(V33) I do not receive praise for working safely					
(V34) Corrective action is always taken when management is told about unsafe practices					
(V35) Operational requirements and activities often conflict with safety measures					
(V36) My line supervisor does not always inform me of current concerns and issues					
(V37) I can influence health and safety performance here					
(V38) Sometimes conditions here hinder my ability to work safely					
(V39) Safety information is always brought to my attention by my line supervisor					
(V40) When people ignore safety procedures here, I feel it is none of my business					
(V41) In my workplace management acts quickly to correct safety problems					
(V42) I am clear about what my responsibilities are for health and safety					
(V43) Sometimes it is necessary to depart from safety requirements in order to achieve operational objectives					
(V44) A safe place to work has a lot of personal meaning to me					
(V45) There are always enough people available to get the job done safely					

Please check the appropriate box to indicate your level of agreement	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
(V46) In my workplace managers and supervisors show interest in my safety					
(V47) I am never involved in the ongoing review of safety					
(V48) Management considers safety to be equally as important as performance					
(V49) A no-blame approach is used to persuade people acting unsafely that their behavior is inappropriate					
(V50) Managers and supervisors express concern if safety procedures are not followed					
(V51) I cannot always get the equipment I need to do the job safely					

APPENDIX E

COMPREHENSIVE SAFETY AUDIT METHODOLOGY

	Organizational Level		
Research Method	Operational	Tactical	Strategic
Survey Interview	Employees and First Line Supervisors	Managers	Administrators
Survey Interview	Firefighters Company Officers	Battalion Chiefs Shift Commanders	Fire Chief Chief Officers

	Reciprocal Determinism Model Variables		
Research Method	Safety Management System	Organizational Safety Culture	Safety Related Behaviors
Surveys	YES	YES	YES
Interviews	YES	NO	YES
Direct Observation	NO	NO	NO
Document Review	YES	YES	YES
Note: Direct observation of the model variables will be conducted as part of the intervention strategy in Phase III of the project.			

APPENDIX F

Interview Questions

Safety Management Systems
Interview Question Set

Policy
1. What is this department's <u>safety policy</u>?

2. How was the current safety policy <u>developed</u>?

3. How is safety policy <u>changed</u> and <u>improved</u>?

4. What <u>barriers</u> get in the way of making changes and improvements in safety policy?

Management, Roles, and Responsibilities
5. Describe the safety management <u>roles and responsibilities</u> for the administrative, management, and supervisory levels within your department (Strategic, Operational, Tactical).

6. How would you describe the <u>relationship</u> between these different levels of administration, management, and supervision with regard to the management of safety related issues and problems?

7. How would you <u>rate the effectiveness</u> of the current safety management system on a scale of 1-10? <u>Why</u> that rating? What <u>recommendations</u> would you make to improve that rating?

8. How is the effectiveness of safety management <u>measured</u>? How do you know if safety is being managed well or not?

Performance
9. What are the measures of <u>safety performance</u>?

10. How is safety performance <u>improved</u>?

11. What <u>barriers</u> get in the way of improving safety performance?

Priorities
12. What would you say is <u>most important </u>in your department, safety or performance? (Example: safety or put the fire out) Why?

Safety Related Behaviors
Interview Question Set

General Safety
1. Are members of this department held <u>accountable</u> for unsafe behavior? Why or why not? For example, if a member of this department did not wear their seat belt while responding to an alarm and the company officer noticed, what would happen?

2. Under what circumstances or conditions would an unsafe act be ignored or be hidden and go <u>unreported</u>? Why does that happen sometimes?

3. How would you <u>rate</u> your department overall with regard to safety on a scale of 1 to 10?

4. What <u>recommendations</u> would you make to improve this rating?

Health and Wellness
5. Why do you think a person would be unwilling to participate in a <u>physical fitness</u> program?

6. Why do you think a person would be unwilling to participate in a <u>medical evaluation</u> program?

Operations
7. How would you describe the typical fire incident in terms of the effectiveness of the <u>incident management system</u> used to organize the incident?

8. How would you describe the typical fire incident in terms of the <u>decision making</u> process used to manage resources?

9. At a typical fire incident, are officers able to maintain an <u>awareness</u> of what resources are operating under them and what they are doing? Why or why not?

10. At a typical fire incident, are company officers able to maintain <u>accountability</u> for the members of their crew? Why or why not?

11. How do operational level personnel <u>manage risk</u> at the scene of an emergency? How is operational risk management conducted?

APPENDIX G

IRB Consent Form

Organizational Safety Study Survey Packet

First, thank you for helping with this research project! Without your thoughtful and honest responses to the attached surveys the research effort would be meaningless.

The purpose of the study is to add to the current nationwide initiative to reduce firefighter line of duty deaths and injuries (LODD&I). The terminal purpose of the research is to develop a systematic methodology to assess *organizational safety culture* that will be applicable to all types (volunteer, combination, and paid) and sizes of American fire departments. In doing so the hope is that *safety management systems* and *safety related behaviors* will lead to safer working environments that allow ALL firefighters to come home and result in fewer injuries.

Instructions: Attached you will find THREE surveys. Each survey will take about 30 minutes or so to complete. It is not necessary to complete all three surveys at the same time. But, for the research effort to be valid, you must provide responses to each question on each survey. Please do not leave any questions without a response. After you have finished responding to each question on each survey, place the survey back in the folder it came in, peel and stick the fastener, and drop it in the mail. The folder is self-addressed and postage will be paid by Fire Protection Publications at Oklahoma State University. **Please do not take the survey packet apart.** Please note the following:

- All responses will be held in strict confidence. All completed data will be placed in a lock box to which only the two field researchers have keys. Once the surveys reach OSU, only the study researchers will have access to the stored data. The data will be kept for up to three years and then destroyed. The records of this study will be kept private. Any written results will discuss group findings and will not include information that will identify you. Research records will be stored securely and only researchers and individuals responsible for research oversight will have access to the records. It is possible that the consent process and data collection will be observed by research oversight staff responsible for safeguarding the rights and well being of people who participate in research.
- Your participation in the study is voluntary. You can choose not to participate or discontinue participation at any point without reprisal or penalty.
- There are no known risks associated with this project which are greater than those ordinarily encountered in daily life.
- There are no personal benefits or compensation associated with participation, the purpose of the research is to help make fire departments in American safer places to work.
- If you have any questions about the study please contact: Chief Bill Pessemier at 303-419-0599 or at wlpessem@mho.net. If you have any questions about your rights as a research volunteer, you may contact Dr. Sue C. Jacobs, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-1676 or irb@okstate.edu

Remember, your responses are anonymous, only aggregate findings will be reported. Finally, for each question we have placed a V1 (variable 1) , V2 (variable 2), etc. for our coding purposes. Once again, we thank all of you for helping make the fire service a safer place.

Chief Bill Pessemier