Improving Safety Performance by Understanding Perceptions of Risk and Improving Safety Management Systems

By: William Pessemier

Causes

Perceptions of risk and safety are influenced by individual, social and organizational factors. In the fire service, individual and social factors are those that operate at the crew or company level. Organizational factors are those that relate to the ability of fire service organizations to effectively manage safety. Extensive research has been conducted in other high-risk occupations on the factors that influence individual and social perceptions of risk and the consequences that these factors have on the normalization of risk. In addition, while other high risk occupations and fire service organizations in other countries have developed very effective safety management systems, the US fire service does not have an institutionalized methodology for managing safety. The purpose of this paper is to provide a brief overview of the individual, social and organizational factors that result in the normalization of risk, the consequences of the normalization of risk in terms of organizational performance, and to present a model for improving safety performance in the fire service.

Individual and Social Factors

Perceptions of risk influence the motivation to encounter risk, control risk, or avoid risk altogether, and may be a powerful determinant of behavior related to safety (Powell, 2007). Perceptions of risk can be influenced by certain cognitive biases and other factors that influence behavioral choices. A bias is a process of influence that tends to produce results that systematically varies from reality (Shannon, 1999). The cognitive biases associated with safety influence the perception of risk and the subsequent response to risk in terms of safe or unsafe practices. For the individual facing risk, bias in the perception of risk creates a rational but unrealistic assessment of risk, resulting in

higher levels of risk taking (Powell, 2007), and higher levels of injury and death. Cognitive biases include melioration bias, rare event bias, and optimism bias. Additional factors that influence the behavioral choices include the cost of safe behaviors and the conflict between the demands for safety and the demands for performance.

Melioration bias is the tendency for individuals to assign greater weight to short term results, and to underestimate the potential for the occurrence of a negative event (Zohar & Luria, 2004; Luria 2008). The result of melioration bias is that the benefits of unsafe behavior outweigh the benefits of safe behavior in the short term. If the unsafe behavior does not result in an incident or accident, and if the unsafe behavior results in positive outcomes, then successive reinforcement increases the strength of the bias.

Rare event bias and optimism bias are similar in that they both result in a tendency to underestimate or minimize the potential impact of rare negative events associated with risk. Rare event bias is the tendency to under evaluate or minimize the likelihood of being adversely affected by a negative event that is known to occur only on rare occasions (Zohar & Luria, 2004; Luria, 2008). For example, within any individual fire department, a firefighter death is a rare event. Optimism bias results in the perception that the level of risk for an individual is lower than for others in the same situation (Powell, 2007, Weinstein, 1989).

Two other factors that can influence the perceptions of risk and safety practices are the cost of safety and the conflict between demands for safety and demands for organizational performance. Safety has an immediate cost for individuals that include a slower pace, extra effort, and personal discomfort (Zohar, 2003; Luria, 2008). These costs would not apply to unsafe practices, which could be perceived to be the benefit of unsafe practices: faster pace, less effort, more personal comfort. Therefore, if the costs associated with safe practices are compared to the benefits of unsafe practices and the low probability of a negative event, the result is an expected value for unsafe behaviors that is greater than the expected value of safe behaviors. Based on the assumption of value maximization, individual would rationally choose the unsafe course of action. The benefit of unsafe behavior is immediate and tangible, while the potential benefit of safe behaviors is long term and results in an intangible non-event.

The fire service represents a classic example of the conflict that can arise between safety and organizational performance. For the fire service, putting fires out is an inherently unsafe business. Performance pressure often results in higher levels of unsafe behaviors, as individuals feel compelled to sacrifice safety in order to accomplish organizational goals. The perception is that the two demands are inherently incompatible. The inability to achieve both results in workers making a choice to prioritize some goals at the expense of other (McLain, 2007). Given the other biases that influence the perceptions of risk and the value of safety, it would not be surprising for firefighters to choose performance over safety.

Each of these factors contribute to the normalization if risk. The individual and social factors that have been described contribute to an unrealistic perception of risk, the underestimation of the level of risk, and ambiguous expectations regarding risk and safety. In the absence of an active and effective capacity to manage safety and to direct management efforts at critical safety related behaviors, these factors will have a significant influence over the perception of risk and result in the normalization of high levels of risk and low levels of safety performance.

Normalization of unsafe practices can also occur as a result of the fact that other individuals take the same actions. If, in general, nothing bad happens as a result of unsafe practices, and if everyone else in the organization participates in the same practices, then these practices become part of the normal and accepted way of accomplishing tasks. Risk acculturation may then occur, which is the condition where greater and greater levels of high-risk activity provide greater and greater benefits, while the perceived risk of the activity diminishes in the absence of a negative event. As a result, individuals engage in increasingly higher levels of dangerous behavior while the risk becomes an accepted part of the activity.

Organizational Factors

The interaction of individual and social factors within fire companies can become dominant and even dysfunctional in terms of safety behavior in the absence of effective organizational management and control. Organizations must actively manage safety in order to achieve high levels of safety performance. Safety in an organization has been defined as the ability of that organization to deal with risks so as to avoid losses and still

accomplish its goals (Reason, 2000). Management and organizational factors have been identified as being critical to the success of safety performance improvement (DeJoy, 2005). High levels of safety performance require an effective system for managing and controlling safety that is specifically focused on the critical safety related behaviors of individual members of the organization.

Safety management systems are defined as the policies, strategies, objectives, organization, management controls, practices, and resources that are used to manage safety throughout the organization (Santos-Reyes & Beard, 2002; Fernandez-Muniz et al, 2007). Critical safety related behaviors are those behaviors that are associated with or correlated with high rates of worker injury or death. The ability of an organization to modify safety related behaviors depends on an adequate safety management system, one that targets specific behaviors for change, has the capacity to make necessary changes in safety related behaviors and sustain changes in behavior over time, and to make continuous improvement in safety performance.

Consequences

It has been argued informally and implicitly accepted that while the higher levels of risk taken by US firefighters results in higher rates of firefighter deaths and injuries, these higher levels of risk taking also result in a higher level of performance, which justifies the high rates of firefighter deaths and injuries. However, research has demonstrated that in other high-risk occupations, high levels of safety performance are associated with high levels of operational performance, and that low levels of safety performance are associated with low levels of operational performance. This pattern seems to hold up in the fire service as well.

For example, in the US, over the period from 1995 to 2004, the fire fighter death rate has actually increased per 100,000 fires from 5 fire fighters per 100,000 fires to almost 7 fire fighters per 100,000 fires (NFPA, 2004). In comparison, the number of fire fighter deaths in both the UK and New Zealand over this same period is less than one fire fighter per 100,000 fires (ODPM, 2004; NZ Fire Service, 2004).

Civilian fire deaths in the United States for the period from 2000 to 2002 were 1.32 per 100,000 population. For the same period in the UK, the civilian fire death rate

was 1.05 per 100,000 population. In New Zealand, the civilian fire death rate was 0.95 per 100,000 population (*World Fire Statistics*, 2005). These figures exclude losses associated with the attacks the occurred on 9/11 of 2001.

A comparison of direct fire loss and costs to national gross domestic product (GDP) is the most common method for making economic comparisons across nations and is expressed as a percentage of the GDP. Direct fire loss as a percent of GDP for the US for the years 2000 through 2002 was 0.022 percent. During the same period, direct fire loss in New Zealand was 0.017 of GDP, and in the United Kingdom the direct loss was 0.014 percent of GDP. The cost of fire protection services as a percent of GDP for the US during that same period was 0.025 percent. In the UK and New Zealand, the costs were 0.020 and 0.016 percent respectively (*World Fire Statistics*, 2005).

Based on these comparisons, fire service organizations in the United States are more costly in terms of the total cost of fire protection as a percentage of GDP than most other industrialized nations. At the same time, US fire service organizations have a lower performance record in term of civilian fire deaths and direct fire losses than in other industrialized nations. The consequences of the current perceptions of risk and the methods for managing safety in the US fire service include not only higher rates of firefighter deaths and injuries, but also include a higher rate of civilian deaths and injuries, higher levels of direct property damage, and higher overall costs. This pattern is consistent with findings in other high-risk occupations, where relatively low levels of safety performance result in relatively low levels of operational performance.

Mitigation Strategies

Recognize how bias can influence the perception of risk

The first step to improving the safety performance for the fire service it to recognize and acknowledge how melioration bias, rare event bias, and optimism bias influence the perception of risk at the individual and group level. In addition, the influence of perceptions of the cost versus benefits of safety must be made explicit, as well as the conflict between safety and operational performance. Fire service organizations need to talk about how these factors contribute to the normalization of risk. Evaluate your

organization and determine to what extent these factors may contribute to an unrealistic perception of risk and to an underestimation of the level of risk to which your members are exposed or to the level of latent risk that is present in your current operational practices. Make these factors explicit and evaluate the impact that these factors have on what is considered to be acceptable operational behaviors and practices.

Improve safety management systems

A world class model for the development and implementation of an effective safety management system has been developed based on the quality management systems standards produced by the International Organization for Standardization, commonly known as ISO. They include ISO 9001, Quality Management Systems – Requirements; and IWA 4:2005, Quality Management Systems – Guidelines for the Application of ISO 9001 in Local Government. These standards have been used in the development of the British Standard 8800, which establishes a clearly defined standard for safety management systems. These standards are known as British Standard (BS) 8800, Occupational Health and Safety Management Systems; OHSAS 18001, Occupational Health and Safety Management Systems – Specifications; and OHSAS 18002, Occupational Health and Safety Management Systems – Guidelines for Implementing OHSAS 18001. Within these standards, Safety Management Systems are comprised of four main elements:

1) Policy – the intentions, approach, objectives, principles, and priorities upon which action is based
2) Organizing – the structure, cooperation, communication, competence, responsibilities, and relationships required to accomplish policy.
3) Planning and Implementation – includes development of Performance Standards, Risk Assessment, and Hazard Identification aimed at eliminating or controlling risk.
4) Measuring and Reviewing Performance – includes procedures for Active Monitoring, Reactive Monitoring, Remedial Action, Reviewing Performance, and continuous improvement

In addition, the Safety Management System should focus on risk control systems, based on the following principles, purpose, and process.

Principles of Risk Control Systems

1. Integrate operational risk management into the mission, policy, planning, procedures and practices of the department at all levels.
2. Accept no unnecessary risk
3. Accept risk when the benefits outweigh the costs
4. High-risk endeavors may only be undertaken when there is clear knowledge that the sum of the benefits exceeds the sum of the costs.
5. Operational risk management involves controlling risk, not avoiding all risk.
6. Make risk decisions at the appropriate level in the chain of command. Higher levels of risk require higher levels of approval before engaging in a high-risk course of action.

Purpose of Risk Control Systems

1. Conserve lives and resources and avoid unnecessary risk.
2. Make an informed decision to implement a course of action.
3. Identify feasible and effective control measures for reducing risk.
4. Provide reasonable alternatives for accomplishing operational goals and objectives.
5. Maximize operational effectiveness and reliability.

Risk Control Process

1. Identify Hazards

A hazard is an actual or potential condition where the following could occur due to exposure to the hazard:

- Injury, illness or death of personnel
- Damage or loss of equipment or apparatus
- Mission degradation

Hazards are sources of danger or risk. The ability of operational personnel, particularly company officers, to identify hazards is essential to maintaining a high level of safety performance.

2. Assess Hazards and Determine Risk

Hazard assessment involves an examination of hazards in terms of probability and severity, resulting in an overall assessment of the risk associated with each hazard. The overall level of risk is determined by a combination of the degree of probability and severity associated with each hazard. Two different types of risk exist in the context of fire service operations: tactical risk and accident risk. Tactical risks are those associated with direct involvement in emergency service operations. Accident risks are those risks posed to civilians from the actions associated with emergency service operations. Both types of risks must be considered when assessing hazards.

3. Develop Risk Controls and Make Risk Decisions

After making a determination of the risk associated with a hazard, a determination is made as to whether the risk is acceptable or not acceptable. If the risk is not acceptable, then risk controls must be developed for the hazard before a course of action is carried out. The purpose of risk controls is to reduce risk or eliminate the hazard. After controls have been established, the risk associated with the hazard is assessed again and the level of residual risk is determined. Residual risk is the level of risk that remains after controls have been selected for the hazard. The process of determining risk, selecting controls, and then revising the level of risk continues until the residual level of risk is determined to be acceptable.

Risk decisions are a determination that the residual risk is justified and that the course of action under consideration may precede under the conditions of the selected risk controls. Risk decisions involve several questions that must be answered by incident commanders and company officers:

A. Is the risk justified?
B. Does the decision balance the risk against mission expectations?
C. Are the controls sufficient and acceptable?
D. Is the residual risk acceptable?
E. If not, what other options are available?
    - Additional controls?
    - Alternate controls?
    - Modify the course of action?

4. Implement Controls

Controls must be integrated into training, operating procedures, and operational practices. Controls must be clear and simple so that they are understood at all levels. Company officers must clearly understand how controls will be implemented.

5. Monitor and Review

Company officers must ensure that controls are enforced. During operations, they must be able to monitor the members of their crew to ensure that the controls are effective and modify them as necessary in order to maintain a high level of safety performance. Company officers and incident commanders must be able to anticipate, identify, and assess new hazards and to implement appropriate controls throughout the course of operations. Company officers and incident commanders must be able to modify controls or the course of action in order to keep risks at an acceptable level.

The preceding principles, purpose and process of risk control are borrowed from the United States Marine Corps manual on Operational Risk Management (USMC, 2002). If Marines are able to use these principles to accomplish these purposes through this process in order to achieve high levels of safety for their personnel and still achieve their objectives on the battleground, then the fire service should be able to use these same principles to achieve high levels of firefighter safety and high levels of operational performance on the fireground.

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About the Author

Chief Bill Pessemier spent twenty five years in the fire service serving in a number of positions throughout his career, from firefighter to training officer to fire chief.

Prior to his retirement as the fire chief in Littleton, Colorado, Bill was the incident commander for the fire and emergency medical response to the shootings at Columbine High School.

Bill was appointed by James Lee Witt, past Director of FEMA, as a member of the America Burning Recommissioned Panel.

In his previous role as the Executive Communications Systems Advisor with the International Association of Fire Chiefs, Bill wrote a handbook on interoperability titled: Top Priority: A Fire Service Guide to Interoperable Communications.

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About the Symposium

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