Addressing the Common Behavioral Element in Accidents and Incidents

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Virtually every college student has faced the philosophical question, "If a tree falls in the woods and no one is there to hear it, does it make a sound?" The answer of course is no; the falling tree does not make a sound. While many people struggle with this answer, it is important to remember that the answer relies, not on the physics associated with a falling tree, but rather on the definition of sound. Sound is a subjective sensation created when the ear is stimulated by changes in the surrounding air pressure. Given this definition, a tree falling in the woods makes no sound when an ear is not present. A comparable safety question might be, "If there is a snag in the woods and there is no one there, does it pose a risk?" Again, the answer would be no. As with the sound example, the answer centers not on the physics of a falling tree, but rather on the definition of risk, a chance of loss or injury to a human. In the absence of a human, a falling snag creates no threat of injury or loss. Although this relationship appears obvious, it is important to realize that there are two components to this question: the snag, and the presence or absence of the human. Both play a role in creating a risky situation.

If an individual is injured by a falling snag, clearly both had to be present. This situation can easily be represented by the following model:

Environmental Hazard (Snag) + Human = Accident

The role of the snag and the individual in this situation are significantly different. The fact that the snag will eventually fall is well known and in contrast to the actions of the human, represents a relative constant. We know that the snag will eventually fall, but not when. If the environmental hazard remains essentially constant, only one component is left to vary: the actions of the human.

The level of risk created by the snag can be mitigated or exacerbated by the behavior of the individual. Injury and loss are more likely when the individual fails to attend to the known risks. When the individual is struck by the falling snag, the proximate cause is apparent, inattentiveness. It is not apparent, however, that this was an isolated case of inattentiveness. This inattentiveness might represent a general pattern of behavior that places the individual at risk in a variety of situations. To adequately respond to the accident, consideration must be given to both the proximate cause and the behavioral pattern. Unfortunately, traditional safety programs have placed far more emphasis on the former than on the latter.

Human Behavior and Accidents

Few will argue that most accidents and mishaps are directly related to unsafe behaviors. A review of the national air traffic control system revealed that 90% of the committed errors could be directly linked to human inattentiveness, poor judgment, or poor communications (Danaher, 1980). Mansdorf (1993) lists nine different causes of accidents and attributes all of them to human error in the form of inadequate training, supervision, and management. Given this consensus, the solution is simple; change the behavior where the accidents occur. Despite the intuitive appeal of this approach, efforts to increase safety in this manner often fail to produce the anticipated reductions in accidents. These failures occur because traditional safety programs generally focus on the unique circumstances and risks that, like the snag, remain relatively constant. Moreover, these programs often do not consider the broad spectrum of situations where the same behavior can also result in an accident.

Krause and Russell (1994) suggest that accidents result, not from unique circumstances or behaviors, but from the intentional display of risky behaviors that occur with such regularity that they have become common practice. These authors contend that an accident represents an unexpected result of an unsafe act that has become part of the working culture. Despite the best efforts to mandate safety, risky behaviors increasingly become acceptable practice each time they are performed without negative consequences. The process is similar to that seen in individuals who interact with hazardous products. Safety researchers have found an inverse relationship between safety behavior and familiarity (Goldhaber & deTurck, 1988). The probability that an individual will comply with safety guidelines decreases as familiarity with the product increases.

Wildland firefighters are not immune to this process. In response to the South Canyon fire of 1994, Rhoades (1994) writes, "And sometimes, even often, the risks we take in doing our jobs include violating the ***10 Standard Fire Fighting Orders*** or ignoring the ***18 Situations that Shout Watch Out***." He further writes, "Nonetheless, very seldom does our inability to comply with the orders cause us to abandon our tasks..." Rhoades' statements reflect the fact that it is possible to violate standard safety practices without the worry of negative consequences. More importantly, however, Rhoades' comments suggest that the violations have occurred with such great regularity that they have become accepted practice in wildfire suppression.

Accident Prevention From a Behavioral Perspective

An effective prevention program begins by understanding that accidents often reflect the unfortunate outcome of

hazardous acts that have become common practices and that these practices frequently span a multitude of different job tasks. To be effective, a safety program must: 1) identify the antecedent behaviors that result in accidents and near-miss incidents; 2) determine how frequently these behaviors occur; 3) evaluate training and management programs; 4) provide consistent and active feedback and reinforcement, and 5) develop remediation plans.

Identifying Antecedent Behaviors. Traditional accident investigations tend to be very myopic, focusing only on the circumstances immediately involved in the accident. The purpose of an investigation is to identify the accident's cause with the aim of creating new procedures, equipment, and standards to eliminate or at least minimize the risk (Mansdorf, 1993). This investigative approach, however, must go beyond the traditional microscopic analysis to identify behaviors that are common in a variety of accidents. To facilitate the identification of these behaviors an investigation team should be composed of individuals from all levels of the work force (Krause & Russell, 1994; Mansdorf, 1993). Moreover, efforts should be taken to reconstruct the accident with the aim of identifying the underlying behavioral patterns that might have precipitated it. Once identified the investigation needs to assess the extent to which these behaviors have been present in other incidents or accidents. Finally, the investigation must assess the degree to which the actions reflect the acceptance of hazardous and risky behavior as common practice.

Assessing the Frequency. To assess the frequency of unsafe acts, a system for reporting accidents, and near-miss accidents must be created. Near-misses play an important role in assessing the frequency of risky acts. From the behavioral perspective, near-misses represent accidents without the consequences (Krause & Russell, 1994). Moreover, given that unsafe behaviors infrequently result in accidents, near-misses can provide better insight into employee safety. Mansdorf (1993) reports that for every serious industrial accident there are approximately 10 minor accidents, 30 property damage accidents, and 600 near-miss accidents.

The overarching motivation driving a reporting system should be the acquisition of reliable and valid data. To facilitate this process, the reporting system must encourage reporting from all levels of the work force. Moreover, individuals should be instructed as to their reporting responsibilities. With regard to the logistics of the system, every reasonable effort should be taken to reduce the cost of complying with reporting requirements. These efforts might include simplifying reporting forms, the use on-site or telephone based interviewers to whom unsafe acts can be reported, the use of anonymous data collection systems, the creation of safety surveys, the use of trained field observers, or the use of automated data collection systems. Such reporting programs might also guarantee immunity from disciplinary actions for individuals who report.

Evaluating Training and Management. There are a variety of questions that must be asked when evaluating training and management. Are instances of the desired behavior demonstrated during training? For example, fire shelter training has traditionally placed more emphasis on getting into the shelter than on other factors such as situational awareness, site evaluation, ground preparation, and contingencies all of which are essential to a successful shelter deployment. Are employees trained in the selection of the appropriate behavior? Invariably more than one option is available for each situation. In a situation where a burnover is inevitable, a firefighter can deploy a fire shelter or attempt to escape. Factors that influence this decisionmaking process must be considered in advance. Training should include techniques and procedures used to evaluate the various options. Is there a system to continue training apart from the classroom? On-the-job-training (OJT) is a widely used technique but it suffers from many shortcomings. Trainers are frequently unaware of instructional techniques, training occurs only when time is made available, the situation typically dictates what skills are learned, and trainees often take a passive role merely watching and not demonstrating behavior (Gordon, 1994). Managers and supervisors must assess the extent to which training relies on OJT and develop specific programs to maximize its usefulness.

After training, are the behaviors practiced? Just as firefighters exercise to maintain a level of physical fitness, skills learned in training must be practiced to ensure competency. In a recent article on decisionmaking in the fire environment Braun and Latapie (1995) noted that training should include the rehearsal of behaviors that are needed in stressful conditions. Safety critical behaviors must be practiced until they become automatic. Finally, what is the perceived priority of safety? Do supervisors and managers expect safe behaviors? Are firefighters asked to work in high-risk conditions that are outside of safe parameters? Is there an established code of conduct that specifies the safe behaviors an individual is expected to display? Finally, is there an accountability system to which all firefighters are held? The answers to these and other questions provide an indication of the priority safety is given.

Feedback and Reinforcement. The concepts of training and reinforcement are closely related. At its most basic level, training serves to educate an individual about the various reinforcement contingencies (Anderson, 1995). That is, during training an individual learns the actions and behaviors that will be reinforced when training is complete. After training is complete, are the trained behaviors expected and reinforced? Moreover, have the trained behaviors been directly or indirectly extinguished by example or directive? For example, are firefighters more often reinforced for

taking risks than for demonstrating good judgment?

While it is important to assess if trained behaviors have been reinforced, it is just as important to determine if unsafe behaviors have been inappropriately reinforced by environmental events. Although the ultimate goal of firefighting is fire suppression, a suppressed fire is not an appropriate reinforcer for firefighting behavior. This unsuitability stems from the fact that all fires eventually go out independent of the actions taken by firefighters. This inevitability makes fire suppression an indiscriminate reinforcer. That is, fire suppression could reinforce both safe and unsafe behaviors. Some would agree that factors such as weather often play a larger role in suppression than firefighters, but still argue that firefighters should be reinforced by the fact that the size of the fire has been limited. There might be some truth in this statement, however, it is not completely verifiable because firefighters often take advantage of areas where the fire would stop on its own (e.g., natural fuel breaks).

Care should be taken in determining the types of reinforcement and feedback individuals obtain from the environment. The containment and suppression of fires, the saving of structures and resources, and other similar events make poor reinforcers because they are indiscriminate and because they target the outcome of behavior and not the behavior itself. Efforts must be made to reinforce the safe behaviors independent of the outcomes.

Remediation Plans. Shortcomings in training, supervision, or management should not be viewed in isolation but as representative of a company-wide pattern of behaviors. Efforts to remediate these shortcomings must endeavor to address both the specific behaviors and the broader culture. Each plan should identify short-term and long-term objectives and the criteria against which the plan will be evaluated.

Conclusions

Programs aimed at enhancing safety by addressing the proximate cause of an accident only consider a small portion of the safety picture. Merely addressing the proximate cause fails to consider that the system either directly or indirectly trains, reinforces, and even expects employees to demonstrate hazardous behavior. An effective safety program must consider both the proximate cause and the working environment that promotes hazardous behavior. The program must identify unsafe behaviors and assess their prevalence. It must evaluate training to ensure that individuals not only gain the necessary skills but are provided with opportunities to exercise and practice those skills. The safety program must survey supervisors and managers to determine if skills learned in training are actively reinforced, and finally, it must make recommendations that affect behaviors and the system that supports them.

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