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SAFETY AND HEALTH CONCERNS IN FORESTRY OPERATIONS[1]

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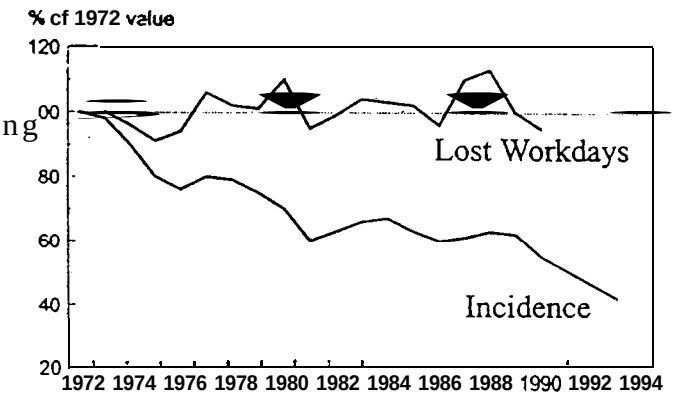
As we discuss safety and health in forest operations this morning, let's look back over 25 years worth of logging safety data from the Bureau of Labor Statistics. The most notable thing in the historical data is that the trend is a reduction in the incidence rate in logging. In the period 1970-1994, we've reduced the incident rate almost 50%, so things are getting better. There's also a lot of variations in the data. You can see some ups and downs.



When we think about what's been going on in this period of time, what's driving safety in forest operations, one of the big factors is increasing mechanization. We can probably attribute a lot of the decrease in accidents to increasing mechanization.

We also see some other things going on here. These bumps up and down over time reflect periods when accident rates increased, then took a precipitous decline. If we take a look at employment records, we find that those are tied to business cycles. During time periods when the work force is expanding, when we bring in a lot more new workers, accident rates go up; as the work force contracts in down times, those workers tend to disappear and we have more experienced workers who tend to want to keep their jobs so they don't report injuries or whatever, accident rates go down.

So we see that safety moves around; it changes. One of the things that we're faced with as we look at safety is that safety is a moving target. It's not a problem that we can solve with a "right" answer or research project that can be handed out and immediately solve the problem. It is a moving target, and as professionals concerned about addressing safety issues in forest operations, we have to know where this target is that we're aiming at. We're doing logger training programs and addressing OSHA compliance; equipment manufacturers are concerned about the design of their equipment. We're throwing lots of stuff at the safety problem. Are we aiming at the right target? Do we have the right tools to address safety in the woods?

[1] Presented at the 1996 spring meeting of the American Pulpwood Association's Southcentral Technical Division, May 30, 1996, in Auburn, Alabama.

Think about some of the things that are changing in forestry right now. We're trying to draw a bead on safety in forest operations based on 25 years passed, but things are changing today. For example, we have more interest in selective cutting, and so all of a sudden we have safety-related questions in selective cutting, dealing with lodged trees and new equipment. We have to keep track of these changes.

This morning, I'd like us to think about how we look at safety. What do we see when we look at forest operations safety? How do we picture safety? The kinds of solutions that we try to develop for solving safety problems are going to be based on what we think safety looks like. So I'd like to talk a bit this morning about logging safety models and how people view logging safety, and then I'm going to look at a current picture of forest operations safety and help us maybe preview a couple of potential problems, some things that might be developing on the horizon.

The Three E's

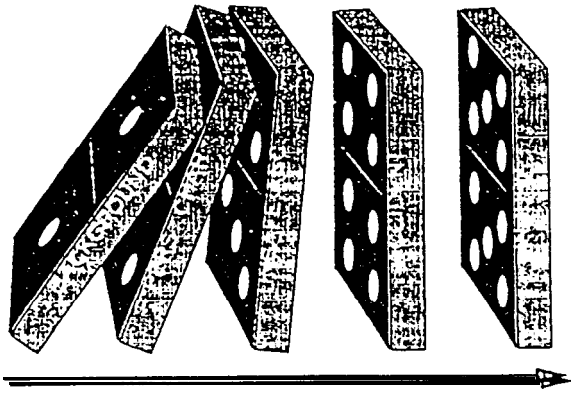
- Engineering
- Education
- Enforcement

One view of safety is what's called the "Three E's" model. Basically the "Three E's" model says that safety is something that is supported by three critical elements. Those are Engineering, Education, and Enforcement. People that look at safety from a "Three E's" perspective say, "I have a safety problem; people are getting hurt in the woods; so I've got to do my engineering controls. I have to develop the right equipment and provide a ROPS that is able to withstand a falling tree or whatever. I must provide appropriate education, instruct workers what to do, provide training on what the hazards might be and how to avoid hazards. Then, I have to have an enforcement component, so if people aren't doing what they're told, I say, "you're doing it wrong; we're going to discipline you."

This view of safety requires these three components, and if any one is lacking, then there's going to be a safety problem. I raise this model because it makes a lot of sense at first glance. It also looks a lot like OSHA's approach. The new OSHA safety standard defines engineering and education, backed up by enforcement. This is a picture a lot of people have of logging safety.

The "Three E's" were first proposed in 1916 and works when hazards are obvious. Maybe we're still at that point in logging where hazards are obvious. However, the "Three E's" model does not solve our safety problem, because it assumes that workers are going to do what they're told to do. It assumes a lot of managerial control, which might be the case in a factory, but not in the forest. Consider an accident where the guy who got hurt went underneath a tree that was hung up to cut the tree that it was lodged in. He knew he shouldn't have (education); we've done all the engineering we can do for manual operations. So why did he do something like that? How can we prevent a similar accident? "Three E's" fails because it can't answer those questions effectively.

The Heinrich-Lateiner Model

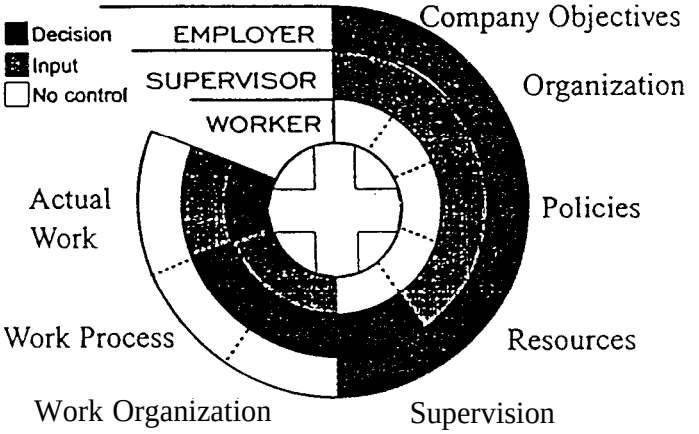


Another view of logging safety is the Heinrich-Lateiner model. It's more advanced and says that safety is a series of events in a time-sequence and can be pictured by a line of dominoes. The idea is that an accident progresses through time as the dominoes fall. My countermeasure is to go and pull one of those dominoes out of there, and then I can keep the whole chain from falling down and producing an injury. This model was proposed in 193 1 for industrial safety. The focus of the Heinrich model is on the worker. We're talking about the background of the worker, the way you were raised, training, personality traits, etc. Heinrich claimed 80-90% of accidents are due to unsafe acts of the worker, so the focus becomes the worker. This model then looks at the worker and says which one of the dominoes precipitated the fall and corrects it. APA Safety Alerts take this approach in analyzing accidents and recommending corrections.

But this model has some limitations. It tends to be a single factor model that doesn't address a broad spectrum of issues related to safe performance.

Industrial sociology takes the opposite view of Heinrich's idea that 80-90% of accidents are due to unsafe acts. In the book Modern Accident Investigation it says that all accidents are the fault of management. The organizational model looks at industrial safety and says there's a lot of factors out there that affect safety in the woods. Most are not under the control of the worker at all, like the objectives of the company, the organization, the resources allocated, equipment, etc. The only place workers make decisions concerning safety is in the actual performance of the work. So the organizational model tells us that we have to think about the big picture if we're really trying to solve the safety problem.

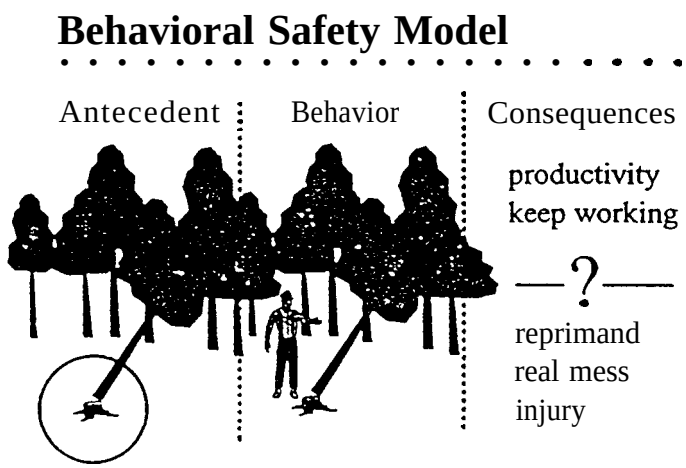
Organizational Model



Another model is the behavioral safety model. We address this in APA safety training in the discussion of the need to observe workers, provide positive reinforcement for good work, and negative reinforcement for unsafe behaviors. Behavioral safety looks at three points in time. It says there's an antecedent (something that comes before), Foravior (response to the initial condition), and econsequences. t h e antecedent is that the tree gets hung up while being felled with a chain saw; the behavior is what the worker then decides to do. This model says that the worker decides the behavior based on his anticipated consequences—that the real driver for people is the consequences of their actions. One consequence if I cut the tree it's hung in is that my productivity will stay up; another

possible consequence is a reprimand if the supervisor sees me do it; another is having a real mess or possibly an injury.

This model says look at the consequences associated with behaviors and think about those consequences in terms of when they're going to occur; a soon consequence is much stronger that a late consequence. Certain consequences are more powerful drivers than uncertain consequences. If I know that if I do this, I'm going to suffer certain consequences, then that's much more powerful than not knowing. The other thing is whether they're negative or positive. Negative consequences are not as strong a driver as positive consequences.



Soon, certain, or positive? Consider the example of the hung tree. Injury would happen soon but is not certain and is negative, so it's not as strong as soon, certain, positive. Productivity is soon, certain, and positive, so it's stronger than injury. I like this model because it telis me why people do stupid things. The problem is using it to come up with good countermeasures. It says come up with soon, certain, positive consequence for doing the right thing. It's a problem to come up with this consequence for the guy in the woods. Some say develop observations of safe behaviors, make a chart, and post it, so the reward is seeing the line on the chart staying up high. Personally, I don't see that as a real strong driver.

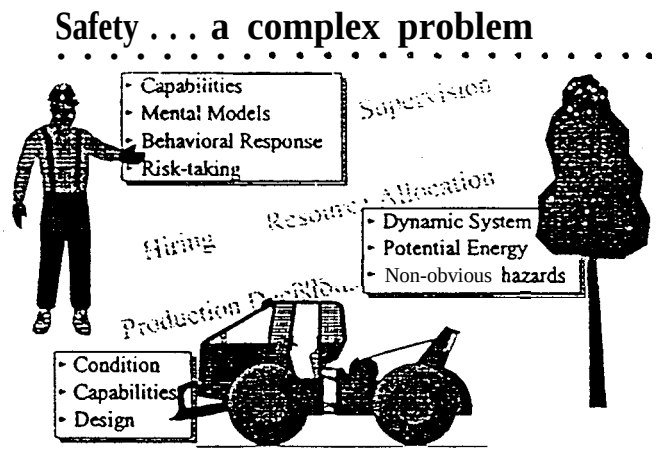
Another consideration in safety behavior is risk-taking. People are making a purchasing decision when they engage in risk. There is **some** benefit to risky behavior that's difficult to quantify. For example, I tend to drive five miles an hour over the speed limit. Driving faster means I get someplace sooner. There's a chance of getting caught by the police. Combining possible injury with possible benefit, you get a bell-shaped curve. The idea is that people are not going to operate at zero risk-not high risk either, but still some risk. If you take all risk out of someone's job by improving the workplace, they're going to find a new way to expose themselves to risk in order to realize more benefit.

So, safety in the woods is really a complex problem. We have all these different components involved: people with different capabilities, mental models (how they understand the environment is going to respond when they do something), behavioral response differences and risk-taking differences; non-recognizable problems; equipment conditions, design, and capabilities; and the organizational issues (hiring practices, management decisions, etc.). If we are truly going to improve safety in the woods, we must consider all of these factors in a broad view of the problem.

An example of how we can broaden our view of safety is in an APA Safety Alert. The situation involved a feller-buncher working on gently-rolling terrain and a 35-year-old operator fully trained but not wearing seat belt or hard-hat. The unsafe act is that there was a very large tree on a hillside that the operator attempted to cut. He had a rollover accident. struck his head on the inside of the cab, and died a few days later of a blood clot

The Heinrich/Lateiner model asks which domino can be taken out to prevent the accident? If the guy had worn a seatbelt and a hardhat it would have reduced or prevented the injury. There's more to look at as well. Why wasn't he wearing a seat belt? Was it in the cab? broken? accessible? Researchers in New Zealand have been doing studies on increasing seatbelt usage. One technique involves having a spring-loaded belt, so the seatbelt stays up by the seat instead of the worker having to fish around under the seat to find it. They found that with the seatbelt up by the seat and a reminder light on the dash, they were able to significantly increase seatbelt usage. So there may be things to be done to the equipment itself.

Wearing a hard-hat is an interesting suggestion, because that's not usually required in a ROPS/FOPS cab. In most cases you're told you don't need one in a cab, because hard-hats are designed for vertical blows rather than for side blows. Another thing to consider is equipment capabilities. The operator was cutting a very large tree on a hillside. Was the tree larger than what the machine was designed to handle? What was the logging plan? Was there a management policy on handling very large trees? Does the operator have an option? There's lots of things that we can look at here. What I'm trying to illustrate is that rather than looking at safety from the domino theory, single-factor approach, if we look at safety in broad terms, it opens up all kinds of possibilities for addressing safety problems and some things we may not think about otherwise.



To summarize these concepts: simple models have limits; they're helpful and do solve problems, but we get to a point of diminishing returns with overly-simplistic approaches to safety. However, when we look at logging safety, we have to address behavioral and organizational issues, not just a checklist approach asking what the worker did wrong.

Finally, just a look at some possible future problems. Increasing mechanization changes safety; different problems emerge. More maintenance problems with people lifting heavy objects and being exposed to whole-body vibrations are emerging, so we can think that a couple of years down the road, logging safety is going to be a different animal than today. In logging safety, trends are improving; we are making progress; there are real benefits from increased awareness and training programs. We can get a lot of return on that investment for years to come, but safety problems are going to get harder to solve, and we must approach safety from a broader perspective if we're going to be able to solve these complex problems. We also have to keep track of the changes that will occur as our industry changes, so we can keep leading the safety target. We want to think about safety ahead of time.