CHAPTER 5. HUMAN AND PSYCHOLOGICAL FACTORS (INCLUDING TRAINING)

This chapter primarily addresses aspects of safety that deal with the human mind and cognition - its capability to deal with changes, pressure, information overload, relationships with others, rewards, denial- a wide range of psychological factors that affect safety. It also addresses training. The focus in this chapter is more on the firefighting or Crew Supervisor level that the senior levels of leadership, except for the discussion on leadership training.

Self-Image and Self-Assurance

Getting and maintaining an appropriate level of confidence and self-image among firefighters is a crucial aspect of safety that is heavily influenced by the culture.

Awareness and Confidence - Many hew firefighters are unaware of some of the dangers associated with fighting wildland fires, such as falling snags. At the other extreme, many experienced firefighters become somewhat complacent or over-confident in their ability to survive most situations. Some firefighters practice denial of fireline dangers so they can "cope" with the situation.

We can use two scales to describe how firefighters perceive the dangers they face. The first scale describes an individual firefighter's confidence, and ranges from fear of the fire and a lack of confidence at one end, to over-confidence or arrogance at the other. We might describe the midpoint as self-confident, with a healthy respect for the fire, or what Weick (1996)[1] calls "an attitude of wisdom."

The second scale describes the firefighter's awareness of the dangers associated with the fire. This scale ranges from lack of awareness of the risks, most likely from lack of experience, to denial of the risks in the face of the evidence at hand. We describe the desirable midpoint as an accurate awareness and appreciation of risks.

The agencies face a significant challenge in teaching new firefighters about the dangers of wildland fire fighting without scaring them off from fighting fires aggressively. On the other

hand, not stressing the risks increases the likelihood of complacency in the face of danger, which makes continual risk assessment such an important attribute to promote.,

Psychological Preparation - Firefighters, especially those in supervisory and Incident Management Team positions, often have problems with stress, fatigue, and mental overload. There is little training or advice given on how to mentally prepare oneself for what is ahead, how to avoid the impacts of fatigue, or how to mentally "reload" during stress. Ways to mentally refresh have generally not been considered part of training, even for supervisors and senior managers.[2]

There were comments in the interviews and survey in Phase I that everyone from firefighters on up needed to be taught how to deal with large amounts of information in the field and how to recognize when critical pieces of information are missing, especially under stress.

Extended stays away from home also cause some of the stress that firefighters experience, especially about the third week away. (This was considered one of the reasons for the higher injury rate observed the third week out, in a BIA study.[3])

The Right Stuff-*Considering* that everyone surveyed in Phase I was connected with wildland firefighting and about half were seasonal employees, it was surprising to find that almost three-quarters of the group (73 percent) agreed either "somewhat" or agreed "strongly" that many firefighters were wrong for the job. Many people interviewed also felt that many firefighters, Incident Management Team members and decision-makers may be wrong for their jobs, too.

The feelings about selecting leaders were especially strong. Many people interviewed thought that the agencies need to subjectively evaluate individuals' competence to lead, and assess their likely performance in an emergency before promotion, and periodically after promotion. A question on the survey asked specifically whether screening is needed to select first-level supervisors. A striking 87 percent of those surveyed agreed with this notion, with 45 percent strongly agreeing – a very strong opinion on this survey relative to other questions.

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[1] Karl Weick, "The Collapse of Decision-making in Organizations: The Mann Gulch Disaster" *Wildfire,* 5(3), 1996.
[2] Putnam has keyed on this problem and recommended use of various techniques including meditation in the field. Presentation at Northwest Wildfire Conference, 1996.
[3] Personal communication, Steve Haglund, Fire Program Director, BIA, 1996.

Psychological Balance – A healthy psychological balance and self-image is obviously a desirable goal. But what does it take for a firefighter to avoid feeling "pushed" by the machismo component of the job? What does it take for a firefighter to be realistic about the risks, challenges, and difficulties, and not feel like they have to say "1 can do anything." How do we focus the "can do" attitude and make it a strength? How do we focus the natural competitiveness of firefighters? This and the issues above are addressed by the implementation strategies of the next several goals.

Goal 58. Firefighters need to maintain an appropriate psychological balance, avoiding the extremes of paralyzing fear of the danger, unawareness of the danger, or overconfidence/ complacency/denial.

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*Implementation Strategy **1** - Promote the image of a well-balanced professional firefighter as a role model*

The agencies should promote an attitude of safety and prudent risk taking, and should foster an image of what a professional competent firefighter is. The image should be shared across agency, cultural, and sub-cultural lines. The desired safety culture would have the following values with respect to firefighters and risk taking:

- Firefighting must be viewed, both by the agencies and by firefighters, as a profession requiring skill as well as guts, where unnecessary or unwise risk taking is considered unprofessional. Safety is to be promoted as following from skills that professionals use, such as proper use of protective equipment and proper assessment of risks (professionalism is discussed further in Goal 59 below).

- Firefighters are people who like excitement and have enough courage to "face a wall of flame" and stay functional, despite their natural fear and the real danger.[4]

- The "can-do" attitude of firefighters, especially in elite units, would be accepted as a strength, but the focus of the can-do spirit would be shifted from "can-do regardless..." to "can do but not if it means taking unwanted risks."

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[4] "Anchor and flank" is a much preferred tactic to frontal assault, but the bravery is still there.

- Pride would be felt for good performance only after taking into account risk assessment and control. The Federal firefighters of the future should be proud that they made a smart assessment of their situation and that their assessment drove decisions along the way to success.

- The organizations and the culture they operate within should not promote safety by slogans or telling people to "work safe/' but rather, as said above, by promoting the skills that lead to safety as being a professional approach. Slogans are viewed as lip service and reduce confidence in leadership. Urban firefighters have had a major culture change in the past two decades of the kind that is desired for wildland firefighters. What was once a macho culture of "smoke eaters" now considers it foolish and unprofessional to fight an interior fire without wearing breathing apparatus and full protective outfits.

- The firefighters that people look up to and emulate will be more than well trained, fit, and experienced, They will exercise skills without being bullied, pushed, intimidated, or "dared" into doing more than is reasonable, realistic, and safe. They will be known for "doing it smart."

To promote the above images and attitudes, and thereby help change the culture, the following steps are recommended:

- Promote the concept of "professional skills" rather than safety per se in a variety of ways, such as in training, through articles and stories in newsletters ,and magazines, and through word of mouth from experienced firefighters.

- Spread "stories" that illustrate skill and risk assessment rather than guts. Tell stories about real incidents to help people picture the inconceivable. To reduce complacency, illustrate how happenstance and the confluence of hard-to-imagine events led to major disasters in 1933, 1937, 1949, 1953, 1966, 1990, and 1994. Have these "stories" passed from one generation to another.

- Recognize that Hotshots, Smokejumpers, and other "elite" professional firefighters serve as role models and focus first on implementing important cultural changes through them. Get them to buy in, such as through participation in discussions of how to get Type II crews and others to emulate their good practices.

- Recognize that the "elite" firefighters feel pressured to succeed, and work with that motivation. Currently, there is more pressure on firefighters to put the fire out than to do it safely. Change that focus by promoting professionalism, risk assessment, and risk control as key components of group success.

- Encourage realistic training (to build confidence).

- Encourage situational awareness (to reduce lack of awareness of dangers).

- Disseminate the good overall statistics on safety (to reduce unwanted fears) but also disseminate data and examples on the near misses and injuries (to maintain awareness).

- Reward ideas that contribute to safety, without denigrating courage.

This strategy should be implemented in concert with the strategies listed for Goal 59 (professional image), Goal 38 (risk management), and Goal 2 (right to speak up on safety).

Professionalism/Professional lmage

A common lament from firefighters is that wildland firefighting and fire expertise is not recognized as a profession within the five agencies. Firefighters are typically classified as forestry technicians or some other category that does not reflect the true nature of their responsibilities.

The linkages of job title and image as a professional to safety are not obvious at first, but are real. First, an image of professionalism helps promote safety, as discussed in the preceding goal. Second, a positive, professional self-image creates pride and job satisfaction, and is a motivator to retain firefighters and build back needed experience levels. However, the key point is that professional stature <u>need not </u>be tied to a position description or job title.

The lack of recognizing and promoting a strong image of professionalism in firefighters is contributing to a growing dissociation between firefighters, Incident Management T earns, and the agencies that employ them. Because they are unable to systematically influence the policies that directly bear on their work, firefighters and others in the fire community create their own ad

hoc safety policy at the field level) often on the fireline. According to Withen' s research). 5 "given their belief in [the need for] stifling the bureaucratization of their parent organization) firefighters use various counter-strategies.)) In other words) safety policy is being set at the fireline level to counter what is viewed as bureaucratic and inappropriate, frequently at odds with the stated objectives of the agencies. These informal policies are sometimes inappropriate) only intermittently effective, or even counter to what the agencies are trying to'accomp1ish~ Informal approaches to firefighter safety may end in tragedy; fire orders may be violated in the belief that the job cannot be done without doing so.

In some cases the agencies have "professionalized" Hotshot crews, Smokejumpers) and others through career appointments and other devices, without creating professionals who are empowered to influence their working conditions without acting against the goals of the organization. 6

A number of firefighters and safety experts we interviewed believe that if the agencies expect professional thinking and safety behavior, then they must recognize the firefighters as professionals rather than skilled labor, and must promote an image of professionalism. *Most* firefighters found firefighting to require high levels of skill and knowledge, and considered firefighting to be their profession. Almost two-thirds (62 percent) of those surveyed said there would be some or much positive impact on safety by considering firefighters as professional firefighters rather than forestry aides and technicians or other general non-descriptive job categories.

The cultures of the five agencies have their own deeply embedded administrative and bureaucratic connotations to the word "professional." For most people in these agencies) "professional" means a member of a "professional job classification series" and by association, those with post-secondary degrees in some scientific or technical specialty. This cultural norm and the attitudes it embodies will present a serious barrier to making this change. The firefighters use the concept of professional in a different sense, more like that found in the dictionary, where the synonyms for "professional" are *expert, specialist, veteran, master,*

5 Patrick Withen, Lower Level Employees' Participation in Organization-wide Issues: Wildland Firefighters' Participation in National Fire Policy Formulation. Ph.D. Dissertation, Boston College Department of Sociology, 1994.
6 Michael DeGrosky, Leadership, Strategy and Consensus: What it Will Take to Change the U.S. Wildland Firefighter Safety Culture, Proceedings of the Canada-U.S. Wildland Fire Safety Summit, International Association of Wildland Fire, 1997.

experienced, learned, masterful, proficient, capable, competent, and efficient. Few would argue that the agencies would not want their firefighters to be all of these things.

The firefighters' perspective that firefighting is a profession receives qualified affirmation from organizational theorists' view of professionalism. For example, Ritzer and Walczak[7] believe that for an occupation to be classified as professional, it must have:

   1. A body of general systematic knowledge
   2. The norm of autonomy
   3. The norm of altruism
   4: The norm of authority over clients
   5. A distinctive occupational culture

Firefighters certainly have attributes 1, 3, and 5. Firefighters have attribute 2, autonomy, only in part. They may not have attribute 4, authority over clients, but neither do doctors or lawyers in any absolute sense either. In firefighting, the public, and in some cases private landowners, are the client. While firefighters have a greater amount of autonomy on-the-job than do most lower-level employees, the level of their autonomy is not comparable to that of the full professions.

When measured against Ritzer and Walczak's qualities, firefighters in Type I crews theoretically represent at least a "semi-profession" in that they do not fully possess all of the attributes listed above, but do possess most. 8 Most other wildland firefighters are at some lesser level of professionalism.

Lower-level firefighters have no widely recognized status as professionals within the firefighting agencies. Ironically, it appears that the general public regards firefighters as professionals more so than the agencies themselves. Within the agencies, it is readily apparent to lower-level firefighters as well as to Incident Management Team personnel that most firefighters are viewed as temporary workers with status comparable to lower-level employees in the wider economy such as laborers and service employees.

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[7] George Ritzer, and David Walczak, (1986), *Working: Conflict and Change* (3Id ed.), Englewood Cliffs, NJ: Prentice-Hall.

The body of knowledge that firefighters utilize -is less comprehensive and specialized than for the full professions. Firefighters in most Type II crews receive only one week of wildland firefighting training. As rookies, firefighters in Type I crews receive between two and six weeks of training. Each year, the firefighters in Type I crews receive a week of refresher training, but some firefighters receive only 8 hours. The body of knowledge continues to grow and is significantly higher than that of lower-level workers in the general economy, but training is significantly shorter than it is for the full professions.

The depth and content of wildland firefighter training have been brought into question by numerous authors, including the Incident Management Review Team assigned to the South Canyon incident. Elsewhere in this report we recommend an interagency fire management apprenticeship program and numerous enhancements to the training curricula, further expanding the body of systematic knowledge employed by firefighters, moving toward making it more of a profession.

Most *firefighters feel* that their job is a profession.[9] Many firefighters speak of the fact that when they observe Type I crews in action or in training, "they looked very professional." In such situations the firefighters were referring to a number of attributes that gave them the impression of professionalism. Some were attributes related directly to the theoretical conceptions of professionalism as listed above. Training is frequently seen as an important aspect. The fact that the training is often viewed as being extensive and difficult to complete successfully gives firefighters the feel of professionalism. Many firefighters speak of the professional responsibility that comes about from being in charge of a fire. The autonomy and independence of action of the firefighters makes them feel self-reliant.

The work discussed above of Ritzer and Walczak, Etzioni, and others provide the "structural" or organizational view of professionalism. The feeling or sense of professionalism that is shared by firefighters and by many others in the semi-professions (and presumably aspiring semi-professions) reflects what Hall designates as the "attitudinal" side of professionalism. According to Hall, characteristics of a professional attitude include: 10

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[8] Amitai Etzioni, (Ed.) (1969), <u>The Semi-Professions and Their Or~anization: Teachers. Nurses. Social'Vorkers,</u> New York: The Free Press, p. 5.
[9] Richard H. Hall, "Professionalization and Bureaucratization," *American Sociological Review,* Vol. 33, No.2, February 1968, pp. 92, 104.
[10] Patrick Withen, 1994, op cit.

1. Use of the professional organization as a major reference
2. A belief in service to the public
3. A belief in self-regulation
4. A sense of calling
5. Autonomy

Doctors, lawyers, and accountants all embrace professional organizations and independent regulatory bodies such as Bar Associations and the American Medical Association. Service to the public represents the belief that the service provided by a profession is vital to the functioning of society. So strong is the sense of the service to the public that the professions believe they must be able to regulate themselves with minimal outside interference or regulation. The sense of calling represents the professionals' dedication and commensurate inspiration concerning their professional endeavors. An attitude of autonomy represents their belief in self-regulation and a sense that they must exercise total responsibility for their client, sometimes even in lieu of the wishes of the clients themselves.

The practical side of professionalism may be seen in occupations such as urban firefighters, and in lower-level medical employees such as nurses and medical technicians. In these instances we see many of the qualities of professionalism as described above. In most cases, these semi-professionals must pass a general examination, they largely function independently of higher authorities, they recognize themselves and are recognized by the public as having narrow, specialized skills, and they have self-regulating oversight agencies.

In light of the above considerations of what constitutes being a professional, the following goal was set:

Goal 59. Recognize and promote the image of the professionalism of wildland firefighters.

Implementation Strategy 1 - Define the concept of being a professional firefighter.

The agencies must collaboratively define the professional work ethic they want, and systematically infuse their organizations with that work ethic through training, leadership, supervision, and effective organization. The concept of professionalism must include intolerance for unsafe work practices, and empowering people to influence their working conditions without acting against the goals of the organization. This strategy should be implemented in concert with Goal 58, which encourages the agencies to identify and promote a skill set that constitutes a

professional approach, and; in concert with all of the goals that call for increased training and an increase in the "body of general systematic knowledge" available to all firefighters.

Implementation Strategy **2** *- Refer to firefighters as firefighters, regardless of their job series.*

The issue here is to help promote the concept of professionalism. The simplest, and most direct change that could be made to promote the professional image of wildland firefighters would be to refer to them as firefighters, fire control specialists, fire management specialists, or some similar term rather than as forestry technicians or the like. However, establishing a professional firefighter occupational series per se has a negative side that many have ignored: there would be a potential requirement to work 56 hours before overtime kicks in, and a lack of hazard pay.

Many of the implementation strategies recommended in this report will enhance the professionalism of wildland firefighters even without a formal job reclassification. They would be more readily accomplished if a name change could be made without negative pay consequences. Firefighters:: would view this reclassification effort as an important and significant step which, perhaps more than any other, would symbolize that administration is serious about improving professionalism and firefighter safety. An alternative is to make sure that firefighters are referred to by a fire-related name (not forestry technicians), regardless of the title on their position descriptions, as is done with many other Federal jobs.

Some titles "would apply to people while working as firefighters apart from their main job. They can be called an engine captain, for example, while on fire duty and then return to their main job title the rest of the year. Many participants in the study felt that at the minimum there should be firefighting, ranks and positions used while firefighting. Engine crews in particular have expressed this concern.

Part of the issue of feeling and acting like a professional is being paid like one. If pay levels were raised enough for individuals to do better than they do now, considering overtime and hazard pay, then a true reclassification would be best. (Pay is discussed further in this chapter as part of the discussion of retention practices.)

Implementation Strategy **3** *- Expand firefighter duties to include prescribed fires.*

The Forest Service and other land management agencies intend to significantly expand their prescribed fire activities. This will allow firefighters to expand their experience and

knowledge, and add weeks of time to the season for professional firefighters. This would also promote firefighter retention. (See also Goal 13, which leads to greater safety by keeping a core of experienced, professional firefighters.) Prescribed fire and the preparation for it would enhance skills such as fire prediction, situational awareness, risk management, and so on.

Implementation Strategy **4** *- Expand other job duties and cross-training among lower-level firefighters. .*

Job enlargement, job rotation, and cross-training should become routine. A general expansion of job duties including the addition of prescribed fire duties to the firefighters' roles would benefit firefighter safety in two ways. First, in highly complex organizational settings such as wildland firefighting, it helps efficiency and safety if each actor (individual or group) understands the roles, capabilities, and limits of each other actor.

Second, one of the main roadblocks to professionalizing wildland firefighting and to granting more authority to wildland firefighters has been the perception that wildland firefighting was a part-time summer job. In this context the college student was seen as the ideal worker, since he or she would want to fight fire only when college was out, i.e., in the summer. In more recent times, given the complexity of firefighting and the lengthening of such historic fire seasons as 1988, 1994, and 1996, college students are seen as less than ideal because many universities have gone to semester systems and fire seasons last too long. The ideal wildland firefighter is one who is willing to work about four full months, and then be willing to find other means of livelihood.

This implementation strategy is also needed for Goal 13, which deals with firefighter retention. Expansion of cross-training would offer firefighters more duties with which to expand their time beyond the average four month stint, perhaps by several weeks each year.

Implementation Strategy **5** *-Increase the autonomy of firefighters to adapt to conditions.*

As discussed in the introduction to this section, Ritzer and Walczak found that one of the five attributes of a professional was "a norm of autonomy," control over how they perform the details of their work.

Jon Driessen, a sociologist at the University of Montana, found that an excellent crew with good teamwork has the following qualities: 11

- Dividing up the labor
- Listening and learning
- A good attitude
- Cooperation
- Making decisions together
- Watching out for one another

Richard Daft has explored so called self-directed teams. 12 These teams rotate jobs, produce the entire product, and assume managerial functions. Self-directed teams have:

- Access to resources
- A range of skills sufficient to perform a major organizational task
- Decision-making authority

The recognition of autonomy as being critical to the definition of professionalism (according to the above cited research and by the firefighters themselves) is based on the rationale that many tasks are so complex that they cannot be safely managed by any outside authority. Rather, the actor(s) carrying out a task are more capable of making safe and efficient decisions than anyone else. Only the professional engaged in that given task can be responsible ultimately for his or her activity. If not, that person is not trusted as being a professional.

"Autonomy" or "self-direction" for a firefighting crew is translated into details such as changing where a segment of line gets dug in light of localized hazards such as exposure to spot fires that were not reflected in the incident action plan. We are not suggesting that a crew should unilaterally diverge from the set tactics, but rather that it should be allowed to adapt to changes in conditions or conditions discounted after a plan was made or orders given, but still consistent with the overall objectives. Some division supervisors are said to "come unglued" when a crew

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11 Missoula Technology and Development Center, <u>Making a Crew: Part I: Putting a Crew Together. Jon Dreissen</u>, Project Leader, lE12H82, Work Crew Orientation, Apri11995.
12 Richard Daft, <u>Organization Theory and Design,</u> (5th Ed.), NY: West Publishing Company, 1995.

does not follow the plan exactly. Of course the Crew Supervisor can consult with the Operations Section Chief or Division Supervisor before changing course of action, when possible.

As the system is organized now, authority is split for safety and task accomplishment. While Incident Management Teams are responsible for organization, task accomplishment, and so on, ultimate authority for safety is seen as being dispersed to all firefighters, thus attempting to professionalize safety. However, it is impossible to disperse authority for safety while simultaneously concentrating authority for task accomplishment (what one actually does) in the hands of the Incident Management Team; safety and task accomplishment are intimately related.

Implementation Strategy **6** *- Develop a larger corps of professional firefighters.*

Safety is affected not just by having adequate numbers of firefighters, but also by the professionalism and size of the cadre around which the firefighting force is formed. Increasing the numbers of Type I crews would increase the number and proportion of highly trained and motivated firefighters to handle complex fire fighting tasks safely.

Increasing the numbers of Type I crews also would help maintain a critical body of knowledge and experience within the wildland firefighting community by training a core of highly experienced firefighters. Since many firefighters in Type I crews would be drawn from the urban population or from a rural population that does not necessarily have "woods knowledge," their higher level of skill and experience would have to be gained though increased training and cross-training.

As recognized by firefighter comments in Phase I of this study, people in Incident Management Teams today have less depth in experience and knowledge than their predecessors a generation ago. An increased number of Type I crews would generate a larger body of personnel from which to draw experienced fire management in the future.

Lastly, larger numbers of Type I crews would increase the percentage of fires successfully suppressed with initial attack forces. Currently about 3 percent of fires escape initial attack. With a larger number of Type I crews, this rate probably could be further reduced. Escaped fires cost millions of dollars each and cause many firefighter injuries.

Implementation Strategy* 7 - *Expand cross-training of a core group of firefighters.

In addition to increasing the numbers of Type I crews, the agencies should cross-train a core group of firefighters to function as Smokejumpers, Hotshots, rappellers, and helitack. The "core of the corps" would provide the highest professional role model for other firefighting resources. This strategy would also decrease inter-organizational rivalry (which often leads to competition and unsafe practices) as well as decrease inter-organizational confusion about roles, and tactics between specialists.

By cross-training firefighters, the agencies would create a corps of the most highly trained and experienced firefighters yet seen in wildland fire suppression. Allowing professional firefighters this expanded training would add training time to each fire season, encouraging greater firefighter retention, another goal (13). Greater retention in turn creates improved firefighter safety by increasing experience. This strategy, coupled with greater numbers of Type I crews and an interagency apprenticeship program would create *a critical mass of professionals and role models to lead firefighting agencies and their lower-level firefighters into better attitudes and safety-related practices.*

***Implementation Strategy* 8 - *Promote the concept of a professional "attitude of wisdom.* "**

The strategies listed above to increase professionalism deal with expanded training, knowledge, experience, and autonomy. The connection between these strategies may be visualized as. a framework in which Weick's concept of "the attitude of wisdom " in firefighting can be realized. "Wisdom" is the quality of having expert knowledge accompanied by an understanding that "knowing that what one knows is usually incomplete and fallible, and that acting on that fallible knowledge involves a tricky balance between knowing and doubting." [13] Dr. Charles Perrow, a sociologist on our study team, has advocated the need to teach firefighters the limits of cognition, the way one can be fooled into thinking you understand the situation but don't; i.e., the problem of human fallibility. [14]

[13]Karl Weick, "Wildfire and Wisdom," paper presented at the Canada/US Wildland Fire Safety Summit of the International Association of Wildland Fire, September 29, 1997.

[14] Dr. Charles Perrow, "Developing a Cooperative Approach to Wildfire Protection," paper on how to change the culture, presented to the Federal Fire and Aviation Leadership Council meeting, Boise, Idaho, TriData Corporation, January 6, 1998.

Weick argues that for firefighters to realize or express their wisdom, they must "shift their confidence from their knowledge to their skills of improvisation." Improvisation is seen not as acting impulsively but rather as "making sense out of previous experience, practice, and knowledge," and applying it appropriately. Wisdom and improvisation are vital components of professional activity that must be realized in today's wildland fire suppression efforts if we are to fight fire aggressively, but provide for safety first. The "attitude of wisdom" is directly related to decision-making under stress, which is discussed later in this chapter. The former comes from a sociologist's framework, the other from a psychologist's viewpoint.

Substance Abuse

Respondents on the Phase I firefighter safety survey identified substance abuse as an ongoing problem, though it is not rampant. However, many thought there were some problems. A quarter of all respondents (and over half those from BIA) who gave an opinion thought there was a problem, especially at incident bases and camps. Being drug-free and sober must be another tenet of professionalism.

> *Goal 60. Maintain a zero tolerance policy for substance abuse at fires (including bases and camps).*

Implementation Strategy **1** *- Enforce the existing policy.*

The agencies currently maintain a policy of zero tolerance for illegal drug use and substance abuse, and generally do an adequate job of enforcing this policy. The agencies must enforce this policy even more vigilantly than in the past, to move closer to 100 percent compliance. Ensure that initial and refresher training address the policy, its purpose and intent, and the consequences of violation. Officials at incident bases need to remain alert to this issue. On-the-job substance abuse can represent an extreme threat to safety.

Implementation Strategy **2** *- Provide education on the policy and the need for zero tolerance.*

Bolster the "zero tolerance" policy with an educational campaign in basic firefighting courses and at incident bases. The campaign should, at a minimum, reinforce the following points:

- Substance abuse can be an extreme threat to safety.
- Even "legal" drinking the night before a day on the fireline can threaten safety.

- Hangovers mean dehydration, slowed mental processes and impaired physical skills, all of which put your life and the lives of your fellow firefighters on the line.
- Illegal drug use land substance abuse will not be tolerated.

Implementation Strategy **3- *Include alcohol and drug testing for fatalities and serious injuries***.

Testing for alcohol and drugs is part of the U.S. Fire Administration's standard protocol for firefighter fatalities, and should be done as soon as possible after a fatality as part of the investigation and autopsy. IS

Alcohol and drug testing should also be done for any serious injuries, not only to see if substance abuse was a factor, but also to help guide treatment. For example, treatment of burn victims who are known to be alcoholics may be provided for differently from others.

Implementation Strategy **4 - *Include being sober and drug-free as part of professionalism.***

As part of promoting professionalism in the strategies in Goal 59, part of the concept should be that professional firefighters must not be involved in substance abuse to do their job well, and for their own safety and health.

Situational Awareness

According to the findings of the 1995 Wildland Firefighters Human Factors Workshop, basic situational awareness is highly dependent on good information, skill, and experience. Situational awareness is one of the most difficult skills to master and is a weakness in the fire community. One cannot mandate situational awareness. The culture must change so that people are observing, thinking, and discussing the situation constantly. People at each level of the fire organization must understand the unique aspects of remaining situationally aware in their role. This leads to the following goal:

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[15] Some religions and cultures do not permit autopsies. In most cases, these feelings can be respected, though there may be exceptional circumstances.

Goal 61. Do what it takes to achieve and maintain situational awareness at each organizational level.

The many goals that address clarifying information, providing better information, increasing experience, and improving the realism of training all will contribute to improving situational awareness. (See, for example, the strategies under Goals 19, 20,21,26, 32, ~d 66.) In addition, the following strategy is suggested:

Implementation Strategy I-Teach techniques for maintaining situational awareness in training courses from firefighter to Incident Commander.

The findings related to situational awareness contained in the Human Factors Workshop report should be incorporated into the training curricula and operational guidance.16 They are contained in the section called "Fire Management, Incident Management Teams, and Fire Crews in a Crew Resource Management Context" in that report and are quite specific.

At the crew level, there tends to be good situational awareness of the immediate fire circumstance, but less awareness of the big picture and what to expect in one hour, two hours, or during the next operational period. At the higher levels of the Incident Management Team organization, the command structure, there may be good information on the big picture, but poorer information on the fire situation faced at the crew level.

Situational awareness must be practiced by every level, not just Crew Supervisors or incident commanders. As one firefighter put it, "Everyone is in a situation and needs skills to stay aware and awake." Personnel at each level must know the elements that need to be tracked to create adequate situational awareness, such as weather, predicted fire behavior, current overall fire situation, special hazards faced, location of escape routes, location of safety zones, and the location and status of one's assigned personnel and resources.

Training courses should specifically require personnel to identify the key elements of situational awareness for their current and potential next position, and how to interpret and use the information. Also needed is practice and skills for dealing with too much information (information overload) ‑ how to select what is needed and ignore the rest.

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16 Human Factors Workshop Report, Op. cit.

What also must be taught is recognizing what you don't know but need to know, and how important it is to find out versus continuing without the information. (Practicing this is recommended later as part of training in decision-making under stress.) Also critical is learning the dangers of false analogies to previous situations - you think you've seen this before, and know how to act, but in reality the conditions are different (e.g., normal humidity last time, very, very low humidity this time). We need to strip any sense of validity from the comment: "But it would have worked in a normal season!"

Weather is an especially critical element of situational awareness. Wildland firefighters need to know which way the wind is blowing, literally as well as metaphorically. But in addition, they must know how to interpret and react to weather information. A less obvious but also critical need is knowing the location of crews relative to each other, which is addressed in the next goal.

Goal 62. Good communication is needed between crews working in proximity, especially one above the other.

Implementation Strategy 1- Mandate that crews and division supervisors be informed of the location of crews near each other.

Crew and division supervisors should be told as part of briefings the location of the crews nearest each other, and especially crews or any resources such as bulldozers working one above the other. They then need to validate this information - what they were told may have been erroneous or garbled.

Implementation Strategy 2- Keep crews working at different elevations near each other in radio contact and informed of each other's plans.

A crew at a higher elevation can dislodge rocks and even firebrands on the crew working below. Likewise, the crew below cannot be setting backfires without making sure there is no crew above if the fire has the potential to threaten the higher level crew. Communication between crews is imperative in such potentially dangerous situations. Continuing knowledge of the positioning of crews above and below when working on slopes should be a key part of situational awareness. Each member of the crew, not just the supervisor, must be aware of the other crew's location.

The importance of maintaining good communication between crews working in proximity is well known in the fire community and has been an objective of basic firefighter

safety training for many years. Nevertheless, both in interviews and" in the 'survey participants in this study raised it as a frequent problem. The agencies should ensure that the S-11 0 (Basic Fire Suppression Orientation), S-130 (Firefighter Training) or other appropriate courses treat this topic adequately. Any injuries resulting from lack of coordination should be cause for review and possible disciplinary action.

Extra Awareness in Drought Years - During periods of extended drought, multiple fires often exhibit extreme fire behavior characteristics that pose high threats to life, property, and natural resources. Severe conditions can develop rapidly. It is a particularly critical time to maintain situational awareness. Fire management organizations need a comprehensive system in place for tracking fuel and fire behavior potential throughout the affected region - "a fire behavior service center" - and getting the relevant information to all the right people. For the most part this already is a standard operating procedure involving GACGs, the weather service and others. This information needs to be provided to all affected regions. While often available at the fire level, the information is not always organized at the region level. In the absence of current information regarding critical fire behavior potential, personnel on the firelines may be caught off guard by sudden increases in fire spread rates, spot fires, and fire intensity. Senior managers and Incident Commanders leaving fires need to be debriefed, and have the information shared.

Recognizing the practical value of gathering, interpreting, and disseminating extreme fire. behavior information during multiple fires, the "Fire Behavior Service Center" concept was first used on a regional basis in Montana in 1984. The concept now has been applied to other regions during drought conditions; and has on several occasions been thought to have saved firefighting personnel from injury. Although the concept has been applied to other areas in the country, activation of such a center under drought conditions is not yet as routine as it might be. This leads to Goal 63:

Goal 63. Take extra safety measures in drought years.

Implementation Strategy **1 -** *Activate regional interagency Fire Behavior Service Centers during drought years to increase available information and raise awareness.*

Regional interagency fire centers should activate a Fire Behavior Service Center when their area experiences conditions of extended drought, outbreaks of multiple fires, or when for other reasons high fire spread rates and fire intensities pose distinct threats to life, property, and

natural resources. The Service Center should be staffed by Fire Behavior Analysts (FBANs) and other qualified fire behavior specialists. A minimum of at least two FBANs per center is needed to allow those individuals to alternate between office and field responsibilities, and to provide sufficient hours of coverage for data collection, interpretation, and briefings.

The purpose of a Fire Behavior Service Center is not to duplicate or replace the functions of FBAN s on individual incidents. Rather, the staff of the Service Center provides ongoing support to FBAN s on major fires, and provides support to FBAN s in the field, and fire behavior overviews to dispatch and command organizations. The Service Center generally is attached to a. regional or interagency coordination center, although in 1988 a Service Center was attached to Area Command in West Y el1owston~ due to the severity of conditions there.

Specific functions of the Service Center include the following:

- Map fire behavior severity zones in the region.

- Update daily measurements from Remote Automatic Weather Stations.

- Update and track burning indices, energy release components, and 1000-hour fuel moistures for geographic areas.

- Gather, plot, and display wildfire perimeter data for all large fires.

- Prepare daily Fire Behavior Situation Reports for briefings and distribution to field units and Incident Management T earns. (This information should also be sent to any geographic areas which are likely to provide additional firefighting resources so that those resources are aware of the conditions to which they are headed.)

- Regularly provide fire behavior briefings for coordination groups, media, Incident Management Teams, and others. Some of this information comes from debriefing people at or leaving fires.

- Conduct reconnaissance flights of major fires with video support to document fire behavior conditions.

- Maintain two-way communications with FBANs on incidents.

- Issue Fire Behavior Warnings as necessary to report severe fire behavior events likely to occur in the next 24 hours based on anticipated changes in fuels or weather conditions.

- Issue Fire Behavior Alerts as necessary to report dangerous conditions observed on an ongoing fire that may be applicable to other fires.

The Fire Behavior Service Center concept has proven useful for informing fire management and crews of potentially dangerous fire behavior events associated with drought conditions. The concept needs to be more widely implemented as an additional safeguard to the welfare of firefighters. The service center concept would become especially important if the National Weather Service further reduces its fire weather forecasting staff

Implementation Strategy 2 - Use other, less formal ways to keep firefighters informed about conditions.

There are other, less formal ways than Fire Behavior Service Centers to keep firefighters and. fire managers informed of drought and extreme fire behavior situations. These include special warning bulletins, and briefings to new arrivals from out of the area. (This can be part of the improved briefings recommended under Goal 4-16.) In 1994, for example, the Southwest Region of the Forest Service issued a special fire behavior report to all firefighters who might be dispatched to southwest fires, warning of the especially dry conditions coupled with the widespread distribution of ladder fuels. People being mobilized to the southwest knew in advance to be on guard against the high probability of high intensity crown fires.

Many tools are available today for assessing wildland fire behavior potential, including fire danger maps, fire weather forecasts, dead fuel moisture maps, vegetation greenness maps, Keetch-Byram Drought Index maps, Palmer Drought Index maps, and Lower Atmosphere Stability Index maps. Field units and fire coordination offices can fulfill an important role in safeguarding firefighters by collecting, interpreting, and distributing such information to fire personnel in a timely and consistent manner. Once again, it is frequently but not always being done.

Training

Training is a key aspect of the organizational culture that needs significant change. Almost everyone interviewed saw training as a significant source of solutions to fireline safety problems and was in favor of more or better training in the classroom and more hands-on training in the field. Survey respondents indicated that major changes were needed in the quality of training, the frequency of training, the access to training, and most of all, the realism of training. Before discussing the goals dealing with improving training, we discuss the background of the problems with the current training system, which has been very good but needs to be improved:

Specific Training Issues

We identified at least 12 separate training issues in the course of this study. To fully understand the goals and strategies related to training requires a brief review of these issues.

Emphasis on Certain Positions. As discussed in Chapter 4 with respect to improving leadership, participants in this study identified Crew Supervisors as the position most in need of better training. Crew Supervisors are the final line of command, and therefore, the final determinant of crew safety, as tactical orders are passed down the chain of comn1and. They need to combine technical information and leadership know-how. In addition, they must work within an environment that allows them to ask for information and allows them to comment on the safety of the assignments given to their crews.

Next after Crew Supervisors, respondents most frequently cited the need for better training of Type II crews as a safety concern. There were concerns that seasonal employees receive less training than they used to get because of shorter seasons. Additionally, the amount of training for Type II crews varies widely. Attention needs to be given to those receiving minimal training but receiving a full range of fire assignments.

Close behind in need came Agency Administrators. A third of those polled felt that administrators were one of the highest priorities for needing further training. Among the Agency Administrators themselves, 'a third thought they needed better training the most of any position. 17

Hands-on Practice. The need for training to include more hands-on practice was the strongest consensus need for improving training. This includes senior level courses in incident management as well as firefighting skills.

Urban/Wildland Interface. Study participants strongly agreed on the need for more training related to safety on interface fires - how to establish escape routes and safety zones in the urban/wildland interface, and the special hazards associated with structures and the areas around structures, such as Propane tanks.

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[17] Within the past year there has peen a surge of interest by Agency Administrators in taking fire-related courses at the training facility in Marana, Arizona, so the situation may be changing.

Frequency of Training. Most study participants felt that conducting safety training once in the Spring was not enough, especially for seasonal firefighters. The training sometimes is curtailed and sometimes is cut out altogether.

EFF Crews. About 25-30 percent of the firefighting workforce are hired as Emergency Firefighters (EFFs) on a call-when-needed basis. Most of them receive minimal training and are not readily available for additional training. Many EFFs who are trained never get to a fire.

Real-time Emergency Decision-making. As noted in several places in this report, real time decision-making at the crew level is considered by some experts who have studied crew behavior (e.g.; Putnam) as a critical factor in determining whether a crew successfully avoids or escapes danger. Three-quarters of the survey respondents agreed that training in real-time decision-making is a need. This is such an important need that it is addressed in a separate section following the other training goals.

Management of People. Three-quarters of the survey respondents felt that supervisors of EFF, inmate, and other Type II crews need better training on how to manage people. (There was general agreement that Crew Supervisors are taught the technical aspects of the job.) The effectiveness of crews is highly dependent on the quality of the Crew Supervisors, and their ability to lead and train the crew on-the-job.

Training as Substitute for Experience. We frequently heard the complaint that the agencies have to use training as a substitute for experience, but the present form of training is not realistic enough to be a good surrogate. There was a call for more field work, more computer based simulations, and more training using realistic scenarios for Crew Supervisors, Incident Management Team members, and senior managers.

Shortage of Qualified Trainers and Variation of Course Quality. Survey respondents and many of those interviewed felt there was a shortage of good, qualified trainers with solid fire experience. Over 80 percent of survey respondents cited variation in the quality of instruction between instructors, organizational units, and geographic areas as a problem.

Completeness of Training. About 60 percent of respondents thought training was rushed or incomplete. Permanent employees felt even more strongly than did the seasonals that training courses were often incomplete and rushed.

Training Availability. A number of firefighters and fire managers interviewed felt that either the types of wildland fire training they needed were not readily available or they were not allowed to attend the training by their home organizations.

Shelters. During the interviews, we heard strong comments about the need to improve training on the use of shelters. About half of the respondents on the survey agreed that it was a problem. Experienced firefighters said that instruction on the deployment of shelters is too often done under benign conditions, such as the front lawn of the training facility or indoors.

Training Improvements

Improvements in training are needed to help reach the majority of goals discussed in this report. Many goals have implementation strategies that involve improving training.

One of the functions of training is to act as a vehicle to instill professionalism and the organizational culture. Training connects the participant with the tenets of the organizational culture not only through the content of the training but also by combining the rituals of training with the investment of personal time and effort. Training should include many anecdotes or stories illustrating the values that help to create the culture of professionalism. The breadth of the fire training curricula must also be expanded to better prepare fire personnel to function as a team, lead and supervise effectively, and most importantly, communicate. It must include the interaction of people and concern for human factors as well as the technological side of training.

In addition, the agencies must assure that key concepts such as situational awareness, risk management, crew resource management, leadership, interpersonal communication, and tactics are taught systematically and comprehensively.

Thus the path to improved safety performance is through cultural change and the path to cultural change requires, in part, changing how the agencies train and certify people. To summarize the overall training needs:

- Training must be more accessible to all.

- Training must be more realistic, including simulations, case studies, field exercises, and training in field settings.

- Training technology and delivery platforms must be modernized.

- People must be taught how to conduct on-the job training and OJT must be used much more than it is.

- People need to train in the context of their work.

- The training and certification system must regain credibility with tougher certification requirements.

- The agencies need to teach people how to maintain situational awareness, recognize danger, and make decisions that are "primed" by that recognition.

- There needs to be a unified training strategy that goes beyond unified standards and interagency training courses, which already exist, to include joint administration, more pooling of training resources, and joint analysis of needs.

- Desired competencies need to be established based on analysis of workload and responsibilities. Core competencies need to be integrated into the agency personnel systems (position descriptions, selection criteria, annual evaluations, compensation, etc.). There has been much progress on doing this.

- The number of people who need training and experience to achieve those competencies needs to be determined, along with the requisite number of training courses and trainers.

- Funding of training programs needs to be adequate for obtaining the desired competencies and meeting expected workload.

- Some ways must be found to improve training of the 6000 or so EFF s who are less accessible than other employees.

In light of the above, the following set of training goals (Goals 64 through 75), should be viewed together with the specific recommendations for training in connection with other goals throughout this report.

Goal 64. *Training should be available to the quality and quantity of training needed).*

Implementation Strategy **1-** *Develop a needs-based strategy for training across agencies (i.e., matching training availability to the quality and quantity of training needed).*

The agencies should adopt a common method for producing a needs-based training strategy that does the following:

- Identifies needed fire competencies through workload analysis and integrates core competencies into agency personnel systems.

- Analyzes agency needs for the various types and quantity of incident and prescribed fire positions, including all positions listed in 310-1 (Wildland Fire Qualifications Subsystem Guide) and 310-2 (the prescribed fire portion of the guide). Assure that the agencies collectively have enough trained people to get the job done safely as well as effectively. That is, once you've figured out the needs, make sure your training system will meet them. This should go without saying, but the training planners self-assessment is that they do not feel this has been achieved yet.

- Assure an adequate training and coaching cadre (enough trainers). Consider using alternative approaches to training delivery (such as community colleges, vo-technical schools, contract trainers) to make up for shortfalls, and for increasing training efficiency.

The needs-based training strategy should be implemented on an interagency basis. The agencies need a comprehensive approach that:

- Provides for each agency to cooperate in developing an interagency needs analysis for consolidation at the geographic zone, and ultimately for consolidation nation all y by the NWCG. Some agencies in some zones currently make interagency assessment of annual training needs through geographic area committees, a step in the right direction. This needs to be done in all zones for all agencies.

- Assesses impacts of the planned increase in prescribed fires on the ability to meet wildfire incident demands (because they involve most of the same people.)

- Considers training of "non-traditional" staffing sources that might be used, including the Department of Defense, Army Corps of Engineers, contractors, rural fire departments, GSA, etc.

- Ensures that all efforts are jointly planned or at least fully coordinated – a national effort to avoid redundancy and maximize use of precious training resources.

- Develops and funds a tracking system for national qualifications that permits the ability to cumulatively assess ("roll-up") numbers without double-counting a person

who has multiple certifications. Agency tracking systems should be fully compatible, allowing "roll-up" by the National Interagency Fire Center. 18

The computer application software already exists to implement a tracking system for national qualifications through the Department of Interior's Shared Application Computer System (SACS). However, differing agency priorities have stalled the initiative begun by the National Park Service and Bureau of Indian Affairs. The Forest Service continues to invest in its own system, and the states handle their training and qualifications in a variety of ways.. All five agencies (through NWCG) should put a priority on a computerized system that:

- Creates compatibility and "roll-up" capability by integrating the Interagency Qualifications System (IQS), the tracking systems employed by the Interior agencies, and the system used by the Forest Service.

- Determines national, regional and geographic zone position shortages based on historical staffing for the 85th or 90th percentile of fire potential (i.e., a severe fire season).

- Allows each agency to individually identify its incident management and prescribed fire position needs by zone, region, and service-wide, taking into account required redundancies for availability, transfers, retirements, etc. (For example, it may require three qualified people to cover each required position).

- Rolls position need numbers up into a shared-application, national database that identifies the number of qualified people (by position) currently within the system and position shortages (by position).

- Identifies individual people who are within five to seven "training levels" of qualification for positions in critically short supply, and their individual training and experience needs to reach the position in short supply.

- Sees that course needs are represented in the development of agency and interagency training budgets.

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18 As noted earlier, this was said to be in progress under the auspices of the NWCG. Another system that lists who is qualified at each level is in place for DOl - the SACS system. The Forest Service has its own system. A state and other non-federal personnel system is being developed under NWCG. Ultimately, the data bases from the three systems need to be melded together.

Implementation Strategy* 2 - *Develop a common approach to certifying instructors.

The agencies should develop a common system for training and certifying instructors consistent with the standards established in the NWCG Course Administrator's Handbook. Also needed is a computerized, interagency instructor database to track instructor qualifications, experience, and evaluations. This database must be available to all agencies. It could be located at the National Interagency Fire Center or the National Advanced Resource Technology Center.

Goal 65. Accelerate learning by emphasizing the positive lessons from successful incidents, not just the negatives from failures.

Implementation Strategy* 1- *identify positive case studies for use in training.

Goals 4 and 14 discussed the need to identify "lessons learned" from successes and failures, and to distribute them through courses, newsletters, word-of-mouth, and other means. The part of this that is easy to ignore is identifying good positive examples.

The agencies should identify successful incident operations and use the positive lessons from them to develop a series of case studies for use in courses, self-study, and simulations, The case studies/simulations show what happens when people make good decisions. Simulation case studies can provide even stronger lessons than paper-based or video case studies. The case studies developed for the "Fatality Fire Case Studies" [19] course are oriented to learning from tragic failures but provide effective examples of the use of case studies. Positive examples should be added to the negatives.

If a Center for Lessons Learned is implemented, as recommended in Goal 4, that can be a prime repository for the positive examples.

Implementation Strategy* 2 - *Reward and publicize people involved in making exemplary decisions.

Recognize and reward the people involved in making exemplary decisions so that they become positive, high-profile models. For example, Chuck Hartley (retired Superintendent of the Dalton Hotshots) was given an award during the 1997 Canada-U.S. Wildland Fire Safety Summit meeting that not only recognized his career of achievement, but specifically his actions

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[19] Formerly the "Firefighter Survival" course.

on the 1966 Loop Fire, where he refused an assignment, and spared his crew the fate of another crew which took the assignment and was burned over, with multiple fatalities.

See also Goal 14 (ways to enhance training to compensate for lack of experience).

Goal 66. Training needs to be made more realistic.

Implementation Strategy **1** *- Increase use of realistic field training and exercises.*

Contemporary research shows that adults learn best by doing rather than listening. Much of the current fire training curricula is listening oriented, supported by paper-based classroom exercises. Whenever possible, tactical training should be reinforced by realistic field training exercises and/or simulations. Highly realistic training is the objective.

The current revision of the training system is underway and projected to be complete in the year 2000. Incorporating the training strategies discussed in this report should be considered. Prior to the next revision, the agencies (through NWCG) should have an educational consultant (such as Boise State University) research the agencies' target audiences (current and projected workforce demographics), make recommendations on how the agencies' target audiences learn best, and revise delivery methods accordingly.

Going further, the agencies should conduct firefighter, squad boss, Initial Attack Incident Commander, and Crew Supervisor training using a "field academy" concept - training in an incident base environment. Field exercises should be used for skill training at the firefighter, squad boss, initial attack IC, and Crew Supervisor levels. Examples of skills suitable to be taught in that setting are line construction, orienteering, use of chainsaws, size-up, engine and pump operation, and fire behavior.

Implementation Strategy **2** *- Develop more case studies and simulations based on real fires.*

Case studies have been called a crucial way of extending people's experience. The agencies should develop a series of case studies designed around real fires. Effective examples abound. For example, Duncan Campbell (Saskatchewan Forest Fire Management Branch) has developed the South Canyon incident into a training case study. Campbell's case study would also make an excellent simulation. This case study could be used at the Crew Supervisor level to teach and reinforce critical skills such as decision-making and application of risk management principles. It could also provide a valuable simulation opportunity for the courses intended for

Incident Commanders Type 3 and 4. Agency Administrators could also benefit from decision-making training using this case study. The South Canyon fire's behavior has been extensively modeled through the incident investigation, and the results of that modeling could be incorporated in the simulation.

Scientists at the Northern Forest Fire Laboratory are developing case studies, based on the Dude, Mann Gulch, South Canyon, and Sundance fires, and others. The Loop, Crank) and Canyon Creek fires and an R-5 helitack incident also can provide high profile examples. (Most of these are in the new Fatality Fire Case Studies course.) The agencies should ask their most experienced firefighters and cooperators for lesser-known examples, including near misses, smaller fires, existing case studies, and positive examples (see Goal 65 for the latter).

Implementation Strategy **3** - *Increase use of simulations and interactive exercises.*

The agencies should intensify the use of simulation and interactive exercises at all training levels. Using simulations of case studies can reinforce the learning points of the case studies. (This also was discussed in Chapter 4 in connection with adding simulations to training to compensate for reductions in experience.)

Simulation and interactive exercises based on case studies of actual fires can be used to learn about specific results of decisions or actions (as is being done in the new Fire Fatality Case Studies course). If there is a choice to be made between paper-based or video case studies and simulations, -focus on simulations.

As discussed earlier, simulations can involve role playing without needing complex simulation equipment. A simulation of fireline command could, for example, include reporting the fire status and the need for resources to dispatch, with responses back. Role playing rather than lecturing will better make the point that you need to inform the division supervisor or dispatch about this or that; the lessons will sink in better.

Implementation Strategy **4** - *Conduct skills training "in context" of realistic scenarios*.

The agencies should conduct more skills training in context (TIC). The key concept of TIC is that under stress, you will perform as you learned. Based on that premise, the training environment should recreate the context of the operating environment. Coach Vince Lombardi' s observation that "Practice doesn't make perfect, perfect practice makes perfect" appropriately describes the intent of TIC.

.   More specifically, TIC is a highly structured method of training that provides an environment in which learners are coached as they visualize and walk through operational tasks, and then perform repetitions of that activity. The training structure recreates the elements of the operational environment and provides lots of coached learning in that environment. Tasks or performance elements are developed from defined operations and are arranged in sequence as they occur tactically or operationally, not by topic.

Training in context involves four steps:[20]

- Explanation of the operation including the objective of the tactic, tasks that make up the tactic, and safety issues.

- Providing firefighters with a vision of perfect performance of the tactics using an example by expert firefighters who demonstrate the desired performance standard. Firefighters are grouped by role (e.g., hose lay, or running a pump) and provided a coach to interpret and highlight the various parts and quality indicators of the tactic or skill being taught. The vision may be provided through the use of video or by demonstrating actual performance to standard. As the vision is presented, firefighters focus on the role they will play in performing the tactic.

- Perfect Process Practice with coaching. "Perfect process practice" means that the firefighter practices until he or she demonstrates the proper sequence of actions, and meets all technical skills and quality indicators without assistance of a coach in the time called for in the standard. The major portion of the learning occurs during coached repetitions. The coach provides immediate corrective feedback. Firefighters are stopped as soon as an error is recognized by the coach.

- Post-performance "Mental Rehearsal." Mental rehearsals are only slightly less effective than actual physical performance of skills. They are effective coaching tools. (Anyone who watched the Olympics will have seen many athletes with eyes closed and body swaying as they visualize their moves.)

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[20] As described in Montana Department of Natural Resources and Conservation, DNRC Wildland Fire Management Training, Training in Context System and Coaches Guide, August 11, 1997.

Implementation Strategy **5** - *Provide realistic shelter training to all wildland firefighters.*

Shelter training is often conducted only in a benign environment (e.g. on a lawn on a calm day). In reality, there may be rough terrain and wind blowing as well as time pressure to deploy. Therefore fire shelter training must be conducted under as realistic conditions as practical, considering:

- Terrain (e.g., a slope or rough terrain)
- Vegetation/ ground cover
- Standard time limits for deployment
- Deploying while moving (executing escape route)
- In the wind (or using fans to simulate winds)

Conditions for sharing a shelter or refusing to do so must also be explained.

Implementation Strategy **6** - *Make use of live fires and prescribed fires for training.*

Live fire exercises and prescribed fires provide excellent training opportunities. The fires' are real but under controlled conditions, allowing opportunities for inexperienced people to learn under the supervision of the more experienced ones. The planned increase in the use of prescribed fires could make this type of realistic training available to many more firefighters than was the case just a few years ago.

Implementation Strategy **7**- *Improve quality of instruction.*

The quality of instructors is always important, but becomes even more important when the instructors have to compensate for the lack of student experience, and need to accelerate the imparting of wisdom and realistic lessons. A great deal of the potential for change rests on training strategies. Therefore instructor preparation and 'quality will become a critical issue as the agencies move to make training more realistic through the use of Training-in-Context, Onthe-Job Training, simulations, exercises, and other advanced techniques. Successfully preparing people to train others competently and effectively represents a paramount issue if the agencies hope to accomplish real change. (See also discussions in Goals 11, 64, 69, and 71.)

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Improving the realism of training is discussed further under Goals 74 and 75, which address decision-making under stress.

Goal 67. Provide an adequate level of training to seasonals.

Implementation Strategy **1 -** *Analyze seasonals training needs (quantity as well as content.*

The agencies should provide a standardized approach to training seasonal and "term appointment" employees by factoring them into workforce needs analyses, and developing the seasonal curriculum based on those needs. To accomplish this, the agencies must identify the skills required, match existing courses and skills where possible, and modify or develop courses where necessary. They then must determine the number and hours of training courses needed to provide training for the desired number of seasonals.

Implementation Strategy **2 -** *Improve content and consistency of refresher training.*

There is currently a widely varied approach to initial and refresher training requirements. The agencies need to assure a more consistent approach that addresses critical skills. For example, 32-hour *initial* training requirements are currently in place as part of the NWCG performance-based training system, and are mandatory prior to fire assignment. However, implementation methods vary widely, and so does the resulting quality and consistency.

The NWCG in May 1997 adopted the recommendation of its Safety and Health Working Team (SHWT) to require annual safety *refresher* training. The adopted recommendation appears to leave much to local interpretation. We recommend that the agencies develop a mandatory 8 to 12 hour refresher curriculum that incorporates the following, at a minimum:

- Hands-on shelter inspection and shelter deployment under realistic conditions (adopt SHWT recommendation to use "Beyond the Basics," 1996, NFES 2179)

- Look Up, Look Down, Look Around ("Look3 ")

- Standards for Survival and/or Firefighter Survival

Agencies should expand beyond the mandatory 8-12 hour curriculum to include pertinent local safety issues and discussions as suggested in the SHWT recommendation.

In addition to the most critical safety-related skills, refresher training should focus on skills and concepts that degrade the fastest over time when not used. Some research is needed to

identify just which skills and ideas those are. Refresher training also needs to include information on new threats and issues (e.g., the first drought after several years).

The Alaska Fire Service (AFS) of the Bureau of Land Management (BLM) employs a novel approach to refresher training that warrants consideration by all the agencies. It starts with what they call the "2 x 4" approach, two sets of four topics:

- Lookouts, Communication, Escape Routes, and Safety Zones (LCES)

- Fuels, Weather, Topography, and Fire Behavior (as presented in "Look Up, Look Down, Look Around" or "Look3 ")

In addition to this, the AFS refresher training adds 8 hours of:

- Fire Safety Guidelines (a risk management approach including situational awareness, risk management, risk controls, decision-making, and evaluation)

- Fire Shelter Training (emphasizing avoidance and escape and then fire shelter deployment)

- Fatality and near-miss reviews

The most novel aspect of the BLM/AFS refresher training is that it is developed, revised, and presented by firefighters. The near miss and accident reviews are developed by the firefighters who were involved.

***Implementation Strategy* 3 - Lengthen "pre-season" for at least first time seasonals and certain specialties.**

The 1,039-hour employment ceiling is a barrier to providing time for adequate pre-season training. It has been suggested that the agencies lengthen seasonal employment terms on the front-end (pre-season). An extension of one to two weeks has been suggested by some. The add-on (and its length) should be based on bona fide training needs. It will increase costs but is critical to safety. The refresher training for some specialties (e.g. supervisors, engine bosses, initial attack incident commanders) needs more than the minimum 8-12 hours allocated for a crew person's training, and is another reason for extending the season. It would be desirable to extend the "pre-season" for all, but to make it more cost-effective it can be extended more selectively.

Implementation Strategy 4 - Provide more off-season training for seasonals.

The agencies have authority to pay temporary seasonal employees and non-employees (EFFs) a "day rate" for attending training during the off-season for up to 80 hours of training a year, at the AD-I level. Paying for training not only makes it more palatable, but adds to a person's sense of commitment to return, and adds to their perception that the agencies care about them and regard them as professionals, with a long-term mutual commitment.

Implementation Strategy 5 - Include in the Red Card system seasonals with ICT 5 or higher level certification.

It currently is hard to know when a seasonal can be scheduled for higher level training. The agencies have a significant investment in the training and experience of their seasonal and term employees. They should protect that investment by including in the Red Card system seasonal and term employees who are qualified at or beyond ICTS and should "track their training thereafter. The agencies should do so consistently across all agencies, providing training plans for seasonal and term employees linked to the workforce needs analyses of each agency as discussed in the previous goal. These training plans could be less formal and not developed to the same level as for permanent, full-time employees.

Implementation Strategy 6 - Revisit Smokejumpers and Hotshot refresher training with respect to safety.

Hotshots require a 24-hour refresher each year. Smokejumpers receive 40-80 hours of refresher training depending on their agency and base. It is unclear whether this 40-80 hours includes in all cases firefighting and safety refresher training (as opposed to jump qualification re-certification). The agencies should review the Hotshot and Smokejumper refresher training nationally regarding the approach to firefighter safety taken in those curricula.

Implementation Strategy 7 - Take advantage of down-time for training.

In some seasons there is much down-time that could be used for either on-the-job training or more formal training modules or courses. This is standard procedure for volunteer and career local fire departments, and should be used to enhance skills and safety of seasonals. It is recommended in addition to training at the beginning of the season.

Implementation Strategy* 8 -*Provide incentives for seasonals to return.

Retention of seasonals would "save" training given in prior seasons. That should be a factor in considering compensation and promotion practices.

Goal 67. Developed training priorities to make the most efficient use of the limited training resources.

Implementation Strategy* 1 - *Use overall training needs analysis to set priorities.

The survey and interviews in Phase I expressed more concern about the adequacy of training for FMOs and Crew Supervisors than other positions, followed by Division Supervisors and Agency Administrators. However, upon reflection and with more recent information on the interagency task group on competencies, we do not agree with that approach to set priorities for training. The agencies should not set arbitrary "priorities" for training based on the importance of a position, but rather should allocate the training resources needed to achieve the competencies for each position, with an allocation of training resources based on an interagency needs analysis, as outlined in the implementation strategies for Goals 42, 43, and 64. That is, rather than giving priority to training Crew Supervisors or FMOs, one should determine the number needed at each position in the hierarchy versus the numbers available and certified. It may well turn out that the positions that most need the training resources are Crew Supervisors and Division Supervisors, but it could turn out that Engine Captains or bulldozer operators or others were more critical.

Implementation Strategy* 2 - *Target certain individuals.

When training slots fire limited, give priority to training those who will take fire assignments, and who will be made available by their organization, if known. Some people take advanced training to build resumes and certifications with no intent or opportunity to use them. That can be harmful to safety if they preclude someone who is active from getting trained.

One should also consider the competency level (versus the required competencies) of the individual person (FMO, Crew Supervisor, etc.) in setting priorities.

A current initiative with potential to do just this is the "allocation of resources" ("draw down") concept being worked on by Buck Latapie of the Forest Service and Lee Englesby of the BLM. Region 6 of the Forest Service, and the BLM in the states of Washington and Oregon already employ this concept. In part, the system identifies in advance of the fire season a list of

individuals by position who agree to be available for fire assignment (and who have no constraints on doing so from their boss, spouse, or others). The assumption is made that if these people go to the training, they will be available for fire assignment, and hence should be given priority for training. The understanding cuts the other way too - if you want to go to training you agree to be available. The agencies should support this effort and expand its use nationally.

Goal 69. *Provide supervisors with training in leadership and supervisory skills.*

As discussed in Chapter 4 on leadership, there is a need to add training on leadership and human relations to the technical side of leadership training.

Implementation Strategy I- Train supervisors, IMT members, Floss, and dispatchers in key "human" skills.

Train all supervisors, IMT members, Floss, and dispatchers in communication skills, and how to interact effectively and with trust. The intent should be to improve effectiveness of communication, conflict resolution, and assertiveness at the operational level. This training should be mandatory for Squad Bosses, Crew Supervisors, Strike Team/Task Force Leaders, Division Supervisors, Operation Section Chiefs and ICs. To accomplish this the agencies need to re-examine what skills a fireline leader needs (see below) and train people in those skills. Courses should employ simulations under stress and realistic conditions.

Just training leaders to think about safety at fires may be less effective than using a more comprehensive approach which changes the process and attitude of how people do their day-to-day job, not just their fire job[21] Therefore, the agencies preferably should provide supervisory and leadership training to all fire management personnel who are in supervisory and management positions in their day-to-day assignments, to get people in a safety mind-set all the time.

Some would suggest that the intent of this goal will be met through new courses S-20 1 (Supervisory Concepts and Techniques) and S-301 (Leadership and Organizational Development). However, these are primarily fire suppression skills courses. For example, S201 is intended as a course to prepare *first level supervisors on a fireline incident.* S-301 is designed to train an individual in mid-supervisory and leadership skills at the unit leader level.

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[21] Patrick Withen, "Beyond Crews: Firefighting and Work Teams," <u>Wildfire.</u> March 1997.

These are well-developed courses and provide a good foundation for overall supervisory and leadership roles. We recommend building on this foundation by adding or expanding several topics and including some changes:

S-201

- S-201 presents an effective approach to the essentials of supervision, particularly in the areas of conduct, ethics, and workforce diversity. Decision-making, communication, and leadership skill areas are addressed, but should be part of a more comprehensive, connected set of skills that also includes situational awareness, mission analysis, adaptability, and assertiveness.

- The S-201 course-also can be the first opportunity, to introduce characteristics of "high reliability organizations," including accountability and responsibility, adaptiveness and responsiveness, openness and cooperation, hazard awareness, inquisitiveness and search for detail, role clarity and maturity.

- S-201 also needs to focus on decision-making concepts such as "recognition-primed decision-making" and "naturalistic decision-making methods" versus the traditional or rationalistic model used in the course at present. (These decision-making concepts were discussed in the Phase I and II reports.) Training in decision-making will be addressed further in the discussion of Goal 74, preparing leaders for decision-making under stress.

- The course's treatment of motivation is external in focus and needs to address why people do what they do and why they do or do not follow their supervisor.

- The course's approach to what it calls "Situation Leadership" and "Situational Style Theory" needs to reflect the state of the art in the application of the Situational Leadership model, and apply critical concepts of that model (currently lacking) in application exercises. [22]

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[22] Situational leadership is an increasingly influential leadership program which is being widely accepted as a managerial philosophy throughout the world. Managers in more than 1,000 of the world's leading organizations use Situational Leadership principles. The Situational Leadership model provides a tool for supervisors and managers to assess their employees' ability and respond effectively. The training materials need to be adapted and redeveloped specifically to the fire community. See Paul Hersey, The Situational Leader. Center for Leadership Studies, Escondido, California, 1984.

S-301

S-301 also appears to be a well-developed course, particularly in the areas of communication theory, power, delegation, conflict resolution, and objectives. The Pre-course Work (what the student does prior to attending the course) includes good information on performance management and coaching/mentoring. The course materials include well thought-out application exercises. However, to achieve the Goals and the Implementation Strategies outlined here, the following modifications are recommended:

- The Pre-Course Work and the Communications Unit should introduce the communication techniques associated with Crew Resource Management (CRM.) These techniques are discussed under Goal 81.

- The unit on leadership provides an effective introduction to leadership and supervision, but requires work to present critical concepts in. a more comprehensive fashion. The leadership unit should be critically reviewed by Human Resource Development professionals. Some specific areas of concern viewed by our team are addressed below.

- The course uses the Blake and Mouton's Managerial Grid as a leadership model. Sometimes the Managerial Grid gets taught as if there is one best style of leadership (what the Managerial Grid calls "Team 9.9"). Other S-201 course materials advocate recognition of differing developmental levels and Situational Leadership. The Team 9.9 style of leadership may not always be appropriate for some fireline situations and could counter the essential skill of "adaptability" associated with CRM. The course should not leave the student with the idea that "9.9" is always the best leadership style. [23]

- The inclusion of Situational Leadership concepts in the course is good but would be better if the course kept closer to the original model as designed by Hersey and Blanchard. The discussion of Situational Leadership should be critically reviewed. This will provide an excellent foundation for additional Situational Leadership study in the curricula.

- A unit on decision-making should be added to this course. It should focus on recognition-primed decisions (RPD) and other "naturalistic" models and provide

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[23] At least one senior instructor said the course is' not taught that way, so in practice the issue may be minor.

opportunities for trainees to apply and exercise those skills. (See Goals 74, and 75, and 82.)

- A unit which applies some of the concepts of High Reliability Organizations to the responsibilities should be added to this course.

- The course already makes extensive use of self-evaluation instruments. Several are appropriate for determining leadership styles for incident management. We recommend that the relatively new and very effective contemporary tool of "360° feedback" be considered for this course. This approach would help address the issues of personal suitability for fireline qualifications and fire management positions, which were raised during this study.

S-201 and S-301 already provide leadership and supervisory training that is a quantum leap beyond what was previously available. With the changes above, S-201 and S-301 should be made required training. The agencies should incorporate S-201 and S-301 into a comprehensive approach to leadership and supervision training that builds on and supplements these foundation courses. The comprehensive approach should provide state-of-the-art (contemporary) leadership training at all levels of the suppression and fire management organizations, and include the following topics for various positions:

Firefighters: one hour of "followership" as a stand-alone module on:

- Interaction
- Listening skills (listening and learning)
- Receiving, interpreting, and following instructions
- Teamwork
- Good followership (attitude, cooperation, influence, leadership, initiative, work ethic) . Making decisions together
- Watching out for one another

Advanced Firefighter/Squad Boss/Incident Commander Type 5. S-201, with the changes recommended above, plus a stand-alone course or stand-alone modules on:

- Giving instructions/influencing behavior
- Dividing up the labor

- An introduction to motivation (why people do things) and power (why people follow your lead)
- Common mistakes of new supervisors and supervising former peers

Crew Supervisor/Single Resource Boss/Incident Commander Type 4. An additional 8 hours beyond the above two modules, including a stand-alone course or stand-alone modules on:

- Assigning work/employing the talents of the crew
- Connecting their crew to outside world/teamwork
- Respectful interaction with crew members and Incident Management Team
- Role of Crew Supervisor as teacher/role model/mentor (build on information from Squad Boss course)
- Making decisions together (build on information from firefighter course)
- Motivation and power (build on information from Squad Boss course)
- Influencing behavior (build on information from Squad Boss course)

Incident Commander Type 3. S-301, with the changes as recommended above, plus a stand-alone course or stand-alone modules on:

- The Command function/role
- Assigning work/recognizing capabilities and deploying resources
- Interaction (respectful) with assigned resources
- Influencing Behavior (building on information from S-301)

Some safety experts suggested that separate leadership modules are needed for helitack foreman, engine captain, and possibly other specialized positions.[24]

To reiterate, the leadership and supervision training discussed above should be developed or at least reviewed by HRD professionals. The added training in human relations should be

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[24] The above comments apply through the 300-level series. We did not review the 400-level and 500-level courses because there were few negative comments about the courses at the top of the hierarchy, including personnel surveyed who were at those levels. An assessment is needed of whether those highest level courses need more human relations content.

conducted by fire people with strong HRD backgrounds (or talents) and who are further developed as trainers.

Goal 70. Teach wildland firefighters the basics on hazards faced in the urban/wildland interface.

***Implementation Strategy* 1 *- Train on the interface hazards to expect, and how to deal with them*.**

Phase I of this study indicated that wildland firefighters are increasingly finding themselves fighting fires in the wildland/urban interface zone, and they are deeply concerned about their safety there. These situations are likely to become more common because of continued development in rural areas. Despite policy to leave structural firefighting to state and local agencies (except within the national park system), Federal wildland firefighters will at times face fires in interface settings. They must be prepared, within the constraints of Federal policy.

Wildland firefighters need to know about hazards such as propane tanks hidden by tall grass or bushes outside of structures, hidden electrical wires, and other hazards if they are to protect structures externally. And if the cultural reality is truly faced, one will find that Federal firefighters in some cases will join with local firefighters to save homes. Citizens expect all firefighters to fight all types of fires. If wildland firefighters ever have to fight structure fires or fires near structures, they need to know the basic procedures and hazards - or be instructed to not fight fires inside structures, and be strongly backed when they do not do so, in accordance with policy.

Wildland firefighters may even need to know some basics on EMS: BLM firefighters have had people drive up to their fire house bleeding or about to have a baby, because they assume all fire houses provide EMS.

The fire suppression curriculum currently contains a course (S-205) intended to cross-train urban and wildland firefighters, and it seems to be doing the job rather well. The National Fire Academy and the National Wildfire Coordinating Group are currently funded and tasked to analyze, and on approval, redevelop S-205 (Fire Operations in the Interface). There is a possibility that the existing course may be redeveloped into multiple courses. This initiative should be completed, and the resulting training implemented widely at the earliest possible date.

On-the-Job Training

An extremely promising way to pass on know-how from experienced firefighters and fire . managers is by improving their skills in on-the-job training.

In most workplaces, On-the-Job Training *(OIT)* is the primary way that people learn what they need to do their jobs well. Classroom training often lacks realism and does not completely transfer into the field. Also, classroom training practices contradict much of what we know about adult learning, such as that adult trainees need to see immediate relevance, to be actively engaged in exploring, and to be self-motivated. Classroom training often disengages the learner from the job context, makes the learner passive, imposes the instructor's mental model, and substitutes the instructor's motivational skills for the trainees' own.

Organizations sometimes produce procedural manuals or checklists of training tasks to be taught to new trainers, but few help *OJT* providers develop the specific skills to deliver effective *OJT* - how to coach people in the field. In fact, few people even think that there are skills that can be taught on how to do on-the-job training, or mentoring. Such skills include the following:[25]

- How and when to pass on expertise
- How to identify the teachable moments in a day (versus forcing a topic on a day with no appropriate examples)
- How to be a manager of someone else's learning
- How and when to use a variety of instructional techniques
- How to diagnose the reason why a trainee "just isn't getting it"
- How to set reasonable learning goals
- How to re-adjust these learning goals so that the trainee is neither bored nor intimidated
- How to notice and change a poor learning climate

For example, one can ask firefighters how they would go from point A to point B before their crew supervisor says how he or she intends to do it, and then discuss the pros and cons of

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[25] A total of 57 skills for tracking OJT providers have been identified- and are included in Appendix B, which expands our discussion of On-the-Job Training.

the options. This often can be done rapidly and can be invaluable to the learning process. It gets people thinking, and accelerates their learning

On-the-job training offers not only the potential to capture some of the expertise now in the agencies before it is lost and to speed up the gaining of experience by the current generation' but also may help retain expertise by offering a rewarding mentor role to the old "warhorses" and encourage them to stay longer to pass on their expertise. OJT provides a variety of other secondary benefits, too. For example, it also helps make firefighting more professional: passing on learning is a hallmark of being a professional. Also, by establishing a new mechanism for sharing expertise, the agencies send a message that they expect their personnel to achieve high levels of competence.

We are confident of the benefits of an OJT program for wildland firefighting because of the success of the program in the Los Angeles County Fire Department, and the enthusiasm of the U.S. Marines in starting their own OJT program. The Los Angeles County Fire Department is in the process of institutionalizing an OJT program for its captains after the positive results of a pilot program. The Department took the OJT training over from its developers and are putting on their own workshops. The Department is planning to ensure that in the future, all captains become skilled in providing OJT.

For all of the above reasons we believe that instituting OJT training (Goal 71) is one of the most important, pertinent, and novel goals in this culture study.

Goal 71. *Maintain skills and safety awareness with on-the-job (and refresher) training. (Also accelerate the build-up of experience.)*

The need for improving refresher training has already been covered in previous goals (e.g., Goal 67). The implementation strategy below addresses how to implement on-the-job training. Appendix B provides a fuller discussion.

Implementation Strategy* 1 - *Develop a formal OJT training program, including teaching supervisors how best to provide OJT.

The agencies should implement a formal OJT program that goes beyond the current OJT component of the performance-based training system. A formal OJT program would use field opportunities to build the skills of personnel at all levels of the organization. Safety can be

improved through gaining expertise, and an effective OJT program can be a vital means of ensuring that expertise is enhanced where it counts the most: in the field.

The OJT approach we recommend for building expertise consists of three primary components: climate-setting for the student, assessment/diagnosis of the student's progress, and instructional methods. These content issues are discussed in Appendix B; below we discuss the overall steps for establishing a program.

The concept of an institutionalized OJT program seems like a major step, and it is. However, we suspect that the agencies are unlikely to make large gains in safety and in building expertise without taking major steps. The logistics and impact of an OJT program are probably even more cost-effective than the investments previously suggested for simulation and multimedia training systems.

The basic tasks to establish an OJT program are as follows:

Set Objectives - The first step in setting up an OJT program is identifying its educational objectives. Among the most important topics to address with OJT are being able to:

- Achieve situational awareness
- Detect when situations have shifted
- Anticipate how situations can or are likely to develop
- Make judgments about what is typical versus what is an anomaly Make
- decisions under time pressure and versus degrees of uncertainty Make
- subtle perceptual discriminations
- Spot problems very early
- Identify leverage points for overcoming problems
- Use various "tricks of the trade"
- Improvise on the spot

These are key aspects of wisdom and know-bow that are difficult to teach in the classroom by traditional methods. There may be many others to add to the list.

OJT can also be used to support skill development for procedural tasks. However, to build a culture of safety the agencies should not simply teach crews how to carry out tasks,

follow rules and procedures, and operate equipment but also how to detect when safety margins are being violated. To do this, an OJT program must develop people's perceptual skills.

Establish targets by position -After setting educational objectives, we suggest that, while OJT can be used at every level, for almost all skills, the primary positions targeted for training in how to conduct OJT would be first line supervisors, including Squad Bosses, Crew Supervisors, and other Single Resource Bosses. These people are in the best position to boost expertise of crews and other fire personnel on a massive scale for a minimal investment.

The secondary targets would be assistant fire management officers, Strike Team Leaders, Task Force Leaders, and Division/Group Supervisors. They would benefit by understanding what the first line supervisors were to do with OJT and could themselves use training in how to provide OJT to help boost the skills of the front line supervisors.

A third target could be firefighters, who would benefit from an OJT orientation program about how to ask questions and how to come up to speed more quickly, particularly in making sense of issues that affected their own safety. They will be more willing to learn if they understand OJT is intended to work.

Develop the instructional materials and framework - The starting point for the program could be either a four-hour course prepared for Crew Supervisors and other first line supervisors, or a module added to existing courses. They need to be given not just the general idea and skills to practice, but to experience themselves how it feels to give and receive effective versus ineffective OJT. This must not be a one-shot course that would be quickly forgotten. Some provision needs to be made to have a series of follow-up sessions to reinforce the use of OJT practices. The follow-ups can be group sessions to discuss progress, add additional strategies to the instructional repertoires, and trade lessons learned in delivering OJT. The OJT training requires direct interaction and practice, and is most effective when taught to groups of 8-12 people at a time. In the interests of practicality, it would be wise to start with a pilot program for 6-12 months, make any course corrections necessary, and then institutionalize the training.

Derive assessment procedures -It is critical to assess how well individuals are conducting OJT. Assessment procedures need to be designed, for example, so that Division Supervisors can determine whether a Crew Supervisor is making effective use of the OJT techniques, is skilled at transmitting his/her own expertise to others, is helping the senior crew members to explain things to the new members, and is establishing a climate that fosters learning

rather than a climate of intimidation that discourages learning. Without a systematic effort to conduct assessments, the OJT program will gradually diminish and disappear, and the initial investment will be lost.

Prepare the organizational support - Too often, programs such as this are initiated with high levels of enthusiasm and expectation, as if good ideas by themselves will prevail. However, the reality of organizational dynamics is that it requires incentives and attention to maintain momentum. It may take the agencies as much as 5-10 years to fully institutionalize a wide-scale OJT program. "Fully institutionalized" means that a new generation of Crew Supervisors will be inducted into an organization that relies on OJT and expects that each Crew Supervisor is competent to provide OJT to the crews in his/her care.

A critical element of organizational support for the OJT program is to certify fire program personnel and Incident Management T earns, including squad leaders, single resource bosses, and division supervisors, as being competent to provide OJT, and to make the demonstration of such competence a requirement for promotion. This is yet another requirement, but the alternative - accepting people in positions of responsibility who are unable to facilitate learning about issues related to safety - seems less acceptable. If we expect that Crew and Division Supervisors are able to provide effective training, then that carries with it the responsibility to ensure that they have the skills necessary to carry out the responsibility. However, it is unreasonable to impose a requirement for OJT certification before there are ample opportunities to receive the training program and to practice the OJT skills. Therefore, the OJT program would have to be established on an informal basis first, followed by the certification requirement after several years, with adequate warning and announcement so that no one was surprised or disadvantaged.

The development of a corps of competent OJT trainers can and should be accomplished in concert with the apprenticeship program described in the implementation strategies for Goal 1l, and with the promotion of professionalism (Goal 59). The cadre of the apprenticeship program would be given priority in acquiring OJT skills. The participants of such a program would form the professional core of agency fire programs.

OJT is cheaper and more effective than classroom training for many skills. Once established, the OJT program can serve as a platform for training in the future. In that way, it is a "force multiplier" for the agency fire programs. As noted earlier, a more comprehensive

discussion of OJT principles, the application of OJT in the fire programs of the five participating agencies, and implementation approaches are to be found in Appendix B.

Individual Action in Emergencies

Firefighters need to understand the necessity to switch modes of action when they are in life threatening situations. Repeatedly we were told of situations where the realization that "something had changed" was delayed. Statements like "I didn't realize we were truly in a bad situation until the squad boss shook out his fire shelter," indicates a real need to improve communications about extreme emergencies. There also is a need for firefighters to recognize when it is time to back out, and when dropping their tools and fleeing at maximum speed makes sense.

The change in behavior or culture needed here requires a new lexicon for bailout situations. Some clear instruction or trigger phrase is needed for "drop your tools and run," versus "move rapidly to a safety zone." Firefighters must be clear whether they are to take tools with them (e.g. so that they may clear a space to deploy their fire shelter) or not to take tools with them (so as to move faster). The goal is for the Crew Supervisor to elicit a timely and appropriate response, and to get firefighters to follow the instructions and act together with their team. For this to occur, firefighters must be prepared to change their mental set in emergency situations, and recognize that one is no longer fighting the fire but rather saving one's life.

The bulk of training recommendations throughout this report are intended to help crews avoid getting into emergency situations. But sometimes the unavoidable happens. Training is needed for facing dire emergencies at both the individual firefighter level and crew level. It is necessary to explicitly train crews on how to react to emergencies not only so they know what to do but also so that they can easily switch modes in an emergency, and remember that what might be inappropriate to do in normal circumstances (such as dropping tools) may be absolutely necessary in extraordinary circumstances.

> *Goal 72. Provide training to crews on the reaction skills needed in dire emergencies that endanger them.*

> *Goal 73. Instill in each firefighter the necessity to switch modes and take extraordinary action in extraordinary emergency situations.*

Implementation Strategy* 1 - *Train on emergency skills at the individual level.

In addition to realistic training on the selection of safety zones and deployment of shelters, individual firefighters must be instructed that in extreme situations they may be ordered to drop everything and run for it. Because there are tragic examples of firefighters injuring themselves with tools while running, they may need to be given drills in activities such as dropping tools and running, to be remembered on the rare occasion when needed. This would be made only after a decision not to walk out carrying tools - when there literally is no time left. There are many examples from other fields that show that people often fall back to usual, familiar skills instead of switching to emergency skills in an emergency. A classic example was a police officer killed in a gun battle who had stopped to collect the valuable spent shell brass casings while reloading because he had formed a habit of doing so in training on the range, even though it slowed him down.

Implementation Strategy* 2 - *Train on communicating in emergencies.

The agencies must train people on crew communications under highly stressful, emergency conditions. Previously we discussed using respectful interaction, following instructions, and preventing loss of crew cohesion/ structure. The intent was to create the ability for firefighters to voice concerns and point out changing conditions in a condensed, respectful manner. But in more extreme situations, when threatened by being overrun, there may need to use stock phrases and instructions that trigger emergency actions that need to be obeyed immediately such as "deploy shelters now," "drop tools and run," or "follow me." This training should include terse emergency signals sent up the chain of command that alert people to an extreme emergency situation. (Communications protocols already include the ability to call for priority use of a channel for an emergency message.) This all needs to be done without losing crew cohesion.

The "emergency vocabulary" should be consistent with the common fireline vocabulary. The previously mentioned Human Factors Workshop participants recommended a consistent vocabulary system for use by Incident Commanders, FMOs, and dispatchers. They frequently mentioned the Campbell Prediction System for this purpose. Whatever vocabulary is used has to describe existing conditions so that everyone understand them and responds appropriately. The vocabulary should enable firefighters to describe fire behavior, conditions, common dangers (snags, rocks, proximity of other crews and equipment, etc.), interface conditions, and escape

urgency (abandoning the line, exercising escape routes, deploying shelters) using standard, understandable terminology.

The agencies should evaluate the Campbell Prediction System, S-290 and Look3, then choose the most appropriate vocabulary, or develop a hybrid, and then teach and use that vocabulary in the training system. The National Fire Protection Association is reportedly working on a standard vocabulary which may influence this strategy; the agencies should stay abreast of this effort.

Implementation Strategy **3 - *Emphasize "stress-resistant" training***.

The desired outcome is to produce firefighters who automatically, instinctively, and "stress resistantly" shift gears from fighting the fire to saving their lives. This instinctiveness will result from "Stress Resistant Training" such as OJT and "Training In Context," which have been recommended under earlier goals. The concept of Training In Context emphasizes that under stress, you will perform as you learned. Based on that premise, the training environment should recreate the context and content of the operating environment (as discussed under Goal 66 on making training more realistic).

Decision-making Under Stress

A key area in which training must be improved is decision-making under stress. This is important enough to merit its own section here.

Stress can be psychological or physical, and represents a significant barrier to individual functioning in the wildland fire environment. Firefighters most commonly recognize stress as information overload, task saturation, exhaustion, or fatigue. Although stress responses, particularly physical ones, are generally predictable, mental stress is very much an individual phenomenon. One firefighter's response to mental stress may be to concentrate on one thing at a time, while another firefighter's response might be to talk incessantly. These individual responses can cause serious communication and cohesion problems within a crew, team, or other unit.

Stress responses and individual means of coping also impact decision-making ability. The ability to make decisions under stress may be the single most important skill needed to improve firefighter safety. It is arguably the most important human factors change needed in the

organizational culture. Firefighters generally keep themselves out of harm's way by making good decisions and by responding appropriately when faced with unexpected fire behavior, the risk of being overrun by a fire, or other challenges to their safety. However, many investigations of firefighter fatalities show that poor decisions made under stress contributed to the incident. These considerations led to Goals 74 and 75, which focus on training people to operate under stress, and ways to reduce the stress.

Goal 74. *Prepare leaders for decision-making under stress.*

Goal 75. Prepare the entire workforce (not just leadership) for working under conditions of stress.

Implementation Strategy **1** *-Develop a Decision Skills Training program*

The agencies should implement an expertise-centered approach to decision training. An excellent version of this is the "Decision Skills Training" program, which consists of seven tools designed to improve decision-making under time pressure and uncertainty by facilitating the "growth of expertise. The tools are:

- Decision requirements
- Tactical decision games
- Decision critique
- Pre-mortem exercise
- Uncertainty management
- Commander's intent exercise
- Situation awareness calibration

These seven tools or exercises are described in Appendix C.

The Decision Skills Training (DST) is aimed specifically at developing the ability to size up situations, determine feasible reactions, manage uncertainty, detect the early signs of problems, clearly communicate assessments of situations, and calibrate the team's understanding of the situation.

The training includes exercises to accumulate a set of experiences and opportunities to make decisions under time pressure and uncertainty. The Decisions Skills Training should be integrated into both tactical and leadership training.

The value of a Decision Skills Training program for the Federal fire community is to produce squad leaders, Crew Supervisors, strike team/task force leaders and division supervisors who can read shifting conditions, anticipate future developments, spot early signs of problems, manage uncertainty, and communicate their intentions.
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The training decision should produce "hardened" decision-makers who are prepared to make tough calls such as decisions to avoid or withdraw From risky situations despite organizational pressures to stay the course.

The DST program would complement the On-the-Job Training program described under Goal 71. Both approaches are geared towards expanding expertise and accelerating acquisition of experience.

Once an OJT platform is created, it can easily be used to provide training in decision-making. Similarly, an organization that wishes to begin with a Decision Skills Training program will find it easier to build on it to establish an OJT program.

This strategy should be implemented in concert with the implementation strategies listed under Goal 4, which advocates the establishment of a "lessons learned" capability that is important background for decision-making.

One of the encouraging findings from the research on training people for decision-making under stress is that practicing for almost any type of stress seems to help people cope with a wider variety of stresses. The agencies should reinforce learning and exercise the decision-making skills learned in the Decision Skills Training throughout the curriculum. See Appendix C for a further discussion of developing a DST program.

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Implementation Strategy 2 - Increase emphasis on "naturalistic" and "recognition-primed" decision-making.

Naturalistic Decision-making and Recognition-Primed Decision-making (RPD) are terms for how people use their past experience to make decisions, and how they must be aware of

cognitive limitations and traps that humans easily get into. These research subjects were discussed in an Appendix in the Phase I report.[26]

Wildland firefighting requires decision-making in time-critical situations. The majority of these decisions will be "recognition-primed," i. e. based on recognizing situations. Recognition-primed decision-making relies upon accurate assessments of the situation(s), which means the decision-maker has to have previous experience to use to help establish goals, expectations, recognize critical cues, and identify and evaluate potential courses of action.

The agencies should revise the decision-making content of course S-201 (Supervisory Concepts and Techniques) to focus on "naturalistic" and "recognition-primed" decision-making in addition to the more traditional approaches to decision-making contained there. The traditional rational decision-making model presented in S-201, which includes weighing of alternatives, would be useful for decisions when people are trying to select the tactics to best implement a strategy. However, on the fireline, firefighters rarely have time to generate options, establish criteria, and rate each option. Naturalistic decision-making models deal with decisions made under stress with minimal response time - making sense of the situation and taking rapid action to mitigate problems. Recognition-primed decision-making (RPD) is such a naturalistic model. According to the findings of the Human Factors Workshop, firefighters need training on various types of decision-making, and guidelines that help determine when each model is best.

The RPD model explains how experienced decision-makers can generate a reasonable course of action without having to compare or contrast it to alternatives. At its simplest level, decision-makers using an RPD approach experience a situation and match it to a typical situation which they have already experienced. Experience enables them to size up a situation, understand what is going on, and react appropriately. Klein's research shows that firefighters rely primarily on RPD strategies. The agencies should focus on incorporating opportunities to exercise naturalistic decision-making through highly realistic and interactive exercises. Use simulations and role plays as appropriate.

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[26] For more information on naturalistic decision-making in the wildland fire environment, please see Gary Klein, 1995, <u>Naturalistic Decision-making and Wildland Firefighting, presented </u>at the U.S. Forest Service Human. Factors Workshop, June 12, 1995. This paper is included in <u>Findings From the Human Factors Workshop, 5100 </u>F&AM, Forest Service, November 1995, 9551-2855-MTDC (updated July 1996).

Implementation Strategy **3** *- Search for ways to reduce workload and stresses in the field.*

Processes, tactics, and techniques for reducing workload and other stressors in operations should be included as a part of operational training. "Tricks of the trade" should be collected from experienced personnel working specific operations, and shared or incorporated into formal training, not as "stress training" but as part of routine operational training courses.

This might include: learning to draw on a crew's collective memory, wisdom, and logic (following the findings of Putnam and Weick), thereby spreading out the perceived burden of decision-making; respectful interaction; meditation (or simply taking breaks to regroup and clear the mind); reducing the number of Watch Outs and orders to remember; managing information overload; and providing adequate, timely information (thus reducing worry about the unknown). All of these have potential for reducing stress and improving" decisions.

Implementation Strategy **4** *- Encourage self-development of ways to cope with stress.*

Crew members need to examine their own stress symptoms in the context of decision-making and safety. As will be discussed further under Goal 81, crew resource management (CRM)-type training can help crew members to understand the problems that stress could cause for themselves and their crews. It can also assist them to develop individual strategies for coping with the situations they personally find stressful, which varies from person to person. For example, as overload represents the high end of the stress spectrum to some, complacency, boredom, and monotony can mean high stress for others. When mopping up for two days, people may drop their guard and not be ready for a flare-up, or not stop to periodically check for dangers such as falling snags.

As problems resulting from individual stress reactions are combined, the collective crew function can suffer greatly, sometimes falling to the lowest common denominator. Crew members and leaders should be trained to understand the effects of common stress reactions in fellow crew members and to find methods for counteracting the effect on the crew and on the leader's decision-making. Again, CRM-type training can assist both crew members and leaders with this effort.

For example, a crew member may recognize a familiar crew situation in the communication section of a CRM workshop. After the participants discuss the issue and work together to come up with possible solutions, the firefighter can develop a personal strategy that will assist him/her to prevent or mitigate the error if/when it occurs again. This process applies

to any CRM concept, such as cohesion/coordination, communication, or decision-making. It also can be applied to barriers such as fatigue, stress, boredom, or complacency. The personal outcomes of CRM vary from person to person, because the development and application of the personal strategies are geared for each participant's needs.

Implementation Strategy 5 -Develop a 'catalog' of visual indicators or cues of situational change.

As part of recognition-primed decisions, one needs help with the "recognition" of different situations. The key point is learning to recognize different kinds of real world cues or indicators of situational change, such as the appearance of cumulus clouds, a drop in humidity, and or apparent shift in the direction the fire is moving.

To make tactical decisions under stress the individuals must be trained and/or experienced in being able to recognize and assess what is actually taking place (situation assessment). This involves training the individuals to first make the initial determination of "what's going on here."

The individual then can draw on previous experiences to help determine what to do, what to watch out for (critical cues and expectancies), what goals to set, etc. For this to be effective, the individual obviously needs a knowledge base of experiences to draw upon. Ideally these are from their own experiences, but some can be learned through training, case studies, video, simulations; and stories.

Decision-makers must be trained to deal with uncertainty. Uncertainty is the norm, not the exception. Individuals can become frozen because they are unable to deal with the degree of uncertainty. Training people to deal with uncertainty includes: understanding what constitutes uncertainty (missing, incomplete, inaccurate, and/or misleading data); recognizing where the uncertainty exists; recognizing where additional information may be able to be acquired to reduce some of the uncertainty (as well as recognizing where it can't); and being able to make the judgment "Which is more valuable to me, the reduction in uncertainty this will buy me, or the time I will use up in the process of trying to reduce the uncertainty?"

Time constraints are usually imposing in naturalistic decision-making. The end result is that decision optimization is usually not a realistic goal. What is more realistic is to identify the option that will "do the job" regardless of whether it is optimal and then get on with it. The central factor in naturalistic decision-making with great uncertainty is not looking for exact

replications of situations experienced before. Rather, it is looking for indicators of change experienced before. These are cues that alert the firefighter that the situation is changing. Some people are able to do this and some can't. Those that can do well with naturalistic decisionmaking; those who can't will be poor field leaders/supervisors.

Therefore, as part of the effort to improve decision-making, the agencies should embark on a project to catalog "visual indicators" needed to build scenarios for teaching and develop simulations. This can be accomplished by interviewing the most experienced fire people to determine images with which to build the catalog. The agencies should evaluate S-290; Look Up, Look Down, Look Around; and the Campbell Prediction System "in light of their emphasis on visual indicators of fire behavior, and develop the most effective method for transferring this knowledge about visual indicators to fire personnel. [27]

Implementation Strategy* 6 -*Talk about stresses and raise awareness.

Simply letting firefighters know the kinds of stresses to expect, and talking about them, is helpful. Firefighters need to be warned to expect feelings of homesickness after being away from family, friends, and home for two weeks at a time; they may find they have difficulty in concentrating. Open discussion of stress factors often helps a person begin to manage the stress.

Fatigue

Fire personnel interviewed in this study cited fatigue as a serious safety problem. Fatigue affects safety by affecting judgment, reducing alertness and situational awareness, and physiologically making people vulnerable. Exhaustion and dehydration are dangerous in and of themselves.

Rested firefighters are not only more effective, but are safer.

Fatigue in wildland firefighting arises in numerous ways. We heard many examples of Agency Administrators and Incident Management Teams pushing firefighters and fireline Incident Management Teams too hard to avoid a 'transition from local control to an Incident Management Team, or from a Type II team to a Type I team. These situations can result from a

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[27]The "agencies might also consider a similar effort to catalog "behavioral indicators" of cohesion and leadership [1] and other human factors problem, and use that to enhance decision-making training as well.

desire to hold down expense, or avoid a more complex situation, or because of lack of available resources, or simply out of pride. However, fatigue and its severe impacts on firefighting safety can more often be traced to four primary causes.

Causes of Fatigue

First, firefighting personnel often work too many consecutive hours, on too many consecutive days, and often on too many successive fires. Data from a BIA study showed that the majority of injuries occurred among crews during the third week since they had left their home base.[28]

Second, firefighting personnel are not receiving adequate rest while assigned to fire duty. Incident bases are busy, noisy places not conducive to sleeping. Inadequate sleeping facilities represent a particularly severe problem for personnel assigned to night operations who must try to sleep during the day. The effects of chronic sleep deprivation are well known, including effects on mood, cognitive abilities, and motor skills. A recent study found that cognitive abilities suffer more than motor skills, but all decline after sleep loss. Given the strong belief that greater situational awareness is a key to firefighter safety, sleep deprivation may represent a very great impediment to maintaining safe and effective operations, and may represent an even more serious threat to firefighter safety than was perceived by the firefighters interviewed in this study. [29]

Third, firefighting personnel pay too little attention to adequate nutrition and hydration, important factors in reducing fatigue. Nutritional and hydration requirements for firefighters have been well researched by the Forest Service's Technology and Development Program. Its research results and recommendations are documented in a technical report entitled *Fitness and Work Capacity.* [30] It found that energy requirements for firefighters are very high. Failure to replace the energy can lead to rapid weight loss and excessive fatigue. The research findings

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[28] Personal communication, Steve Haglund, Fire Director, BlA, to Philip Schaemnan, 1996.
[29] "Effects of Sleep Deprivation on Performance: A Meta-Analysis," Sleep, 1996, (19(4): 318-326. Sleep is the Journal of the American Sleep Disorders Association, the Sleep Research Society, the Japanese Sleep Research Society, and the World Federation of Sleep Research Societies.
[30] Brian Sharkey, 1997, *Fitness and Work Capacity,* (2nd ed.), Tech Report 9751-2814-MTDC, Missoula, Montana: U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Center, 78 pp.

also show that firefighters are prone to heat stress, dehydration, exhaustion, and heat stroke caused by inadequate fluid intake.

Fourth, as reported in Chapter 4, firefighters we interviewed cited transportation as a fatigue factor. Whether the transportation required is long-distance or local, transportation planners and managers walk a fine line in managing tradeoffs between cost, safety and fatigue. For example, people believe that because helicopter transportation alleviates firefighters from long walk-ins, it is the answer to transportation fatigue problems. However, extensive helicopter transport exposes large numbers of people to the risks of helicopter flight, and tends to concentrate fire fighting forces on mountain tops and ridge lines. This factor often raises tactical safety issues such as increasing the risks associated 'with the downhill hike and the dangers of inappropriate downhill line construction.

Contributing Factors

Some of the factors leading to fatigue, or worsening an already bad situation, are as follows:

Lack of Acknowledgment of Fatigue - The problem of fatigue is aggravated by the lack of crew and institutional acknowledgment of fatigue. Fatigue can cause major safety problems, especially when a crew does not acknowledge its fatigue level, and is not aware of how their potential for getting injured goes up significantly with fatigue. Survey respondents listed this as the highest rated fatigue issue.

Lack of Rest After Dispatch at Night - Study participants felt strongly about being dispatched in the middle of the night and not given adequate rest after their arrival and before receiving an assignment. This is a common situation. Personnel are often immediately assigned to the fireline after receiving little sleep, starting out in a highly fatigued condition that they are unlikely to recover from over the course of a fire assignment. Stories abound of crews arriving exhausted at the incident base after driving all night either from their home base or another fire and being put immediately out on the line.

Desire for Extra Money - Fire crews and fireline Incident Management Team commonly mask or deny their fatigue in order to stay out longer, work more operational periods, and generally do what it takes to make more money. While survey respondents from every geographic area rated this problem highly, it was rated highest in the Northwest and the Northern

Rockies areas. Seasonal firefighters thought that crews working too long to make money was a worse problem than did the permanent employees.

Fatigue Levels Not Checked - Crews often arrive on a fire assignment directly from another fire, but little attention is paid to evaluating their fatigue level. Frequently they are treated as a fresh crew even though they may have been working long operational periods for two weeks.

Reticence in Speaking Up - While it appears that plans and operations personnel rarely ask incoming crews about their fatigue level, it is also true that many crews do not voluntarily speak up about their need to rest upon arrival at the fire. This may happen because of their eagerness to get "on the fire," the objective of earning money, pride in the crew's stamina, or the belief that the crew won't get any sleep at their incident base or camp during the day anyway.

The above considerations lead to Goal 76, another one of the very most important safety issues flagged in this study.

Goal 76. Monitor and reduce fatigue levels to safe limits.

Implementation Strategy* 1 - *Limit the duration of field assignments to two weeks.

At present, firefighters are allowed to work at one or more fires for three consecutive weeks (21 days.) The agencies should consider limiting fire assignment duration further to 14 or 15 consecutive days, and then sending the person home, with a guarantee of at least 8 hours administrative leave. During periods of extreme need, this policy might be amended to allow 14 days on assignment, followed by two days of rest and recuperation (R&R) without demobilization, followed by 7 additional days, terminating in mandatory demobilization and at least three days off To be of value, rest and recuperation time must be spent in a quality environment that allows people to clean up, relax, do laundry, and most important of all, get sustained, restful sleep. Motels and dormitories away from the incident base would be best. R&R at incident bases and armories often is not effective, and should be discouraged. To summarize, people should have to rest several days after working two weeks, if at all possible.[31]

The agencies should examine other approaches to assignment lengths including those used in Australian and Canadian wildland fire agencies, and the United States military's experience with fatigue mitigation.

Implementation Strategy **2** *- Assure comfortable, quiet sleeping conditions.*

Night crews and Incident Management Teams must try to sleep while contending with incident base noise, daylight, and hot daytime temperatures among other things. The agencies must work harder to assure comfortable, quiet sleeping areas in incident bases, particularly for night operations crews and off-duty Incident Management Teams. Additional cost to provide higher quality sleep is justified and the agencies should approve expenditures to improve incident base and camp sleeping conditions. Air-conditioned tents should be considered for night crews in areas with high daytime temperatures.

The least expensive improvement is to provide adequate numbers of ear plugs and eye covers to facilitate daytime sleeping. The agencies should also seriously consider portable structures (large tents, weather ports, other soft-sided structures, and trailers) in which darkened, air-conditioned daytime sleeping quarters can be provided in dormitory or barracks-style. The quality of rest in so-called spike camps also needs to be considered. They can defeat their purpose if the quality of rest is not good.

Implementation Strategy **3** *-Improve dissemination of information on the need for adequate' hydration and nutrition.*

The Forest Service's Technology and Development Program has researched and clearly documented nutritional and hydration requirements for wildland firefighters.[32] However, it appears that the information is not finding its way to the operational level, or is not being implemented operationally. The agencies should use a three-pronged approach to assure that individual firefighters receive and understand this important information and that it influences operational planning and decision-making.

First, training sessions in the skills curricula (particularly those for firefighter, advanced firefighter/squad boss, Crew Supervisor, Safety Officer and medical unit leader) should

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[31] One must be sure that sending someone home does not result in even higher fatigue levels from the added travel home and back, when the distance home is farther than the destination where the person is to be sent next. Therefore, there is a need to consider the R&R option.

emphasize information on firefighter health and safety, especially fatigue mitigation, nutrition, and hydration.

Second, the agencies must make much stronger efforts to get this information out in incident bases in a "public awareness" style campaign including posters in and near field kitchen serving lines and eating areas. Table top nutrition reminders would also be effective.

Third, make a concentrated effort to inform Logistics Section Chiefs, food unit leaders, and caterers about the needs and deficiencies in nutrition and hydration.

Fourth, the most important guidelines from the report *Fitness and Work Capacity* should be consolidated into concise job aids for inclusion in the Fireline Handbook.

Fifth, the above concerns should be reflected in national catering contracts.

Implementation Strategy 4 - Conduct further study of sleep deprivation and other factors affecting fatigue of firefighters.

We already know much about the importance of fatigue and sleep deprivation, but not directly about that of firefighters. The agencies should contract for a study on the effects of sleep deprivation on firefighters and their safety. The study would examine current approaches to operational periods, work-rest ratios, cumulative effects of fatigue over a season, assignment duration, and rest and recuperation policies with the intent of evaluating their contribution to sleep deprivation, and fatigue, and their impact on firefighter safety. The study would increase attention to the issue of fatigue and help convince firefighters (and their agencies) of the importance of getting adequate rest.

Implementation Strategy 5 -Use transportation or spike camps to reduce fatigue.

As discussed in Goal 27, crews, teams, and individuals should be transported where needed with attention to net risk reduction and with consideration of reducing fatigue. Another alternative is increased use of so-called spike camps or coyote tactics, reducing the hike back to an incident base, but only if they can provide adequate quality of rest.

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[32] Sharkey, 1997, op cit.

Information Overload

Information overload is a problem that was raised by many in fire leadership positions. It is also a particular type of stress. Many people do not understand the skills of prioritizing and filtering information, nor do some people realize the danger in flooding people with information. Wildland fire operations can be rapidly moving and extremely complex. 'Timely information is needed to keep up, but information overload can be devastating, too, if one does not have the skills to filter it. Fortunately, simple techniques can be taught to improve personal information management skills.

Some field research on information overload in the command and control environments of wildland fires found no observable performance degradation due to information overload during a study in which research psychologists observed the functioning of two national level Incident Management T earns during the suppression of a large forest fire.[33] The authors of the study thought that a variety of factors were responsible for shielding the Incident Management Team members from information overload. First and foremost was that these were highly experienced people. It was another case of experience improving decision-making and safety. Second, the authors observed that the Incident Command System provided an effective organizational structure that prevented people from being burdened by too much information, by establishing reasonable spans of control, and by providing the team members with ways to structure and format information. Third, the observed Incident Management Teams benefited from familiarity with each other and teamwork that enabled them to anticipate events, which enhanced their situational awareness. Their experience' enabled them to anticipate the goals, actions, and intentions of other people, and to recognize which information was important and which was not. Therefore, they tended to concentrate on the "high pay-off' information, and they did not acquire information faster than they could assimilate or use it.

As the expertise of an individual increases, so does his or her ability to synthesize or "block-up" (i.e., group) information, thereby reducing the amount of raw information that they must deal with. What a relatively inexperienced person sees as 10 pieces of information, the experienced person might see as one or two.

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[33]J. Taynor, J., G. A. Klein, & M. Thordsen, (1987), <u>Distributed Decision-making in Wildland Firefi~hting</u> (KATR-858(A)-04F), Yellow Springs, OR, Klein Associates, Inc. Prepared under contract MDA903-85-C-0327 for U.S. Army Research Institute, Alexandria, VA.

One might conclude from the above study that the wildland fire agencies are in good shape when it comes to preventing information overload. However success in preventing people from becoming overwhelmed with too much information is very dependent upon the experienced and level of expertise of the individuals involved. The challenge is to transfer successful information processing techniques to team leaders and crew members.

All available evidence suggests that experience levels have declined. We speculate that so has the ability to deal with information overload. Judging from the many who raised this as an issue in the interviews and surveys, it should be taken as a serious problem, which led to the following goal:

> ***Goal 77. Crew Supervisors, Division Supervisors, and Incident Management Teams must get the information they need, but also be shielded from a flood of unnecessary information, and the risk of information overload,***

***Implementation Strategy* 1 -** *Be selective on what is broadcast and what is requested.*

Most of what is needed to reduce information overload and to deal with it is addressed in other goals. The reduction of information overload is the purpose of the strategies in Goal 37 on reducing the numbers of orders and rules, and Goal 19, on training people to use the radio efficiently. The goals related to building up experience levels again. The purpose of several other goals also leads to people able to cope with information in the field.

For people to be able to determine whether information is necessary or unnecessary, they need to understand the "big picture." Strategies contained in this report related to situational awareness, learning risk management skills, information flow dynamics, interpersonal communication, and briefings are critical to achieving better situational awareness and giving people the tools they need to get adequate, pertinent information and manage information overload.

Training a firefighter or fire manager to avoid information overload does not require additional courses. Rather, it should be viewed as a natural extension of our recommended emphasis on two-way dialogue (not one-way command). The related principles are working to acquire/share vital information while personally learning to ignore information that is not worth paying attention to.

Realistic decision-making training under stress addresses this problem by providing skills to the firefighter to manage information. Simple skills to determine what information is critical

to understanding a situation (and what adds no value) and how to acquire it (by talking within a crew, by asking for it) are part of decision training, discussed under Goal 74, Implementation Strategy 1.

Physical Fitness

The agencies introduced fitness testing to the process of selecting wildland firefighters to help reduce the number of heart attacks and other physical fitness-related injuries and illnesses experienced by firefighters. The Step Test (and alternate 1 1/2-mile run) have been in place since 1975. Consequently, while the leading cause of deaths to structural firefighters has been heart attacks and strokes, very few wildland firefighters die from heart attacks or stress at fires despite their strenuous activity.

Despite the excellent record to date, physical fitness issues were among the highest rated problems identified for improving safety in the interviews and survey in Phase I. The three big issues raised on physical fitness were the validity of the step testing process (some seemingly fit individuals struggle to pass it), the veracity of the test process (some unfit people are intentionally passed), and the wide variation in physical fitness for Type II crews.

Many respondents strongly believe that the step test is not a good indicator of real-world performance in the field. Both men and women said that the physical fitness test should be gender-blind. They felt that women should be expected to pass the same physical test as men, especially if it was for stamina or skills related to fireline performance. A number of firefighters made the point that someone could be overweight but have the stamina and ability to walk up a mountain and do strenuous physical work, though they did not do well on the step test. This was mentioned especially for physical types common in certain ethnic groups, Most study participants felt less strongly about exactly what new test might replace the step test than that the new test address their objections.

There is also a significant minority of firefighters who do not understand or do not accept. the importance of physical fitness standards, even if intended for their own good. (We found the strength of this feeling somewhat surprising in light of the very positive life-saving results that have been achieved.) They: need further information on the benefits, and convincing by their peers.

Recent laws (including the Americans with Disabilities Act), field experience, and research on long-term work capacity have caused the agencies to reevaluate their current approach to physical fitness testing. The proposed new pack test series - three different levels of work capacity tests relating to "arduous," "moderate" and "light" duties - resulted from that initiative. The NWCG concluded that:

- The Step Test (and alternate 1 1/2-mile run) does t:l°t meet Federal standards for testing employee fitness.

- The Step Test and 1 1/2-mile run are not directly performance related.

- The post-exercise heart rate count used in the Step Test is difficult to perform accurately and incorrect fitness assessments result.

The new wildland firefighter physical fitness test (the Pack Test series) has been. developed by Dr. Brian Sharkey and is being evaluated for adoption. It is more directly work-related than the Step Test, and is in final testing and validation review. Many respondents commented favorably about the "Pack Tests."

On a related issue, study participants indicated that there was at least some cheating that allowed people to slip through without passing a physical fitness test, and that many people were allowed to work on the fireline without having their fitness credentials checked. Like the training and experience requirements, the physical fitness test needs to have credibility and needs to be enforced as the third leg of the qualifications system.

Type II *Crews* - There was a strong consensus among those responding to the national survey that many firefighters in Type II crews are not sufficiently physically fit. (Virtually no one during the interviews raised questions about Type I crew fitness other than to praise it.) Almost 50 percent of the survey respondents said that physical fitness of Type II crews was a high priority for improvement.

A number of interviewees said that the problem was complicated by there being a wide range of fitness levels across Type II crews, which makes it difficult to safely match assignments to crews. This is a clear safety issue and a significant challenge for those who have to assign crews to tasks on the line without adequate information on their physical condition.

Contract Crews - Study participants showed the greatest concern over the physical fitness of contract crews, who are expected to be used more as the Federal firefighting workforce decreases. They may not have the same physical fitness as the Federal crews. Some dispute this concern as a misperception and believe that most contract crews are comprised of adequately screened personnel.

State Crews - The Federal firefighters expressed a virtually identical concern about the physical fitness of state crews as they did about contract crews. It was felt that some states do not have or do not adequately enforce firefighter physical fitness standards.

Incident Management Team Fitness - More attention to physical fitness training was also considered a need for Incident Management Team personnel. Some felt team personnel need to be in reasonable shape to walk the line, work at base camps, and handle the stress of the job. Slightly over half of the survey respondents thought that physical fitness of team personnel was a medium to high priority problem.

The above concerns led to Goals 78 through 80.

Goal 78. Develop a widely accepted physical fitness test for wildland firefighters.

Goal 79. Physical testing must be conducted honestly and for all.

Goal 80. Minimize wildland firefighters fatalities from health or physical conditioning factors.

Implementation Strategy 1 - Finish validation and acceptance testing of the Pack Test series or another new physical fitness test, and rigorously enforce the new test.

A widely accepted and validated physical fitness test must be put into effect as soon as possible. With the old test judged invalid and no new test to replace it, this is a critically important task of the highest urgency. If given final approval, all five agencies should adopt the proposal "Pack Test series," which is a family of three related physical screening tests as documented in Physical Fitness and Work Capacity.[34] The pack test series is a gender-neutral, widely regarded as work-task related, and effective in testing the fitness of firefighters of

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[34] Brian Sharkey, 1997, op cit. See also the USDA Forest Service briefing paper, "Questions and Answers: Pack Test. "

different sizes and weights. The Pack Test series is undergoing pilot testing and further review in 1998.

Implementation Strategy* 2 -*Require contractors and encourage all others at Federalfires to meet the new physical fitness test.

The agencies should continue to require contractor personnel to meet the federal wildland firefighter fitness standard used by the agencies, and should see that the new standard is implemented. The agencies have flexibility under the ICS 310-1 (Wildland Fire Qualification Subsystem Guide) to establish appropriate physical fitness test(s) for their contractors as well as' employee personnel.

By agreement, all NWCG members, including state agencies, accept each others' personnel for fire duty based on each agency's own standards. The Federal agencies should, through the auspices of the NWCG, continue to encourage all member organizations to adopt and implement the new Pack Test series or whatever test is ultimately accepted.

Implementation Strategy* 3 - *Educate the workforce about the new test.

The information on the new test needs to find its way to the operational level. The agencies should assure that managers and supervisors at operational levels of their organizations, as well as individual firefighters, receive and understand this important information and that it influences operational preparation of firefighters.

Implementation Strategy* 4 - *Hold testers accountable.

Anyone who allows people who are not fit to be certified as passing a fitness test should be held accountable.

Crew Dynamics

Although Phase I survey participants did not include crew dynamics issues in their most highly rated problem areas, some of the most knowledgeable experts on crew behavior in the wildland fire environment and on unit decision-making under stress in other environments believe that crew dynamics, particularly crew cohesion, is extremely important to safety.

Crew Cohesion

Research shows that closely knit crews communicate better, make better decisions, care more about helping each other, and respond to instructions more quickly and accurately, especially in emergencies. Unit cohesion is needed to maintain discipline in uncertain and dangerous situations and for people to think and work cooperatively.

In the wildland fire community, people tend to cite Type I crews, particularly Hotshot crews, as models of unit cohesion. We believe this is because they typically:

- Train together.

- Maintain their crew structure away from fire assignments and work together during non-fire time.

- Live together in barracks or dormitory settings or at least spend a great deal of time together.   .

- Tend to have fairly low turnover, maintaining considerable crew continuity from season to season.

- Screen their members fairly carefully, seeking proven performance.

- Have a common background or organizations of origin.

- Have succeeded together as a team.

- Have good leadership.

Most Type n crews do not enjoy many of these attributes and are often a collection of relative strangers. The challenge of creating unit cohesion on Type II crews can be very difficult and requires different approaches than might be used with Type I crews. However, crew cohesion is not a problem unique to Type II crews; some Type I crews also will benefit from initiatives to improve crew cohesion.

Crew Resource Management (CRM)

This report contains several references to Crew Resource Management (CRM) training as a potential solution to several problems, including improving crew dynamics. CRM is a model for cultural change that has been used in the aviation environment since the 1970s; it has been effective in improving operational efficiency and reducing safety problems. It is one of many

tools the agencies should employ as part of a comprehensive strategy to change their organizational safety culture.

Participants of the 1995 Human Factors Workshop devoted a considerable amount of their effort to exploring the wildland fire applications of CRM and recommended that CRM-type training remedies be applied to strengthen crew and crew member performance in the wildland fire environment. [35] CRM training directly addresses many aspects of human performance and crew dynamics, including communication, decision-making, leadership, situational awareness, and barriers to these processes such as stress, conflict, and potentially hazardous attitudes. The goals of CRM training is to improve crew effectiveness, reduce the occurrence of error, and improve safety.

CRM training focuses on individual performance and attitude. The resulting attitude changes are effective because they both directly assist the crew member in working within the crew and present an example for others. CRM training helps each crew member think about his or her individual situation, including job duties and barriers to performing those duties. They help them develop individual strategies for combating potential safety problems caused by human error.

History of CRM - CRM originally stood for Cockpit Resource Management. It was first coined for training crews to reduce pilot error, and make better use of human resources. A NASA research project found that many air crashes resulted from failures in interpersonal communication, decision-making, and leadership, and this training concept was a response.

The first comprehensive CRM course was started by United Airlines in 1981. It was derived from corporate management development training. It emphasized changing individual styles and correcting deficiencies in individual behavior such as a lack of assertiveness by juniors and authoritarian behavior by captains. Starting about 1990, the airlines included other aircraft crew members in the training, and renamed it Crew Resource Management.

CRM then was adapted to other industries, including medicine, engineering testing, maintenance, and offshore oil exploration. CRM also became more specialized in aviation, addressing problems such as flight deck automation. The Federal Aviation Administration now

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[35] USDA Forest Service, Fire & Aviation Management Technology & Development Program, <u>Findings From the Wildland Firefigters Human Factors Workshop,</u> 9551-2855-mtdc, Missoula, Montana, 1996.

requires that CRM concepts be integrated into the airlines' technical training curricula. This resulted in the development of aircrew target behaviors and skills, which the airlines now include in operational procedures and checklists.

Cross-cultural environmental considerations of CRM **-** There have been problems in exporting CRM to some organizational cultures. CRM training targeted specific crew member behaviors in mostly Anglo aviation environments. Some of the behaviors were not readily acceptable to some cultures, for example, the notion of verbally challenging authority, especially when a specific wording was suggested. Also, by integrating CRM into other forms of training, some of the original focus on error was weakened. This led to a shift in CRM training from recommending very specific actions and words, to explaining an approach for determining what to do and say. That is, CRM training in non-aviation settings solved some of the cross-cultural problems by refocusing the CRM concepts on the goal of error reduction and error management rather than on specific, pre-selected target behaviors.[36] Even so, a CRM course will still require some adjustment for group differences.

The bottom line is that CRM-type training can be adapted to meet the needs not only of wildland firefighting in general, but also can be adapted to individual organizational subcultures (e.g. Smokejumpers, Hotshots, Native American firefighters, etc.). We use the term "CRM-type" training rather than "CRM training" to describe the potential final products after needed adaptations.

Methods -There are many forms of CRM-type training. Most involve some type of experiential learning process that is facilitated, not instructed. This training helps people change their attitudes about how they operate, so that they can improve the way they function. Because every person has a different set of attitudes and experience, the attitude change resulting from these programs may vary *from* individual to individual. In the end the participant needs to be able to adopt a change in attitude and strategize methods of improving personal performance in the future.

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[36] Research in non-aviation environments and in cross-cultural studies by Robert Helmrich and Ashleigh Merritt of the NASA/University of Texas/FAA Aerospace Research Project (1996) found that many cross-cultural barriers can be reduced by refocusing CRM on its initial root - error reduction - which is a more universally accepted goal across cultures. This is also consistent with research on national culture differences discussed in G. Hofstede, *Culture's Consequences: International Differences in Work-Related Values,* Beverly Hills, California: Sage, 1980.

An experiential learning cycle involves the stages of experiencing, "publishing," processing, generalizing, and applying. For example:

> *During a simulated blow up, an Incident Management Team uses their*
> *knowledge and experiences to deal with the situation (experiencing). During*
> *debrief they go into sharing (publishing), look at habits they have or need to*
> *develop (processing), discuss how things could/should be different*
> *(generalizing), and then go on to examine how to apply new skills*
> *(applying). Next time they are experiencing similar circumstances they*
> *should relate their new skills to the situation (back to experiencing, etc.).*

Taking learners through this cycle usually requires strong, well-developed facilitation skills. The strategies formulated by the crew members during this process are individual and can address a variety of problems/issues that are identified within the workshop.

Approach - To get the most from the CRM-type training, the agencies must employ it as part of a comprehensive strategy including other organizational remedies. For example, the agencies need a management stance and culture that encourage personnel to report errors. Error reporting is a critical support element for successful culture-wide (not just crew-wide) CRM implementation. (See the related discussion of Goal 3 in this report.)

Many of the safety concerns uncovered in this study relate to human error. Adopting a CRM approach and CRM-type training represents a fundamental and important cultural change that could dramatically improve firefighter and Incident Management Team effectiveness. As a remedy that directly addresses human attitudes and behavior, the potential impact of this approach on organizational effectiveness and safety could be far reaching.

Goal 81. Foster better crew cohesion, especially among Type II crews.

Implementation Strategy **1 -** *Adapt and adopt CRM-type training and attitudes.*

We concur with the findings of the 1995.Human Factors Workshop that most of the organizational and interactive behaviors that are part of CRM are relevant to the wildland fire community. Some of the high level components of CRM that are applicable include teaching:

1. Situational awareness
2. Mission analysis

3. Decision making
4. Communication
5. Leadership
6. Adaptability
7. Assertiveness [37]

Components of CRM-related behaviors as they apply to wildland firefighting are well documented in Findings From the Wildland Firefighters Human Factors Workshop[38] This set of skills helps get crews and teams to work together, versus just taking orders from a leader. The agencies, through the NWCG, should adopt the principles of the CRM approach.

"CRM" has come to mean many things to different people in the wildland fire community, creating some confusion and dampening the concept's potential as part of a comprehensive approach to improve firefighter safety.[39] Therefore, the NWCG should uniquely name their interagency CRM-like approach for the wildland fire community (i.e., stop using "CRM"). The participants of the Human Factors Workshop suggested "Fire Crew Dynamics" and/ or "Fire Team Dynamics."

Implementation Strategy **2** *- Develop assessment instrument to periodically refine CRM-type training.*

As mentioned, the aviation industry has experienced some failures exporting CRM training to other organizational or cultural environments, by prescribing specific crew member behaviors which did not effectively transfer to different operational and cultural environments.

Successful applications of CRM in the aviation community now are continually refined for various cultures via the "Cockpit Management Attitudes Questionnaire" (CMAQ),[40] and its later version, the "Flight Management Attitudes Questionnaire" (FMAQ). The FMAQ measures attitudes about issues such as crew cohesion and leadership style. The results determine the

[37] Assertiveness became associated with CRM because of the need for a co-pilot to be assertive in pointing out problems to the pilot. Assertiveness also represents a skill area of great importance to the wildland firefighting community (e.g., a subordinate speaking up about safety; minorities and females being assertive).
[38] USDA Forest Service, Fire & Aviation Management Technology & Development Program, ,Findings From the Wildland Firefighters Human Factors Workshop, 9551-2855-mtdc. Missoula, Montana, 1996.
[39] L. McDonald, "Are We There Yet?" Wildfire. L, Vol. 6, No.4, August 1997.
[40] Cockpit Management Attitude Questionnaire (CMAQ), (Helmreich, 1984; Gregorich, Helmreich. & Wilhelm, 1990.

baseline "culture" before organizations introduce CRM-type training or other interventions. In other words, organizations use the FMAQ to focus their CRM-type training. NASA and the University of Texas Aerospace Program have produced a data base developed from more than 30,000 responses to these inventories which have been used to assess values and to direct CRM-type training efforts in a variety of cultures.

Recently, the FMAQ has been modified for use outside of the aviation environment, including fields as diverse as medicine, petrochemicals, and manufacturing. It can be used to assess or predict an organization's ability to indoctrinate CRM-type concepts into their culture. M C Solutions, Inc. of Denver, Colorado has recently modified the FMAQ for use in the wildland fire community. They are pilot-testing a "Crew Member Attitudes Questionnaire" (CAQ) with 20 Hotshot crews in a privately funded effort.

The agencies should use an assessment mechanism such as the FMAQ/CAQ to evaluate training needs particular to subcultures within the Federal wildland fire management community. These subcultures might include different agencies, Type I versus Type II crews, EFFs, Incident Management Teams, Smokejumpers, Hotshots, etc. The assessment tool would evaluate training needs based on attitudes toward the various components of CRM defined in the findings of the Human Factors Workshop.

For example, let's say that the CAQ indicates that the crews of some ethnic group have what is known in CRM circles as "a High Power Distance Factor," which stresses the absolute authority or-leaders, common in many countries. In this case, content areas regarding consensus decision-making or assertiveness training may be slimmed down or changed, while subject content revolving around leader-based (hierarchical) decision-making functions and barriers might be increased. Alternatively, more effort could be given to consensus training. In both cases, the information would be tailored by the facilitator to fit within the prevailing cultural norms so that the new attitudes and strategies can be accepted.

Implementation Strategy **3** *-Infuse CRM principles throughout training.*

Because its application can be particularized to different applications, CRM training can be beneficial to many types of organizational groups. Although the greatest benefit of CRM training would be initially felt at the operational levels, the training is appropriate to all levels of operations and management.

CRM concepts may be particularly critical for the Single Resource Boss level. However, the training curricula should begin to establish a foundation for CRM concepts starting right at the firefighter level, and continue to comprehensively reinforce and expand the concept throughout the curricula. The Fatality Fire Case Studies course under development will introduce advanced firefighters to CRM concepts. This will provide a foundation for infusing the CRM concept in the fire training curricula, assuming the course becomes mandatory training. The Fatality Fire Case Studies course is being developed by Jim Cook of the Boise Interagency Hotshots and scheduled for beta testing in Spring 1998.

The National Park Service pilot-tested a compressed (8-hour) CRM module at their 1997 Crew Supervisor Academy.41 The session presented introductory information on the essentials of the CRM concept and led people through exercise scenarios. The training cadre found that non-fire examples (air crash, aborted missile launch, etc.) were effective because they focused people on learning about the concept rather than on the exercise content. The cadre felt that because students did not get wrapped-up in the tactics of "fighting the fire," they were able to focus their learning on CRM concepts for later application.

We provided examples of where to infuse CRM-type training under various goals discussed earlier. Our recent review of S-201 (Supervisory Concepts and Techniques) and S-301 (Leadership and Organizational Development) revealed that these newly available courses represent logical places to infuse and reinforce CRM concepts. The agencies should review the entire incident management and prescribed fire curricula and infuse "CRM" concepts wherever appropriate: That effort should pinpoint courses where the most impact can be made, focus redevelopment efforts on those courses and require those courses in the performance-based training and qualification system.

In addition to those mentioned above, courses with potential for inclusion of CRM concepts include: S-110 (Basic Fire Suppression Orientation), S-130 (Firefighter Training), S-131 (Advanced Firefighter Training), S-200 (Initial Attack Incident Commander - ICT4), S-230 (Crew Boss - Single Resource), S-231 (Engine Boss - Single Resource), S-232 (Dozer Boss - Single Resource), S-233 (Tractor/Plow Boss), S-300 (Incident Commander, Multiple Resources), S-320 (Unit Leader), S-330 (Task Force/Strike Team Leader), S-339 (Division/Group Supervisor), S-378 (Air Tactical Group Supervisor), S-400 (Incident

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41 The module was team-taught under the guidance of Lark McDonald of M C Solutions, Inc.

Commander), 1-420 (Command & General Staff), S-430 (Operations Section Chief), and S-440 (Planning Section Chief).

As CRM concepts are introduced in the low and intermediate level courses, it will also be necessary to include at least a condensed summary of the ideas in the S-520 (Advanced Incident Command) and S-620 (Area Command) courses. After several years, when most people have had CRM training on the way up, there would no longer be a need to introduce them in the higher level courses, though the CRM principles (e.g., respectful interaction, querying, acknowledgment) would still be used in exercises or simulations.

Implementation Strategy **4** *- Employ team building technologies when teams first meet.*

People size up each other when they first meet. This was confirmed in the course of research conducted by the U.S. Air Force Academy, which found that attitudes, perceptions, and conclusions are drawn almost immediately by both leaders and crew members.[42] These initial perceptions remain in effect until something happens that proves them otherwise. The longer these perceptions and attitudes stay in place, the harder they are to change.

Crews frequently rely on time to eventually solve cohesion problems. However, operational cohesion does not have to be tied to how long a crew has worked together. Studies conducted by the military indicate that newly assembled teams can work as effectively as longer standing crews if critical cohesion components are addressed. Respect, well-defined and communicated roles and responsibilities, and active control of barriers to cohesion are some of the critical components required for a cohesive crew, whether they are newly assembled or a standing crew.   .

The agencies' leadership training, especially for Crew Supervisors and other unit team leaders, should focus on immediately developing the components of cohesion critical for operational effectiveness, and define methods for leaders to identify and correct deficient areas. CRM-type training can be useful in assisting leaders to identify and correct cohesion barriers and improve leadership performance. Unit formation skills include the following:

- Being sensitive to the fact that when teams are assembled, people size each other up in the first ten minutes. Effective leaders, hoping to establish and maintain a cohesive

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[42] Ginnett, 1992.

unit, must understand that this is known to happen and make the most of that initial meeting period. A Crew Supervisor could explicitly say something to the effect that "many of us don't know each other yet, but we need to get acquainted", and then get each person to say something about their background, interest, and experience.

- Facilitating agreement on what makes an effective crew (internal measures of success and external measures of success), also thought off as establishing shared goals and intent. For example, leaders can develop shared goals and intent by deliberately engaging people in a discussion of the unit's purpose. An effective way to accomplish this is by using a training technique known as the "Commander's Intent" exercise. In these exercises, the leader describes what it is they want to accomplish. One of the participants then introduces an unexpected variable. The leader writes down how he or she believes the variable will impact the "commander's intent;" as do the subordinates. Afterwards, they compare notes to establish whether leader and followers share goals and intent. (This exercise is included in our recommended training on decision-making, discussed in Appendix C.)[43]

- Immediately establishing roles and functions for each crew member, so that people understand their role and responsibility, the roles and responsibilities of others, and their interrelationships from the outset (positions like those in a Hotshot crew could be assigned - hot shovel, lead pulaski, etc.). The leader can also establish roles and functions by asking people to participate in a simple training exercise. During the exercise, each team member describes with whom on the team they will interact; what they need from those people and what the others need from them. This exercise provides an opportunity for people to articulate their current mental model of how the unit will function, it allows the members to jointly find the limitations in those mental models and confront them.

- Establishing trust between crew members, including the leader.

- Recognizing the needs of others before being asked (anticipation). The key to recognizing the needs of others is understanding their role or job. Therefore, the exercise described above can be employed to produce this desired effect as well.

- Providing clear expectations and desired outcomes, including the crew member's responsibility to communicate and report problems. Leaders can accomplish this through use of the Commander's Intent exercise described earlier.

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[43] Some of the exercises described here may be culturally unacceptable in some Native American communities, noted a BIA reviewer. Sensitivity to such issues must be kept in mind as one develops training programs and other changes to the organizatioJ;1al culture. Adaptations may be necessary.

- Focusing on results. Leaders should express goals in terms of outputs or results, not activities. For example, "establish a fireline from the creek to the division break" versus "dig fireline." Supervisors who express goals in terms of activities get lots of activity, but few results.

- Coaching to gain commitment and maximum productivity. (Coaching skills are discussed in Appendix B on on-the-job training.)

- Establishing multiple means of communication, including redundant or backup methods (voice communication, tone of voice, eye contact, hand signals).

- Understanding personalities - the responses you can expect and anticipate from a person. Leaders can achieve this by striving to recognize and understand current as well as past behavior, anticipating future behavior, and influencing or dealing with that behavior.

- Establishing high cohesion without creating blind trust (i.e., encourage respectful questioning of the leadership as appropriate). "Pre-mortem exercises," as discussed in Appendix C of this report, provide a respectful way of having an entire team share its worries about a plan.

- Fostering tight cohesion at the team/crew level without causing mistrust or distrust outside of the team (including division supervisors, strike team leaders, etc.), or countering the larger organization's goals.

The agencies need to consider (and perhaps experiment with) providing time for "team building" of "unit cohesion" when crews or teams are assembled for the first time. During this period (perhaps one day) the team leader and team members would exclusively and deliberately work to establish the teamwork atmosphere described above.

Implementation Strategy 5 - Consider use of outside vendor for CRM development and training.

To speed up adaptation and adoption of CRM, the agencies should consider contracting with an organization that specializes in CRM to provide a wildland fire version of CRM, and to maintain the courseware. It would be used initially with Type I standing crews, Type II crew leaders, and Incident Management Team across agencies. This recommendation is consistent with the recommendations of the Human Factors Workshop.

The training needs to be ongoing, recurrent, and continue to evolve as the culture evolves. Organizations that assign internal resources to do CRM as another job in a list of jobs

have almost invariably seen their programs fail. For example, the Air Force started with specialist CRM contractors in 1988 and their accident rates went way down. The Air Force then had the contractors train Air Force cadres in CRM and started teaching it themselves to save money. The individuals trained in CRM never stayed in place, and the "critical importance" of CRM was lost when the CRM courses were thrown in with other courseware. Within a few years, CRM courseware was being redeveloped and administered in pockets and the accident rates started climbing again. Currently, the Air Force is working to reassemble a system-wide CRM initiative and start again.

As a program which is involved in changing attitudes and looking at things in a new light, CRM conducted by outside contractors tends to be more effective. In part this seems to be because people lend credibility to "experts." In part it is the level of focus and consistency that specialized vendors can provide. The real secret to this training is not in the printed facilitator guides, but in the delivery and conduct of the course. Focusing on the right things is very important.

Another benefit to using external vendors here is the turnaround time on courseware evolutions. As the environment changes and incidents happen which have human factors relevance, they can be incorporated immediately into the program. Courses in the standard curriculum tend to be revised according to a prescribed schedule, and can be out of date until their scheduled revision.

Ideally, a CRM program should be managed and funded at a fairly high organizational' level. This prevents the program from being hijacked or undermined. It also gives management the ability to focus the effort on current trends it wants to address from an organizational standpoint.

Unfortunately, the wildland fire community currently has a relatively small budget allocated for training. CRM training will compete with other similar soft-skill training programs, and it is expensive per student when compared to NWCG courses. The agencies should consider maintaining a separate training budget line for CRM and perhaps other high priority new training thrusts.

Implementation Strategy **6** *- Develop work climate of trust through changes in the culture.*

The implementation of many of the goals and strategies discussed elsewhere in this report will help create a work climate that establishes trust and respectful interaction, the basic elements

of team building. The agencies will be encouraging communication and interaction by consistently and comprehensively preparing all firefighters with a common frame of reference, training all firefighters to use a common vocabulary to describe their working environment, and by the actions and conditions the firefighters observe and the situations they encounter.

> **Goal 82. Develop a safety culture that encourages people to think in the context of safe practices; standards and procedures.**

Implementation Strategy 1- In addition to all of the above, get firefighters and managers to raise safety consciousness in day-to-day activities.

Among all the proposed solutions that were included on the firefighter safety survey, respondents gave one of the very highest rankings to "develop a culture that encourages people to think." The agencies will eventually achieve that cultural change by implementing strategies discussed under a variety of other goals, especially Goal 20 (adequate information).

Developing a safety-oriented culture can be fostered through the incremental contributions of everyone from firefighter to fire program manager. [44] Senior managers need to frequently ask about how various new programs or ideas will affect safety, and to praise individuals or groups who contribute good safety-related ideas.

Debriefing at fires should raise the question, "How did the action match or miss meeting safety considerations? How close did we come to having an incident?"

Various individuals, especially those firefighters people look up to, need to be encouraged to discuss safety issues informally, among members of crews.

Stories of positive and negative examples need to be spread, perhaps with a newsletter, as suggested earlier.

Starting new initiatives and following them up will also send signals, and encourage thinking about safety. It will be a whole collection of actions that will change the culture.

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[44] Charles Perrow, " Developing a Cooperative Approach to Wildfire Protection," TriData Corporation, 1998. Paper developed for fire program managers on how to change the culture, presented at the Federal Fire and Aviation Leadership Council, Boise, Idaho, January 6, 1998.

Summary

This chapter on Human and Psychological Factors addressed self-image; professionalism; situational awareness; substance abuse; training, including availability, quality, realism, and training on-the-job; personnel practices; fatigue; crew dynamics; physical fitness; decision making under stress; and individual responsibility.

The next chapter shifts focus from the individual to factors outside of fire suppression that affect the safety of firefighters.