

CHAPTER 3. ORGANIZATIONAL CULTURE

This chapter discusses implementation of the goals and principles dealing with organizational culture. These are the goals discussed in Chapter 4 of the Phase II report.¹ Subsequent chapters deal with "leadership" and "human factors" goals. Many goals could be listed under more than one heading.

Preserving Strengths

The vast majority of firefighters interviewed or surveyed as part of this study felt that the current overall Federal interagency approach to fighting wildland fires was good or excellent. They think the system needs many improvements but it is generally sound, and the agencies should preserve its many strengths. More than 80 percent of the firefighters surveyed believe that the system's strengths include:

- Concern of supervisors for the safety of their crews
- Recognition of the need for improvement in fire safety
- Good personal protective equipment
- The concern for safety now being accepted as part of the culture by firefighters
- Firefighters' generally positive attitude (committed, energetic, can-do, love the job)
- Air operations
- Specialized training and the use of Type I crews
- Forecasting of weather conditions
- The Incident Command System
- Interagency cooperation in firefighting
- Use of the "LCES" approach (Lookouts, Communications, Escape Routes, Safety Zones)
- Integrating people from allover the nation into a successful firefighting force
- Firefighters' adaptability and cross-training
- Fire reconnaissance

¹ For readers of the Phase II report, note that the goals in this report have been renumbered and in some cases reordered from the Phase II report, but all goals have been retained.

- Lessons learned from the South Canyon fire have led to more people questioning strategy and tactics
- Good transportation and equipment

This led to the first goal:

Goal 1. The existing strengths of the Federal wildland firefighting system should be preserved and built upon.

Implementation Strategy 1- "Physician Do No Harm." Evaluate proposed strategies and changes to avoid unintentional negative side effects.

As they move forward to implement the goals and strategies outlined in this report, the agencies would be well advised to reinforce the strengths outlined above, build on the sound foundation existing, and make sure that proposed changes do not inadvertently damage something that is working well.

Implementation Strategy 2 - Disseminate information on what is perceived to work well

In addition to taking care not to damage any good parts of the system, we recommend dissemination of the findings on strengths identified in Phase I so that firefighters throughout the system understand that it currently works well, and just needs improvement rather than a total revolution.

Implementation Strategy 3 - Fix the existing system first.

The current system should be used as a foundation upon which to build. Some safety problems are caused by not using the existing system well. The first approach should be to make sure the system is working as intended before trying new approaches.

Healthy Attitudes Toward Safety

Phase I of this study found that present attitudes toward safety were generally quite good. Most interviewees and survey respondents believe their supervisors and colleagues genuinely care about safety. However, a significant minority said they receive mixed messages about safety: they are being told safety comes first, but are then urged to achieve unreasonable fire management objectives. Also, some employees feel

uncomfortable about raising safety issues. One-fifth of the responding employees felt that their supervisors do not listen when they voice safety concerns. Many people also expressed concern about the potential for reprisal if they speak out about safety problems. Additionally, evidence suggests that firefighters do not generally regard speaking out about safety issues as a personal, individual obligation. This led to Goal 2 below. (Note also the section on individual responsibility for safety, Goal 8.)

Goal 2 A “Code of Conduct” should be established in which employees should have both the right and obligation to report safety problems, and to contribute ideas on their safety to their supervisors. The supervisors are expected to give the concerns and ideas serious consideration

Implementation Strategy 1 - Disseminate directives - and otherwise spread the word - that each person is expected to report safety problems and to contribute potential solutions."

Firefighters should be held responsible for their own safety with respect to things they can detect and have control over.² Part of this professional responsibility is to report safety problems as well as contributing ideas for solving them. Another part of professional responsibility is related to following safe practices and preparing for emergencies, and is discussed later under Goal 8.

The professional responsibility to report safety problems starts with informing one's *immediate supervisor* of any problem. This includes administrators and managers as well as firefighters. If the problem is not solved at the first level (either the supervisor denies the problem, does not act on it, or cannot act on it), then it can be taken to the *second level supervisor* in the chain of command. If not solved there, it can be taken to the *Safety Officer* (or person given safety responsibility) for" the incident. The appeal can continue to the *Agency Administrator* and ultimately the Area, State, and Regional levels.

This process already exists, but it is not well known, especially among seasonal firefighters. There is also reluctance to use it from fear of retribution, skepticism about getting results, the reluctance of people in junior positions to speak with higher levels, fear of losing prestige among peers, and reluctance to bypass one's supervisor.

² The FF AST Team co-chair, Paul Broyles, proposed this very concept at the NWCG meeting in Boise on March 13, 1997.

To better advertise the process:

- Add a statement of the right and the responsibility to the (red) fireline handbook.
- Add it to the initial response pocket guide (developed by the Southwest geographic area).
- Add it to the card, with the ten fire orders on the reverse, that is given to all firefighters. (Perhaps call this the "Marana Card," in gentle, humorous analogy to the well-known "Miranda Card" carried by police to read arrestees their rights.)³
- Add the procedure to the posters that must be posted in incident bases.
- Emphasize in training courses, and by word-of-mouth, and by example that it is the responsibility of a professional to identify and do something about safety problems.
- Encourage the dialogue between raising safety problems and their supervisors to take place. as a "respectful interaction."⁴

Implementation Strategy 2 - Train new firefighters to speak up about safety.

The agencies must train new firefighters to express safety concerns to their colleagues and supervisors routinely and assertively. This can be done by role playing, by giving examples of what and when things can be brought up, and other means. Getting the right mind-set from the start of their career will prevent attitude problems later on. Clearly describe the process in the basic (S-130) firefighter course. It is apparently mentioned now, but not directly enough.

Implementation Strategy 3 - Train supervisors to listen.

Fireline supervisors must be taught to accept the raising of safety issues as a firefighter's professional right and obligation. Additionally, the agencies must train their fireline supervisors to listen and foster openness by allowing crew members to present alternative views without criticism for raising them.

³ Much leadership training is conducted at the training center at Marana, Arizona.

⁴ More on "respectful interaction" later. It originally was used to describe the dialogue between an aircraft crew under the "crew resource management system," and has been promoted for adoption throughout wildland firefighting by Karl Weick, a noted researcher on wildland firefighter safety issues.

To help make the point:

- Discipline supervisors who refuse to listen to a safety suggestion or problem that leads to an injury because it was not resolved in time. Publicize that anecdote among firefighters and supervisors using formal and informal networks. .
- Publicize positive examples of supervisors who were not aware of a problem until it was pointed out by a firefighter. Publicize examples where procedures were changed in a geographic area, or even nationally, as a result of a suggestion coming up through the ranks.

Implementation Strategy 4 - Include the raising and handling of safety comments in performance ratings and accountability systems.

Both "the system" and individuals must actively hold people accountable for safety practices. NWCG working teams are already exploring one approach to improve accountability by incorporating responsibility for safety into new and revised Position Task Books (PTB). Safety and accountability must 'be integral parts of the PTB, and of personnel performance evaluations (in addition to real-time accountability for flagrant actions.) Each position has safety requirements essential to that position, and not delegable to others. This strategy should be given high priority.

Implementation Strategy 5 - Involve employees in developing ways to get these ideas implemented in the field

A culture of firefighter safety excellence will result from widely held attitudes, and should include an accepted "code of conduct" to help foster the desired attitude. Shared attitudes result from widely observed *behavior*. Thus the agencies should focus on changes that influence behavior of people on the fireline. To affect behavioral change, the agencies need to have a fireline safety policy that enjoys a great deal of consensus and field support, ultimately manifesting itself as conduct on the fireline. A consensus on, and widespread commitment to, the strategic goals outlined in this report will expedite their implementation, thereby facilitating the desired outcome of improved firefighter safety.

Commitment springs from involvement, and widespread commitment to organizational change demands the vigorous and systematic participation of the people expected to carry out change. This involvement should occur through an organized, methodical employee involvement process that encourages employees at all levels of all

agencies to influence how their organizations carry out this and other goals and strategies documented in this report.

For example, safety reviews are often conducted after accidents by people not involved in the incident, often slowly and considering policy issues. That is good, but also needed is for crew or team members to review and critique their own actions, preferably soon after the incident, and coming to some conclusions and lessons learned. Accidents and near misses need to face the glare of dialogue (without blame). Successes, too, need to be discussed and shared as models. The opportunity for post-action reviews must be identified in crew and team training, or firefighters will never look for the opportunities.

Another way to get employees involved is to form working groups with representatives from various position levels to address the implementation of ideas in this report.

Reaching Emergency Fire Fighters (EFF) employees to get their participation is more difficult. Besides informing them on-the-job, local "town meeting" -style gatherings could be held in villages, on reservations, or elsewhere to solicit ideas from those involved in firefighting. (This could be done through such organizations as Montana Indian Firefighter Program (MIFF), Southwest Indian Firefighter Program (SWIFF), Snake River Valley crews (SR V), Alaskan national firefighters, and others. Another opportunity may be at spring meetings of Crew Supervisors held at local levels.

Implementation Strategy 6 - Promote a single code of conduct (including the reporting of safety incidents) across agencies.

The agencies have worked to establish a "Code of Conduct" that focused on safety but did not specifically emphasize the reporting of safety issues, as is addressed in this goal.

In 1995, Jack Ward Thomas, former Chief of the Forest Service, established "The Chiefs Safe Practices Code." Later that year, the Secretaries of Agriculture and the Interior released to all employees a memo committing to "Zero Tolerance of careless and unsafe actions" and establishing a "firefighting code of safe practices." In addition to the 10 Standard Fire Orders, the 18 Situations that Shout Watch Out and LCES, the Chief's code includes the following principles:

- Firefighter safety comes first on every fire, every time.
- The 10 Standard Firefighting Orders are firm... we don't break them; we don't bend them.
- Every firefighter has the right to know that his or her assignments are safe.
- Every fire supervisor has the responsibility to confirm that safe practices are known and observed.

The code of conduct selected must be part of a comprehensive approach to modify a wide range of overlapping agency and workplace cultures and subcultures. Those cultures and subcultures range across five decentralized agencies. The agencies need to maintain a single, unified code. Several goals discussed in various places in this report provide further clarification of the concepts to promote (e.g., risk assessment/risk management, and accurate reporting of safety incidents), and might be incorporated into a unified code.

Reporting Safety Incidents

The integrated collection and analysis of data on safety incidents must be established immediately. This is one of the highest priority recommendations from this project.

Collecting and analyzing data on safety incidents, and making use of the resulting lessons in training and operations, is at the heart of effective safety programs. By collecting and analyzing comprehensive, reliable safety data, the agencies can identify safety problems early and respond appropriately. Additionally, the agencies need the data to evaluate their overall safety performance and to confirm that time and effort invested in new safety practices are effective. The data also is critical to setting priorities among competing safety issues.

An integrated database is needed not only on injuries and deaths, but also on the incidents and details of entrapments, shelter deployments, and other near misses that, often by chance, do not result in injuries, but give insights on problems.

Further, it is desirable to get information from employees on perceived safety problems that may not have led to an incident or near miss yet. This type of data may be

tabulated ("number of complaints about... "). Even though it is not the same sort of hard statistic as the above data, it is still of great interest. Many aviation safety problems have been headed off by this type of anecdotal information, especially when several anecdotes appear from different quarters about the same issue.

At present, the agencies are struggling to obtain thorough accident information. There is no central reporting system, aside from the OWCP (worker's compensation) form, despite several efforts to create a system. Reporting varies widely not just across the five agencies (and especially between the two larger governmental departments - Agriculture and Interior), but also across different regions, divisions, units, and assignments, within the same agency.

We strongly recommend that all five agencies develop a single incident report form, similar to the National Fire Incident Reporting System (NFIRS) reports, which can be used to develop consistent statistical information. The form would include sections to describe the above events, as a matter of routine. The five fire programs have undertaken several efforts toward a common system of reporting, but none has reached fruition yet. The form/process needs to be simple and direct so it can be completed on a timely basis. If the reporting system gets too cumbersome, it will not yield timely or accurate data. Any data system should be expected to evolve over time, as flaws are found and the list of necessary and useful data elements gets modified.

Many firefighters said in interviews and on the survey that they do not report safety-related incidents 1) out of fear of discipline or reprisal, 2) because the reporting system is inconvenient, 3) because they believe that the report will not be acted on, or 4) they fear losing hard-earned credibility. A new reporting system must address these concerns. It must have an analysis and dissemination component as well as a reporting component.

According to key findings of the Human Factors Workshop, the current system for reporting entrapments works to some extent, but not adequately.⁵ Some entrapments are reported only after long delays, and some are not reported until someone follows up on rumors and pressures a person or crew to fill out the forms. Despite these difficulties, the

⁵ USDA Forest Service Fire and Aviation Management, Findings of the Human Factors Workshop. Missoula, Montana, 1995. The strategies for Goal 3 reflect key findings of the workshop.

agencies have collected a wealth of data on entrapments, fire shelter deployments, and other incidents. That data is currently compiled and stored, but not well utilized.

The agencies must implement a unified, interagency system for collecting and tracking data on all near miss, injury, entrapment, shelter deployment and fatality incidents. In addition, they need to refine their investigation protocols and the method of carrying them out.⁶ The design of the system should take into account the needs of the analysis protocols, and be under the auspices of the NWCG.

Once collected and analyzed, the facts on safety performance must get disseminated down to individual firefighters to achieve maximum learning benefits. The aviation community, the National Aeronautic and Space Agency (NASA), the U.S. Army and Navy, and U.S. Fire Administration employ successful systems to disseminate safety information. These systems represent valuable models for the five agencies involved in this study. The above considerations led to the following three goals.

Goal 3. Every employee is expected to report a) injuries (and of course fatalities), b) entrapments/shelter deployments/burnovers, and c) near misses.

Reaching this goal requires two approaches: 1) development of a system to facilitate reporting and 2) encouragement of employees to report, and giving them proof that they will not be harmed or reprimanded for doing so. The second point, encouraging reporting, was basically covered by Implementation Strategy 1 of Goal 2 above. The strategies below focus on the development of a reporting system. Note that Goal 2 dealt with reporting in the sense of employees telling their supervisor about problems they observe; Goal 3 deals with formal reporting of incidents to a central repository of data and information.

There is a significant issue left to resolve: how to promote accountability for bad decisions and yet also encourage reporting. At least a partial answer is to hold people

⁶ At the fire directors semi-annual meeting on March 11-12, 1997, it was decided that an improved system for reporting safety incidents should be developed by June 1997. Part of the decision was to include a method for reporting near misses. This assignment was never completed. There also was an "Interagency Fire Statistics Task Force Group" charged with developing a "Standardized Fire Statistics Summary" report. Fire casualty reporting can be linked to fire reporting, to prevent redundancy, as was done with NFIRS. Although originally scheduled for completion in March 1997, this effort is still going on, and has thus far identified over 200 desired data elements to be collected on each fire - too many for practical, routine reporting.

accountable who do not file reports they are supposed to, but also use good judgment on appropriate corrective actions, too.

Implementation Strategy 1- Develop a common interagency reporting system.

The agencies currently use multiple databases, hampering a consolidated effort. The Forest Service is keeping their accident data in an Office of Workers' Compensation Program (OWCP) format, while the Interior agencies use Form DI 134 and the Safety Management Information System (SMIS). An integrated, interagency approach needs to be established for reporting non-injury accidents and "near misses" as well as injuries and fatalities: It requires development of supporting policies, procedures and reporting instruments. A comprehensive approach will include a single definition of a reportable incident, and methods that encourage both traditional, overt reporting mechanisms and anonymous, penalty-free reporting. The system should encourage firefighters to report unsafe actions in addition to near misses and other safety incidents. When no injury is involved, the reporting can be anonymous and even be about one's own actions, as is done in aviation safety reporting.

At present, despite repeated efforts by working groups to establish a reporting system, there is not yet a satisfactory system in either the Department of Agriculture or Department of the Interior. The current Wildland Fire Entrapment/Fatality Report form (NWCG) provides a good starting point, but requires expansion to include injuries and near-misses. A reporting system that would roll-up data for agency and interagency combination would facilitate a coordinated monitoring and evaluation effort by the NWCG and FFAST. Another alternative is to expand on the Department of the Interior SMIS injury reporting system, which allows for a "functional data set" (special set of data elements) to be added for a function such as wildland firefighting. The newly revised version of the National Fire Incident Reporting System has a firefighter casualty module, and the *nev*' wildland system could build on that as a starting point for its data elements.

There may be several reportable "safety incidents" associated with a single fire incident. The data system must be able to analyze the data either; in terms of the number of incidents with casualties or the number of casualties, subdivided in various ways.

Part of the challenge is the sheer number of incidents. The Forest Service alone may respond to 12,000 to 14,000 incidents in a given year. If accidents occur even at a low rate per incident, we are still managing data on thousands of occurrences per year.

Design of a reporting system needs to be based on the simple question: What information is needed to identify the causes of accidents or the trends? The answer identifies what minimal data are needed and what analysis procedures are called for. From this, the actual design of the collection process is derived, with concentration on minimal data needs and easy, efficient reporting.

A position or function in each of the fire agencies, a "lessons learned coordinator," needs to be the focal point for turning in the data for that agency to a central source, which could be in one of the agencies or with an outside contractor. (Perhaps the FF AST representatives or their designees could play that role in their agencies.)

Any interagency data system developed should be coordinated with the NWCG and its Information Resource Management Working Team (IRMWT) and its Safety and Health Working Team (SHWT).

Data Elements - Defining the specific data elements to use across agencies required in reporting casualties, near misses, and burnovers requires a collaborative effort involving safety analysts and data analysts. As a catalyst to respond to, a list of data elements to consider is shown in Exhibit 3 -1. These are meant to be suggestive, and not a definitive list. (They have some redundancy and may have some gaps.) A sorting is needed of the elements to be reported by a person in the field versus the elements reported by an investigation team. The list is long, and compromises have to be made between what can be reasonably collected routinely, and the need to capture many details of potential use in formulating corrections.

The list of data elements should evolve over time. If there is not a good consensus on the data elements that are both feasible and useful to collect, the list of mandatory data elements can start small, with open ended questions used more freely. Then, after analysis, more elements can be prescribed as required.

Starting with a short list of data elements and having firefighters suggest additions can help increase the acceptance of the ultimate system. Also, to improve credibility,

allow people to ignore the irrelevant data elements or a particular case, and to report "unknown" for an element if that truly is the case.

Exhibit 3-1. Some Data Elements to Consider in Casualty, Near Miss, and Burnover Reporting

Data Elements	Situation
Basic Data	
Type of situation, (e.g., fire-related fatality or injury, non-fire fatality or injury, entrapment with shelter deployment, entrapment without shelter deployment, etc.)	All
Date/Time	All
Location of incident (by geographic area and by region! state/administrative units)	All
Agency (or agencies) responsible at incident	All
Number people and job functions of people entrapped	All
People Entrapped	Entrapment
Shelters deployed	Deployment
Type of resource involved (e.g., Smokejumpers, Type I crew, . helitack/rappelers, Type II crew, engine crew, tractor/plow driver, Incident Management Team, support personnel, other)	All
Age and gender(s) of personnel injured, trapped, or otherwise at risk	All
Agency affiliation of involved personnel	All
Originating location of personnel involved (region, state)	All
Was resource local or from out of region?	Entrapments, deployments, multiple victim
Accident/Injury Specific Data	
Narrative/chronology	All
Fire behavior analysis	All fire-behavior-related incidents
Equipment analysis (Was PPE being used and did it perform as designed?)	All

Data Elements	Situation
Was equipment a contributing factor?	All
Nature of injury (e.g., strains, sprains, burns, etc., following NFIRS)	All
Proximate cause, e.g., <ul style="list-style-type: none"> - overexertion - slips, stuck by object - vehicle accident responding - vehicle accident operations - vehicle accident - returning - vehicle accident - Transportation - hit by vehicle - aircraft incident (fixed wing) 	All
Type of activity, e.g., <ul style="list-style-type: none"> hoselays (building, advancing, breaking down) - water supply - pump operations - line construction - handline - line construction mechanical - heavy equipment operation - incident command/Incident Management Team (fireline) 	All
First aid/medical attention required, (e.g., injuries treated on-site only, injuries treated at incident facility only, off-site medical attention required, hospitalization required).	All
<i>Escape and Deployment Data</i>	
Were adequate safety zones and escape routes established and known?	Entrapments, deployments
Were survivable safety zones that did not require shelter deployment available?	Entrapments, deployments
Were escape routes used?	Entrapments, deployments
Were survivors/victims in a designated safety zone?	Entrapments, deployments

Data Elements

Were shelters deployed properly/shelter training followed?

Situation
Entrapments,
deployments

Incident Management Team

Contributing factors considered (explain any yes answers):

All

Were current tactical safety guidelines/SOPs being used/
followed/adhered to?

All

Was an ICS organization properly developed/evolved for the
scope of the operation?

All

Were radio or other communications a contributing factor?

All

Were briefings conducted and adequate/were instructions clear?

All

Were staffing appropriate/resources adequate?

All

Did agency/interagency policy contribute to accident?

All

Did management decisions contribute?

All

Was there on-site operational accountability by the Incident
Management Team?

All

Strategy and Tactics⁷

Did Agency Administrator/WFSA alternatives consider the current and
anticipated condition?

Entrapment,
deployments,
multiple injuries

If so, did the incident objectives adequately reflect those conditions?

Entrapment,
deployments,
multiple injuries

⁷ Questions on strategy and tactics need to be thought out further; these are some starting points, to be refined.

Data Elements	Situation
If so, did the strategy selected reflect those conditions?	Entrapment, deployments, multiple injuries
<ul style="list-style-type: none"> - Was strategy balanced with available resources? - Appropriate for fire behavior and available resources? - Designed to ensure firefighter safety? 	Entrapment, deployments, multiple injury
<ul style="list-style-type: none"> - Implemented as planned? - Was this fire fought without violating current tactical safety guidelines/ SOPs or policy? 	Entrapment, deployments, multiple injury
<p>Did the tactics conform to the current and anticipated conditions?</p> <ul style="list-style-type: none"> - Were adequate resources assigned to implement the tactics? - Was the LCES process followed? - Other problems? 	Entrapment, deployments, multiple injury
Was there an adequate command structure/cohesive organizational structure. in place and functioning?	Entrapments, deployments, multiple injury
Was this a wildland-urban interface fire?	All
Was command/resource transition a contribution factor?	All
Was this a wildland-urban interface fire?	All
Was command/resource transition a contributing factor?	All
<i>Personal Performance Data</i>	
Was the quality of supervision and leadership a factor?	All
Physical fitness a contributing factor/in compliance with current standards?	All.
Fatigue?	All
What role did human error play?	All
<i>Personnel Training and Qualifications</i>	
Training, qualifications, and experience of personnel involved (training and experience records examined).	All

Anonymous Reporting - The NASA CallBack system, used to monitor aviation mishaps, provides an excellent and proven model for how to obtain anonymous, sanction

free reporting of safety problems. The CallBack system and its associated Callback newsletter are the effort of the NASA Aviation Safety Reporting System (ASRS). The system utilizes NASA as an expert but impartial organization outside the airline/aviation/FAA community, and encourages pilots and flight crews to report accidents, near-misses or unsafe behavior at the earliest opportunity without a penalty. By assessing penalties for not reporting, the system provides additional incentive to report.

To achieve the aims of this goal, the five agencies should establish a "Callback"-styled reporting system that can be used for both "signed" and anonymous reporting. The system should allow reporting via the Internet, a 1-800 hotline and a mail-in system to increase convenience of reporting - a key element to encourage comprehensive reporting. The hotline and CallBack system might be administered by a non-government organization to help assure confidentiality and promote greater use.

Incident Base Survey Form - To supplement the above approaches, anonymous survey forms could be placed in incident bases for everyone's use. Consideration might be given to making the forms available even at incidents without incident bases. To obtain effective feedback, the survey effort would have to:

1. Use a simple, straightforward approach.
2. Assure the respondent that the questions are objective and not leading to, or supporting "an agenda."
3. Use a form that is easy to understand and requires minimal effort on the respondent's part. Survey cards might be placed on tabletops at mealtime.
4. The respondents must see some result from their effort. The Incident Management Team might post statistics and issues raised on the base bulletin board, and the questionnaires could be used by the Safety Officer and Incident Commander (IC) to generate safety items for the incident action plan and operational period briefings.

The prime purpose of these forms is to get a more complete count of problems, get some quick diagnostic comments from those who were there. It also lets people vent, but that can be counterproductive in the long run if they do not see something useful done with their comments. Consideration must be given to whether this incident base survey should be mandatory; some voluntary forms have not worked in the past.

A rough example of a brief survey form is shown below. (Again, this would need testing and refinement.) Start with just a few simple, specific questions and leave several open-ended. After a while, refine the forms based on the quality and quantity of responses, and their usefulness for identifying safety problems

<p>Your Type of Crew or Resource _____</p> <p>Were your safety concerns adequately addressed on this fire? - Y /N</p> <p>Were you very concerned about your safety or the safety of your crew at any time? _____ Y/N</p> <p>Did you or your crew have what you would describe as a "near miss" or "close call," or other safety problem on this incident? _____ Y /N (If so, describe in detail below.)</p> <p>Did your supervisor demonstrate concern for your safety at all times? _____ Y /N</p> <p>Did your supervisor discuss safety with you and your crew? _____ Y /N</p> <p>Did the Safety Officer talk to your crew or supervisor? _____ Y /N</p> <p>Other Comments _____</p>
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Respondents could drop the forms in any of several boxes left around their base. A pattern of comments would trigger the Safety Officer to intervene with supervisors to correct the situation. The forms would also allow the Incident Management Team to collect data for later analysis by agencies or the NWCG to evaluate safety initiatives.

The intent is to provide an accessible, non-threatening system to promote reporting. However, the agencies must formalize the reporting mechanisms and establish protocols to prevent the unintended consequences of unsubstantiated accusation or safety reporting as a method of character assassination, which has happened in some instances in the past.

Accountability for Interfering with Reporting -Swift and severe disciplinary action, consistent with agency disciplinary procedures, should be taken against anyone found to have interfered with an employee reporting a safety incident, made a reprisal, or knowingly misused the reporting system to damage another party. Firefighters should not

have the option of failing to report entrapments, shelter deployments, or other fireline incidents without a penalty. ⁸

In short, the development of an interagency safety incident system that provides good data is of the highest priority. It is key to many other recommendations, monitoring change overtime, and setting priorities for other actions.

Implementation Strategy 2 - Incorporate basics on safety reporting in training courses.

Courses for firefighters, advanced firefighters and Crew Supervisors should adequately clarify the incident reporting requirements for an injury, fatality, entrapment, shelter deployment and near miss and at least a rough outline of reporting responsibilities, procedures, and protocols.

Goal 4. The five agencies should strive to obtain a clear, quantitative picture of the pattern of safety incidents, their causes, trends, and the lessons learned; and to identify potential problems at the earliest time possible.

Achieving this goal requires 1) analyzing the safety data on a routine basis and 2) disseminating the information throughout the wildland firefighting community.

Implementation Strategy 1 - Analyze and publish safety data.

A comprehensive safety report should be published annually - starting now, with available data - showing trends in the number of deaths, injuries, near misses, and entrapments; the types of casualties and their causes; and lessons learned. Also to be reported are the number and nature of safety problems reported openly or confidentially. Data on fatalities, entrapments, and shelter deployments already is analyzed by the agencies annually (there are usually only a small number). Wildland firefighter fatalities also are analyzed in the annual U.S. Fire Administration report on all firefighter fatalities. Data on the other aspects of safety are not routinely reported.

The results of the annual analysis should be disseminated in several ways:

⁸The larger issues of accountability beyond just for reporting safety incidents are discussed under Goal 6.

- An annual safety report widely distributed to fire managers and Agency Administrators, and accessible to all. .
- Highlights disseminated via an article in a safety newsletter that goes to all fire personnel. This should include positive and negative examples ("stories") of safety problems.
- Dissemination of the reports to instructors of fire courses at the National Advanced Resources Technology Center (NARTC) near Marana, Arizona, regional training centers, or elsewhere.
- Dissemination to curriculum development teams or committees, so they can use recent examples and lessons learned from safety incidents.
- **Safety Newsletter** - NASA, the U.S. Army and Navy, and the aviation community have successful mechanisms to disseminate safety information that can be models for the fire agencies. The five agencies should establish a safety newsletter, similar to the previously mentioned Callback Newsletter (NASA-ASRS), or the magazine Safety Line (U.S. Navy), or Flightfax (U.S. Army) with the intent of widely distributing stories about accidents and near misses to the individual firefighter, along with a scorecard (statistics) on safety performance.

Implementation Strategy 2 - Establish a safety-oriented Center for Lessons Learned.

Another important type of information on safety is examples of good and bad decisions, and analyses of the way critical situations were handled. These examples call provide key insights for organizational as well as individual learning.

Many different organizations are currently attempting to compile their "lessons learned" in a usable way. Of special note is the U. S. Army's Center for Army Lessons Learned (CALL) and the aviation community's ASRS 'system. A recent issue of *The Economist* (October 4, 1997, pp. 79-80) reports that the banking industry is trying to set up a method for capturing lessons learned modeled on the ASRS. The *Wall Street Journal* article of May 23, 1997: Lessons Learned - Army Devises System to Decide What Does, and Does Not. Work - The Real Value of Experience. reported on the Army's Center as a model to emulate:

The lessons-learned system now is getting some attention in corporate America. Management experts say the Army outstrips many companies in learning from experience. "The Army has perfected a remarkably efficient

process for correcting its mistakes and sustaining its successes, " concludes a recent case study by The Harvard Business School... }t

In 1985 [the Army] founded the Center for Army Lessons Learned at Fort Leavenworth, Kansas. At CALL, a small group of seasoned officers collected the lessons, codified and distributed them. One early lesson - Tanks placed on hilltops to gain a clear field of fire are almost always destroyed.

The analysts quickly learned that the more hectic the operation, the more important is an organized system of collecting lessons learned. Otherwise, warns Col. Richard Sayre, head of Advanced Concepts Directorate of the Army's Advanced Warfighting Experiment, the process degenerates into exchanges of "Here's what I thought... "

The remaining challenge is to ensure that lessons are applied. For example, the GAO found that problems leading to the Army's (friendly fire" casualties in the Gulf War had been spotted two years earlier but ignored...

... Then, in 1995, came Bosnia, which was ideal for the process because the problems were difficult and new but generally not lethal. Rather than let each unit develop its own operational lore, Maj. Gen. William Nash, the U.S. commander, ordered that even operations such as routine convoys get intense reviews. "We must be a learning organization, " he said.

Lessons were forwarded to -CALL representatives, and the best ones were e-mailed to all units...

...Harvard's Professor Garvin says any corporation can adapt this process to collect information, compile lessons and disseminate them. "The key is to understand that no project is complete until it is systematically reviewed and its lessons learned, " he adds. What the process does, says Maj. Gen. Robert Scales, who wrote an Army study of Gulf War preparations, is to "sharpen your leaders. "

The Army's Center is aimed primarily at improving performance, not just safety. The concept for a wildland fire agencies Center could be broadened to that scope, but we recommend starting with a safety focus.

We recommend that the five fire agencies establish an interagency Center for [Safety] Lessons Learned. We recommend using the Center to collect and disseminate sanitized incident accounts to increase organizational safety learning. This center could also be the central point for collecting safety incident reports, but some experts feel the two functions should be kept separate, to encourage anonymous or confidential reporting to one, and routine reporting of incidents to the other.

A discussion of how to develop a Center for Lessons Learned for the wildland fire community may be found in Appendix A. The Center could be developed under the NWCG either in-house or under outside contract, and/or through the NARTC (located

near Marana, Arizona). There are many alternatives. The following are a few of the key ideas for establishing a Center:

- The Center would have to ensure anonymity, prevent retaliation, and facilitate communications of cases to it.
- The Center would encourage firefighters and fire managers to submit incident accounts motivated by improving the professionalism of the organization. Financial incentives do not seem appropriate here, and might even be counter-productive.
- The Center would select the best incident accounts and format them as case studies, simulations or "Tactical Decision Games" (discussed in Chapter 5 under decision training). In this way, the agencies would arrange a feedback mechanism for using the most difficult cases as training opportunities.
- The Center would disseminate lessons learned through newsletters, articles in fire magazines, tape recordings, and other means.

An organization designed to collect and disseminate lessons learned, regardless of the format used, can be a highly valuable component of a safety program for the agencies participating in this study. A learning process is triggered by each safety incident. The fact that the agencies have set up such an organization will send a message that everyone is expected to contribute to a culture of safety. This strategy should be implemented in concert with others outlined under Goals 3, 4 and 5.^{9,10}

Goal 5. All wildland firefighter fatalities should be investigated in a consistent manner To glean lessons for averting future fatalities.

Implementation Strategy 1 - Develop interagency protocols for the process and substance of investigations.

Since the Phase II report was published, a working group from the five agencies in 1997 drafted a proposal outlining the qualifications for investigative teams and the process by which they will be appointed. An interagency group also is developing an investigation

⁹ Some initial steps toward developing a Center for Lessons Learned are being taken already at the NAR TC near Marana. John Roberts and Buck Latapie (Forest Service) can be contacted for more information.

handbook. That handbook should include guidelines on the specific data to be collected by the investigative team, including human factors information. Additionally, the agencies should investigate incidents involving near-fatal injuries and incidents where multiple firefighters sustain serious injuries with the same vigor as fatality incidents.

A firefighter fatality autopsy protocol has been developed by the U.S. Fire Administration and should be part of the wildland protocol. The National Institute of Occupational Safety and Health (NIOSH) started investigating all firefighter fatalities in 1998. Some coordination ground rules need to be established with them and USF A, which investigates multi-fatality incidents.

In addition to the usual elements of a firefighter fatality (nature of injury, action at the time of injury, protective gear, narrative, etc.), the investigation should include the following:

- Interviews with multiple people at the scene as to what took place and how the problems could have been avoided.
- Why the incident occurred, as well as what happened.
- Contributing factors.
- Lessons learned.

Accountability

Among firefighters' strongest feelings for improving safety was the need to hold people accountable for the safety decisions they make. Firefighters surveyed in this study listed accountability as one of the areas most in need of change.

THE DEGREE TO WHICH ACTION IS TAKEN TO IMPROVE ACCOUNTABILITY WILL BE ONE OF THE BENCHMARKS BY WHICH FIREFIGHTERS WILL JUDGE WHETHER THE CULTURAL CHANGE IS TO BE TAKEN SERIOUSLY.

¹⁰ The International Association of Wildland Fire has been keeping a reporting of accounts of safety incidents, including "near hits." Their information has been disseminated through their *Wildfire* magazine and Websites, and provides another example of making "lessons learned" accessible.

Many firefighters complain that safety violations and deficiencies are never reported to the offender's home unit, options for discipline are limited and the same unsafe people continue to show up on fire assignments. Even when an offender is sent home, he or she often goes out again on the next fire.

Lack of accountability has been a problem at high levels as well as at the firefighting level. Firefighters need to know that an Agency Administrator who demands more than is reasonable with existing resources will be held accountable as surely as a Crew Supervisor who violates fire orders.

If handled properly, accountability can be a source of professional pride. Unfortunately, too often accountability is handled poorly' and undermines crews, teams, and entire organizations. What is needed is a fair system that restores accountability and confidence, but recognizes the difference between performance and competency issues, versus policy violations requiring punitive discipline.

Goal 6. Individuals at all levels should be held accountable for safety violations.

Implementation Strategy 1 - Start a policy of removing safety violators from the job.

As noted earlier, there was a very strong feeling from all ranks surveyed, firefighters through incident commanders, that those who make serious errors in judgment or disregard safety should be held accountable. Certainly there should be "due process", but individuals can be removed from their immediate job or task, and put on administrative leave or returned to their non-fire job or given another assignment while a casualty, turnover, or near miss is investigated, and before any disciplining action is taken. (This is similar to what happens when a police officer discharges a weapon in the line of duty, or a pilot has an accident.)

If a serious safety violation was committed, the "punishment" might be remedial training, being required to work under a "coach" on one's next assignment, being demobilized, having one's qualification level reduced, or even suspension for a week, a season, or permanently, depending on the severity of the offense. Sending someone home from a fire for a safety violation and then immediately reassigning them to another fire should not be done. Some people should not be or cannot be firefighters or fire leaders; they need to be weeded out if they cannot be trained and perform work to standard.

The National Park Service already has a strategy to stand-down people who commit serious safety infractions. This policy includes both fireline violations and fire program management violations. We recommend that all five agencies adopt this or something similar as a common policy.

People at all levels must be subject to this policy. Suspension from fire duty could be for a single incident, a short period or long period of time. The ultimate punishment would be permanent suspension, i.e., revocation of certification or the authority to manage or direct a fire program.

Implementation Strategy 2 -- Follow-up on reported safety infractions.

The agencies should establish a joint policy that all reports of serious safety infractions will be investigated. The policy should mandate that, upon verification and establishment of responsibility, some action will be taken - remedial training and/or coaching, progressive disciplinary measures, or de-certification.

Implementation Strategy 3 - Consider safety performance in performance reviews and promotions.

An individual's safety performance and approach to risk management should be considered explicitly. It should be an item reviewed and discussed as part of each performance evaluation for anyone taking a fireline assignment. Safety performance and risk management should be criteria added to position descriptions and/or selection factors for all fire positions. ¹¹

Implementation Strategy 4 - Add training in accountability.

Emphasize accountability in the fire management training curricula by expanding the discussion of accountability in S- 201 (Supervisory Concepts and Techniques) and S-301 (Leadership and Organizational Development): Include the duties of "working supervisors," on-site supervision, and accountability through physical observation and

¹¹This is being considered. as part of the work of the task group on competencies for fire management positions, and is to be presented to the FF ALC in June 1998 for approval.

inspection of work. The concept of accountability must include providing for the safety and welfare of one's assigned personnel for the entire period of supervision.

Implementation Strategy 5 - Include accountability in operational guidelines.

Restore the concept of accountability to operational guidelines'. An interagency Task Group examined and made recommendations involving the duties and responsibilities of Division/Group Supervisors relative to the duties which were performed by Sector Bosses under the Large Fire Organization that existed prior to the adoption of the Incident Command System (ICS.) The Task Group's evaluation and recommendations strike at the heart of the accountability issue. However, their recommendations were somewhat "soft" in nature, and follow-up NWCG action softened their recommendations even further. We recommend that the five agencies, working through the auspices of the NWCG, should adopt the recommendations of the interagency task group with the following slightly revised wording to strengthen the changes:

1. Revise the Position Task Books for the Division/Group Supervisors, Task Force Leaders, and Strike Team Leaders, and strengthen those weaknesses identified in the analysis. (These books are currently under review.) Add job responsibilities d, k and l from the "old" sector boss position to Position Task Books as was recommended by the NWCG Interagency Task Group. Add guidelines for frequency of line inspection to responsibility 1.
2. Emphasize implementation of the segment concept from the Incident Command System Operational System Description 120-1. Use annual Incident Management Team meetings as opportunities to retrain/reorient teams to the use of segments. Incident Commanders, Planning Section Chiefs and Operations Section Chiefs will be trained to consider and implement segments when establishing division boundaries.

Make it clear that the Division/Group Supervisor has more flexibility to delegate management of segments and various resource types if there is a task force leader in place rather than a strike team leader.

3. Evaluate the training curriculum and revise courses as necessary to ensure that the use of segments is presented. Ensure that all appropriate trainees are

taught the concept of delegating the management of personnel and a geographic piece of ground to form a segment. 12

4. Distribute the above information through appropriate channels (training courses, newsletters, guidebooks, Position Task Books, etc.).

Implementation Strategy 6 -- Provide guidelines for accountability.

The agencies, through the NWCG, must provide Strike Team/Task Force Leaders, Division/Group Supervisors, and Safety Officers with job aids (clear, concise references) that deal with accountability and formalize a system by which they can formally demand safety compliance. For example, a Division/Group Supervisor or Safety Officer might employ a list of things to check for such as Lookouts, Communications, Escape Routes, and Safety Zones (LCES) and other tactical guidelines to evaluate fireline performance. If departures from the guidelines were observed, they would require the offending crew or other resource to stand-down until the observed departures were corrected. This approach will also reinforce the responsibility for on-site accountability by fireline Incident Management Teams as discussed elsewhere in this report. It is interesting to note that, in a recent field study, observers found that 40 percent of firefighters were unaware of the day's safety briefing messages. 13

Ability to Refuse Assignments - In dealing with wildland firefighter cultural attitudes toward safety, one of the cutting edge questions is, should an employee be able to refuse a fireline assignment or tactic because he or she perceives it to be unsafe for themselves, their crews, or others? Some believe this to be a key to improved firefighter safety, and a fundamental aspect of being accountable for the safety of your crew and yourself. Others believe that whether an assignment is "unsafe" can be a matter of perception and experience, that some firefighters will refuse assignments simply because they do not want to do them, and that fireline anarchy will result. However, individuals and Crew Supervisors routinely refuse assignments and pull back to safe locations when unsafe situations exist.14 The practice does not seem overused; if anything it is underused.

12 A segment is a geographically defined sub-unit of a division.

13 Jason Greenlee; Observations on Three Large Fires in Canada and the U.S., Canada/U.S. Wildland Fire Safety Summit., Rossland, B.C., September 30, 1997. The Proceedings of this conference are cited in several footnotes and available from IA WF, P.O. Box 328, Fairfield, W A 99012.

14An excellent example by Nancy Rencken appears in the "Near Hits" feature of Wildfire, Volume 6, Number 4, August 1997.

In one sense, the question is moot: current Federal law already grants Federal, state, and private employees the right to refuse unsafe work assignments. Federal wildland firefighting policy further states that "Every firefighter has a right to a safe assignment, every fire, every time," but that leaves a great deal open to interpretation and leaves many questions unanswered.

Firefighting is a hazardous business by its very nature and cannot be made risk free. Many suggest that collaborative approaches to leadership and communication, including those embodied by Crew Resource Management (CRM), could largely supplant the need to refuse an assignment. Thus, although the goal stands as stated below, the real question is to what extent and how should it be presented and fostered.

Goal 7. An individual or Crew Supervisor should have the right of refusal to pull Themselves or their crew out of what they perceive as undue danger.

Implementation Strategy 1 - Train firefighters on the process to use, not just the right.

The agencies should revise their training materials to ensure that the right to refuse an unsafe assignment is discussed in S-110 (Basic Fire Suppression Orientation), 8-130 (Firefighter Training) and 8-201 (Supervisory Concepts and Techniques). This should be part of the revised Firefighters Code of Conduct, and also considered an element of being a professional firefighter.

New firefighters must be trained to communicate their safety concerns. to their colleagues and supervisors routinely and assertively.

We also recommend adding a one to two hour-introduction to the concepts of risk analysis/ risk management at the firefighter level, and expand the concept throughout the training curriculum. Jim Cook of the Boise Interagency Hotshots has developed a risk management concept which is incorporated into S-339 (Division/Group Supervisor) and will also be a part of the new Fatality Fire Case Studies.¹⁵ Fireline supervisors must be taught to accept this interaction as a firefighter's professional right and obligation. The

¹⁵ J. Cook, "Fire Environment Size-up - Human Limitations versus Superhuman Expectations" Wildfire, December 1995, 49-53.

agencies must train their fireline supervisors to listen and foster openness by allowing crew members to present alternative views without criticism.

In most situations, having a dialogue will prevent any precipitous withdrawals. Before any action is taken on one's own (unless it is an immediate emergency), the employee should discuss his or her concern with the next level supervisor, who may explain why the danger is not as great as they perceive, or how it is to be mitigated. If the next level supervisor does not concur with the employee, the employee should have the right and obligation to go one or more level up the organization (time permitting).

It would be far more desirable for the wildland fire community to approach these and other sensitive issues in a collaborative spirit than in a confrontational, "my right versus your right" environment. But there needs to be a formal approach (such as the above) when simple good will and collaborative efforts fail.

Wildland firefighting is not the same as a military situation. In the final analysis, one cannot be ordered to stay in place, even if it means losing the line. One also does not have a right to be a firefighter, nor to be paid if one does not work. Judgment will be needed by policy makers, human resources departments, and by the law as to what constitutes reasonable safety behavior. The culture has to reflect the fact that it is a civilian operation and not a military organization. '

Crew Supervisors have the right to refuse assignments that they think are beyond the capabilities of their crew or that would endanger their crews unduly. Refusal to undertake fireline assignment generally should be based on a violation, without adequate mitigation, of the established safe practices, procedures, or standards (e.g., the 10 standard orders, standards for downhill line construction, etc.). Further definition of criteria for a refusal could be developed by a panel(s) of firefighters and by examining examples on either side of the refusal decision boundary, and case studies to point out gray areas.

Implementation Strategy 2 - Monitor frequency of refusals.

A key question is how often refusals of assignments would occur, and whether they would endanger other If a crew refuses to dig a portion of a fireline and there is no substitute crew, that hole in the line could endanger adjacent crews. If an individual with a

key skill (e.g. a bulldozer operator) refuses to continue work, that too can endanger others.

Also, how often can someone refuse assignments and still be considered a firefighter? In the extreme, suppose someone always refuses an assignment, should they still be paid? Further thought is needed on how to allow people the right to refuse an assignment without leading to anarchy Of ridiculous situations where masses of people refuse work but are required to be paid. However, these fears may prove groundless.

Further, setting a new goal or practice in place does not mean it is unchangeable forever. There should be monitoring of how often people are quitting the line, refusing to take an assignment for their crews, etc. That feedback can be used to regulate the practice. If it is rare that out and out refusals occur, and they seem to be in reasonable situations, the new rule can be tolerated; otherwise, it would need to be revisited or reformulated.

Implementation Strategy 3 - Head off situations in which refusals are necessary.

Supplant the need to refuse unsafe assignments by restoring trust in the Incident Management Team. Allow people flexibility in achieving assigned tasks, based on risk management and knowledge of the detailed, changing conditions that the planners may not be aware of. Encourage feedback up the chain of command. Carrying out the strategies and achieving the goals related to supervisor training and experience contained elsewhere in this report will make great strides toward resolving this issue, especially the emphasis on having a dialogue and allowing people to point out situations they consider unsafe. Other related changes in the culture that are discussed elsewhere in this report include:

- Defining the professional work ethic wanted by the agencies, and systematically infusing the organizations with that work ethic through training, leadership, supervision, and effective organization.
- Fostering and teaching a concept of professionalism that includes intolerance for unsafe work practices and empowerment to allow people to influence their working conditions without acting against the goals of the organization.
- Holding people accountable for safety requirements and creating instruments to improve accountability by incorporating responsibility for safety into new

and revised Performance Task Books and integrated fireline performance evaluations.

- Initiating and fostering an operational culture that employs relevant "Crew Resource Management" (CRM) concepts, and training fire personnel to operate using those concepts. CRM addresses the human components of operations, including communication, decision making, leadership, situational leadership, and barriers to these processes. The goal of CRM training is to improve the crew effectiveness (including safety), and reduce the occurrence of error. Therefore, CRM-type training can assist firefighters to understand and apply communication strategies in "right-of-refusal" situations. CRM is one of many tools that the agencies should include in a comprehensive strategy to change organizational culture, and is discussed at length later in this chapter and in Chapter 6 of this report.

Taking Individual Responsibility - Ultimately, one has to be accountable for one's own safety. While the 'wildland firefighting system is very concerned about the safety of firefighters, the individual firefighter cannot depend entirely on the organization for his or her own safety. Individuals have a professional responsibility to stay alert and watch out for their own safety -

Reports from the field criticize continued departures from accepted safe practices. However, the agencies should not expect willing compliance with all safety directives from lower-level employees who have had little input to the safety policies of their organizations. New safety policies will only become *effective* policy when they produce the behavior the agencies want from people on the line. However, to manifest itself as behavior on the fireline, the comprehensive safety approach of the agencies must enjoy a widespread field support, and that in turn requires widespread, systemic, and influential employee participation. Any leader hoping to influence the safety of firefighters in these agencies must recognize how important it is to gain the commitment of employees at all organizational levels, but especially the lower-level employees, by requiring employee involvement in setting safety policy. (In a sense, this study contributes to that because it brings the concerns and perception of over 1,000 firefighters to the analysis.) The above concerns lead to the following goal:

Goal 8. Foster a sense of individual responsibility for safety actions.

Most of what is needed to achieve this goal has already been discussed or will be discussed under other goals. The agencies will foster a sense of individual responsibility for safety actions if the 'Strategies are pursued for situational awareness, accountability, and professionalism, under Goals 2, 4, 6, 8, 9, 41, 58, and 59. Fostering a build-up of experience also will allow build-up of personal skills. Additionally, the following implementation strategies are recommended.

Implementation Strategy 1 - Include in the "Code of Conduct" that all employees are responsible for adhering to safe practices and correcting violations.

Goal 2 dealt with establishing in a Code of Conduct that employees had the right and responsibility to report problems and contribute ideas and solutions. Going further, the "Code of Conduct" and the organizational culture should expect Agency Administrators, managers, and employees to adhere to established safe practices, and have the right and responsibility to intervene and correct safety problems. This is part of the oversight responsibility of everyone from first level supervision on up. Non-supervisory employees do not have authority to direct others, but they should feel obliged to point out problems they see. The methods for promoting the "code of conduct" were already described in Goal 2.

Implementation Strategy 2 - Discuss the issue of responsibility in initial training and in refresher training.

In addition to forthrightly teaching the philosophy that there are many details all firefighters must attend to themselves to be safe, some of the specifics of what to do should be mentioned. And training should emphasize that safety reminders are part of every assignment, not just training situations. In addition to following prescribed procedures, using protective equipment, and staying physically fit, personal responsibility at the most basic level includes care with tools, keeping an eye out for snags or falling rocks and other debris, foot placement on rough terrain, and recognizing signs of fatigue. There is also personal responsibility to know the location of safety zones and escape routes, and to pay attention to weather and shifting fire behavior. If they are not pointed out the firefighter needs to ask about them. The objective is not to question the knowledge of leadership, but rather to broaden the team effort to assure both individual safety and the safety of the crew.

Implementation Strategy 3 - Disseminate examples and stories of successful individual initiatives.

Videotapes showing "model" individual firefighters attending to safety details should be added to training if not already included in existing materials. Anonymous stories about individuals who were injured because they did not pay attention (e.g., were not alert to falling snags, or watching where they were walking) should also be spread.

Safety for All Firefighters at Federal Fires

Anyone working at a "Federal workplace," including incident bases and the fireline, should operate under the same safety philosophies (unless some non-Federal law supersedes). Safety goals and rules should apply to all firefighters working on a Federally controlled wildland fire, including firefighters from state and local government and inmate, military, and contract crews safety must be the same for firefighters regardless of ethnic group or gender.

Non-Federal Firefighters - In our interviews and survey, Federal firefighters raised as much or more concern about the safety of non-Federal firefighters, especially local volunteers, as they did about Federal firefighters. It is difficult for Federal agencies to directly influence the organizational culture of the non-Federal firefighters, but the Federal culture can promote watching out for the welfare and safety of those who help the Federal firefighters.

Application of safety standards should also be done in compliance with Federal Equal Employment Opportunity laws protecting against discrimination, whether the employees work for Federal or non-Federal agencies.

The above considerations led to the following goal:

Goal 9. The safety goals and rules should apply to all firefighters working at a wildland fire which is a Federal worksite.

Implementation Strategy 1 - Require, encourage, and assist non-Federal agencies to comply with safety precautions.

Many non-Federal firefighters will not have received the training, information, or experience necessary to function as described in this report. However, the cultural change envisioned by this report requires widespread acceptance and change across the interagency spectrum. Non-Federal firefighters must be expected to comply with the norms required of the Federal firefighters when fighting Federally controlled wildfires. The Federal agencies can (and do) set rules for contract, inmate, and military crews. While not setting rules for local firefighters, the Federal agencies can turn away local firefighters if they are not properly equipped (e.g., with protective clothing and radios).

Organizations supplying non-Federal firefighters and the firefighters themselves (e.g., EFFs) should be informed of safety requirements ahead of time. Inquiries can be made as part of the call-up of local, state, and other non-Federal resources as to their having the appropriate equipment. Only qualified, properly equipped firefighters are supposed to be mobilized to Federal incidents, but it was widely reported in Phase I that that requirement often was not met, and not checked. The final review is at check-in at a fire.

In some cases, Federal lands are protected only by local firefighters, and their equipment may never be seen. That situation might be handled by written agreement in arranging for coverage of an area. (Any existing written agreement needs to be reviewed to see if it requires meeting reasonable local or Federal safety standards.) The Federal agencies should not tacitly accept poorly equipped or trained local firefighters doing the Federal job to save money.

The agencies should encourage the NWCG to continue planning a comprehensive approach to fireline safety policy that is shared across the spectrum of the wildland fire community - including state and local governments. NWCG standards are not mandatory, but the use of standards should be encouraged for all.

Implementation Strategy 2 - Provide (or facilitate obtaining) training and equipment for non-Federal firefighters who assist.

Provide Federal aid to local government and volunteer fire departments as they expand their wildland fire responsibilities on and near Federal lands, as called for by the Federal fire policy review. Disseminate new standards. Help facilitate or conduct training of non-Federal wildland firefighter leaders and trainers.

Provide, through property loans, payroll deduction, or contract adjustments, essential safety equipment so that non-Federal firefighters do not arrive without proper equipment (or find some way to loan them equipment if they arrive with some deficiencies). Another alternative is to send back any individuals or units who are not properly equipped.

Equity Considerations - All goals and implementation strategies outlined in this report apply to the entire Federal wildland firefighting force and their cooperators regardless of race, gender, ethnicity, or employment status. The intent is to assure a positive work and rest climate free of distractions caused by harassment, intimidation, or discrimination. Though some problems of discrimination and harassment exist, Phase I of this study uncovered remarkable consensus across ethnic and gender groups on almost all safety issues. ¹⁶The goals for safety are the same for all members of the wildland firefighting community. However, special efforts may be required to get all groups and individuals to achieve the goals.

Goal 2, which sets a code of conduct encouraging firefighters to speak up, directly addressed one of the prime equity issues - reluctance of some women and minorities to speak up on safety issues for fear of being further discriminated against or poorly thought of rather than have a separate goal for women and minorities, Goal 2 should be applied to all types of firefighters. In addition is the following goal:

Goal 10. The right and responsibilities of wildland firefighters should apply to all, Regardless of race, gender, ethnic affiliation, or employment status.

Implementation Strategy 1 - Ensure that all of the recommendations here are applied uniformly for all types of firefighters.

¹⁶ Appendix B of the Phase II Report shows how sub-groupings of wildland firefighters felt about various recommendations for improving safety. The sub-groupings include age, ethnic groups, and gender.

There must be no discrimination with respect to any safety issue. We did not hear of any equity issues *related to safety* other than regarding radio distribution, reticence to speak up, and fast-tracking. There are equity problems, but they do not seem primarily safety issues - at least as related by the women, minorities, and other firefighters we heard from. The recommendation here is basically to remain vigilant and open to any special issues -that may emerge, and to be even-handed in applying training and other suggested improvements

Implementation Strategy 2 - Ensure equitable equipping and treatment of Type II crews.

Apart from some gender issues, most of the discrimination voiced in Phase I dealt with some Type II crews that were comprised mostly or entirely of minorities. The agencies should reaffirm that Type II crews are the foot soldiers of the interagency firefighting effort, and a mainstay of the system. Extra effort should be made to properly equip and train all Type II crews to meet the objectives of the goals and strategies outlined in this report.

Implementation Strategy 3 - Provide opportunities for verbal communications training.

The language of some minorities presents a barrier to firefighter safety and effectiveness, and to their ability to get promoted. Some ethnic firefighters need help with language skills, especially to prepare them for leadership positions. As demographics changes, the numbers needing help may increase.

Rebuilding Experience Levels

The people interviewed and surveyed during Phase I of this project, and many senior fire program managers, raised major concerns about the decreasing fire experience in the agencies' workforce. They are most concerned about the impact that this loss of experience has on judgment and decision making under the stress of the fire line environment, and thus on safety. In addition, the pool of Federal employees who are willing and available to fight fire is shrinking, due to several factors: There are fewer Federal employees, and the agencies have lost a great deal of fire experience through downsizing and early retirements. Some people with experience in the fire program have

dropped out from lack of motivation or disenchantment. As budgets and workforces shrink and missions become more complex, agency managers are less willing to release collateral duty firefighters from their primary responsibilities to take fire assignments. Finally, the composition of the agencies' workforces has changed. Many employees have little personal or professional interest in fire, and thus fewer people are making themselves available for fire duty.

A competent, experienced workforce is a basic underpinning of safe and efficient organizations. However, the agencies are not replacing the experience of seasoned Federal wildland firefighters as they retire or withdraw from the workforce with equal numbers of well-qualified people. This impact is magnified by a system that chooses its managers and critical decision-makers from a permanent workforce where fewer and fewer people have a solid fire management grounding. Consequently, the agencies have, of necessity, put some inexperienced people in the position of making critical strategic and tactical choices and decisions on the fireline. The implications to firefighter safety are enormous. The agencies need a process to ensure that adequate numbers of trainees are in the pipeline and gaining experience to meet future needs, and to achieve the following goal:

Goal 11. Adequate experience levels are needed for Crew Supervisors and higher Positions. There is a minimum cadre of experienced personnel needed for each Supervisory level of the fire program.

Implementation Strategy 1 - Periodically develop strategic assessments of personnel needs.

A strategic assessment is needed at the fire program level to determine the minimum resources needed to safely and effectively fight fire. This information needs to be available at the national level. It can be built up from assessments at each organizational unit, including existing and desired staffing levels. There must not be double counting of needs or resources (i.e., two units listing the same resource). The flow should be from individual agency units to zone dispatch offices to area dispatch office to the national level. This is current policy but not totally implemented. Some areas do it and others do not.

The approach to periodically develop a personnel resource needs assessment should be computerized. The NPS developed a concept for such an approach for the

Department of Interior, the Shared Application Computer System (SACS), but it was not accepted at the time by the other DOI agencies, nor was it completed. That can be a starting point for developing an interagency tool, or at least serving as an example to stimulate further thinking. ¹⁷

Implementation Strategy 2 - Track experience levels.

At present, dispatchers know the resources they can tap. The number of people available for various positions in firefighting and fire management is known approximately, and each level has a minimum requirement nationally. However, their experience level is not known and there did not seem to be confidence in the data on the total number qualified at each position. ¹⁸ Much of the workforce could be 'new at their position and that would not be known. The number of fire seasons in which one was active for at least one fire (or, more preferably, the number of fires one has fought) would be a desirable measure of experience levels. The number of people qualified for each position should continue to be monitored. Based on this, and the strategic assessment of personnel needs, the number of people in the training and certification pipeline should be adjusted to build up experience levels.

Implementation Strategy 3 - Establish an Apprenticeship Program.

All five agencies should collaborate to establish a "Fire Management Apprenticeship Program," combining elements of the Joint Apprenticeship I & II (JAC) program of the Forest Service and the National Park Service's Crew Supervisor Academy into a new "Fire Management Apprenticeship Program." The intent is to continuously develop a professional cadre of crew superintendents; trainers, supervisors, Fire Management Officers, etc. who are technically qualified and able to provide competent fire program leadership. ¹⁹

¹⁷ Under development is the Resource Ordering and Station System (ROSS») which will show status and availability of qualified resources. This may be the way to provide the necessary data on existing positions. This NWCG project is planned to be available for the 1999 fire season.

¹⁸ When we did the survey in Phase I the agencies were not able to tell us how many people there were at each level (firefighter Crew Supervisor) division supervisor, etc.). That information may exist) but it was not readily available. We assembled a database that went far toward doing this; it is now held by the International Association of Wildfire.

¹⁹ Note that FMO positions require college training; an Apprentice would have to obtain that training or already have it to qualify for an FMO job.

Benefits of this approach include:

- Establishment of a base-level of professional expertise.
- Appropriate training and mentoring from a topnotch training cadre.
- Training and education coupled with practical experience.
- Graduates who are observed, measured, tested, and the products of a respected training curriculum and staff (known quantities).
- Educational support and accreditation through formal relationship with a community college (which also enables graduates to combine an apprenticeship program with degree programs).
- An opportunity to retrain "the downsized" for opportunities in fire suppression and prescribed fire roles, and perform effectively in them.

The *interagency* apprenticeship program would have at least two paths to entry:

Track 1 would be for existing employees, especially long-term seasonal employees without continuous appointments, who would get a guarantee upon successful completion of the program of an appointment to some position - either permanent part-time, subject to furlough, term appointment, or permanent. (This or a third track might be used for employees affected by downsizing.)

Track 2 would be an apprenticeship hiring program, as the JAC is currently used by the Forest Service in California. Hiring for continuing, entry-level appointments in fire management would be completed through this apprenticeship program (except for FMO positions, as noted in the previous footnote).

The current Forest Service Joint Apprenticeship Program and other current initiatives could serve as a model for an interagency program. The Joint Apprenticeship Program is a Department of Labor certified apprenticeship program. It originated because of a court ordered consent decree requiring the Forest Service to diversify its workforce in its Region 5 (California). In that region, all hiring for continuing appointments in fire management is done through the JAC. The Forest Service apprenticeship confers "Student Coop" status on the participants and requires them to complete over 3,000 hours in the program (2,000+ hours required by Department of Labor as a certified program, with an additional requirement levied by the Forest Service).

The Forest Service's apprenticeship program initially met with resistance due to its origins (the consent decree) and cost. However, many people in the fire management community now recognize that graduates of the apprenticeship program display better basic skills than firefighters who have not participated in the program. About 400-500 Forest Service personnel have completed the program. The Forest Service contracted for their California (JAC) program through a private provider in the past, but beginning this year, the agency will run the program itself, at an estimated one-third the cost of the contract. ²⁰

The apprenticeship program has five parts:

1. Entry-level Academy (30 days).
2. Approximately 1000 hours of practical experience at a work duty station guided by a training plan.
3. Advanced Academy (30 days).
4. Additional practical experience period at their homework duty station (length depends on hours needed).
5. Guaranteed appointment pending successful performance.

The next (9th) Forest Service Academy is planned to begin in February or March of 1998 and will be run by Region 5, though participants will come from other states/regions. The 10th Academy will be run as a national program under the guidance of a national steering committee. An agreement on national standards for the National Joint Apprenticeship program was reached with the Department of Labor in early 1998. The apprenticeship program will provide 4,000 hours of training and will produce a new position, "senior firefighter" at the GS-5 level. They will be prepared for serving in single resource positions.

Neither the Forest Service's apprenticeship program nor the NPS Crew Supervisor Academy are widespread interagency programs at this time. A few (about 20) BLM personnel and a few BIA and tribal people and others have participated in the Forest

²⁰ There are some specialized training programs outside the JAC that provide tracking opportunities; e.g., the Technical Fire Management (TFM) program provided through some universities, and the Northern Arizona University training program for fire prevention and use of fire in ecosystem management.

Service program through agreement between the agencies, but there has not been wholesale participation, because of the costs of the program and because it is tailored primarily to Forest Service needs.

The Forest Service has recognized that the apprenticeship program needs to add an intensive leadership and supervision module. The one week curriculum used by the National Park Service in a pilot Crew Supervisor Academy (conducted at the Presidio in San Francisco, 1997) includes leadership and supervision material with potential to provide the basis for this module. This leadership and supervision module also could be the venue for preparing participants as certified On-the-Job Training (OJT) providers (as will be discussed under Goal 14)..

The five Federal fire agencies have discussed the need for apprenticeship and academy approaches such as discussed above. Other curriculum suggestions made from within the agencies include adding advanced "specialty" academies (such as the BLM's current two-week "Engine Academy"). This may be particularly useful to fill known resource gaps and alleviate known weaknesses in specialties such as dispatcher, lead plane pilot, and air operations. However, the agencies must place a priority on first establishing an interagency program that produces a core staff possessing essential technical and leadership skills, allowing the program to evolve from there. The Forest Service apprenticeship program is associated with a community college that confers accreditation, allows participants to combine the apprenticeship program with degree programs, and allows participants to qualify for positions under the Federal job series classification for natural resources.

For practical reasons, an interagency fire management apprenticeship program must be phased-in. Some agencies have funding and staffing limitations that may initially preclude their involvement. An interagency needs analysis would have to be completed to determine the demand for participation and to set targets for a scheduled, but rapid phase-in of the program. The phase-in could begin by combining the elements of the Forest Service *JAC* program and the leadership aspects of the National Park Service Crew Supervisor Academy.

The current Forest Service *JAC* academy location is in Southern California in the Los Padres National Forest. Ultimately, academies may need to be held more than once per year and at more than one location. However, recognizing that the concept requires

academy attendance during the winter months to avoid fire season conflicts is important, and requires warm climate location(s). National Park Service facilities at Golden Gate National Recreation Area (San Francisco) have also been suggested as a potential good location. The NPS Crew Supervisor Academy is, there, and the location reportedly includes on-site accommodations and eating facilities and excellent cost-effective airline access. Apparently the Fire Management Officer there is very supportive of the idea of expanding the role of this program and of interagency cooperation. At a minimum, the "leadership and supervision" part of the program might be conducted there.

Another important consideration in establishing a fire management apprenticeship program is that it be done without creating a "fire department" subculture within cross-functional *natural resource management* agencies. The agencies will need to establish how they will achieve the aims of the apprenticeship program without alienating collateral duty and seasonal firefighters on whom the agencies have become so dependent. One approach would be to encourage "space available" participation by employees whose primary duties lie outside the fire discipline (non-fire dedicated positions). However, meeting the fire-related practical experience requirements of a certified apprenticeship program would be difficult for those not engaged in fire management full time.

Ideally, the apprenticeship program would take a tiered approach, recognizing that the apprenticeship program could serve three allied purposes:

- To establish a core professional cadre of wildland fire specialists and provide a dedicated fire career ladder.
- To enhance the careers of professionals whose primary duties lie outside the fire discipline (non-fire dedicated positions) through fire training.
- To enhance the fire program and improve agency-wide participation in the fire program by providing fire training/ qualifications to professionals whose primary duties are outside the fire discipline (non-fire dedicated positions).

If people have either primary responsibilities or significant collateral duties in fire management, then they would enter the job through the apprenticeship program regardless of their job classification.

An apprenticeship program will provide great benefit to the professional development of people holding dedicated fire positions. However, it will not be available to seasonal and temporary employees without continuing appointments, and cannot be expected to accommodate all of the employees who contribute to the fire program as a collateral duty. *Therefore, it does not replace the need for an effective performance-based training system.* The agencies must assure that the existence of an apprenticeship program does not water down the performance-based training program by making excessive demands 'on qualified trainers, training developers, training and travel budgets, and other resources at the expense of "non-apprenticeship" training programs.

This strategy supports other strategic goals outlined in this report, including Goals 14, 42, 43, 44, 59.

Implementation Strategy 4 - Revise requirement for currency of certification.

The agencies should reconsider their approach to currency requirements and currency re-certification, and do the following:

- Require three-year currencies for operations and command positions (instead of the five years at present). Not having done anything for five years and then being thrust into critical fireline decisions seems way too long.
- Devise better extension! currency re-certification mechanisms for people whose qualifications have lapsed. Simulation, shadowing, apprenticeship, and other forms of on-the-job training all merit consideration for greatly expanded use. Multiple approaches for maintaining or restoring currency should be allowed. A rigid (experience only) approach has deterred people from maintaining or refreshing their qualifications, and the agencies need to consider whether that is desirable. If there were enough people with fresh credentials and adequate experience the point would be moot, but that is not the case.

Implementation Strategy 5 - Increase the use of special assignments to build experience.

The agencies currently use a performance-based training and qualification system. The on-the-job aspect of that system may be misunderstood and underutilized as a tool to accomplish the aim of ensuring that adequate numbers of trainees are in the pipeline ~d gaining experience to meet future needs. To implement this feature of the system

effectively, the NWCG should clarify use of training and evaluation assignments, and expand their use.

Two types of assignments exist, a "Training Assignment" (to conduct on-the-job training), and an "Evaluation Assignment" (for evaluating trainees on their performance as required for completion of a Position Task Book). To expand the use of these assignments, a guideline such as the following should be established: on a given fire, about 5 percent of assigned personnel should be people on Training and Evaluation assignments (split roughly 50-50). For it to succeed, the coordination and dispatching system must understand and implement this concept, as must line managers in home units. The agencies also need a process for making sure that people who get training then receive timely experience and evaluation assignments, meet requirements quickly and become qualified. The Forest Service and Bureau of Land Management are currently working on an "allocation of resources" or draw-down strategy that identifies individual people available for fire assignments ahead of the fire season. Region six (Washington and Oregon) of the Forest Service already employs such a scheme. One by-product is that qualified individuals (those who have received the training) are identified and obligated to be available for fire assignments. These efforts should be continued and broadened to all agencies.

Implementation Strategy 6 - Encourage more participation from non-fire personnel.

The agencies should develop and fund recruitment, retention, and career development strategies that get more of their "non-fire" personnel participating in incident and prescribed fire operations and support. The problem of how to do this is complex. Many people can be trained, but few accept assignments, for many reasons.

Work often piles up while an employee is on a fire assignment, resulting in displeased supervisors and overloads on colleagues and on the returning employee. A simple, "quick-call" system needs to be developed at the unit level to help find temporary fill-ins for the employee. Important support to an emergency does not have to be at the incident, but rather can involve filling in at the workplace to allow someone else to go to the incident. In an era when electronic office and communication tools are available, it does not seem that strategies for "fill-in" or "back-up" work management should be a major impediment.

Budget and personnel staff need to develop performance and evaluation standards that do not penalize employees who work at an emergency assignment and do not meet targeted goals back in their home unit. To the contrary: unit managers need to be held accountable if they do not release qualified firefighters and do not try to arrange fill-ins. Everyone has to do his or her share.

Personnel Practices for Retaining Experience - People who participated in the Phase I interviews and survey suggested more ideas for improving personnel practices than for any other area. While many of the ideas do not seem related to safety on the surface, they are needed to retain experienced personnel, especially candidates for promotion, and that expertise is definitely related to safety.

A number of changes are needed in personnel practices. The agencies must especially consider changing their approaches to rewarding and recognizing the most experienced and valuable of the collateral duty and seasonal firefighters. Currently, disincentives discourage people from returning season after season, thereby impeding the agencies' ability to build and retain experience in the workforce.

The agencies also have had difficulty retaining some experienced collateral duty personnel in the fire programs. These employees are reluctant to leave their non-fire jobs when they have supervisory pressure not to volunteer, pay and work disincentives, and a lack of rewards and appreciation. Progressive personnel practices are key to employee retention.

At present there are few pay incentives for permanent employees to take on collateral fire duties. Their own work stacks up, causing more workload and pressure when they return. Their managers end up sacrificing overtime pay from tight budgets.

In addition, pay rates for fire responsibilities taken on by supervisory or management employees is a further disincentive. Not only are they not sufficiently rewarded for the hardships of fire duty, but in some ways they are actually penalized financially. Consequently, many employees are now thinking, "Why spend the time and effort to get more credentials and qualified experience only to get less pay for being away from home and my regular work?"

More and more permanent employees with fire qualifications and experience are dodging fire assignments, at all levels of the fire management organization, from firefighter to manager.. Consequently, the fire program increasingly will have to rely on less experienced people's judgments on the fireline if retention is not improved, which leads to Goal 12.

Goal 12. Encourage the retention of permanent employees on fire duty.

Implementation Strategy 1- Remove pay caps for overtime on fires.

There currently are pay caps on overtime for employees-exempt from FLSA overtime requirements. Exempt employees earn overtime at time-and-a-half of a GS-1 0, Step 1, instead of time-and-a-half of their pay rate. This leads to situations in which exempt employees in Incident Management Team positions (e.g., IC) earn less than someone delivering supplies in a pick-up truck. If the objective is to limit pay to an individual, one could set a ceiling on the number of overtime hours and send them home when they reach it. However, it would be much better if the agencies could remove the pay caps and pay overtime at time-and-one-half of their salary when employees serve on fire duty regardless of the number of hours worked or dollars earned.

This change may require an Act of Congress. An appeal has been submitted by the agencies to OPM to see if an administrative waiver can be obtained or legislation suggested.

Implementation Strategy 2 - Consider expanding use of special pay and retirement incentives for collateral duty personnel.

Some personnel receive an extra 25 percent for hazardous duty if they go to the fireline, but many working on the fire do not get it.

The agencies should consider broadening the pay incentives and providing a retirement incentive for fire duty performed by permanent employees. For example, an extra bonus of 20 percent of every hour spent on fire assignment might be added to a permanent employee's tenure at retirement time. Under this scenario, for every 40 hours spent on actual fire duty (including support functions charged to specific fires) an employee would earn 48 hours of service time (an extra.8 hours.) Note that the Federal firefighter retirement system already gives full-time firefighters an earlier retirement benefit than other employees, though they also contribute more to retirement than regular

employees. The proposed benefit would apply to all personnel in wildland fire positions, without extra contributions by them. Legislation may be needed to change the pay or benefits.

Implementation Strategy 3 - Increase expectations for employee participation in fire programs.

The agencies and their employees should expect that all permanent employees will participate in fire activity unless such participation creates a personal hardship or is limited by disability. Hardship examples might include single parents with young children, children sick at home or similar reasons for not being away from home for three weeks. The agencies should require supervisors to encourage and not discourage participation in fire duties by their employees. Even though agency directors place priority on this, it does not always happen. Supervisors that discourage permanent employees from taking on fire responsibilities should expect a negative report on the Supervisory Responsibilities element at evaluation time. Supervisors should be prohibited from receiving an outstanding rating in the Supervisory Responsibilities element if they discourage any employee from fire duty.

Implementation Strategy 4 - Evaluate employees' willingness to participate in fire programs.

Permanent employees should have an evaluation element that addresses their willingness and ability to take on fire responsibilities. The fire program has a wide variety of personnel needs and there are few, if any, employees who couldn't contribute to the effort in some way. Non-fireline qualified employees can staff administrative or support functions at the fire or in office settings. Fire responsibilities can be rotated so that offices continue to function and the public is served. In this way, everyone shares in the responsibility of keeping offices functioning and contributing to fire management functions.

Goal 13. Encourage retention of seasonals on fire duty.

Implementation Strategy 1 - Re-examine personnel policies that inhibit retention of seasonals.

By implementing goals and strategies found throughout this report, the agencies will improve their retention of seasonal employees because they will be members of a

better trained, more empowered, safer, high performance firefighting community with a positive professional image.

In addition, the agencies should evaluate the personnel policies, terms of employment, pay classifications, and pay scales for seasonal fire management employees with an eye toward enhancing their retention. Pay disincentives should be removed and a method of providing pay incentives implemented so that raises may be provided in recognition of increasing experience and qualification as appropriate. Artificial constraints' imposed via limitations on terms (length) of employment should also be abandoned.

Some seasonals should not and will not be asked to return, and that should be made clear, too. Likewise, the seasonals should be told about the chances for promotion.

A study is needed to help set standards for the percent of crew membership that should be seasonal versus permanent to perform well. The feeling from the experts consulted in this study was that the cadre of permanent firefighters needed to be increased, as was discussed in Goal 59. Of course this would require additional funding. To be cost effective, these firefighters could be assigned non-fire duties to fill slack time off-season. However, as use of prescribed fire increases, they would have a growing fire-related workload, and may have little slack time.

Training to Accelerate Experience - Aviation, medicine, law enforcement, the military, and industrial settings clearly show that experience can be effectively augmented by training and that certain types of training convincingly replace some experience requirements. Training can expand the experience base and build up the expertise of the trainees. The agencies currently rely on a system that requires them to wait for five or ten years while people accumulate more and more experiences. Various types of training can expedite this process, speeding trainees along the learning curve.

This is not to say that the "S," "I" and "RX" curricula as currently structured can effectively or safely replace experience. To replace fireline experience, training must be highly realistic, interactive, and challenge people to apply decision-making skills under stressful conditions.

Direct experience in wildland firefighting takes a long time to accumulate and carries with it many risks. The very nature of the firefighting job is to work in proximity to danger, and firefighting cannot be made risk-free. That is why the agencies must find

ways to expand the experience base and accelerate the rate at which trainees build up experience.

A particularly important link is the Crew Supervisor, who arguably has the most influence on firefighter safety. Crew Supervisors must recognize and understand what is an acceptable level of risk. If their tolerance for risk is too low and they withdraw at the slightest sign of danger, they cannot effectively perform their job. Conversely, if they accept too many risks, they may needlessly put their crews into harm's way. Fire personnel cannot learn the edges of the risk envelope if they are not gaining the opportunity to experience these edges while they work close to danger. Therefore, the gradual accumulation of experience is likely to be slow because these opportunities will (hopefully) be limited. Relatively few firefighters have been in critical situations such as blowup conditions or a shelter deployment, so most do not accumulate these experiences first hand. That is another reason why it is so important to speed up the learning curve by means other than direct experience.

We can try to present rules, including the existing rules and guidelines such as LCES, the Standard Orders, 18 Watch Outs, and Downhill Guidelines to help firefighters react to risks. But, as discussed elsewhere in this report, prescriptive rules are not adequate, on their own, to ensure safety. Each rule is itself a compilation of experience, and depends on experience in order to know how to interpret it.

On-the-Job Training. There exists a separation between training and operations in the organizational mindset. Though people are accruing most of their skills in the operational environment, many Crew Supervisors and squad bosses do not seem to consider fire operations as training opportunities. On-the-job training (OJT) represents a significant opportunity for replacing actual or full fireline performance with training. OJT is part of the current performance-based qualification system, but is profoundly underutilized. A comprehensive On-the Job Training strategy is presented under Goal 71, described further in Appendix B.

Simulation. Simulations and simulators can replace some experience and facilitate hands-on exercises that recreate real situations without danger or the need to go to the field. Simulations are used effectively to train military and commercial pilots, police officers, emergency room and surgical medical teams, ships' officers, ground-based and shipboard firefighters and industrial and manufacturing workers. Properly designed and

conducted, simulations are stimulating, effective, fun, adaptable - and in some cases - portable.

Evidence shows that simulation improves safety and allows people to learn to cope with dangerous, even life threatening situations in a realistic, yet low-risk setting. Simulator training is not constrained by safety, environmental, or other physical limitations. For example, astronauts trained for landings on the moon used simulators, and could repeatedly crash! This is a high profile example of training successfully replacing experience, since preparing in the actual operational environment was not possible. According to the FAA, the state of the art is such that simulator training alone qualifies a commercial pilot to fly a new type of aircraft. Pilots also can complete conversion training and recurrent training in a simulator. A pilot of one aircraft type can cross-train to another in a simulator, and then carry fare-paying passengers the first time he or she flies the new aircraft.

The Defense Science Board concluded that computer-based, simulated scenarios offer the only practical and affordable means to improve the training of military service operational commanders, their staffs, and the people who report to them (Defense Science Board, 1988). The military has made an enormous investment in the technology necessary to maintain a credible simulation training program. Military personnel do not get the opportunity to fight as many "battles" as do wildland fire personnel, so they must stress simulation more, but it is still a tool that can be used much more than it is for fire managers.

Training As a Substitute for Experience. Because the agencies have lost a great deal of tactical experience, less seasoned people must make critical tactical and strategic decisions on the fireline with enormous firefighter safety implications. For that reason, the agencies must enhance the current system of strategic and tactical training, and in particular to replace the experience lost in the ranks of Type 3 and Type 4 Incident Commanders, and in Division Supervisors.

Below is a description of strategies for developing training that can directly impact the safety of wildland firefighters, including simulation platforms for delivering training. These strategies advocate a balanced approach to making training more realistic by employing alternative training methodologies, including advanced training technologies,

"low fidelity" technology (e.g., simulations, paper-and-pencil exercises) and on-the-job training.

Goal 14. Develop ways to use training of various types to compensate for lack of Experience.

In addition to the strategies below, the Implementation Strategy to increase use of an interagency fire management apprenticeship program discussed under Goal 11 is relevant.

Implementation Strategy 1 - Expand use of on-the-job training; train people on how to do it.

The agencies should establish a formal OJT program to augment the classroom teaching and experience requirements of the performance-based training system. OJT opportunities include non-incident settings such as prescribed fire assignments and project work, as well as at incidents. The NWCG should clarify, emphasize and encourage the use of OJT as envisioned in the performance-based training and qualifications system.

Considerable research has been done on how to teach OJT. Klein and Associates (a part of our project team) have catalogued 57 OJT instructional techniques, as part of their research on OJT for the military, private sector, and fire departments. The reader is referred to Goal 71 and Appendix B for details of how to improve OJT.

Implementation Strategy 2 - Enhance course training in strategy and tactics.

The agencies should enhance training in *strategy and tactics*, particularly for Incident Commanders Type 3 & 4, by making further improvements to the content of the required courses. There already has been progress. The new S-131 course (Advanced Firefighter Training) is right on target. It appears to be very well developed and partially fills an important gap in the fire suppression training curricula created when the agencies made the transition to ICS in the early 1980s. The course is designed to emphasize basic tactics, strategy, and safety for Advanced Firefighters and Squad Bosses and to serve as a prerequisite for Incident Commander Type 5. The course materials emphasize safety, introduce a risk management approach, and include good application of the available fireline tactical and safety references and job aids. Those references and aids include the

Fireline Handbook, the "Look Up, Look Dawn, Look Around" materials, LCES, and others. 21

S-131 includes good training opportunities through scenario-based exercises (Unit 4). These scenarios represent a positive and effective instructional approach. They are also opportunities for future use of simulation-based training that would be even more realistic and effective. The S-200 (Initial Attack Incident Commander-ICT 4) and S-300 series (Incident Commander, Multiple Resources Extended Attack - ICT 3) courses also effectively address tactics. However, additional emphasis on strategy and tactics training is needed to enhance the performance of Incident Commanders Types 3 and 4, Crew Supervisors, and Strike Team/Task Force Leaders. The agencies must take care to assure that they are building strategy and tactics training continuously, consistently and *comprehensively* throughout the suppression curriculum.

Implementation Strategy 3 - Develop a family of simulators and other instructional technology.

The agencies have been using simulation in courses at the 300, 400, and 500 level, but the instructional/training technology lags behind that used in many industries and government agencies today. They are experimenting with, but not yet systematically using, simulators, but there is little use of interactive and multimedia technology. 22 Computer-based simulation technology has been in routine use in the military, airlines, and other industries for more than 20 years. The military, the airlines, manufacturing companies, and others who use simulation extensively are well on their way to moving beyond computer and video simulation to training in "synthetic environments" (virtual reality).

21 Interestingly, the plethora of safety guidelines contained in the S-131 course reinforces the opinion expressed in the survey and interviews of Phase I (and by many others) that there are far too many things for firefighters to try to learn and remember. It also reinforces the point of view that the LCES concept has been widely accepted and is here to stay. Because the course is strongly oriented to existing fireline tactical and safety references and job aids, it will be heavily affected by analysis and revision of those references as recommended elsewhere in this report. Once the fireline safety and tactical references have been revised, immediate revision of these course materials should follow, as should a revision of the Fireline Handbook.

22 Training technology includes Internet-based, telecommunications, distance learning, and open-systems learning options to train employees in the fire curricula. Commercial enterprises are available to adapt training materials into Internet-based packages and administer the training, though this option has not been utilized.

The Alberta, Canada Environmental Training Center (within Alberta Environmental Protection) is currently developing a CD-ROM application of the S-290 Intermediate Fire Behavior Course in conjunction with the National Interagency Fire Center (NIFC) Division of Training. This training package demonstrates the great potential of this technology. Alberta Environmental Protection recently tasked their Environmental Training Center to begin work on firefighter safety applications. The technology would work well for self-paced instruction of many courses currently contained in, or planned for, the (United States) fire management curricula, including ICS training, Fatality Fire Case Studies, Standards for Survival, and S-190. The agencies should encourage the NWCG to expedite its review of this technology, make this course available in the NFES Publications Catalog, and facilitate its use (which requires accessibility to multimedia personal computers at agency field locations).

The agencies must avoid the extremes as they move to modernize their training technology. Waiting for (or developing) the "best," most cost-effective technology will only cause the agencies to fall further behind. Constant changes in technology mean that acquisition of the latest "turnkey" systems will *always* be a moving and expensive target. On the other hand, exciting, cutting-edge, and emerging technologies such as immersive training in synthetic or virtual environments (VE) and Digital Visual Disc CDs are tempting but expensive. State-of-the-art simulators can cost \$5 to 20 million. Fortunately, the simulation marketplace is very competitive, driven by the defense and entertainment industries. Cost trends continue downward, as much as 30 percent to 68 percent per year according to some estimates. At that rate, the agencies in 8-10 years will be able to purchase for \$10,000 the computing and simulation power of a system that would cost more than \$1 million today. Technology in this price range would mean that the agencies surely could, in 10 years, have the close-to-reality simulation capabilities used by the military and airlines today.²³ The capability can be available earlier, depending on the importance given to improved training. The agencies should try to obtain for at least some key courses a simulator even at today's prices.

We recommend that the agencies immediately acquire at least some training simulations in standardized delivery platforms. The agencies can use off-the-shelf technology and PC/video-based simulator systems. The FAA is recommending a similar strategy for non-airline flight simulation.

²³ Air Power Journal NO.2 (Summer 1995), pps. 27-41.

There are several promising avenues that are, or can be, applied to wildland firefighting training, such as the following:

- *The Multi-Interactive Multimedia Simulator (MIMMS) (Canada)*. This is a laser-disk based, multi-person, interactive decision-making training program. The instructor creates simulations by compiling scenarios into carefully designed scripts developed from specific training objectives. The scenarios, are stored on a video laser disk, developed from video footage compressed onto the laser disk. The MIMMS software captures the scenarios through computer icons that can be arranged to allow flexibility in calling up appropriate images at the correct time during the simulation. The simulation unfolds according to the decisions and strategies employed by the trainee(s). To incorporate multi-person interaction, and therefore realism, the MIMMS incorporates role playing of up to eight people using a closed radio system monitored by the instructors.

This system is in use in several locations in the United States and is being actively promoted by the U.S. Forest Service's San Dimas Technology Development Center. However, due to the decentralized nature of the Forest Service, awareness and acceptance in the training and field communities remains low. Its cost is approximately "\$50,000 per unit.

- The Federal Emergency Management Agency (FEMA) and the National Fire Academy (NF A) have developed, and use, a simulator housed at the NF A.
- The U.S. Navy has developed advanced simulation on shipboard firefighting.
- The NIFC Division of Training is working in this area and the Bureau of Indian Affairs is working on a fire growth model for initial attack training that is CD-ROM based (through NIFC Division of Training.)

Virtual reality technology offers great promise and is where simulator technology is headed. However, Virtual Environment (VE) training represents a "quantum leap" for the five agencies at this time. Nevertheless, the agencies are experimenting with virtual reality technology and should continue to search for practical, cost-effective ways to incorporate that technology into fire training simulations and simulators.

Implementation Strategy 4 - Develop a family of simulations.

To better compensate for lack of experience through training, all tactical and strategy training, including S-131, S-200, 8-330, and 8-336 should be given high priority for increased realism through use of scenarios and simulation, as technologies (and budgets) permit. The agencies should develop a family of "hot seat" -style fire simulations. The agencies would use the simulations to develop people's Recognition Primed Decision-making (RPD) skills, apply other instructional objectives in "high tempo" environments and evaluate performance.²⁴ Simulation exercises should incorporate computer modeling of fire behavior where appropriate.

The agencies should design simulated exercises to convey the critical necessity for clear thinking and decision making in time sensitive situations, and condition participants to react to situations reflexively and with consistent approaches. In these simulations, instructors would scrutinize participant actions and decisions and actively coach, correct and evaluate trainees against established performance standards. Simulation exercises can be cost-effective and would benefit the agencies through low risk exposure. This strategy should be implemented in concert with other goals related to decision-making training discussed later in this report.

Implementation Strategy 5 - Use more visual, interactive multimedia training.

A strong suggestion from many firefighters in Phase I was to make training more visual, to get across a better sense of different situations, and to make training more interesting.

"Multimedia" technology is the carefully orchestrated interaction of video, audio, text, graphics, slides, and animation. "Interactive Computer-based Training" enables users

²⁴ Recognition-Primed Decision-making is discussed in the Phase I and II reports, and later in this report. Basically, it is sizing up a situation and determining if it is "typical," in which case the typical reaction to the situation is used as the starting point for deliberation on what to do. If the "typical" reaction appears likely to be adequate, no other options need be considered. If the typical is not adequate, you move to others in your experience. If none of those fit, you move into "problem solving" to find a reaction that will work.

to control the pace and direction of information using a computer. Combining these concepts produces "interactive multimedia training."²⁵

Evaluation of multi-media training has shown that it is effective and produces results such as a 25 percent gain in retention over single medium training, a 50 percent reduction in training time, and a 40 percent increase in interest and motivation. ²⁶

In addition, computer -based training offers the following advantages:

- Students can work alone with the computer in privacy.
- The student can shut down the system, and later to resume where they left off at any time.
- Computer equipment can be mobilized to almost any office site.

The training coordinator can review and track the student's inputs, selections, and performance for certification purposes.

The agencies, through the BIFC Division of Training and the NWCG Training Working Team, should consider a joint venture with the Alberta Environmental Training Center (as was done with the S-290 CD-ROM package) to develop CD-ROM based firefighter safety training materials, and other interactive multimedia training that is more visual than text.

Implementation Strategy 6 - Prepare for Out-of-Region Experience.

A strength of the current wildland fire management system is the ability to quickly mobilize and transport crews across the nation. However, firefighters and fire managers interviewed in Phase I raised concerns about inexperienced crews transported from their home area to another geographic area where they were not familiar with hazards posed by local fuels, terrain, or weather. One cannot realistically require crews to

²⁵ Recent examples of a more visual, scenario-based approach is the new LCES training package being developed by Paul Chamberlain, at Missoula, the new Fire Fatality Case Studies course developed by Jim Cook at Boise, and a joint FS/NPS project to develop video modules for the NWCG "Tactics Guide" (to be used in all appropriate courses). These are all in the right direction, being developed by Clark Noble, at Boise.

²⁶Presentation made by Rob Thorburn (Alberta Environmental Training Center, Alberta Environmental Protection) at the "Canada/U.S. Wildland Fire Safety Summit," Rossland, B.C., September 30, 1997.

have experience with all types of fuels and terrain they may encounter on an out-of-region assignment. Fortunately, there are at least three ways to reduce this problem:

- As part of initial training, give all crews an idea -of the wide variation in fuels, types of terrain and climate they may encounter, stressing the potentially most dangerous situations (this would be just a brief introduction to the subject, to sensitize them to the issue).
- Brief crews en route to a fire or at the fire on local conditions of importance to their safety (e.g., the rate of spread in the local fuel and fire behavior in local terrain).
- Provide crews with supervisors experienced in local conditions.

Training for Other Regions - All NWCG fire behavior training courses already employ "the fire environment concept," and discuss the conditions, influences, and modifying forces that control fire behavior. As Countryman stated, "Fire must obey physical laws. We consider certain types of fire behavior unusual or unexpected only because we have failed to evaluate properly the conditions, influences, and forces that are in control" ²⁷ This concept remains sound.²⁸

²⁷ Countryman, Clive M., *The Fire Environment Concept*, Berkeley, Pacific Southwest Forest and Range Experiment Station -. Forest Service, 1972. (Revised for inclusion in *Intermediate Fire Behavior*, S-290, 1992.) .

²⁸ The fire environment concept is well represented in three courses that are mandatory training in the critical positions of Firefighter, Single Resource Boss (Crew Supervisor, Engine Boss, Dozer Boss, Tractor/Plow Boss), and Strike Team/Task Force Leader. The concept is first introduced in the foundation course *S-190* (Introduction to Wildland Fire Behavior) and is expanded comprehensively through *S-290* (Intermediate Wildland Fire Behavior) and *S-390* (Introduction to Wildland Fire Behavior Calculations). All three courses were revised in 1994, and an interactive CD-ROM version of *S-290* is awaiting approval. *S-190* is required training for firefighter qualification and is designed to train firefighters in the basic fire behavior factors that will aid them in the safe and effective control of wildland fires. *S-290* is mandatory for qualification at the Single Resource Boss level and is a «skill course" designed to instruct prospective fireline supervisors in wildland fire behavior to produce effective and safe operations.

S-390 is mandatory training for qualification as a Strike Team/Task Force Leader and is also a skill course for that level of prospective supervisors. It is designed for use throughout the United States, and is (or at least used to be) the first place in the curriculum where specific fuel models used to estimate fire behavior across the country are introduced. The curriculum is continually being revised in a very positive way.

. The newly revised *S-330* (Strike Team/Task Force Leader) puts additional emphasis on fire behavior and its impacts on tactics in safety. This development is a positive and welcome addition to the fire training curriculum.

Federal agencies in the United States are recognized as world leaders in theoretical and applied research into wildland fire behavior, prediction of wildland fire behavior, and fire behavior training. The current fire behavior training system could and should adequately prepare firefighters for fire assignments in a variety of conditions found throughout the country. However, the curriculum and its delivery contain small, but important flaws that can be fixed (and should be).

Under the national mobilization concept, crews, individual resources, and fireline Incident Management Teams are moved to areas of critical need. Individual firefighters, squad leaders, and, most importantly, crew and other single resource bosses must be prepared to fight fire outside their local area or region safely. However, the fire behavior curriculum first introduces specific fuel models and a national perspective on fire environment differences in S-390, a course designed to prepare Strike Team/Task Force Leaders.

Ironically, the S-390 course description and instructor guide say that "Fire environment differences are discussed when important." They direct instructors to "stress local and regional conditions." Many observers know that course coordinators and instructors "localize and regionalize" this training liberally, at the expense of preparing trainees for conditions found outside their local area or region.

Though the NWCG briefly experimented with laser disc technology for visual support of the S-390 course, the fire behavior curriculum makes little use of multimedia technology. As stated earlier, simulations and simulators can replace some experience, and can facilitate hands-on exercises that recreate real situations in various geographic areas.

We recommend that at least some attention be given throughout the curriculum to potentially dangerous conditions that could be encountered in other areas, and not wait until S-390. The agencies (through the NWCG) should make the following revisions to the fire behavior curriculum:

1. Develop a module, supported by video examples, for S-190 to introduce fire behavior in the 13 fuel models used to estimate tire behavior. The intent is not to acquaint trainees with mathematical fire behavior prediction, but rather to familiarize them with the range of conditions found throughout the United

States and potential fire behavior under those conditions. The theme should be picked up and expanded in a module for S-290, again not for the purposes of making fire behavior calculations, but for displaying fire behavior in a variety of fuel models under varying atmospheric and topographic conditions.

2. Existing slide sets and video tapes, available through the National Fire Equipment System (NFES) publications catalog, should be used as multimedia support of the new S-190 and 290 modules. However, the emphasis should be on highly realistic exposure to fire behavior conditions. Video disc and computer simulations of fireground conditions should be developed to support training scenarios. This approach is consistent with goals and strategies related to highly realistic training, substituting experience with training and Recognition-Primed Decision-making (RPD) found elsewhere in this report.
3. The agencies should use the Interactive CD-ROM version of S-290 when it is available, and pursue development of a similar S-190 package.
4. The 8-390 course description and Instructor's Guide should be revised to reflect the need to train people to respond to fires outside their region, and to address firefighter safety issues in support of the national mobilization concept. S-390 should employ extensive videodisk and computer modeling applications to allow students to visualize realistic examples of fire conditions under varying atmospheric and terrain conditions in many fuel models.
5. The newly revised S-330 course and S-339 (Division/Group Supervisor) course currently under development should be supported by simulator technology or other realistic scenarios as soon as possible. At this level of training, trainees should be exercising decision-making skills in high-tempo training environments.

Briefings for Out-of-Region Resources - The agencies should develop a joint protocol for briefing out-of-region resources before assignment, not unlike approaches used in California's South Zone and Alaska in the past. The joint protocol would be carried out through the auspices of the NWCG, and should include guidelines for conducting separate initial briefings for resources arriving from outside their local region. Applying these guidelines, an Incident Management Team might assemble groups of out

of-region resources as they checked in to provide a short, but intensive briefing on local conditions, fire behavior, and other expectations. Briefing guidelines currently exist and are used by Incident Management Teams, fireline Incident Management Team and Agency Administrators and their staffs. Full implementation of this strategy will require that the agencies incorporate the new guidelines into all appropriate training materials and the Fireline Handbook when they are completed.

It also may be useful to formalize sharing fire danger/fire behavior information about an area via e-mail or other means when mobilizations to the area appear likely.

Provide Local Oversight - Similarly, the agencies should develop a joint protocol for assuring adequate supervision and safety oversight for out-of-region resources before they enter assigned status. This joint protocol should include guidelines for assigning out-of-region resources and their associated Incident Management Team. The intent is to prevent situations where an out-of-region resources without experience in the local fuel type, terrain or conditions are supervised by an out-of-region Incident Management Team with the same limitations. When completed, the agencies must incorporate these guidelines into appropriate Planning Section training and references and the Fireline Handbook. .

Goal 15. Ensure that individuals and crews in low fire incidence areas have the opportunities for experience in other areas, and/ or have adequate oversight when sent To different or complex situations.

Goal 15 addresses lack of experience from working in a low fire incidence area versus Goal 14, which addressed lack of familiarity with other areas in general.

Implementation Strategy 1 - Provide opportunities to work in high incidence areas.

When possible, it would be desirable to provide individuals and crews with opportunities for experience in higher fire incidence units out of their immediate area. That gives them the exposure to other fire environments and also increases the number of fires they attend.

The agencies should consider FMOs as well as crews and Crew Supervisors for detail assignments to high fire incidence areas, backfilling their home agency positions as necessary. This policy would increase experience levels of those with the lowest

experience, and also be fair in balancing risk and workload among individuals. It will, however, cost more in transportation. The FMOs would get to see more complex fire programs, and different or more complex incidents. In some cases this strategy might increase the number of times when people will fight fires in unfamiliar terrain (by sending fire managers to another area to which they might not otherwise ever get to). Note that FMOs (and others) may be detailed to firefighting assignments or roles other than their own as an alternative to a detail in their own job, and get much (perhaps even more) out of the experience.

Integrity of Certification and Qualification System

Achieving a culture of firefighting excellence and safety will require getting renewed respect for the performance-based training and qualifications system. The agencies use this system to qualify and certify fire suppression personnel. "Red Cards," the certification instrument, should be a strong and positive symbol that inspires confidence in its veracity and validity. The performance-based system's credibility is directly linked to people's perceptions about its impact on the performance of fireline Incident Management Team and the Red Card's effectiveness as a measure of experience.

Results from the system's first few years have been mixed. People have expressed three principal concerns - that some certification requirements were too easy; that some certifications were made without the requirements being met; and that qualifications were not consistently checked in the field. This is more a poor application of the performance-based qualification system than a problem with the system itself. In addition, field level units have had difficulty in carrying out the performance-based system, which has harmed the system's credibility and the workforce's trust of the system and its commitment to it.

Furthermore, the performance-based training system's "suggested" training term has not produced the result originally intended by the NWCG. The developers of the performance-based system envisioned that the use of the term "suggested training" would eliminate duplication and cut costs by allowing people to achieve equivalency through experience, other training or on-the-job training. However, the term "suggested training" has confused people and connoted "nice to have, but unnecessary" to many. Concerns in the Phase I survey about the quality and performance of "the Incident Management Team" derive, in part, from this trend. People expressed the most concern about the preparation and certification of Crew Supervisors, Division Supervisors, and the criteria

Used to prepare and select Agency Administrators. In some cases, factors other than competency alone must be considered in making job offers and promoting the Native American preference law, for example, which significantly affects firefighter hiring in BIA.

Goal 16. Certifications (e.g., Red Cards) should be meaningful indications that a Person is ready to take on the requirements of the job they are certified for.

The agencies should continue firm support of the current performance-based system, since it is a better way of obtaining and measuring performance. However, the following changes should be made.

Implementation Strategy 1 - Better explain the intent of the system and its requirements.

The NJIMS Wildland Fire Qualifications Subsystem Guide (310-1) is being revised in 1997/98. As part of that revision, the agencies (working through NWCG) should emphasize that the purpose of the 310-1 is to provide minimum qualification requirements that can be augmented by individual agencies if they so choose.

We also recommend dropping the term "suggested training." Instead, first describe the "Required" or "Mandatory" training for each position in the system, and describe the other training or its equivalent that are needed. Make clear that people can be exempted from non-mandatory training if they have attained equivalency through experience, other training, or OJT. This revision will retain the benefits intended (reduced duplication and cost), but better describe the intent of this feature of the performance based system.

Implementation Strategy 2 - Train managers better on implementing performance-based certification.

The agencies should provide more effective implementation training on the performance-based training system. The training should enable people to manage its features and requirements effectively. The NWCG-Training Working Team is currently tasked to develop and implement this training, and has placed a high priority on the project.

Implementation Strategy 3 - Revise .Position Task Books if necessary.

The agencies should continue using Position Task Books (PTB) as indicators of experience for initial qualification, but need to modify the requirements and clarify the wording as deemed necessary by the NWCG Incident Operations Standards Working Team.²⁹

At least some fire managers feel that the number and quality of assignments required before being eligible to start the process for the next higher level is way too low, especially for division supervisors - that may be the underlying cause of the quote in the Executive Summary that "one in five division supervisors were really scary."

Implementation Strategy 4 - Use key tasks from the Position Task Books in performance evaluations.

To further strengthen the importance of the Task Books, and to improve performance evaluation and accountability, use key tasks from them to develop performance evaluation criteria for evaluating on-incident performance. After-action performance evaluations should be mandatory, and should determine whether individual certification may continue without any remediation. (See Goals 2 and 6 for additional comments regarding performance evaluation and accountability.) .

Implementation Strategy 5 - Toughen currency requirements.

See Goal 11, Implementation Strategy 4, regarding requirements for currency of certification.

Implementation Strategy 6 - Make training "required" (versus "suggested" to achieve qualifications.

Many Operations and Command courses, including training required for subordinate positions, should be mandatory for people intending to obtain qualifications in Operations or Command roles, especially those with direct impact on tactics and safety. At present, some of the needed training is "suggested" rather than mandatory.

²⁹ Position Task Book revisions are in progress.

We suggest that the following courses be required for the positions indicated. This list is not all-inclusive, but provides some important examples.

Fire behavior training should be mandatory for qualification for all Operations functions, for Incident Commanders Type 3 and 4, and for many Planning functions. It is already a requirement for some of these positions; the status quo should be maintained for them.

Functional Command and General Staff training including 1-400 (Incident Commander), 1-404 (Safety Officer), 1-430 (Operations Section Chief), and 1-440 (Planning Section Chief) should be mandatory for qualification in those positions. The system should also require 1-420 (Command and General Staff) for qualification in these positions.

The new Unit Leader course (S-320) should be required for employees intending to perform at the Unit Leader level in any ICS function.

The Division/Group Supervisor (DIVS) requirement should be retained for Air Tactical Group Supervisor (ATGS), but in addition, ATGS training (S-378) should be a requirement for qualification as Air Operations Branch Director.

Goal 17. Signing off on Red Card credentials without reasonable evidence that the Person has met all of the requirements should be punishable offence.

Some people have reported that certifications have been made without the requirements being met; to help friends, or because of a lack of respect or understanding for the certification requirements. The system employs a three pronged approach, and the standards for all three elements (training, experience, and performance competency) must be vigorously and honestly applied.

Implementation Strategy 1 - Educate and build confidence about the system.

By carrying out the strategies listed above under Goal 16, there should be increased respect for the performance-based training system and the Red Card's role as an indicator of training and experience. In the course of training people to implement the performance-based system successfully, the agencies will increase the understanding of

that system. Improved understanding will inspire confidence and heighten people's trust of the performance-based training scheme and their commitment to it.

Implementation Strategy 2 - Utilize disciplinary actions when appropriate.

The agencies must prepare to handle both unintentional misapplications and deliberate abuses of the system. To protect the integrity of the Red Card system, no abuses to the certification process can be tolerated. Swift and severe disciplinary action, consistent with the disciplinary procedures of the agencies, should be taken against anyone found to have knowingly misused the qualification and certification system to benefit themselves or another party.

Goal 18. Credentials should be reviewed for all resources before the resources are utilized.

As intended, Incident Management Teams and Incident Commanders use the Red Card to facilitate the verification of fireline qualifications. This usually is done when resources "check-in," or report for assignment on a fire or other incident. The check-in process is a "common responsibility" of the Incident Command System (ICS). It is well documented, and is presented in many training 'courses throughout the "I" and "S" curricula. ³⁰ On larger or complex incidents controlled by Incident Management Teams, the check-in process is usually well-defined and takes place at the Incident Command Post, Base Camp, Staging Area or other point of contact. Nevertheless, there have been many incidents where crews or individuals without adequate credentials slip by the system.

As a "common responsibility," the check-in process is supposed to occur on every incident, regardless of size or management. For the initial or extended attack on wildland fires, resources typically respond directly to the fire and/or tactical assignments. Sometimes people are instructed to report directly to a tactical assignment on larger fires as well. In these circumstances the Incident Commander or a member of the fireline Incident Management Team assumes responsibility for knowing people's qualifications and deploying resources appropriately.

³⁰ See Common Responsibilities (Module 6 in the 1-200 course) from the Incident Command System National Training Curriculum for example.

Three flaws exist in the system as it stands today; none of them should be difficult to repair. First, reports from the field show that the diligence with which check-ins are conducted is inconsistent and varies across the spectrum of Incident Management Teams. A flaw in the ICS and associated training materials is likely contributing to this irregularity.

Second, the check-in approach for resources reporting directly to the fireline and/or tactical assignments is flawed. If the check-in process is to support the improvement of safety, adequate vetting of credentials must occur regardless of reporting location.

The check-in approach outlined in the ICS training materials could be viewed as contradicting an essential ICS principle - under the ICS, the Incident Commander (IC) performs all functions unless other organizational elements have been activated and the IC has delegated the authority to perform certain functions to them. If no Planning Section or Check-in Recorder has been established, or the resources have bypassed the Incident Command Post, the check-in function still should be performed. However, under the current training direction it can be construed that you can check in after returning from the fireline.

Finally, we interviewed people familiar with the internal functioning of Incident Management Teams. Some of them revealed shortcomings in the collection and application of the information received through the check-in process. For example, often a few overworked check-in recorders must process hundreds, and sometimes thousands, of firefighters using a paper-based check-in process. They necessarily limit the information they collect to only what is needed to administer basic planning functions and aid demobilization. In addition, the check-in information collected is often put to only minimal use. This is true, in part, because the information is recorded on paper forms that can be accessed by one person at a time and only in the Planning Section workspace. Others have said that information is not well shared between the Planning and Operations Sections, resulting in uninformed decisions by both.

The above problems led to the following recommendations:

Implementation Strategy 1 - Revise ICS training materials regarding check-in.

ICS training materials advise that "Agencies will often have different procedures associated with incident responsibilities. The checklists provided in this module will cover most of the major requirements. However, some agencies may need to augment the checklists." This approach leaves too much open to interpretation for the check-in process to influence decision-making, resource deployment and firefighter safety. The agencies (through appropriate NWCG working teams) should evaluate the information contained in the check-in checklists and revise them as necessary to meet the aims of this goal. ICS and planning function training should be amended to reflect their revisions and strengthen the approach. Training should emphasize that certain check-in information represents *minimum standards*, but that *these minimum standards may be augmented*.

Secondly, ICS training teaches firefighters that "If instructed to report directly to a tactical assignment, you should report to the designated Division or Group Supervisor or to the Operations Section Chief or Incident Commander depending on the level of ICS activation. After release from tactical assignment you will formally check-in at one of the above locations" (incident command post, base or camp, staging area, helibase). Though implied, it is not explicit that the fireline Incident Management Team should still verify credentials in these situations. The Division Supervisor, Group Supervisor, Operations Section Chief: or IC should review credentials before assigning resources. or making deployment decisions. The Crew Supervisors or other resources checking in should be expected to have integrity, and to point out the lack of appropriate credentials for any members.

Many people believe that initial attack, extended attack, and fir~s in transition represent the very most dangerous firefighting environments. Ironically, these are the fires where resources are most likely to report directly to tactical assignments, without verification of credentials. They also are the fires where the situation's complexity exceeds the capability of the initial forces on-site.

We do not mean for this implementation strategy to be blindly bureaucratic. In any field situation, you expect the IC to make the ultimate decision about staffing and an individual's capabilities in filling critical positions. Some flexibility is needed.

Implementation Strategy 2 - Motivate the check-in recorders concerning the importance of their role.

Many times, any available "warm bodies" are assigned to be check-in recorders. The function is often perceived as a bureaucratic requirement. Untrained personnel are frequently assigned to it and given only a cursory introduction on to how to fill out the forms. In the future, the agencies should place more importance on the check-in function and the ICS and suppression training that prepares people for it. An improved focus on the check-in function will provide accurate information for strategic and tactical decisions, and therefore improve overall performance and firefighter safety.

Implementation Strategy 3 - Develop "smart" Red Cards that allow quicker, more accurate check-in of individuals.

In the slightly longer term, the agencies should enhance the current check-in system by developing "smart" Red Cards that can be used in a computer-based resource tracking system. Smart Red Cards may be bar-coded, or may use embedded chips that contain electronically-encrypted information. Smart cards would enable check-in recorders to retrieve electronically more information with greater accuracy in less time than at present. The information could be immediately downloaded to a computer database and shared by all management team functions, particularly Planning, Operations, and Finance.

Red Cards will still need to include visible information; the resource tracking function must include a manual fallback option, that enables ICs and Incident Management Teams to review credentials and track resources at remote fires without computers or electric power, on the fireline, during equipment failures, etc.

It is, perhaps, paradoxical to suggest that automating incident information management has a direct bearing on firefighter safety. Several safety goals discussed in this study, however, require quick, accurate access to information about firefighters: qualifications for assignment, other qualifications for possible reassignment, and assignment duration as it relates to fatigue and fitness levels. Managing an incident is as much about having accurate, accessible information about resources as it is knowing the productive capabilities of resources.

It is imperative, then, that the fire bureaus initiate development of a single, integrated system to manage incident information, with dependable electronic communication to the jurisdiction unit or coordination center. "Smart" Red Cards are a necessary component of that system.

Implementation Strategy 4 - Ensure that IMT training stresses the need to consider and share information on status and certifications of crews at check-in.

All members of an Incident Management Team's Command and General Staff, including the Planning Section Chief and Operations Section Chief attend S-420 (Command and General Staff) as part of their required training. S-420 is a simulation exercise which takes complete Type II Incident Management Teams through common and specific responsibilities of the team's members, stressing their collaborative efforts and interaction.

Among the evolutions involved in this simulation exercise, participants must provide for the safety and welfare of assigned personnel and establish and maintain positive interpersonal working relationships; assess the fire situation and determine resource needs; staff and adjust the organization as necessary; brief and debrief staff members; assign work and coordinate staff activities, manage planning meetings; approve incident action plans; and plan, approve, and initiate demobilization functions. Aspiring Type I (National) team members must also attend S-520 (Advanced Incident Management), an advanced team exercise. S-520 trains a fully functional IMT to understand team dynamics and how to operate under extreme stress.

The agencies (through the NWCG Training and Incident Operations Standards Working Teams) should ensure that these courses reflect the need for the Planning Section of both Type I and Type II Incident Management Teams to collect and manage fireline qualification information if they are going to provide for the safety of assigned personnel throughout the duration of the incident, and make informed resource deployment decisions. It is particularly important that the Planning and Operations Sections are encouraged by their training to share information and collaborate on informed decisions as they determine resource needs, staff and adjust their organization and deploy resources.

The agencies also can implement this strategy by encouraging the inclusion of Operations Section personnel in Planning Section training courses and vice versa. We

have seen effective examples of courses where an Operations Section Chief was invited to instruct Situation and Resource Leaders, and where Situation and Resource Unit Leaders were brought in to teach Operations Section Chiefs.

Implementation Strategy 5 - Ensure equality of review across positions.

The check-in process and the review of qualifications or credentials should apply to all types and levels of fire management resources. The agencies should apply the same vigor in reviewing the credentials of agency regulars, interagency cooperators, temporary hires, contractors, and local government forces. The agencies will continue to operate under the principles of the National Interagency Incident Management System (which includes the Incident Command System approach) and under existing interagency agreements. However, the agencies should ensure that all fireline resources meet the standards that apply to them before these resources are assigned to tactical duty.

Symbols and Insignia - Another way to display credentials is through the insignia on uniforms that indicate qualification level and special skills. The use of insignia drew enthusiastic support or fierce disapproval among those interviewed. The use of insignia would represent a profound cultural change in many quarters of the wildland fire community.

Some argue that insignia help identify leaders and would aid in fireline task delegation. Others argue that insignia emphasize distinctions and promote elitism in the firefighters' largely democratic workplace. Dr. Patrick Withen, a sociologist with over 20 years of wildland fire experience, found in his research that wildland firefighters' work relationships are quite democratic in nature, as is their decision-making approach.³¹ The use of insignia might change this culture in an undesired and unintended way.

Structural fire departments use insignia to show rank or position (Chief: Battalion Chief, Captain, etc.) and/or level of qualification (Firefighter I, Firefighter II, etc.). However, we have seen no persuasive case made for use of insignia for wildland

³¹ 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.

firefighters. It is true that quickly identifying a person's level of qualification on the fireline would be valuable to help find someone of appropriate level to do a task or take command in a hurry. However, there is a danger that insignia in the ICS-based wildland fire organization could cause confusion. For example, a person wearing an "OSC2" (Operations Section Chief Type II) sticker to denote his or her training level may be serving in the capacity of Crew Supervisor on the fire. Training level and current assignment differ quite often. On the other hand, having the insignia provides more information than not having insignia. Although we cannot recommend the use of insignia, to be open-minded, we suggest the following:

Implementation Strategy 6 - Evaluate the acceptance level for insignia.

The agencies should conduct focus groups using members of the workforce, and evaluate the pros and cons and acceptance level for using insignia that would show each person's highest operations training level. The agencies should pursue a universal approach toward insignia through the NWCG if there is support for it.

Hardhat stickers represent the most realistic option for displaying insignia. They are inexpensive and changeable. Sewn patches would prove impractical, because many articles of fire clothing are exchanged at incident bases, or are laundered and returned to regional fire caches. "Collar brass" and other forms of removable insignia would likely prove cost prohibitive and are viewed as more elitist.

Interpersonal Communications

Interpersonal communication is an area in great need of change in the firefighting culture. Clear, understandable communications is one of the pillars of safety. The current methods of communication that are common in the wildland fire community tend to be "one-way." Information is sent up or down the line, without adequate checks to see that it got through and that it was understood. The agencies need to change the ways in which fire people communicate, requiring both attitudinal and behavioral change and a fundamental change in existing culture.

Traditionally, a great deal of fireline communication involves "sending messages," "giving directions," "briefing people," and "giving orders," all authoritarian, one-way styles of communication. Correspondingly, firefighters expect "to be told" and often

passively await instructions, often failing to ask when information is not provided. "These communication styles reduce assurance that messages get through and are understood, which can greatly affect safety.

Many firefighters are hesitant to ask for information they have not received. Firefighters also often hesitate to ask for clarification of garbled radio transmissions to avoid embarrassment. Some firefighters consider it "bad form," not macho, or uncool to request a repeat of a message garbled by poor radio transmission or indistinct speaking, or containing unclear instructions.

There is a need to improve both the physical quality (transmission clarity) and the comprehension (understandability) of communications on the fireline. The agencies will greatly improve their safety and effectiveness by promoting a culture that uses dialogue, not one-way communications, and that expects both the sender and the receiver to take responsibility for clear communications. This operating climate should include desirable communication norms (informal and unstated rules) and formally sanctioned communication processes, and protocols.

A productive and successful model of communications is one that views the communication process as an interactive exchange. An interactive approach recognizes and minimizes the barriers to effective communication that cause misunderstanding. It puts responsibility not only on communication gatekeepers to foster understanding, but on everyone - senders and receivers alike. These characteristics, coupled with the concept of "respectful interaction" (politely but assertively raising safety concerns), should form the desirable norms of communication within the wildland fire community.

Crew Resource Management - A variation on the dialog concept is the use of a set of interactive communication and assertiveness skills and processes that have been associated with the "crew resource management (CRM) concept,"³² which is discussed

³² Though associated with CRM, the communication protocols used in the aviation industry were developed outside of the CRM approach to address specific operational issues within the aviation environment. The wildland fire community is struggling with many similar operational communications issues.

more fully in Chapter 6. CRM training includes communication and assertiveness skills that relate to wildland firefighting:³³

Communication Skills

- Use standard terminology
- Provide information as required
- Provide information when asked
- Ask for clarification
- Assume a response is negative if no reply (i.e., if you ask a person if they are okay and there is no response, you need to see if they are in trouble)
- Acknowledge communication
- Repeat information
- Reply with a question or comment
- Use nonverbal communication appropriately

Assertiveness Skills

- Advocate a specific course of action
- State opinions on decisions and procedures, even to the higher ranking
- Ask questions when uncertain
- Make suggestions
- Raise questions about procedures

Training in these skills would assist firefighters to understand modes of communication in hierarchical, command and control environments, and help them focus on communication methods that avoid or mitigate communication errors. This training will assist in reinforcing formally sanctioned communication processes and protocols.

Information Flow - Besides improving attitudes and behavior regarding interpersonal communication, the agencies must address problems with: a) the application of their communication technology, b) the quality of briefings, and c) the quality of dispatching. There is a need to improve both the quality and quantity of communications

³³ USDA Forest Service Fire and Aviation, Findings of the Human Factors Workshop, Missoula, Montana, 1995.

channels used on the fireline. Communications hardware concerns will be addressed later in Goals 23 and 24. Here we address the human side of communications.

A National Park Service (NPS) work group analyzed a series of fire entrapments involving more than 300 firefighters that occurred between 1985 and 1989.³⁴ They found that on seven of the 12 incidents reviewed, firefighters observed a breakdown in communications. In very few instances did the communication failure involve equipment failure. Fifty percent of the incident reports noted disruption in the flow of vital information between the incident management and the line personnel. In several instances, Crew Supervisors did not adequately communicate escape routes to their crews.³⁵

Radio Discipline - While increased communication and information flow is desirable and necessary, we must also recognize that increased information flow requires disciplined radio communication and increased radio system capacity. The intended result is to increase the flow of important information through interaction, without the unintended result of flooding the available radio communication frequencies and interfering with critical messages. This is simultaneously an issue of training, discipline, infrastructure and technology.

Standard Terminology and Protocols - When the agencies transitioned to the Incident Command System (ICS) in the 1980s, they adopted the concept of "clear text" communications in place of complicated radio codes. The ICS considers communication clear text (the absence of radio codes) to represent an essential part of an effective multi-agency incident management system, and we agree. However, for many, the shift to clear text meant "just use common sense" without standard phrases or protocols. The Incident Command System's designers did not envision clear text this way. Sometimes the consequences include undisciplined, inefficient demands on a limited resource and jammed frequencies that block the transfer of critical information; this has enormous fire safety implications. Some field units diligently teach radio use while others expect users to pick it up on their own.

³⁴ USDI National Park Service, Fire Entrapments and Shelter Deployments, Internal memorandum from Jack Morehead - Associate Director, Operations, 1990.

³⁵ An effort should be made to identify any other studies such as this, and review them for lessons learned, to be used in training and as inputs to refining reporting systems.

Incident Base Briefings - People whom we interviewed or surveyed frequently mentioned incident base briefings as examples of poor communication and information flow. Too often large groups jam into inadequate spaces for a briefing with, at best, a poor sound system., and try to listen over the noise of generators and other distractions. Frequently, only the participants nearest the front can see or hear the person presenting information. The limited time rarely permits an opportunity for questions or interaction (briefings are held just prior to resources reporting to their transportation or tactical operational period) and most information is "delivered" without clarification or opportunities to confirm understanding. The NPS entrapment analysis found that Incident Action Plans (IAP) were often outdated by the time they reached the line and sometimes contained incorrect information. Briefings are intended as the vehicle for transferring critically important strategic, tactical, safety, and other operational information to people who will be on the fireline and in harm's way for the next 12 hours. Of course situations may change after a briefing and situational awareness needs to be maintained throughout an operational period. But still, the briefings, appear to be woefully inadequate to achieve their goal in too many cases.

Comprehensive Communication Strategy - Resolving the agencies' communication issues will require a comprehensive approach that includes improvements in communication "soft skills"; establishment of sanctioned communication processes, procedures, and protocols; radio system capacity improvements; adequate distribution of radios; and diligent accountability for change. Evidence shows that organizations employing skills and protocols such as those outlined below achieve "organizational resiliency" in emergencies through clear and fail-safe communication.

Goal 19. One-way communication should be replaced by two-way dialog. People at Each level of the fire hierarchy should be comfortable with requesting clarification of Information, or requesting additional information. There should be no stigma attached to requesting clarification; it should be considered professional to do so.

Implementation Strategy 1 - Start training in interpersonal communications with the very first firefighting training, and expand the training to include the new concepts presented here.

Place communications training early in the fire training curricula and make it requisite (mandatory) for qualification in all five ICS functions (Command, Operations, Planning, Logistics, and Finance.) The newly released S-20 1 (Supervisory Concepts and

Techniques) and 5-301 (Leadership and Organizational Development) courses include well-developed communications units that provide excellent foundations.

However, communications training should first be established at the firefighter or advanced firefighter level, and then comprehensively and consistently developed throughout the curricula. The two-pronged change to introductory training is 1) showing that, bottom-line, everyone is responsible for his or her own safety, and 2) that a few communications elements are essential to achieving that goal. Communications training modules (including 5-201 and 5-301) should achieve the following objectives through instruction reinforced by application exercises:

- Foster a climate of interaction and interdependence (teamwork approach). among all people interacting in fire operations
- Teach people to communicate interactively and respectfully (two-way communications and respectful interaction)
- Legitimize and encourage querying
- Teach people to communicate assertively (versus the extremes of passivity and aggressiveness)
- Teach people the skills of querying, formally acknowledging, and providing feedback.

Interpersonal communications training modules preferably should be conducted by professionals in the fields of organizational behavior, communications, or human relations, or by fire professionals with extensive background and preparation in these areas. (Most fire professionals are trained in command and control communications techniques, but may not be the best ones to select as change agents in communications.) This implementation strategy should be carried out in concert with the CRM strategies discussed in Chapter 6 of this report and the following strategies below.

Communications skills, developed early in the curriculum, should be consistently reinforced and applied in operational contexts throughout the curricula. Tactical and functional training "Should exercise the communications objectives listed above and achieve the following objectives through instruction and by application exercises:

- What the operational roles and responsibilities are regarding communication

- What techniques work well to keep communication flowing in that environment and for that operation
- What common problems or communication barriers can be expected
- What devices and techniques can effectively mitigate these problems or barriers

Implementation Strategy 2 - Require formal acknowledgments, especially in radio communication.

At present, much communication is one-way (sender to receiver) with little or no indication whether the communication was received or how it was understood. Formal acknowledgment is not common in everyday communication, and people expect ambiguity to resolve itself. The agencies must require acknowledgment of all radio and many verbal communications. One of three levels of acknowledgment should be required for every message:

Level 1 - Simple acknowledgment when receiving routine information. For example:

Sender: "Meals are being dropped off at Drop Point 2."

Receiver: "Copy" (or "Copy, Drop Point 2.")

In person, one simply observes whether the person "got it."

Level 2: Acknowledgment and feedback of a kernel of key information. For example:

Sender: "Take your crew to the helispot."

Receiver: "Copy, crew to helispot."

Or

Sender: "Construct line on the east flank from the creek to the division break."

Receiver: "Copy, dig from creek to the division break."

Or

Sender: "Relief crew coming at 0500."

Receiver: "Copy, relief at 0500."

Level 3: Acknowledgment of more complex instruction. This also provides a vehicle for a possible dialogue on its interpretation, or an opportunity to ask for clarification. Here, the receiver may repeat the

direction on where to go and what to do, and discuss what is expected if that is not clear. For example:

Sender: "Dry cold front passing through the fire area in about two hours. Be prepared to pull out in one hour."

Receiver: "Front in two hours. Possible pullout in one hour. Is road 4355 still our escape route?"

Or

Sender: "Extra three crews you requested not available today."

Receiver: "Extra crews unavailable. Probably can't hold additional line. Any change in plans," or do we keep digging?"

The sender (including dispatchers and Incident Management Team members) must have the obligation not to sign-off until acknowledgment is received, and the sender believes the receiver is "getting it." This may require probing: "Did you copy?" or "Please acknowledge." If the sender thinks the receiver is unclear about what the sender considers a vital piece of information, for example a critical time or piece of weather information, the sender must continue the initiative until satisfied that the receiver understood the message and its possible implication. The agencies will need to train and encourage dispatchers and others to sense a lack of understanding or a balkiness to comply with an instruction. All personnel, including dispatchers, Incident Management Teams, and other supervisors must acknowledge messages as part of a communications standard operating procedure (SOP).

The receivers must be taught that they have responsibility to acknowledge messages, and to query if they did not understand what was sent. Failure to acknowledge should be considered not getting through, especially for critical pieces of information relevant to safety. No response would be taken to mean a negative reply (failure to receive or "understand the message").

When non-routine messages are broadcast to more than one receiver, acknowledgments should be made by the units either in some prescribed order, or polled by the sender ("Crew A"- "Understand"; "Crew B" - "Copied," Crew C, etc.) This should also be part of communications SOP.

Implementation Strategy 3 - Legitimize and encourage the asking of questions.

Many firefighters are reluctant to ask their supervisor about the wisdom of a course of action or an unnoticed danger. People fear that the boss might think a question is challenging their authority. The culture must change to establish the legitimacy of asking questions about safety. The agencies can increase comfort with this concept in several ways:

- Publish examples of queries that led to a positive change in action (for example, a crew member pointed out a hazard, the need for a second escape route, a better safety zone, or suggested posting a lookout).
- Get the new supervisor of an existing unit (crew or team), or the supervisor of a newly formed unit to say something like the following at their first meeting: "You don't know me and may be concerned about speaking up if you see a problem, but don't hesitate to do so. When you get to know me better you'll see I appreciate it." Do not say "nobody should be afraid to speak up." Speak to the situation of newness rather than "commanding" speaking up. Likewise, when a new person or people join an existing group, say something like "Because we have some people who haven't been with us long, they may feel hesitant to speak up. When you get to know me better, you'll see its okay." Make people comfortable to raise safety issues and share observations to keep the unit safe.
- Promote crew cohesion and stability. (People who are familiar with each other are more likely to feel comfortable to speak up, and to care about each other. More on how to do this later.)
- "Respectful interaction" should be promoted as the way in which queries and responses to queries are made.
- Supervisors should be ready to explain why a potential problem pointed out to them is not really a problem or has been superseded by another concern, where appropriate.

Implementation Strategy 4 - Use multiple means to convey the cultural change.

Communicating the change in culture needs to be done on many fronts in parallel, and repeated until the culture changes. Communicating a change about communicating gets a little tricky, but in this case the medium can literally be part of the message.

We have already mentioned using training to encourage dialogue (Strategy 1). Additional methods for communicating cultural change are as follows: Issue a directive or notice describing the desired changes, and change SOPs (see Strategy 5). Have Dispatchers and IMT members lead by example (after receiving training on the new communications approach themselves). Provide video and audiotape examples of real or simulated communications feedback (good and bad) for use in training, including refresher training. Tell funny, irreverent stories about lousy communications to reinforce learning points.³⁶ Use stories and case studies that examine problems, near misses, injuries, and entrapments caused by communication screw-ups.

Include interesting stories in internal newsletters, broadcast e-mail, and/or an employee magazine (like the air safety reporting newsletters "CallBack," "Safety Line," and "Flightfax"). A "quips and comments" or "overheard" column is likely to be widely read and is a good place to give examples that show the system listens and gives feedback on safety issues.

Implementation Strategy 5 - Establish communications protocols for tactical operations.

The agencies should establish communication protocols or standard operating procedures (SOPs) that explain the roles and responsibilities for communication tasks associated with various tactical operations. For example, there are specific communication requirements associated with a retardant drop. The pilot must make certain contacts and provide and receive certain information at specific times. The firefighter on the ground has responsibilities to communicate specific information either to the air tanker or lead plane at specific times. Who is responsible for what communication tasks should be deliberately taught in tactical and functional courses rather than as

³⁶ The British actor John Cleese (of Monty Python's Flying Circus fame) produced an excellent series of hilarious management training tapes. Cleese's approach uses the right tone, and provides an effective example.

communications training. Tactical communications should be treated like safety training: it should be part of each course, not a separate course.

Implementation Strategy 6 - Use CRM-like training.

Use a CRM-like approach in training people to function in the operational environment using the essential assertiveness and communication skills and the established communication protocols. Communications skills, developed early in the curriculum, should be consistently reinforced and applied in operational contexts throughout the curricula. All tactical or functional training should exercise the communications objectives listed above and achieve the following objectives through instruction reinforced by application exercises:

- What the operational roles and responsibilities are regarding communication
- What techniques work well to keep communication flowing in that environment and for that operation
- What common problems or communication barriers can be expected
- What devices and techniques can effectively mitigate these problems or barriers

Implementation Strategy 7 - Change the dialogue on the fireline through OJT and examples provided by supervision.

It may be hard to expeditiously reach the many people in the fire program who will not have had training that reflects the new communications concepts. To speed up the culture change, supervisors and dispatchers who are clued in to the change need to provide informal OJT and also to set an example. In other words, use lots of occasions to make incremental changes.

Supervisory performance on and off the fireline is a key to this important cultural change. The agencies must provide supervisors and fireline Incident Management Team members with clear expectations regarding their responsibility to make open, interactive and respectful communications a reality.

Implementation Strategy 8 - Provide instruction on use of radios and radio discipline.

Many fatality and entrapment reports raise questions about the adequacy of communication channels. The recommended changes in communications described above

will add a considerable load to the existing communication channel usage. Close tabs need to be kept on whether the recommended feedback is wisely used, and good radio discipline is maintained.

The agencies should train people to use the radio effectively and- efficiently to communicate. Radio use training should be added to the existing curriculum. Logical locations in the curriculum include S-131 (Advanced Firefighter Training), S-200 (Initial Attack Incident Commander), and other mandatory courses that span the ICS functional areas (Command, Operations, Planning, Logistics and Finance). At a minimum, this training should cover radio discipline, message priorities, the duty cycle, standard phrases and protocols (already developed in ICS), formal acknowledgment, and the importance of closing the communication loop and links to CRM. This strategy should be implemented in concert with Goal 14, Goal 23, Goal 24, and the strategies listed above. These radio communication training objectives should be reinforced in simulated exercises throughout the training curricula (see Goal 14).

Goal 20. Information needed for safe operations and warnings should be transmitted Up, down, and laterally within the organization at an incident (with positive feedback That the information is received and understood, as discussed in Goal 19.

In addition to clarifying information and having a dialogue, as discussed in Goal 19, it is necessary to make sure that key information affecting safety is communicated at the right times. People forget to mention certain things in briefings. Dispatchers and others sometimes forget to convey key information.

Implementation Strategy 1 - Improve the quality of briefings at incidents.

About one-third of the interviewees and respondents in Phase I felt that the quality of briefings (and planning meetings) they attended left something to be desired. Comments ranged from briefings with too little opportunity or encouragement for questions and discussion by Crew Supervisors, to briefings held in noisy, disruptive environments. Some Crew Supervisors said they often were either not allowed to speak, or were uncomfortable about raising questions about strategy during these meetings.³⁷ That meant they had less of a chance to clarify the instructions, and less chance to raise

³⁷ One senior fire manager who has been to hundreds of briefings said he never observed these conditions. Another saw many examples.

problems for consideration based on their knowledge of the terrain. Both can lead to safety problems.

There also was concern among Crew Supervisors and others that those coming off duty at the end of an operational period often did not even see, let alone help brief, those coming on duty. The briefing for the next period usually must take place before the previous one ends. (However, the debriefings are supposed to take place with planning staff: and any significant information is supposed to be passed on to the next operational period.)

Briefing guidelines already exist and are used by Incident Management Teams Division Supervisors, Agency Administrators and their staffs, but the guides need to be revised, and the practices they suggest need to be followed. A revised joint protocol for briefing resources assigned to incidents managed by Incident Management Teams should be adopted and carried out under the auspices of the NWCG. The intention is that improved standard briefing practices become an expectation and a reality. The agencies should implement the following revisions:

- The most basic requirement is to make sure people being briefed can hear, whatever the size of the briefing. That should go without saying, but we heard it mentioned too often not to think it is a widespread problem. Provide an adequate sound system for large briefing locations and require briefers to use it. Maintain audience discipline. (Several interviewers noted how quiet and easy it was to hear briefings by military units at fires.)
- Provide adequate space at the briefing location. Participants should be seated! and have a clear view of the briefer. It is preferable for all people down to Crew Supervisor to hear the same briefing. Often there is no time to split the group and repeat the briefing twice it would be preferable to find a good spot, and use a bullhorn if necessary. However, on occasion, it may be necessary to conduct separate concurrent briefings, perhaps dividing the group by divisions or functions. Smaller groups encourage interaction. On large fires, it already is supposed to work this way, with each division/group supervisor briefing his or her subordinates.
- Provide an adequate number of Incident Action Plans (IAP) to assure that they are widely distributed to all fireline supervisors, their assistants and single

resources. Make sure the IAP is of good quality and exact enough. Division assignments are particularly important to focus on.³⁸

- Allow time and opportunities for interaction, questions, clarification, and feedback.

Implementation of this strategy will require that the agencies reevaluate their approach to the scheduling and conduct of incident briefings. Following this evaluation they should incorporate the new briefing guidelines into all appropriate training materials and the Fireline Handbook when they are completed. (Goal 15 also addressed briefing of "out-of-area" resources to familiarize them with a new environment.)

Implementation Strategy 2 - Develop and use checklists for transmission of information.

Checklists are simply a way to make sure you do not forget to pass on critical information. Most checklists should be considered a memory aid, and not necessarily a list you go through every time.

There is some disagreement on how well checklists are used today. Checklists and protocols should be established where not available for the types of information and the timing of that information that must be sent to various levels, most especially crews. The checklists should be incorporated into training, and provided in convenient, waterproof format to the positions needing them.

Checklists are needed for

- Size-up
- Briefing of Crew Supervisors and others during incidents
- Briefings of crews enroute and/or upon arrival
- Updates and briefings of crews during an incident
- Information exchange between operational periods (singled out as the worst information flow problem)

³⁸ We understand that one of the problems identified at the multi-fatality Dude fire in 1990 was that a division supervisor was not aware that the two crews who later took the casualties were assigned to his division.

- Dispatchers operational period change
- And possibly others

Some checklists already exist. The Forest Service response to the OSHA report on the South Canyon 14-fatality fire provided a seven item checklist for briefing personnel assigned to fires, as part of the proposed risk abatement plan. All checklists should be reviewed for clarity and completeness and whether there are unnecessary or not useful elements in them. The types of information that must be communicated with high reliability to ensure safety include the items in the following composite list:

- Weather
- Predicted fire behavior
- Fuel condition
- Special hazards or situations
- Overall strategy
- Tactics to implement the strategy
- Who is in charge
- Escape routes and safety zones
- Specific assignment and objectives for the operational period
- When requested resources will be available (or when they will be diverted)
- Where nearby crews are operating (e.g., whether two crews or other units are operating one above another on a slope)

This information may be obvious and already explicit in much of firefighter training, but it is not to be taken for granted that it is communicated to whom it should be, when it should be.

Some of this information is needed only one time for a particular incident (e.g., fuel type and condition); other information requires updates (e.g., weather, predicted fire behavior).

Policy needs to be set on whether crews should be given the training or assumed to have the ability to interpret the raw weather information or weather digests, or whether

advisories should be transmitted with instructions as to their implications and what to do. It is the difference between saying that: a) winds are expected to pick up to 35 mph, leaving it to the crew to interpret; or b) that winds are expected to pick up to 35 mph and in 30 minutes you may have to retreat from your section of the line. How much more burden do we want to put on Crew Supervisors?

The checklists suggested above might be used by two people together, either in person or at each end of a radio line. For example, the size-up of a fire might be conducted in a way similar to a cockpit check by a pilot in dialog with the co-pilot, using a written checklist of the items to be covered and two people confirming that they all have been covered.

As discussed earlier, people should be obliged to request clarification if they did not understand. It should be an obligation of Crew Supervisors to make sure they have received all the types of information they are supposed to be sent. It should be the obligation of the division supervisor or IMT to make sure that the information is sent and that people are receiving and processing the information they need from above and below.

Dispatchers

Dispatchers are gatekeepers of essential information, and as such, play a critically important role in the flow of information. Dispatchers make key decisions on resource allocation and deployment, keep Incident Commanders and Incident Management Teams informed of resource availability, and play a crucial role in situational awareness. The "accuracy of information gathered by dispatchers influences their decision-making and the information they relay. The timeliness of the information affects the decisions of others. Initial attack dispatchers have the greatest influence over the safety of firefighters. Many people in the wildland fire business agree that dispatchers are generally underutilized as agents to improve safety.

Some dispatchers have no fire experience yet are called on to make important judgments and decisions. Some dispatchers were said to make decisions on resource allocations or other matters without being called on to do so. In other cases, firefighters who have been injured or have retired from field fire duty take dispatcher assignments but know little about dispatching.

Dispatchers also play a key role in fostering and facilitating "respectful interaction," and will play a key role in changing the communication processes and culture of the fire community. Dispatchers will be given primary responsibility for ensuring that people use the radio to communicate effectively and efficiently as the agencies move to bring discipline to their radio communications. The above considerations lead to the following goal:

Goal 21. Dispatchers are key nodes in the communication system and must be well-Trained, well-informed during the incident, and must not exceed their authority.

Implementation Strategy 1 - Train dispatchers in the new approach to communications dialogue and in their role as change agents.

Dispatchers will be key players in changing the nature of communications. Their classroom and OJT training needs to incorporate the new communication practices discussed above under Goal IS immediately. The dispatchers also need to help monitor communications and foster the changes by example and by direct advice and enforcement.

Implementation Strategy 2 - Improve recruiting and initial training of dispatchers.

Recruit experienced firefighters into initial and extended attack dispatching positions, and give them appropriate formal and on-the-job training in dispatching.

As part of revising dispatching procedures and training materials, study the dispatcher roles and methods in dispatching fire departments and emergency medical services (EMS), and adapt the strengths of those systems into the wildland fire dispatching scheme as appropriate.

Equipment and Personal Protective Gear

As a principle, all wildland firefighters and fire managers should be provided the equipment they need to do the fire job safely. Over time, affordable new technology should be considered for improving firefighter safety.

Most Federal wildland firefighters have satisfactory equipment, but there are some problem areas that affect safety, despite existing rules mandating the use of personal protective equipment (PPE) and ready access to that equipment.

Radio Equipment - Maintaining radio contact is critical to firefighter safety. Real-time communications with every crew and squad on the fireline must be assured. Contemporary firefighting strategies assume that firefighters have radios. However, limited numbers of radios, inadequate distribution of radios, and overloaded communication frequencies have all contributed to communication problems on some large fires under the control of Incident Management Teams. Many investigations of wildland firefighter fatalities have found problems in radio communication as a contributing factor. Some federal crews have been on the fireline with no radios for squad-to-squad communications, and sometimes with no radios at all. This problem is even more common with contracted fire engines, water tenders, and heavy equipment.

Agencies are finding that communication problems are exacerbated during interagency or intergovernmental operations. Firefighters from state agencies and local government, including volunteer and city firefighters, contribute to Federal firefighting efforts far more often today than they did just 10 years ago, and the trend is for that dependency to increase. It is essential that state, local, and Federal firefighters establish reliable, mutual communications to assure safe and efficient operations. As with many of the problem areas addressed in this report, this is a question of implementation - the policy exists.

Unfortunately, non-Federal firefighters frequently report to fire assignments lacking radios that are compatible with Federal agency systems, or with no radios at all. A review of the National Fire Equipment System (NFES) Fire Supplies and Equipment Catalog reveals an impressive array of communications equipment. The cache system can provide Command/Tactical and Logistics Radio Kits; Logistics, Command, and Backbone Repeater Kits; UHF, Military Low Band Link Kits; Satellite Systems; Electronic Key Service Phone Kits; Cellular Phone Kits; Radio Telephone Interconnects (RTI) Link Kits; and several aviation communication systems. The fire logistics system appears to have kept pace with developments in communication technology quite well, and the agencies have access to technologies that should address most of the communication problems reported from the field.

Furthermore, the fire logistics system possesses enough radios and other communications equipment overall to support the number of end users in total, and to adequately support national fire operations. In 1996 field staffing peaked at 24,000. Not

including local radio capacity, the national cache system contains 6,000 handheld radios, enough for one out every four of those persons to have been equipped with a radio if those radios were properly distributed. Since those 24,000 people included many individual firefighters, laborers, administrative positions, etc., the numbers of radios should have been more than adequate. However, reports from the field indicate that at least some Incident Management Teams still found radios in short supply and communication systems inadequate. Distribution and allocation problems appear to be contributing to this situation more than the total supply of radios.

Increasing radio communications may, in some cases, prove detrimental to firefighter safety rather than a benefit. By many accounts, firefighters are overusing the features of new generation radios, frequently scanning too many frequencies, receiving information they do not need and missing information they do. In addition, though firefighters cite a lack of frequencies as hampering fireline communications, it is likely that a lack of radio communication discipline may be contributing significantly to jammed channels.

Radio communications on initial and extended attack operations are even more - problematic, as fire operations in the urban-wildland interface and interagency (including intergovernmental) operations have become much more common.³⁹ Frequently, multiple agencies respond simultaneously to incidents in their initial stages or as they extend. The responders often include local fire departments, law enforcement officers, emergency medical services, state natural resource agencies, disaster relief agencies, and others. This is particularly true in wildland-urban interface zones.

Fire operations can be very chaotic during initial attack and transition phases. Quite often, fire conditions are at their worst while organization is at its minimum. Experts interviewed during this study recognize initial and extended attack as the riskiest of fire operation environments. The absence of radio system compatibility frequently hampers communication and unified effort in these situations, intensifying the risks.

Other Equipment of non-Federal firefighters - Federal natural resource agencies are dependent, like never before, on state agency partners, local government firefighters,

³⁹ The term "interagency" as used means "between Federal agencies" and also "between Federal, state, and local agencies."

emergency hire (AD) employees, contractors, and the military to carry out their fire suppression mission. A major reason for the dependency is that agency workforces are shrinking and their nature changing. Downsizing and budget cuts have reduced overall resources, and fewer agency employees participate in fire management activities. For example, as of 1995, only half (52 percent) of the permanent, full-time and temporary employees in the U.S. Forest Service were "Red Carded." This is a break from the past when fire was recognized as virtually everyone's duty ⁴⁰

During Phase I, we also uncovered many significant concerns about the lack of adequate equipment and personal protective gear of non-Federal firefighters who assist in Federal firefighting, as summarized below.

State Firefighters - Although many states run wildland firefighting operations using practices similar if not identical to Federal firefighters, there were many concerns expressed by Federal firefighters about the adequacy of equipment and protective clothing for state firefighters. About one-quarter of Federal firefighters surveyed felt that in their personal experience there often were equipment problems among state crews. The largest numbers expressing concern were in the following regions: the Southwest (52 percent), the West Great Basin (42), Northwest (39), Southeast (38), East Great Basin (37).

Local Volunteer Firefighters - Of even more concern than state firefighters were local firefighters. Over half of the Federal firefighters surveyed (57 percent) said that local volunteer personnel often did not have adequate equipment or protective clothing. There are wide extremes in the equipment of volunteer firefighters. Some are very well equipped, while others struggle to equip themselves for essential functions in their protection district.

More Southwest area respondents (78 percent) reported local volunteer personnel as not being adequately equipped than any other area. Other geographic areas where 60 percent or more of the survey respondents felt volunteers often lacked adequate wildland equipment or training were: Rocky Mountain, Great Basin, and Eastern Area. The areas with the lowest level of concern over volunteers equipment was the Northwest

⁴⁰ USDA Forest Service Fire and Aviation Management Course to the Future - Positioning Fire and Aviation Management, 1995.

and the South Zone of California, but even there about a third of respondents said lack of equipment was often a problem.

Private Contractors - Agencies used to use contractors primarily to provide specialized equipment including bulldozers and water tenders, or special services like catering or tree falling. However, as Federal arid state agencies reduce their resources and fewer full-time and seasonal personnel are on the payroll, the agencies increasingly turn to contractors to fill gaps. Some firefighters interviewed said that occasionally there are unqualified operators coming along with some of the contracted equipment and some of the contracted equipment is of poor quality. Both can be dangerous. The majority of respondents felt it was only occasionally a problem. The strongest response came from BIA respondents, of whom over one-third thought this was often a problem. The above findings led to Goals 22 through 26.

Goal 22. All firefighters (on Federal fires) must be equipped with the personal Protective equipment needed for their job (and the training to use it.

Implementation Strategy 1 - Broadcast and enforce a minimum standard for radios and personal protective equipment (PPE).

Individual firefighters, crews, fireline Incident Management Team, equipment operators, contractors, and support personnel should not be allowed to report to fireline assignments without meeting minimum PPE and communications equipment standards. This equipment can be assessed upon check-in (if not sooner). Resources found lacking should be required to stand down until they can be equipped. Anyone caught unequipped should be removed from the fireline. That these actions will be taken should be communicated to the entire non-Federal firefighting establishment, during the year, and again to particular units at the time assistance is requested.

Implementation Strategy 2 - Prepare for equipping non-Federal firefighters at incidents.

The agency and interagency logistical support systems must adapt to the changes and trends occurring in fire operations. Specifically, regional fire caches and logistics section chiefs must be prepared to augment non-Federal resources with PPE and radio communications equipment at fire locations, especially in the geographic areas known to have the worst problems. A system must be in place to supplement or equip non-Federal

firefighters prior to mobilization or as they arrive. To help implement the strategy, the agencies should adopt a universal system for arranging property loans and/or payroll deduction purchases for equipment. Under no circumstances should essential safety equipment be withheld and still expect state, local, or contract firefighters to assist.

Implementation Strategy 3 - Support funding for state and local fire units.

The Federal wildland fire community needs to support increased funding to state and local governments so that they may better equip themselves for the wildland fire mission. Current mechanisms for funding include the Rural Community Fire Program (RCFP) and Federal Excess Personal Property (FEPP) program. The five agencies should work with the states (through NWCG) and the General Services Administration (GSA) to streamline the disposal and acquisition of resources under the FEPP, and seek increased funding to cooperative fire programs, including RCFP, which have been drastically cut in recent years.⁴¹

In addition, especially in areas where dependence on local assistance is greatest, give Federal aid to municipal and volunteer fire departments to improve their preparation, as called for in the Federal Fire Policy Review.

Implementation Strategy 4 - Reinforce policy on carrying shelters.

For years, agency policy has mandated that firefighters carry fire shelters at incidents. The agencies have made extensive fire shelter training available since the early 1980s. Despite those efforts, reports from the field say that some Federal firefighters, including very experienced ones, routinely violate the policy and ignore their training.

The agencies should take affirmative steps, including disciplinary actions, to reinforce the policy that fire shelters are mandatory safety equipment. In addition, they should embark on an education campaign to reinforce several points:

1. That avoiding entrapment is expected of a professional wildland firefighter; a fire shelter is not a substitute for LCES, or the "10 and 18." Use your head and avoid the need to deploy your shelter. A fire shelter is to be used *only* as a

⁴¹ At present, FEPP is administered by the USDA Forest Service alone, but the program can help local fire organizations that work with the DOI agencies as well.

last resort, not as a planned alternative.-' However, like a parachute, if you need one you'll be glad you have one.

2. Fire shelters work (as attested to by many deployment survivors).
3. Fire shelters are mandatory equipment.
4. You need to know how to get into a shelter under adverse conditions (winds, rough terrain).

The British Columbia (Canada) Forest Service employs a training course entitled "Fire Entrapment Avoidance and Shelter Deployment." The emphasis of this course is clearly on entrapment *avoidance first*, and then shelter deployment.

Goal 23. Every crew should have a continuous communications link to incident Management and to nearby crews; this means having at least two radios in good working condition per crew.

In addition to the strategies discussed for Goal 22 above, the following strategies should be undertaken:

Implementation Strategy 1 - Improve distribution of radios, batteries, and other communication equipment.

Due to the expanding participation by non-Federal firefighters, there may be a need to provide more radios, more frequencies, more batteries, and more repeaters/links and to generally enhance communications support. The agencies should reevaluate the interagency radio cache network with the intent of maximizing its adequacy and responsiveness to current and future operational needs.

As noted earlier, the national cache system appears to have an adequate total number of radios to support fire operations nationally. However, the fact remains that firefighters are reporting to the fireline with inadequate communications equipment, and this is a serious matter. Either the distribution of radios needs to be improved or more radios added to caches in the regions that expressed the most serious distribution problems.

Also, regional fire caches should have enough radios so that radios can be "rented" to local government resources, contractors and other contracted resources not meeting communication requirements. "Rental fees" can be deducted from contract payments.

Implementation Strategy 2 - Establish new caches if necessary.

The agencies should identify the most common points from which large numbers of Type II crews are dispatched and establish radio caches at their mobilization points, so that Type II crews have radio capability when dispatched, to the extent possible. The Type II crews were by far those of most concern about being under-equipped. The agencies should consider mass purchases of inexpensive, but effective radios for intra-crew use.

The National Interagency Fire Center (NIFC) is already planning to improve the availability and access to standard command/tactical radios for inter-crew and Incident Management Team use by prepositioning command/tactical radio kits throughout the nation.

Implementation Strategy 3 - Mandate radios for each squad

The agencies should mandate that all crews must have internal communication between its Squad Bosses, Crew Supervisors, and Crew Foremen, and "external" communications between the Crew Supervisor and his or her supervisor and the Incident Dispatcher or Communications Unit. This would require 3-5 "crew communication" radios and one frequency-changeable radio for the Crew Supervisor on a typical 20 person crew.⁴² Preferably, resources should arrive at an incident with at least their intra-crew radios. Recognizing that this is not always possible, shortfalls in crew communications capabilities should be reported to the receiving incident at time of dispatch so that the incident may order radios appropriately.

⁴²The need for 3-5 radios comes from having 2 or 3 squads (and a crew foreman for Hotshots) per crew, each needing a radio, plus one for the Crew Supervisor, in addition to the frequency-changeable radio needed by the Crew Supervisor.

Implementation Strategy 4 - Assure adequacy of radios for mobile resources.

The agencies should mandate that all engines, water tenders and other mobile equipment have a frequency changeable radio in the apparatus when dispatched. Furthermore, engine crews should be equipped with at least one portable radio, either on dispatch or at the incident. Any shortfall in communications capabilities should be reported to the receiving incident at the time of dispatch so that the incident may order radios appropriately.

A great deal of fireline communication occurs over two-way radios. More than one-third of the survey respondents say distorted, cluttered, and jammed radio transmissions occur on most fires, and we believe it to be a serious safety matter. Inadequate radio communications have been cited as a factor contributing to confusion that led to the death of six firefighters on the Dude Fire in 1990.

Goal 24. The communications system used at fires needs to provide adequate Channels, adequate clarity, reliability for communication with all fire Personnel, aircraft, and IMTs.

Implementation Strategy 1 -. Periodically re-evaluate and improve communication channel capacity and reliability.

The agencies currently work with manufacturers, phone companies and other contractors to provide emergency communications capability. The agencies should explore various feasible options for expanding the current system of portable repeaters, cells, radios, and telephones, including joint planning efforts with the states, private entities, and non-traditional partners. Partnerships, including public/private alliances, should be pursued to share the costs of improving access and availability to an adequate network of cached communications equipment.

Implementation Strategy 2 - Move some of the communications load off the radio.

Use of telephone, radio telephone, computer and satellite technologies, and digital data communications can help move some communications off radio frequencies, thereby freeing-up frequencies and duty cycle time for tactical communications. Some would suggest that these technologies, particularly cellular telephones, are a simple and readily

accessible answer to the fire community's communication problems. However, use of these technologies requires planning and protocols. Some considerations:

- The use of portable telephone communication could lead to "free-lance" decisions outside the control of the Incident Management Team (for example, a Division Supervisor could contact his or her home unit via cell phone and order unauthorized additional resources).
- One-to-one telephone conversations are not appropriate for most fireline *tactical* communications, particularly since reliance on cell phones for tactical communications would limit the ability to rapidly disseminate emergency information to many. It is faster to broadcast by radio.
- Many logistical and administrative communications and some routine command communications do lend themselves well to non-radio transmission (for example, when the Operations Section Chief must contact the Division Supervisors to arrange the next day's resource needs).
- Sensitive communications (regarding personal emergency messages, critical incidents, etc.) lend themselves better to telephone (than radio) communication.
- Portable telephone cells, including Cells on Wheels (COW) and Cells on Light Truck (COLT) are available. However, they are not plentiful and are very expensive.
- Centrally located cellular phone kits (in NIFC or other fire caches) present problems with local area codes, local versus long distance calling and therefore costs. (For example, a phone programmed with a local Boise number, could make all calls long distance when used elsewhere.) Recently, Incident Management Teams have been procuring cellular phones locally. However, it is important that the system maintain the ability to provide larger numbers of phones than are locally available in a small town, using phones programmed with local numbers (either from caches or through contractors).

- Satellite phones currently provide the ability to talk by phone from almost any location without the need for cell access. Satellite phones are not currently very "field-user friendly," since many are the size of a laptop computer. However in the next 5 years the Motorola IRIDIUM system, for one, will provide handheld, "smart radios" that will roam between cell and satellite systems.

Accountability for Equipment Maintenance - Tool care and inspection are basic firefighter skills and supervisory responsibilities. However, the importance of these tasks seems to have diminished in the minds of some firefighters, squad bosses, and Crew Supervisors. About 20 percent of the survey respondents mentioned that equipment care was a problem. In the interviews, people raised concerns about equipment that had been inadequately refurbished at a regional fire cache before being dispatched again.

Goal 25. There should be accountability for keeping equipment well maintained.

Implementation strategy 1 - Describe equipment maintenance responsibility in basic courses.

The agencies (through the NWCG Training Working Team) should review the Firefighter, Advanced Firefighter, and Crew Supervisor training materials and Position Task Books to assure that equipment maintenance is adequately addressed in the materials and that it is addressed in the courses.

Implementation Strategy 2 - Review and revise if necessary the qualifications of equipment specialists.

The agencies (through the NWCG Training and IO~ Working Teams) should review the qualification requirements for equipment specialists working in the regional fire caches. Consider making training such as 1-256 (Tool and Equipment Specialist) and 1255 (Equipment Manager) mandatory for fire cache specialists. Employees in supervisory positions at regional fire caches should be required to attend S-201 (Supervisory Concepts and Techniques) and S-301 (Leadership and Organizational Development).

Implementation Strategy 3 - Hold users and cache operators responsible.

As part of the stepped up attention to accountability that is to be a major new thrust of the culture, hold crews responsible for taking care of equipment, and for inspecting it and noting problems. They must also help by properly packing equipment being returned to caches, and must do so carefully, with the realization that the safety of other firefighters who will use the equipment again depends on them. Likewise, those at caches must be held accountable for inspecting and refurbishing equipment before sending it out again.

Aerial Reconnaissance to Improve Situational Awareness - Better awareness of the progress of a fire, where crews are located relative to the fire, locations of houses and infrastructure being threatened, and potential escape routes and safety areas can all clearly affect safety. Situational awareness will be discussed more in the next chapter; the hardware part of the problem is introduced here, to keep discussion of all equipment needs together.

The agencies have appropriately applied a wide variety of aerial surveillance and reconnaissance methods, including, aerial observation from fixed wing aircraft and helicopters, aerial photography, infrared (IR) sensing and imagery, Forward Looking Infrared Radar (FLIR), and the Global Positioning System (GPS). Representatives of the fireline Incident Management Team routinely observe fire conditions and operations from the air. It is not uncommon for the Operations Section Chief to "recon" a fire by helicopter two or three times per day.

However, there is still a sense that overall situational awareness and decision-making could be improved by further enhancing the "global" view that strategists and tacticians have of a fire. Of particular value would be aerial imagery providing "real time" information to fire managers. Increasing aerial imaging also carries the possibility of cultural consequences from Incident Management Team literally looking over firefighters' shoulders. Some firefighters are already distrustful of the management and IMTs. Many complain that tactical supervisors and Safety Officers spend too little time on the fireline and too much time at the incident base. Ultimately, the agencies need to try to gain the benefit of aerial imagery as a planning and briefing tool without creating the "rear echelon" culture despised by soldiers in Vietnam; that is, sitting back at the incident base and

making decisions placing firefighters in danger without walking the line and seeing the circumstances firsthand. The Incident Management Team still needs to leave the base and keep in tune with the line. ⁴³

Goal 26. Situational awareness should be improved by improving the ability of Crew Supervisors, Incident Management Teams, Incident Commanders and above to obtain Overhead views of the fire, including data from infrared and possibly other sensors.

Each of the strategies outlined below also present opportunities for getting better information to improve the quality of fireline briefings, and should be implemented in concert with the strategies, of Goal 20.

Implementation Strategy 1 - Use satellite imagery.

Low earth orbit satellite imagery is now available for civilian use.' Satellite imagery can be used by the Planning Section to more accurately evaluate the fire situation in real time or otherwise, and as a powerful briefing tool. The Incident Commander, along with the Operations and Planning Sections, could use the imagery to plan overall strategy. The Logistics Section could use the information to plan safe and efficient transportation routes and drop points. This all is done sometimes, but not nearly enough.

Implementation Strategy 2 - Use real time air-to-ground and ground-to-air-to-ground video.

The agencies should explore options for "real time video" observation that transmits images back to the Incident Command Post. This could enable all Incident Management Team members to observe fireline conditions, and improve their situational awareness without exposure to the risks associated with helicopter flight. It also would improve their ability to keep track of the location and status of their personnel. ⁴⁴ Video cameras might be mounted on helicopters carrying minimal flight crew or only those personnel essential to the reconnaissance flight.

⁴³ Another solution to consider, besides providing better imagery, was proposed by a member of the FFAST Team: assign three operations section chiefs to an IMT; one would do strategic planning and the other two work 12-hour shifts to maintain a current, in-the-field, big picture view of tactical activities. ⁴⁴ Losing track of the location of crews and who is assigned to supervise them has been a contributing factor to some multi-fatality fires, e.g., the 1990 Dude Fire.

Likewise, there are now relatively low-cost ground-to-air and ground-to-air-to-ground technology for transmitting images. Cameras mounted near a fire front could show those higher up the chain (and the media and political leaders) what is being faced.⁴⁵

Implementation Strategy 3 - Use aerial drones.

The U.S. Army employs drones, now called unmanned aerial vehicles (*UAV*), for low risk battlefield reconnaissance. One military model is essentially a 23-foot model airplane carrying television and night-penetrating thermal imaging cameras. UAVs of this type represent a potentially outstanding technological opportunity for wildland fire managers. The agencies should pursue application of this technology; there are already UAVs available on the market.

Transportation

Effective wildland fire management hinges on the ability to quickly and effectively move people and material, sometimes in great quantity. Firefighters and their support resources must travel to fire locations that are often in remote areas quickly and in a condition that allows them to deploy and go to work immediately. Once on site, firefighters, their supervisors and their equipment must be moved back and forth to fireline assignments, typically over rugged and often inaccessible terrain. Often, hundreds of people and tons of supplies and equipment are moved each day by helicopter. Once the fire is extinguished, the transportation process begins anew as firefighters, support staff, and their accumulated support equipment rapidly demobilize.

The United States wildland fire community currently depends upon a doctrine of total mobility. Federal agencies mobilize fire control resources from throughout the nation to respond to large fires and critical situations. It is quite common for firefighters to take assignments in several states during one fire season. During active fire seasons, thousands of firefighters are moved throughout the country. It is not unusual to have 10,000 to 15,000 firefighters afield simultaneously.

⁴⁵ The concept has been proven. One example with which we are familiar is the TacLink system developed by System Planning Corporation (our parent company) for sending imagery to and from helicopters/ aircraft and the ground. There are probably others.

The shrinking pool of Federal employees available to fight fire makes it all the more important to quickly assemble and transport firefighters. Effective transportation during mobilization efforts also reduces fatigue.

Fire mobilization employs commercial airliners and other transport aircraft large and small, and long distance highway travel in commercial, contracted, and agency vehicles. All have their associated risks, however, few firefighters have expressed concern with the safety of this type of transportation. On the other hand, there is much concern over fatigue as a major safety factor and the potential to reduce it using better transportation (as will be further discussed in Chapter 5 on Human Factors).

Transportation at the fire site is more problematic. Once they arrive at a fire, firefighters are transported to their assignments by riding in trucks, buses, and helicopters; parachuting from planes; rappelling from helicopters; or trudging long distances on foot. Air transportation (mostly helicopter operations) received high marks and few complaints. Ground transportation was another matter. In the past, the National Guard or Army Reserve commonly transported fire crews to fireline assignments in fire personnel transports and other large military vehicles (even dump trucks). However, this mode of transportation was largely abandoned following high profile accidents in which firefighters were killed when these open trucks rolled-over. Since then, school busses have provided most localized transportation services.

Unfortunately, nearly three quarters of the survey respondents in this study cited the inexperience of bus drivers as a safety problem and one third thought it was a major safety problem. Numerous firefighters complained about the safety of school busses driven along logging or fire roads by inexperienced drivers. An experienced Crew Supervisor said the bus trip to the fire was usually scarier than the fire itself

In addition, people have questioned whether school buses represent the most appropriate mode of fireline transportation. They require good roads and large spaces to turn around. Frequently, busses can only get to pickup and drop off points that still leave firefighters long distances to walk before or after arduous fireline construction operational periods. Also, school bus availability becomes a problem when fire activity reaches its peak after schools return to session in the fall, which seems to have become more common.

Whether considering long-distance or local transit, transportation planners and managers walk a fine line, managing trade-offs between cost, safety, and fatigue. Helicopter transportation alleviates firefighters from long walk-ins, but raises costs and exposes large numbers of people to the risks of helicopter flight. However, rested firefighters are not only safer, but more effective. The ideal is to have a safe transportation system that minimizes fatigue and is cost-effective, which leads to the following goals.

Goal 27. Crews teams, and individuals should be transported where needed with attention to net risk reduction and with consideration of reducing fatigue.

Implementation Strategy 1 - Give more weight to risk reduction, especially reduction of fatigue.

The agencies should revise their approach to mobilization, demobilization, and fireline transport, mandating that firefighters will be transported by the safest, quickest and most effective mode of transportation, not necessarily the least expensive. The relationship between fatigue and safety is not always thought about when planning transportation.

Implementation Strategy 2 - Explore use of safer ground transportation.

In the past, the agencies explored options for installing crew compartments and/or roll-over protections systems (ROPS) in transport vehicles. The agencies should re-institute these or other efforts to find a cost-effective means of providing safer crew transport in vehicles. Crew personnel should be seated and belted in. The intent is not necessarily to replace bus transportation, but to supplement it at least in the most dangerous terrain. Ultimately, Incident Management Teams would draw from both modes, using each where appropriate.

Implementation Strategy 3 - Use computerized transportation scheduling.

The agencies should use computerized scheduling tools to plan and schedule mobilization, demobilization and tactical transportation. The intent is to match passengers to available transportation resources, move passengers as quickly and efficiently as possible, and minimize fatiguing and unproductive "down time." Necessary transportation down time should be used productively to provide "tailgate" training sessions, safety

meetings and enhanced briefings, which will be productive and will also reduce the perception of wasted time.

Goal 28. All transportation drivers should have adequate experience and training.

Implementation Strategy 1 - Increase requirements and realism for training of bus drivers and other drivers.

If not already experienced and in possession of a successful fireline performance evaluation, passenger-carrying transportation drivers should be trained for fireline conditions before beginning service. As part of the training, drivers must be oriented to the conditions under which they will be operating: unpaved, narrow roads; smoke/poor visibility; tight turnarounds; congested loading and unloading; fatigue; etc.

In addition, drivers must receive formal training that orients them to their relationship to fireline Incident Management Team, their role in the operation, and their impact on firefighters. Drivers must also receive training on appropriate fireline survival skills, including fire shelter use and recognizing danger or situational awareness. This training must be effective, but brief, possibly no longer than two hours of formal training. Drivers should be trained at the point of hire, and trained drivers provided to the incident whenever possible, though some training may have to happen at the incident (orientation to conditions and "check rides," for example).⁴⁶

The above conditions can be made part of the transportation contract (if the service is not provided in-house.) The agencies might contract out the development of the training, too, so that the NIFC Division of Training can focus on larger, more complex training needs associated with the goals of this study.

Implementation Strategy 2 -Hold drivers accountable.

Reckless driving, falling asleep at the wheel, DWI, and other potentially life-threatening actions should be dealt with swiftly and severely. Drivers who cause injuries through their negligence should be prosecuted.

⁴⁶ A "check ride" is aviation talk for a flight in which a pilot demonstrates his or her capability to a ridealong observer.

Medical Evacuation - A specialized form of transportation of great importance to firefighters is medical evacuation of the injured. Injured firefighters are often under mental stress in addition to their physical injuries, and deserve rapid evacuation and transport to medical facilities. Some firefighters who were interviewed one-on-one raised issues regarding timely medical evacuation. However, very few survey respondents reported problems with the prompt rescue of injured firefighters. A few of the complaints dealt with situations where progress in receiving medical care was slowed by the need to complete paperwork. Only a few people raised this paperwork issue, and it was not for major injuries. Some experienced observers reported that medical evacuation procedures were not clear under the agencies' application of the Incident Command System; there can be confusion about who is in charge when a firefighter is injured.

Goal 29. Injured firefighters should be speedily rescued.

Implementation Strategy 1 - Appoint a task group to review evacuation procedures and the associated paperwork, and consider a model evacuation plan.

The agencies (through the auspices of the NWCG) should appoint a special task group to examine the procedures used by Incident Management Teams to evacuate, transport, obtain medical attention, and process necessary paperwork when a firefighter is injured. As part of their charge, the task group should examine agency and interagency administrative and paperwork requirements, and make recommendations to streamline processing and ensure that it does not delay evacuation or treatment of the injured.

Reports from the field suggest that protocols and performance vary widely, with some Incident Management Teams implementing very effective accident action plans while others have delayed prompt medical evacuation of injured firefighters.

The task group may consider the following model, which was developed and successfully used by a Type II Incident Management Team.⁴⁷ Two experienced Operations Section Chiefs, one qualified and experienced as a Medical Unit Leader and Aid Station Specialist, developed the plan.

⁴⁷ The interagency team included Mike DeGrosky, a co-author of this report, who with Jerry Anderson (FS), developed the model plan, working under Incident Commander Herb Spradlin (FS).

MODEL ACCIDENT ACTION PLAN - TYPE II TEAM

The **IC** holds ultimate responsibility for the team's actions in case of an accident.

Simple evacuation/non-fatality

For medical evacuations involving one or two victims, the Medical Evacuation Plan in the Incident Action Plan (IAP) shall be followed. **The Operations Section Chief and Safety Officer** will immediately meet with the **Medical Unit Leader** and provide assistance as necessary.

Multiple injury/fatality/shelter deployment

When an accident occurs which involves multiple victims, a fatality, shelter deployment, or other event not covered by the Medical Evacuation Plan, the **Division or Group Supervisor** shall go directly to the scene to take control of the situation. Treatment and evacuation of the victim(s) shall be per the Medical Evacuation Plan. The **Division or Group Supervisor** is responsible for ensuring that the MedEvac Plan is implemented at the scene.

The **Operations Chief** and **Safety Officer** will go directly to the scene. Immediate and clear communication must be established between the **Operations Chief** and the **Division or Group Supervisor** to determine who can arrive at the scene quickest and establish control of the situation.

Upon arrival at the accident scene, the responsible party (**Division/Group Supervisor or Operations Chief**) will take immediate action to move all unnecessary personnel from the scene. These personnel will return to suppression activities or return to base.

If the **Operations Chief** is unavailable to respond to the accident scene, the **Safety Officer** will carry out the Operations Chief's responsibilities.

The **Emergency Medical Technician (EMT)** on the scene will hold responsibility for emergency treatment and movement of victims, but the **Operations Section** is responsible for overall control of the accident scene.

The **Communications Unit Leader** will take immediate action to clear all radio traffic on the incident until such a time that they have provided clear channels to handle the emergency traffic.

The **Incident Commander, Planning Section Chief, Logistics Section Chief, Finance Section Chief and Information Officer** (or their Deputy) will meet the **Medical Unit Leader** at the Communications Unit and stage all accident actions from that point. The **Planning Section Chief** will assure that an individual is assigned to document all communications regarding; the accident. Only those personnel who are essential to the accident operation or communications will be allowed in this area. All team members involved in accident related duties will insure that they have appointed a Deputy or "Acting" to carry out their regular duties.

The **Logistics Section Chief** will immediately close all communications out of base except those necessary for the accident operations.

The **Planning Section Chief** will contact the **Agency Administrator**, who will notify appropriate agency personnel. If the accident involves a fatality, the **Agency Administrator** will contact the **County Sheriff, Coroner, and the victim's home agency**.

The **Planning Section Chief** will consult with the **IC** and other team members to determine the need for a Critical Incident Stress Debriefing (CISD) Team.

AT NO TIME DURING THE ACCIDENT/FATALITY EVACUATION PROCESS WILL THE NAME OF THE VICTIM BE USED OVER RADIO COMMUNICATIONS. NO INFORMATION REGARDING THE ACCIDENT/FATALITY WILL BE RELEASED TO THE MEDIA OR PUBLIC WITHOUT THE APPROVAL OF THE INCIDENT COMMANDER. ALL PUBLIC INFORMATION WILL BE RELEASED THROUGH THE **INFORMATION OFFICER**.⁴⁸

Approved by - _____

Incident Commander

Date

Implementation Strategy 2 - Reduce evacuation needs by improving on-site care.

For routine medical emergencies and illness, on-site medical care can eliminate delays and expense associated with medical evacuation. It also reduces the number of people who have to leave, and improves the level of care. The benefits of front line health services have been successfully demonstrated in a ground-breaking pilot program in Ontario, Canada. The Ontario Ministry of Natural Resources provides advanced health services to incident bases by contracting with Registered Nurses who work under the

⁴⁸ Contacts with media require authorization by the agency sponsoring the fire. This example would have required a delegation of authority to be consistent with policy.

supervision of medical doctors. The health services are fully integrated into the fire operation. The Federal agencies should consider implementing a similar program for fires that have a Medical Unit established (almost all project fires), possibly using RNs, Nurse-Practitioners, or Physician's Assistants as Medical Unit Leaders. At least one agency (BIA) said they already routinely hired nurses, EMTs, or physician's aides for this purpose.

Summary

Chapter 3 has examined a wide range of attributes of organizational culture, including preserving strengths, safety attitudes, reporting safety incidents, ability to refuse assignments, protecting non-Federal as well as Federal employees, accountability, experience levels, training, certification, interpersonal communications, the dispatchers' role, use of technology (equipment and personal gear, surveillance, and transportation), and equity across ethnic and gender groups. While many of these areas are generally in good shape, the above recommendations should make a significant improvement in safety, especially over the long run.

The next chapter focuses on another topic of critical importance to safety: leadership.