

LESSONS LEARNED 2003

**SUCCESSSES AND CHALLENGES
FROM AAR ROLL-UPS**



**For: Wildland Fire Lessons Learned Center
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LESSONS LEARNED RELATED TO THE SAFETY FUNCTION

Providing for Safety Under Extreme Conditions

Background: IMTs operating during 2003 reported that they faced challenges when providing for firefighter safety due to extreme fire conditions. One IMT reported that, on their incident, extreme fuel dryness, heavy fuels in very inaccessible terrain, potential for explosive fire behavior, a lack of safety zones and a large number of spot fires presented challenges to their efforts to provide for firefighter safety. The IMT overcame these challenges when a break in the weather allowed direct attack and allowed the team to use areas where stand-replacing fire had occurred (the “black”) as safety zones.

On another fire, an IMT reported challenges associated with working safely in a fuel type consisting of thousands of small tree stems per acre and areas of decadent timber with an enormous number of snags. The risk of sawing accidents, slips, trips, and falls was significant. Every briefing emphasized that supervisors needed to actively take responsibility for their crew’s safety during each entire operational period so that the crewmembers stayed safe and sound each day.

Lesson Learned: Extreme conditions can present enormous safety challenges. Sometimes these challenges cannot be completely overcome, but only mitigated through improved briefings or by modifying strategy and tactics. Other times, a change in weather or conditions may be required before tactics or strategy can be adapted to provide for firefighter safety.

Safety Position at Area Command

Background: On fires, area command teams established safety positions to provide a service to the agency administrators. Primary responsibilities were recognition of logistical and hazard exposures and identification of trends.

Lessons Learned:

- ☀ Fill an Area Command safety position for the purpose of coordinating safety functions between multiple IMTs.

- ☀ Monitor to ensure that the Area Command safety position does not become involved in operational safety, but remains more broadly focused on trends, hazard exposure, and logistical support related to safety.

Safety On an All Risk Incident

Background: Respondents reported that, although the Space Shuttle Columbia Recovery Effort was a unique incident from the perspective of the nature of the work and the diverse agencies involved, health and safety issues

varied little from those found on wildland fires. One IMT modified ICS form 215A (IAP Safety Analysis) for non-wildfire use, which provided an effective tool for identifying and mitigating safety issues.

However, this assignment also presented a number of unique challenges for the Safety Officers, requiring that personnel search hazardous areas by a variety of means, and mitigation methods were employed to minimize those exposures. Typically, dangerous situations were eliminated or the objectives were altered to avoid the risks to incident personnel. Specific examples of challenges and the mitigation measures taken include:

- Providing evacuation and sheltering of personnel in the event of severe weather events in the field and in camp. Detection, notification, proper actions and resumption of normal operations were covered in written severe weather procedures that were part of the Incident Action Plan (IAP.)
- Providing medical treatment for respiratory illnesses for a significant portion of the incident population. Having a clinic staffed by a professional health care practitioner significantly reduced treatment costs, lost time illnesses, and the number of follow-up visits.
- Gauging the effectiveness of PPE and flexibility in the application of alternatives. Most crews were not prepared for this non-traditional assignment. Wildland firefighting PPE did not adequately protect against the many and varied hazards. Snake chaps, rubber boots, mesh goggles and insect repellents were successfully used to provide protection from venomous snakes, biting insects and thorns and briars.
- Providing specific safety training for English and non-English speaking incident personnel. The use of bi-lingual translators and multi-language safety messages helped in the exchange of important safety related topics.
- Coordinating and establishing multi-agency/contractor accident and injury procedures and protocols in advance of the need. Most agency and contractor policies did not mesh well at the time of the injury or illness. Standard, incident specific protocols and procedures eliminated many misunderstandings and conflicts.
- The need to account for severe weather. Spring is tornado season in the south. One IMT responded to this hazard by revising an existing Severe Thunderstorm/Tornado Emergency Plan, and executing three live-action drills in the three weeks that the IMT was there. This IMT equated their drills to proficiency drills on Standards for Survival and fire shelter deployment.

Lessons Learned:

- ☀ ICS form 215A (IAP Safety Analysis) can be effectively modified to identify and mitigate safety issues on non-wildfire incidents.
- ☀ On multi-agency and multi-jurisdictional incidents, the safety functions of each agency need to work together. Communicate and support each other.
- ☀ Require that incident specific hazard mitigation plan be a part of the IAP. This plan would give specific directions on major hazards to personnel from natural or incident hazards (i.e. severe weather, flooding, fire, etc.)
- ☀ Establish professional health care and clinical hours at the base camps.
- ☀ Make agency/ NWCG bi-lingual safety related materials available, including six minutes for safety for non-English speaking crews.
- ☀ Establish incident specific accident and injury protocols and procedures for all incident personnel regardless of their individual employment status. Train and drill on the protocols.
- ☀ Ensure that the Medical Unit reviews all return-to-duty medical releases prior to redeployment of an individual to line assignments. Individuals have been cleared for duty by non-incident medical professionals but are unable to perform the assigned task at the health/ fitness levels required.

Planning for MEDEVAC

Background: Three IMTs cited their medevac planning efforts as notable successes.

One IMT reported that steep terrain and lack of access required them to plan for military “dust-off” capability via the use of Military Assistance to Safety and Traffic (MAST). As it turns out, the capability was needed, and the IMT implemented a very safe and effective military “dust-off” operation that went according to the plan developed before the need. The plan enabled the timely extraction of an injured person from a challenging location.

Some basic information is required to make effective use of this emergency transportation system and the information must be gathered prior to its need. Information needs include latitude and longitude at the pickup site, refueling sites, and other standard information. It is important to recognize the lag time involved in this complicated mission, and the need to plan for and implement intermediate medical attention during the interim.

A second IMT also reported an air medevac, from the fireline, which they completed in a very efficient, professional manner. In this case, a Division Supervisor took control of the situation and the crews at the scene did a

commendable job of working as a team to move the patient to a constructed helispot. The IMT Air Operations Branch Director presented the team with several possibilities for action, and incident personnel were able to fly the patient off the hill before the end of the operational period. Like the other IMT, this team cites the value of planning ahead, and reports that it had included an Accident Communication Procedures and Guidelines page in the IAP that they believe was a factor in the successful evacuation.

Finally, another IMT reported that, because their incident was far from hospital services, they were dependent on helicopter medevac for all off-site emergency care. This IMT mentioned that, under these circumstances, locating their helibase close to camp helped with emergencies.

Lessons Learned:

- ☀ Develop a MEDEVAC plan ahead of the need.
- ☀ Include the medevac plan and accident communication procedures in the IAP and brief incident personnel on the plan and those procedures.
- ☀ Establish a team procedure for medevac, and assure that personnel responsible for implementing the procedure know their responsibilities.

Safety of Burned Area Emergency Rehabilitation (BAER) Team

Lesson Learned: On one incident, the team managed the safety of BAER Team members by assigning the BAER Team to a Group Supervisor and by assigning fallers to the Group to survey the area for snags before the BAER Team entered.

Aviation Safety: Providing Training During the Incident

Lesson Learned: On an incident, the Air Support Group conducted numerous airbase safety training programs during one week. The programs focused on aircraft rescue and fire fighting, risk management, and general aviation safety.

Work/Rest: Managing Guidelines and Handling Violations

Background: Respondents report different approaches to managing the work/rest ratio. On one incident, crews and individuals were demobilized due to violations of team policies addressing appropriate behavior and work-to-rest guidelines. Personnel were well briefed on the team's policies, and violations were dealt with. This IMT believes this approach represents a good example of a way to manage for safety.

Another IMT reported continuing difficulty with personnel understanding and interpreting the 2:1 work/rest ratio policy. Much of their difficulty was mitigated

when their Finance Section began monitoring all personnel time for the incident and providing clarification to individuals as needed. If home units would provide training to all personnel, many of the oversights that occur would be prevented.

Lessons Learned:

- ☀ IMTs need to manage their safety function by establishing team policy, briefing incident personnel on the team's policy and enforcing the policy.

- ☀ IMTs can address work/rest ratio policy by having their Finance Section monitor all personnel time for the incident and provide clarification to individuals as needed.

- ☀ If home units would provide training to all personnel, many of the oversights that occur would be prevented.

Safety Lessons from Australian Assignments

Overview: Many lessons were learned about how fires are managed and suppressed in Australia, including regarding approaches to firefighter safety. The following section addresses Australian approaches to fatigue management, safety officers, crew protection on engines, communications and radio traffic, and escape routes and safety zones.

The Australians Live Fatigue Management

Background: U.S. personnel found that the Australians live fatigue management. They work seven days on, followed by two days off. On occasion, Australian firefighters go a little longer than seven days before their days off. If Australian firefighters are working a night operational period, firefighters work five shifts on and then take two days off.

In Australia, Safety Officers are Not Out on the Line

Background: The Australians teach safety to all firefighters throughout their career, and they are taught that safety is their responsibility. Each person looks out for himself or herself. Supervisors also look out for their crew's safety, but there is not a Safety Officer around emphasizing the basics. There were no daily safety briefings on routine safety matters. The only safety issues discussed were those occurring at that time or significant to the area that firefighters were working in, making the briefing brief.

Australian Engines Have a Crew Protection Sprinkler and a Reserve of Water to Run It

Background: When firefighters are entrapped and/or burned-over, they turn the crew protection sprinkler system on, and it puts a water curtain over the vehicle cab. The fires in most areas have short residence time, so this works well.

Radio Communications Protocol

Background: U.S. personnel found Australian communications and radio traffic unusual in that the Australians talk back and forth using each other's first names. This worked for the Australians because they knew each other, but for visiting Americans it proved difficult. The U.S. firefighters would have to constantly refer to the IAP to match names to positions so they could figure out what was going on. Ultimately, each group of U.S. firefighters had an Australian assigned to them as a radio operator for the overhead and the U.S. firefighters communicated through them.

Lack of Safety Zones and Escape Routes

Background: The lack of safety zones and escape routes as U.S. firefighters know them caused U.S. firefighters concern at the beginning of the assignment until they understood how the fuels reacted and how the Australians used their vehicles. However, the U.S. team still functioned like a U.S. hotshot crew, assigning one or two people to look for safety areas ahead of their operation and in the general work area. The U.S. team also assigned someone to take the weather and report it on the radio every ½ hour to track trends and moved some individuals around as lookouts, which is not routinely done in Australia.

Lessons Learned:

- ☀ The Australian approach may provide a model to manage fatigue.
- ☀ The Australian approach to safety briefing may provide a model for improvement to the methods used in the U.S. Examine whether safety briefings should be addressing very routine safety matters, or should address only safety issues unique to that incident and operational period.
- ☀ Examine Australian crew protection sprinkler systems for use on U.S. engines, particularly in areas where people fight fire in flashy fuels.
- ☀ When language barriers or radio communication protocols interfere with timely and effective communication, assign a radio operator who transcends the language or protocol barriers and communicate through them.
- ☀ When assigned to foreign assistance missions, U.S. firefighters will confront approaches to firefighter safety that they may find unusual and difficult. Make sure you have full situation awareness before deciding whether the domestic approach is right or wrong, and adapt familiar procedures to the local environment as necessary.

Vehicle Accidents and Driver Safety

Background: An IMT managing a fire found that driving and transportation issues presented a challenge, especially in light of the serious incidents that had occurred during the fire season. Narrow dirt roads; steep side slopes; mixed traffic including water tenders, buses, engines, private residents; and the concern of excessive speed by some drivers were all issues that the IMT had to deal with.

The IMT began an aggressive driver awareness and education program including printing an IMT Driving Policy in the IAP and providing briefing reminders to all IMT personnel daily. The IMT used a one-way traffic system on the worst roads, with road guards controlling the traffic flow. National Guard personnel staffing road closure points reminded each vehicle driver of safety requirements. The IMT also requested and received assistance from the county sheriff's department in the form of enforcement patrols on county roads, and the IMT immediately demobilized personnel ticketed for speeding or reckless driving. The IMT believes these actions all contributed to an absence of driving related accidents on this incident.

An IMT assigned to the Space Shuttle recovery effort reported that, with a enormous operational area, their drivers logged over 300,000 miles without any bus accidents and only one minor backing accident with a van, which the IMT felt was an incredible record.

Lesson Learned: IMTs can address safety challenges caused by driving and transportation issues with an aggressive driver awareness and education program coupled with an effective traffic management system that is enforced. National Guard personnel, county sheriff's officers and other cooperators can assist.

Public Safety/Law Enforcement Liaison

Background/Lessons Learned: One IMT modified the normal ICS organization this year to place security and all law enforcement functions under the Safety Officer, and added the position of Public Safety/Law Enforcement Liaison. This change continued to prove its value as the IMT had several interactions with the military, search and rescue organizations, the county sheriff's office, and other entities external to the ICP and camp that would not have been handled as effectively if attempted by the traditional Security Manager.

Adjusting to Changing Conditions

Overview: Several IMTs reported that some of their best successes came from their ability and willingness to adjust strategy and tactics to reflect changing conditions. Some IMTs found that by altering their strategy and tactics expose fewer firefighters to risk during challenging conditions, they also achieved the side benefit of reducing suppression costs and resource impacts. The section below demonstrates examples of adjusting to extreme fire behavior, managing safety when conditions changed suddenly and achieving safety benefits by going indirect.

Adjusting to Extreme Fire Behavior

Background: An IMT reported that when their fire made a 200 acre run, the crews and engines assigned to the fire maintained their calm, remained patient with a lack of effective communication, did exactly what was asked of them, and worked hard to suppress the fire, even though the incident lacked resources.

Another IMT reported their need to adjust to extreme fire behavior presented a challenge. A situation in which five large fire whirls were going in opposite directions at the same time gave an indication of the fire behavior with which they were dealing. Consequently, the IMT conducted all its burn out operations around structures and lines with a formal briefing and input from the Fire Behavior Analyst.

Lessons Learned: When fires exhibit extreme fire behavior, personnel need to remain calm, think clearly, act decisively, do what was asked of them, and continue to work to suppress the fire.

When faced with extreme fire behavior, adjust operations and briefing procedures accordingly. Involve the fire behavior analyst directly in operational planning.

Managing Safety When Weather Conditions Changed Suddenly

Background: One fire was running and spotting prior to the IMT taking over. Resistance to control was very high with heavy fuels in fuel models 8 and 10 with a large dead component, and a large number of crews and equipment were ordered to manage the fire. The IMT took over command at 1800, with a small night shift and a plan in place for a large operation during the following day operational period. During the night, a rainstorm moved in and settled over the fire. In the morning it was still raining hard, and the ICP was just being set up. Rather than briefing crews at 0600 as planned and putting them out in the rain, the team's Command and General Staff met and decided to delay the briefing until 0800, giving the Operations Section time to revise the plan for the day operational period.

By 0800 the IMT decided to keep six crews and demobilize 16 crews, including some that had arrived overnight and others that were still enroute. The Planning and Finance Sections worked closely to facilitate simultaneous check-in and demobilization for resources surplus to the incident's needs. By early afternoon, all surplus resources had been demobilized without any problems. In addition, the IMT decided to hold the remaining resources in camp until the overhead could assess the fire area. The rain had stopped by noon, and all remaining resources were engaged by early afternoon. The actions of the IMT minimized the exposure of fireline resources to adverse weather and associated hazards, gave the Operations Section time to adjust the operation to the changed conditions, and permitted orderly demobilization of excess resources. The team felt that personnel safety and health provided the driving force behind all decisions made.

Lessons Learned: IMTs must be prepared to adjust quickly when weather conditions change dramatically. Personnel safety and health, including minimizing exposure of fireline personnel to adverse weather and associated hazards, should provide the driving factor behind the decisions of the IMT.

Simultaneous check-in and demobilization can prove effective when resources are still arriving that are surplus to the incident's needs.

Improving Safety and Reducing Costs by Going Indirect

Background: An IMT assured that safety was not compromised for its resources, when the IC and Operations Section Chief immediately realized the need to take the fireline indirect to ridge tops and roads and give up large acreage to provide for the safety to the firefighters. The fire was still contained quickly, safely and at a cost savings.

On another incident, an IMT found success with less aggressive suppression tactics that reduced overall costs and reduced risk to firefighters. Rather than aggressively constructing line through rugged inaccessible country, they used existing trails and natural barriers. Though more acres were burned, largely due to burnout operations, most of the burning provided a resource benefit. The IMT placed firefighters at less risk by reducing aircraft shuttles and by reducing the need to place firefighters in areas lacking safety zones, or having steep, dangerous terrain.

Lesson Learned: In some cases, going indirect represents the safest strategy and the best option for minimizing firefighters' exposure to risk. Additional benefits may include allowing fire to spread into areas in which it will provide a resource benefit, decreasing containment time and reducing fire suppression costs.

The Safety Value of a Good Briefing

Background: One area command team found that their “in-briefing” provided a good overview of strategic, logistical and political issues. The team also found that the briefing also stated that the primary objective was to provide for the highest level of firefighter, public and aviation safety. The Incident Management Team (IMT) implemented the stated objective by stressing the Standard Fire Orders, Watch Out Situations, and utilizing the ICS 215A process.

On a separate incident, an IMT reported that their command transition with another IMT was essentially seamless thanks to an outstanding "in-briefing" by the outgoing team's Safety Officer Trainee. They also report that their briefings from the agency administrator provided their Safety Officer with excellent information, which aided in the risk mitigation process. This briefing was effectively backed up with additional information provided by a local person assigned by the agency administrator.

Another IMT reported that for non-wildfire and non-traditional assignments (such as the Space Shuttle recovery), all resources reporting to the incident were provided with a comprehensive orientation including information on physical requirements of the assignment, tactical approach, and sensitivities.

Lessons Learned: A good briefing that makes objectives clear and focuses on risk management can help provide for the highest level of firefighter, public and aviation safety.

The agency administrator's briefing provides the Safety Officer with important information that aids in the risk mitigation process and sets the tone for operational safety. This briefing can be effectively backed up with additional information provided by a local resource assigned by the agency administrator.

Contract Engines/Engine Boss Qualifications

Background: One area command team reports a concern that came up during their in-briefing, that of contract engines. Specifically, in the briefing, it was stated that the Region did not require a fully qualified Engine Boss on contract engines, and they would allow trainees to operate them until 2004 when full compliance with “Standards for Fire and Aviation Operations 2003” (former BLM Redbook) would be achieved. The situation was discussed at length after the official meeting with the Area Command staff. It was felt that this requirement would limit their effectiveness and require additional overhead to ensure safe operations. This situation was resolved about half way through the incident when Area Command clarified the situation by stating that fully qualified Engine Bosses would be supervising the trainees operating the contract engines.

The geographic area policy of allowing unqualified contract engine staffing was raised as a significant safety issue by all out-of-area IMTs and was consistently addressed at all close-outs and in all final narrative reports. The involved teams recommend that when there are localized policies, especially those contrary to national standards, that these localized differences be identified at the IMT in-briefs either in the delegation of authority or the briefing package.

Lessons Learned: IMTs will encounter situations where jurisdictions have modified their qualification and certification systems to allow personnel on the fireline that do not meet NWCG 310-1 standards. IMTs must be prepared to address this situation in their policies, procedures and planning.

Recommendation: The NWCG agencies need to find a single, comprehensive strategy for managing the qualifications of contracted resources

Note: This issue is also discussed in the Operations Function section of this report under the heading Dealing With A Host Specific Qualifications System (Page 55.)

Incident Management Team Response to a Serious Safety Concern

Background: An IMT working on a complex of fires reported that two agencies learned a valuable lesson in safety, and the IMT learned that not all areas run fires as they do in their home states. When the IMT arrived, the two agencies were running their respective fires on adjacent Indian reservations independent of each other. However, one fire was on both reservations, and the agencies were running this incident with two different Incident Commanders (IC), and two different radio communication frequencies. Individuals had been working on this incident for over 24 hours and working in positions beyond their red card rating. The situation represented a major safety problem and an accident waiting to happen.

Lessons Learned: IMTs need to be ready to react to safety concerns immediately, even if the incident has not yet been turned over to the IMT. Political differences need to be put aside when safety is the issue, and a team needs to be ready to correct a situation and worry about mending fences after the safety issues have been resolved.

Be prepared to offer recommendations to improve the working relationship between host agencies.

Providing Fire Shelter Training at the Incident

Background: One IMT reported that they used Safety Officers to provide fire shelter training to personnel arriving on the incident such as drivers, media, etc., who had not had the training. Another IMT reports that they resolved this challenge by having the host agencies provide a person to the ICP to provide Standards for Survival training to drivers and other miscellaneous resources.

Lesson Learned: Safety Officers and host agency personnel can provide fire shelter training to personnel arriving on the incident who have not had the training, such as drivers, the media, etc.

Dealing With Ammunition Caches And Marijuana Plantations

Background: One IMT was challenged by dealing with ammunition caches and marijuana plantations both inside the fire area and outside the fire line. Firefighter safety issues relating to ammunition caches and marijuana plantations became the immediate issue for the IMT. Armed, line qualified Law Enforcement Officers (LEO) were ordered for the incident. LEOs were assigned to the divisions to be with the firefighters when these items were located. The FBI and ATF were brought in as well.

Lessons Learned: When drug plantations, ammunition caches and other illegal activities exist within and adjacent to the fire area, order line qualified, armed Law Enforcement Officers and assign them to the fireline to escort and assist operations personnel.

Mitigating the Effect of Extreme Conditions on Firefighters

Background/Lesson Learned: An IMT faced extremely rough conditions that tested the physical condition of many crews. The IMT was also providing support for three initial/extended attack incidents. The team established a rotation schedule to bring crews down from the mountain spike camp. While in their rest rotation away from spike camp, crews augmented initial attack support resources.

Planning and Managing Radio Communications

Background: According to one IMT, communications presented a significant challenge for the first two days of their incident assignment. The first day, all operations on the forest (two complexes and an array of initial attack fires) were on the same command and tactical frequencies, and the situation presented a major safety issue that needed quick resolution. The IMT had ordered a radio kit, but it did not show up for several days. They were able to get four tactical frequencies established and put them into place for the second operational period, alleviating the issue on the tactical side. However, problems continued

on the command frequency. Fortunately, the incident received its own command frequency by the third operational period.

Lessons Learned: Frequency sharing can quickly lead to communication system overload and unacceptable compromises to firefighter safety. When radio kits are not available to alleviate communication frequency sharing and system overload, Incident Management Teams need to resolve communication problems quickly. Working with their host agencies and the host agencies' cooperators to make additional frequencies available and re-route communications traffic may be a solution.

Using Field Reconnaissance to Overcome Safety Challenges

Background: An IMT reported that they used field reconnaissance as a strategy to overcome numerous safety challenges. The incident included several divisions with critical safety concerns, including steep slopes, explosive fire potential and a lack of escape routes and safety zones. A strong inversion and the unavailability of Type 1 crews initially delayed control efforts in these more difficult divisions. The inversion severely limited aviation operations, increasing the risks and hazards for line personnel. Neither Air Attack nor the Helicopter Coordinator could provide "eyes in the sky" for the ground resources because aircraft were unavailable to support burnout operations.

The IMT undertook several days of on-the-ground reconnaissance, allowing the team time to formulate effective tactical plans that were implemented once adequate resources arrived and the inversion lifted. The IMT Operations Section performed detailed reconnaissance and constructed escape routes to safety zones. The IMT also used the ICS 215A process to help mitigate the hazards they faced. When the inversion lifted, aviation resources could provide "eyes in the sky." The aviation support, combined with the other mitigations, allowed the IMT to provide for firefighter safety.

Lessons Learned: Suspend, delay or reduce operations in dangerous locations and take proactive measures to gain full situation awareness and mitigate critical safety concerns in those locations. Performing extensive reconnaissance represents a key step in this strategy when faced with steep slopes, explosive fire potential, lack of escape routes and safety zones, inadequate resources of the appropriate type and other significant hazards.

Mitigating Grizzly Bear Hazards

Background: An IMT reported that an incident they managed was their first exposure to the Grizzly Bear hazard. Because the Grizzly Bear is listed as a threatened species, special protections and precautions are required, and the host agencies were very serious and strict about bear management practices in the fire area. The host agencies supplied qualified personnel to discuss proper food storage techniques and bear avoidance tactics at all morning briefings. In