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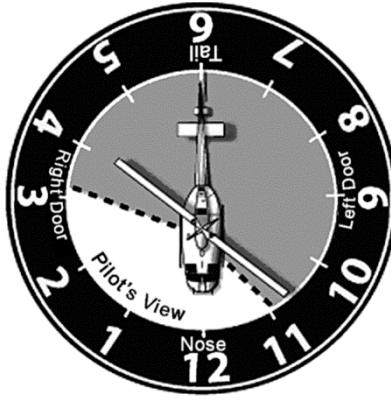
Incident Response Pocket Guide

PMS 461 **April 2018**
NFES 001077



SIZEUP REPORT

- Incident Type (wildland fire, vehicle accident, hazmat spill, search and rescue, etc.)
- Location/Jurisdiction
- Incident Size
- Incident Status
- Establish IC and Fire Name
- Weather Conditions
- Radio Frequencies
- Best Access Routes
- Assets/Values at Risk
- Special Hazards or Concerns
- Additional Resource Needs

This reference is intended to assist in reporting key information regarding incident conditions when first arriving on scene. All agencies will have specific information requirements that may involve additional reports.

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The *Incident Response Pocket Guide* (IRPG) establishes standards for wildland fire incident response. The guide provides critical information on operational engagement, risk management, all hazard response, and aviation management. It provides a collection of best practices that have evolved over time within the wildland fire service.

The IRPG does not provide absolute solutions to the unlimited number of situations that will occur. Some fireline decisions may be relatively simple; many are not. These decisions often require individual judgment and creativity — skills developed through extensive training, dedicated practice, and experience

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2018 Revision Summary

This edition reflects feedback and input received since the 2014 version. Therefore, the cover color has been changed to purple. The notable changes include:

New References

Smoke Hazards and Mitigations
Smoke and Transportation Safety
Principles of Airtanker and Water Scooper Use
Recommended Retardant Coverage Levels
Important Winds to Firefighters
Alignments and Patterns for Dangerous Fire Behavior
Helicopter Extraction Operations

Deleted References

Flight Following
Working with Airtankers
Severe Fire Behavior Potential Related to RH and Fuel Moisture Content

Existing References with Significant Changes

Added Assets/Values at Risk to Size Up Report
Added LCES to Briefing Checklist
Revised Look Up, Down, and Around
Added Critical Burn Period to Common Denominators of Fire Behavior on Tragedy Fires
Emphasized effects of slope and wind on Safety Zones
Updated Wildland Urban Interface Firefighting
Removed the 30/30 Rule in Thunderstorm Safety
Edited Last Resort Survival
Updated Aviation User Checklist
Revised Retardant Use Reminders
Updated Directing Retardant and Bucket Drops
Updated Spot Weather Forecast information
Updated Medical section including the Medical Incident Report

Table of Contents

Operational Leadership

The most essential element of successful wildland firefighting is competent and confident leadership.

Leadership means providing purpose, direction, and motivation for wildland firefighters working to accomplish difficult tasks under dangerous, stressful circumstances.

In confusing and uncertain situations, a good operational leader will:

- TAKE CHARGE of assigned resources.
- ASSESS SITUATION by gaining intel.
- MOTIVATE firefighters with a “can do safely” attitude.
- DEMONSTRATE INITIATIVE by taking action in the absence of orders.
- COMMUNICATE by giving specific instructions and asking for feedback.
- SUPERVISE at the scene of action.

D U T Y

Be proficient in your job, both technically and as a leader

- Take charge when in charge.
- Adhere to professional standard operating procedures.
- Develop a plan to accomplish given objectives.

Make sound and timely decisions

- Maintain situation awareness in order to anticipate needed actions.
- Develop contingencies and consider consequences.
- Improvise within the leader's intent to handle a rapidly changing environment.

Ensure tasks are understood, supervised, and accomplished

- Issue clear instructions.
- Observe and assess actions in progress without micro-managing.
- Use positive feedback to modify duties, tasks, and assignments when appropriate.

Develop your subordinates for the future

- Clearly state expectations.
- Delegate tasks that you are not required to do personally.
- Consider individual skill levels and developmental needs when assigning tasks.

R E S P E C T

Know your subordinates and look out for their well-being

- Put the safety of your subordinates above all other objectives.
- Take care of your subordinates needs.
- Resolve conflicts between individuals on the team.

Keep your subordinates informed

- Provide accurate and timely briefings.
- Give the reason (intent) for assignments and tasks.
- Make yourself available to answer questions at appropriate times.

Build the team

- Conduct frequent debriefings with the team to identify lessons learned.
- Recognize individual and team accomplishments and reward them appropriately.
- Apply disciplinary measures equally.

Employ your subordinates in accordance with their capabilities

- Observe human behavior as well as fire behavior.
- Provide early warning to subordinates of tasks they will be responsible for.
- Consider team experience, fatigue, and physical limitations when accepting assignments.

I N T E G R I T Y

Know yourself and seek improvement

- Know the strengths and weaknesses in your character and skill level.
- Ask questions of peers and superiors.
- Actively listen to feedback from subordinates.

Seek responsibility and accept responsibility for your actions

- Accept full responsibility for poor team performance.
- Credit subordinates for good performance.
- Keep your superiors informed of your actions.

Set the example

- Share the hazards and hardships with your subordinates.
- Don't show discouragement when facing setbacks.
- Choose the difficult right over the easy wrong.

Communication Responsibilities

All firefighters have five communication responsibilities:

- Brief others as needed
- Debrief your actions
- Communicate hazards to others
- Acknowledge messages
- Ask if you don't know

Leader's Intent

In addition, all leaders of firefighters have the responsibility to provide complete briefings and ensure that their subordinates have a clear understanding of their intent for the assignment:

- Task = What is to be done
- Purpose = Why it is to be done
- End State = How it should look when done

Human Factor Barriers to Situation Awareness

Low Experience Level with Local Factors

- Unfamiliar with the area or the organizational structure.

Distraction from Primary Task

- Radio traffic
- Conflict
- Previous errors
- Collateral duties
- Incident within an incident

Fatigue

- Carbon monoxide
- Dehydration
- Heat stress
- Poor fitness level can reduce resistance to fatigue
- 24 hours awake affects your decision making capability like .10 blood alcohol content

Stress Reactions

- Communication deteriorates or grows tense
- Habitual or repetitive behavior
- Target fixation – Locking into a course of action; whether it makes sense or not, just try harder
- Action tunneling – Focusing on small tasks, but ignoring the big picture
- Escalation of commitment – Accepting increased risk as completion of task gets near

Hazardous Attitudes

- Invulnerable – That can't happen to us
- Anti-authority – Disregard of the team effort
- Impulsive – Do something even if it's wrong
- Macho – Trying to impress or prove something
- Complacent – Just another routine fire
- Resigned – We can't make a difference
- Group Think – Afraid to speak up or disagree

After Action Review (AAR)

The climate surrounding an AAR must be one in which the participants openly and honestly discuss what transpired, in sufficient detail and clarity, so everyone understands what did and did not occur and why.

Most importantly, participants should leave with a strong desire to improve their proficiency.

- An AAR is performed as immediately after the event as possible by the personnel involved.
- The leader's role is to ensure skilled facilitation of the AAR.
- Reinforce that respectful disagreement is okay. Keep focused on the what, not the who.
- Make sure everyone participates.
- End the AAR on a positive note.

What was planned?

What actually happened?

Why did it happen?

What can we do next time?

(Correct weaknesses/sustain strengths)

Risk Management

Identify Hazards (Situation Awareness)

- Gather Information
  - ☐ Objective(s)
  - ☐ Communication
  - ☐ Who's in Charge
  - ☐ Previous Fire Behavior
  - ☐ Weather Forecast
  - ☐ Local Factors
- Scout the Fire

Assess Hazards

- Estimate Potential Fire Behavior Hazards
  - ☐ Look Up/Down/Around Indicators
- Identify Tactical Hazards
  - ☐ Watch Outs
- As conditions change, what other safety hazards are likely to exist?
- Consider probability versus severity?

Develop Controls and Make Risk Decisions

- Develop control measures that reduce risk:
  - ☐ Firefighting Orders ➔ LCES
    - Anchor Point
    - Downhill Checklist (if applicable)
  - ☐ What other controls are necessary?
    - Engineering/Administrative
    - PPE
    - Educational
    - Avoidance
  - ☐ Emergency Medevac Procedures/Plan
- Are controls in place to mitigate risk?
  - ☐ NO - Reassess situation
  - ☐ YES - Next question
- Are selected tactics based on expected fire behavior?
  - ☐ NO - Reassess situation
  - ☐ YES - Next question
- Have instructions been given and understood?
  - ☐ NO - Reassess situation
  - ☐ YES - Next question
- Consider risk versus gain

Implement Controls

- Ensure controls are in place and being implemented by personnel.
- Ensure controls are integrated into operational plan and understood at all levels.

Supervise and Evaluate

- Are controls adequately mitigating the hazards?
  - ☐ NO – Reassess and consider:
    - Human Factors:
      - Low experience level?
      - Distracted from primary tasks?
      - Fatigue or stress reaction?
      - Unsafe attitude?
    - The Situation:
      - What is changing?
      - Are strategy and tactics working?

If the situation changes significantly, restart Risk Management Process at the appropriate step

Planning for Medical Emergencies

Prior to each operational period, Incident Commanders, supervisors, and all wildland firefighters need to ask and be able to answer the following three questions:

1. What are we going to do if someone gets hurt?
    - Are there personnel on your crew/division/fire that can provide medical support?
    - What type of equipment is available to treat and transport injured personnel?
2. How will we get them out of here?
    - Could you get an injured firefighter to a road or to a helispot?
    - How many personnel and what kind of equipment would you need to get an injured firefighter out?
3. How long will it take to get them to a hospital?
    - Where is the closest hospital?
    - Will you use air or ground transportation?
    - Could conditions change and affect the transportation timeline?
        - Smoke/clouds/nightfall
        - Fire behavior
        - Mechanical failures

All operational activities should be based on answers to these questions. If the answers are insufficient, stop, reassess, and consider alternate strategies and tactics.

Look Up, Down and Around

Fire Environment Factors	Indicators
Fuel Characteristics	• Substantial amounts of cured or curing fine fuel/continuous • Heavy dead and down • Tight crown spacing (<20 ft.) • Unusual low live and dead fuel moisture values (locally defined) • Special conditions ☐ Efficient firebrand sources ☐ Numerous snags ☐ Preheated canopy ☐ Frost and bug-kill ☐ High dead-to-live ratio
Topography	• Steep slopes (> 45%) • Chutes/chimneys/passes/saddles • Box and narrow canyons
Weather	• Wind ☐ Speeds above 10 mph ☐ Lenticular clouds ☐ Fast moving clouds ☐ Cold frontal passages indicated by weak vortices and fluctuating temperatures ☐ Cumulonimbus clouds ☐ Dust cloud approaching ☐ Sudden calm ☐ Battling or shifting wind

Look Up, Down and Around (continued)

Fire Environment Factors	Indicators
Weather	• Atmospheric Instability ☐ Good visibility ☐ Battling or shifting wind ☐ Dust devils ☐ Cumulus clouds ☐ Castellanus clouds in the a.m. ☐ Smoke rises straight up ☐ Inversion begins to lift ☐ Unusually high Haines values for the local area • Temp/RH ☐ Above normal temperatures ☐ Critically low humidity based on local thresholds
Plume Dynamics	• Well developed, nearly vertical column • Formation of a large ice cap/ pyrocumulus cloud • Thunder heard/lightning flashes • Sprinkles of rain • Sudden calm • Changing column with alternating strengthening inflows and outflows • Becoming hazy with smoke at your feet
Rapidly Changing Behavior	• Smoldering fires pick up • Trees begin to torch • Fire whirls beginning • Leaning or sheared column • Frequent spot fires

Common Denominators of Fire Behavior on Tragedy Fires

There are five major common denominators of fire behavior on fatal and near-fatal fires. Such fires often occur:

1. On relatively small fires or deceptively quiet areas of large fires.
2. In relatively light fuels, such as grass, herbs, and light brush.
3. When there is an unexpected shift in wind direction or in wind speed.
4. When fire responds to topographic conditions and runs uphill.
5. Critical burn period between 1400 and 1700.

Alignment of topography and wind during the critical burning period should be considered a trigger point to reevaluate tactics. Blowup to burnover conditions generally occur in less than 60 minutes and can be as little as 5 minutes. A tactical pause may be prudent around 1400 for reevaluating your situational awareness of topography, weather, and fuel.

Common Tactical Hazards

Position

- Building fireline downhill.
- Building undercut or mid-slope fireline.
- Building indirect fireline or unburned fuel is between you and the fire.
- Attempting frontal assault on the fire or you are delivered by aircraft to the top of the fire.
- Establishing escape routes that are uphill or difficult to travel.

Situation

- Poor communication due to a rapidly emerging small fire or an isolated area of a large fire.
- Suppression resources are fatigued or inadequate.
- Assignment or escape route depends on aircraft support.
- Nighttime operations.
- Wildland Urban Interface operations.

When selected tactics put firefighters in these positions or situations, a higher level of risk is involved. Consider additional hazard controls that may be needed.

LCES

LCES must be established and known to **ALL** firefighters **BEFORE** it is needed.

Lookout(s)
- Experienced, competent, trusted
- Enough lookouts at good vantage points
- Knowledge of crew locations
- Knowledge of escape and safety locations
- Knowledge of trigger points
- Map, weather kit, watch, IAP

Communication(s)
- Radio frequencies confirmed
- Backup procedures and check-in times established
- Provide updates on any situation change
- Sound alarm early, not late

Escape Route(s)
- More than one escape route
- Avoid steep uphill escape routes
- Scouted for loose soils, rocks, vegetation
- Timed considering slowest person, fatigue, and temperature factors
- Marked for day or night
- Evaluate escape time vs. rate of spread
- Vehicles parked for escape

Safety Zone(s)
- Survivable without a fire shelter
- Back into clean burn
- Natural features (rock areas, water, meadows)
- Constructed sites (clear-cuts, roads, helispots)
- Scouted for size and hazards
- **Upslope? Downwind? Heavy Fuels? Each means more heat impact meaning larger safety zone.**

Time available to use escape routes will decrease and safety zone size will increase (possibly by more than double) as wind exceeds 10 mph and/or slope exceeds 20%!

Safety Zones

A safety zone is an area where a firefighter can survive without a fire shelter. Considerations for effective safety zones:

- Take advantage of heat barriers such as lee side of ridges, large rocks, or solid structures.
- When possible, burn out safety zones prior to arrival of the fire front.
- Avoid locations that are upslope or downwind from the fire; chimneys, saddles, or narrow canyons; and steep uphill escape routes.
- Not intended for structure protection.

Separation distance between the firefighter and the flames should be at least four times the maximum continuous flame height. Distance separation **for flat terrain and no wind** is the radius from the center of the safety zone to the nearest fuels.

Flame Height	Separation Distance (firefighters to flames)	Area in acres*
10 ft.	40 ft.	1/10 acre
20 ft.	80 ft.	½ acre
50 ft.	200 ft.	3 acres
100 ft.	400 ft.	12 acres
200 ft.	800 ft.	46 acres

*Area in acres is calculated to allow for distance separation on all sides for a 3-person engine crew (1 acre is approximately the size of a football field, or 208 feet by 208 feet). Calculations are based on radiant heat only and do not account for convective heat from wind and/or terrain influences. **Since calculations assume no wind and no slope, safety zones downwind or upslope from the fire will require larger separation distances.**

Downhill Checklist

Downhill fireline construction is hazardous in steep terrain, fast-burning fuels, or rapidly changing weather. It should not be attempted unless there is no tactical alternative. When building downhill fireline, the following is required:

1. Discuss assignments with crew supervisor(s) and fireline overhead prior to committing crew(s). Responsible overhead individual stays with job until completed (TFLD or ICT4 qualified or better).
2. Decision is made after proposed fireline has been scouted by supervisor(s) of involved crew(s).
3. Coordinate LCES for all personnel involved.
   - Crew supervisor(s) is in direct contact with lookout who can see the fire.
   - Establish communication between all crews.
   - Rapid access to safety zone(s) in case fire crosses below crew(s).
4. Use direct attack whenever possible. If not possible, the fireline should be completed between anchor points before being fired out.
5. Fireline will not lie in or adjacent to a chute or chimney.
6. Starting point will be anchored for crew(s) building fireline down from the top.
7. Monitor bottom of fire; if potential exists for the fire to spread, take action to secure the fire edge.

Indicators of Incident Complexity

Common indicators may include the area (location) involved, political sensitivity, organizational complexity, jurisdictional boundaries, values at risk, weather, and threat to life, environment and property. Most indicators are common to all incidents, but some may be unique to a particular type of incident. The following are common contributing indicators for initial attack and extended attack complexity types.

Type 5 Incident Complexity Indicators

General Indicators	Span of Control Indicators
• Incident is typically terminated or concluded (objective met) within a short time once resources arrive on scene. • For incidents managed for resource objectives, minimal staffing/oversight is required. • One to five single resources may be needed. • Formal Incident Planning Process not needed. • Written Incident Action Plan (IAP) not needed. • Minimal effects to population immediately surrounding the incident. • Critical infrastructure, or key resources, not adversely affected.	• Incident Commander (IC) position filled. • Single resources are directly supervised by the IC. • Command Staff or General Staff positions not needed to reduce workload or span of control.

Type 4 Incident Complexity Indicators

General Indicators	Span of Control Indicators
• Incident objectives are typically met within one operational period once resources arrive on scene, but resources may remain on scene for multiple operational periods. • Multiple resources (over 6) may be needed. • Resources may require limited logistical support. • Formal Incident Planning Process not needed. • Written IAP not needed. • Limited effects to population surrounding incident. • Critical infrastructure or key resources may be adversely affected, but mitigation measures are uncomplicated and can be implemented within one operational period. • Elected and appointed governing officials, stakeholder groups, and political organizations require little or no interaction.	• IC role filled. • Resources either directly supervised by the IC or supervised through an ICS Leader position. • Task Forces or Strike Teams may be used to reduce span of control to an acceptable level. • Command Staff positions may be filled to reduce workload or span of control. • General Staff positions may be filled to reduce workload or span of control.

Type 3 Incident Complexity Indicators*

General Indicators	Span of Control Indicators
• Incident typically extends into multiple operational periods. • Incident objectives usually not met within the first or second operational period. • Resources may need to remain at scene for multiple operational periods, requiring logistical support. • Numerous kinds and types of resources may be required. • Formal Incident Planning Process is initiated and followed. • Written IAP needed for each operational period. • Responders may range up to 200 total personnel. • Incident may require an incident base to provide support. • Population surrounding incident affected. • Critical infrastructure or key resources may be adversely affected and actions to mitigate effects may extend into multiple operational periods. • Elected and appointed governing officials, stakeholder groups, and political organizations require some level of interaction.	• IC role filled. • Numerous resources supervised indirectly through the establishment and expansion of the Operations Section and its subordinate positions. • Division Supervisors, Group Supervisors, Task Forces, and Strike Teams used to reduce span of control to an acceptable level. • Command Staff positions filled to reduce workload or span of control. • General Staff positions filled to reduce workload or span of control. • ICS functional units may need to be filled to reduce workload.

*If multiple Type 3 Incident Complexity Indicators are exceeded, consider the next level of incident management support.

Wildland Urban Interface Firefighting

Structure protection is inherently dangerous because it involves indirect firefighting.

Do not commit to stay and protect a structure unless a safety zone for firefighters and equipment has been identified at the structure during sizeup and triage. Move to the nearest safety zone, let the fire front pass, and return as soon as conditions allow.

Fire Behavior Prediction

- Base all actions on current and expected fire behavior – do this first!
- An estimate must be made of the approaching fire intensity in order to determine if there is an adequate safety zone and time available before the fire arrives.
- Due to the dynamic nature of fire behavior, intensity estimates are difficult to make with absolute certainty. It is imperative that firefighters consider the worst case and build contingency actions into their plan to compensate for the unexpected.

Structure Sizeup

Site Considerations

- Adequate safety zone based on fire behavior prediction.
- Adequate lookout and communication capability.
- Adequate defensible space based on surrounding wildland vegetation.
- Avoid narrow canyon bottoms, mid-slope with fire below, and narrow ridges near chimneys and saddles.

Tactical Challenges and Hazards

(Firefighters with a safety zone can safely defend structures with some challenges.)

- Narrow roads, unknown bridge limits, and septic tank locations.
- Ornamental plants and combustible debris within 30 feet of structure.
- Wooden siding and/or wooden roof materials.
- Open vents, eaves, decks, and other ember traps.
- Fuel tanks and hazardous materials.
- Powerlines or underground utilities.
- Limited water sources.
- Prevailing sense of urgency.
- Property owners remaining on-site or evacuations, which may cause panic.
- Smoke byproducts often laced with chemical compounds not found in pure wildland fires.

Structure Triage

Defensible – Prep and Hold

- Determining Factor: Safety zone present.
- Sizeup: Structure has some tactical challenges.
- Tactics: Firefighters needed on-site to implement structure protection tactics during fire front contact.

Defensible – Standalone

- Determining Factor: Safety zone present.
- Sizeup: Structure has very few tactical challenges.
- Tactics: Firefighters may not need to be directly assigned to protect structure as it is not likely to ignite during initial fire front contact. However, no structure in the path of a wildfire is completely without need of protection. Patrol following the passage of the fire front will be needed to protect the structure.

Non-Defensible – Prep and Leave

- Determining Factor: NO safety zone present.
- Sizeup: Structure has some tactical challenges.
- Tactics: Firefighters not able to commit to stay and protect structure. If time allows, rapid mitigation measures may be performed. Set trigger point for safe retreat. *Remember pre-incident preparation is the responsibility of the homeowner*. Patrol following the passage of the fire front will be needed to protect the structure.

Non-Defensible – Rescue Drive-By

- Determining Factor: NO safety zone present.
- Sizeup: Structure has significant tactical challenges.
- Tactics: Firefighters not able to commit to stay and protect structure. If time allows, check to ensure that people are not present in the threatened structure (especially children, elderly, and invalid). Set trigger point for safe retreat. Patrol following the passage of the fire front will be needed to protect the structure.

Structure Protection Tactics

Rapid mitigation measures

- Remove small combustibles immediately next to structure.
- Close windows and doors, including garage (leave unlocked).
- Clean area around fuel tank and shut off tank.
- Charge garden hoses.
- Apply CAF, foam, or gel retardants if available.

Equipment and water use

- Mark entrance to indicate a staffed location if it is not obvious.
- Charge hose lines.
- Long hose lays are not recommended.
- Keep 100 gallons of water in reserve.
- Identify a backup water source.
- Identify powerlines for aerial resources.
- Never rely on water for firefighter safety.

Patrol following the fire front

- Many structures do not burn until after the fire front has passed.
- Be aware of the structural collapse zone when structures are exposed to fire.
- Move to closest safety zone and let fire front go through.
- Return as soon as conditions allow safe access to structures.
- Secondary ignition is usually due to residual spot fires or creeping ground fire.
- Take suppression actions within your capability.
- Call for assistance if needed.

NOTES

NOTES

How to Properly Refuse Risk

Every individual has the right and obligation to report safety problems and contribute ideas regarding their safety. Supervisors are expected to give these concerns and ideas serious consideration.

When an individual feels an assignment is unsafe they also have the obligation to identify, to the degree possible, safe alternatives for completing that assignment. Turning down an assignment is one possible outcome of managing risk.

A "turn down" is a situation where an individual has determined they cannot undertake an assignment as given and they are unable to negotiate an alternative solution.

The turn down of an assignment must be based on an assessment of risks and the ability of the individual or organization to control those risks. Individuals may turn down an assignment as unsafe when:

1. There is a violation of safe work practices.
2. Environmental conditions make the work unsafe.
3. They lack the necessary qualifications or experience.
4. Defective equipment is being used.

- The individual directly informs their supervisor they are turning down the assignment as given. Use the criteria outline in the Risk Management Process (Firefighting Orders, Watch Out Situations, etc.) to document the turn down.
- The supervisor notifies the Safety Officer immediately upon being informed of the turn down. If there is no Safety Officer, the appropriate Section Chief or the Incident Commander should be notified. This provides accountability for decisions and initiates communication of safety concerns within the incident organization.
- If the supervisor asks another resource to perform the assignment, they are responsible to inform the new resource that the assignment was turned down and the reasons why it was turned down.
- If an unresolved safety hazard exists or an unsafe act was committed, the individual should also document the turn down by submitting a SAFENET (ground hazard) or SAFECOM (aviation hazard) form in a timely manner.

These actions do not stop an operation from being carried out. This protocol is integral to the effective management of risk as it provides timely identification of hazards to the chain of command, raises risk awareness for both leaders and subordinates, and promotes accountability.

Thunderstorm Safety

Approaching thunderstorms may be noted by a sudden reverse in wind direction, a noticeable rise in wind speed, and a sharp drop in temperature. Rain, hail, and lightning occur only in the mature stage of a thunderstorm.

Situation Awareness: Sound waves move at different rates based on atmospheric conditions. Take the storm precautions below as soon as you hear thunder, not when the storm is upon you. Do not resume work in exposed areas until 30 minutes after storm activity has passed.

Hazard Control:

- Take shelter in a vehicle or building if possible.
- If outdoors, find a low spot away from tall trees, wire fences, utility lines and other elevated conductive objects. Make sure the place you pick is not subject to flooding.
- If in the woods, move to an area with shorter trees.
- If only isolated trees are nearby, keep your distance twice the tree height.
- If in open country, crouch low, with feet together, minimizing contact with the ground. You can use a pack to sit on, but never lie on the ground.
- If you feel your skin tingle or your hair stand on end, immediately crouch low to the ground. Make yourself the smallest possible target and minimize your contact with the ground.
- Don't group together.
- Don't stay on ridge tops, in wide open areas, or near ledges or rock outcroppings.
- Don't operate landline telephones, machinery, or electric motors.
- Don't handle metal hand tools or flammable materials in open containers.

Hazard Tree Safety

Hazard trees, both dead snags and live green trees, are one of the most common risks encountered on the fireline. All firefighters should frequently survey their work area for potential hazard trees.

Situation Awareness

Environment:

- Current and forecasted winds
- Night operations
- Steep slopes
- Diseased or bug-kill areas
- Number and height of hazard trees
- Anticipated burn-down time
- Potential for trees to domino

Hazard tree indicators:

- Trees burning for any period of time
- High risk tree species (rot and shallow roots)
- Numerous downed trees
- Dead, broken, or burning tops and limbs overhead
- Accumulation of downed limbs
- Absence of needles, bark, or limbs
- Leaning or hung-up trees

Hazard Control

- Eliminate the hazards with qualified sawyers, blasters/explosives, or heavy equipment.
- Avoid hazards by designating “No Work Zones” (flag, sign, and map).
- Modify suppression tactics or fireline location to avoid high risk areas.
- Post lookouts to help secure high risk areas.
- Utilize road/traffic controls in high risk areas.
- Fire proof potential hazard trees to prevent ignition.
- Keep clear of bucket drops near trees/snags.
- Reposition firefighters to secure areas in response to high winds in forecast.
- Provide timely feedback to others regarding any hazard trees.

In addition to suppression and mop up operations, assess, control, and monitor hazard trees along roads and when selecting break areas or campsites.

Powerline Safety

Fire activity near high voltage electrical transmission/ distribution lines can cause multiple hazards and electrocute or seriously injure firefighters. The IC and line supervisors must be aware and communicate powerline hazards to all resources. Contact power companies when powerlines are threatened or involved.

Down Powerlines

- Communicate: Notify all responders of down electrical lines. Obtain radio check-back.
- Identify: Determine *entire* extent of hazard by visually tracking all lines, two poles in each direction, from the downed wire.
- Isolate: Flag area around down wire hazards; post guards.
- Deny entry: Delay firefighting actions until hazard identification and flagging are complete and/or confine actions to safe areas.
- Downed line on vehicle: Stay in vehicle until the power company arrives. If vehicle is on fire, jump out with both feet together. Do not touch the vehicle. Keep feet together and shuffle or hop away.
- **Always treat downed wires as energized!**

Ground Tactics

- Normal tactics apply when fire is more than 100 feet from powerlines.
- Heavy smoke and flames can cause arcs to ground. Direct attack must be abandoned within 100 feet of transmission lines.
- Spot fires or low ground fires can be fought with hose lines if heavy smoke or flame is not within 100 feet of powerlines.
- Always maintain a distance of 35 feet from transmission towers.
- Never use straight streams or foam—use a fog pattern.
- Use extreme caution if engaging in tactical firing operations.
- Extinguish wooden poles burning at the base to prevent down wire hazards.

Aerial Tactics

- Communicate locations of all transmission lines to air resources.
- Aerial drops onto powerlines will cause arcing to ground or arcing to powerline towers and poles.
- Drops should be parallel to lines and avoid drift making contact on the powerlines.
- When flying across powerlines, cross at the towers.

ALWAYS!

- ***L*ook Out** for any powerlines near the incident.
- ***C*ommunicate** location of all powerlines that present a hazard.
- ***E*scape Routes** should not be under or near overhead powerlines.
- ***S*afety Zones, ICP, and staging areas** should not be located under or near overhead powerlines.

Roadside Response Safety

- Anytime traffic flow is affected by the incident, contact the jurisdictional law enforcement agency for assistance.
- Conduct all operations as far from traffic lanes as possible.
- When working in traffic and not involved in fire suppression activities, high visibility vests must be worn.
- Park vehicles on the same side of the roadway.
- Exit the vehicle away from the roadway whenever possible.
- Post lookouts to watch for and control traffic in both directions.
- Utilize road flares or other traffic warning signs.
- Operate pumps from the non-traffic side or from the cab of the fire apparatus.
- Keep all hose, fire tools, and equipment out of traffic lanes.

Unexploded Ordnance Safety

Unexploded ordnance (UXO) is most likely to be encountered on military or former military sites. UXO poses risk of injury or death to anyone in the vicinity.

Situation Awareness

- Early identification of potential UXO is the first and most important step in reducing risk posed by UXO.
- Many types of UXO may be encountered:

Small arms munitions	Projectiles
Grenades	Rockets
Mortars	Guided missiles
Bombs	Sub munitions

- UXO may be found fully intact or in fragments. All UXO, whether intact or in fragments, presents a potential hazard and should be treated as such.
- Deteriorated UXO presents a particular hazard because it may contain chemical agents that could become exposed.

Hazard Control

- If you see UXO, stop and do not move closer.
- Isolate and clearly mark the area.
- Deny entry to others.
- Never transmit radio frequencies near UXO.
- Never remove anything near UXO.
- Never touch, move, or disturb UXO.
- Keep a minimum of 1,000 feet away from areas on fire that contain suspected UXO.
- Report discovery of UXO to your immediate supervisor.
- U.S. Army Operations Center for incidents involving explosives and ammunition: (703) 697-0218.

Oil and Gas Site Safety

When responding to an incident with oil and gas fields and/or coal seams, you must receive the appropriate training or a briefing before your operational assignment. Primary hazards include toxic gases as well as industry operations and facilities.

Situation Awareness

Methane (CH_4):

- Toxic, flammable, odorless, and colorless.
- Unlikely to cause physical problems in open environment, but does pose a fire risk in high concentrations.
- Beware of enclosed buildings/vehicles if gas is suspected.

Hydrogen Sulfide Gas (H_2S)

- Highly toxic, flammable, and colorless gas.
- Odor of rotten eggs at low concentrations.
- Sense of smell rapidly deteriorates at higher concentrations.
- Exposure indicators include high heart rate, respiratory paralysis, seizures, and rapid incapacitation.

Hazard Control

- Ensure contact is made with the appropriate authorities before engaging in suppression activities.
- Ask for H_2S monitor/breathing apparatus and adequate briefing.
- Do not depend of sense of smell for warning.
- Avoid low lying areas during stagnant air conditions.
- Anticipate industry traffic on narrow, unimproved roads.
- Be aware of exposed pipes and utility lines.
- Park at least 20 feet away from facilities and equipment. Avoid tampering with the oil and gas pumping equipment.
- Avoid open pits/dumps.
- Before starting dozer operations, ask your local dispatch to notify the appropriate utility representative. Don't assume pipelines are buried deeply or directly under their markers.
- **Seek immediate medical care at a hospital if H_2S exposure is suspected.**

Smoke Hazards and Mitigation

1. Line Personnel

- Direct attack, line holding and mop up resources have the highest smoke exposures. Symptoms of over exposure start with headaches and visual impairment, then impaired decision making, and possible death (from carbon monoxide). If needed rotate resources in and out of smoky areas. Consider exposure when developing mop up standards.
- Use lookouts to monitor and communicate hazardous smoke conditions that may impact nearby roads. Make appropriate supervisory and/or safety notifications.

2. ICP/Spike Camps

- Avoid locating camps in valleys or lower lying areas where smoke can concentrate under potential inversion conditions, in drainages where smoke can flow through, or where the fire is adjacent to camp.

3. Public

- Identify possible smoke sensitive areas (roads, communities, which can include schools and hospitals, etc.) that may be impacted by smoke. Monitor smoke impacts, and when heavy smoke is expected or present, notify authorities such as the air regulatory agency, health department, or public safety directly or through dispatch.

Smoke and Transportation Safety

1. Assess safety risks to personnel and public posed by smoke on roads. During initial attack and/or daily sizeup on extended attack, evaluate the potential of smoke to impact roadways up to three miles away. Identify drainages that may allow for smoke to impact roadways during the night and early morning.

2. Critical threshold values that identify potential for reduced visibility:

- **Surface Temperature ≤ 70 ^{0} F**
- **RH ≥ 70 %**
- **Surface Wind Speed < 7 mph**
- **Cloud Cover ≤ 60 %**

3. Hazard Control: Mitigate when roadway visibility is expected to be impacted**.** Consider use of: smoke observers, smoke signs, reduced speed limit, drone car, lead car, lane closure, or, if necessary, entire road closure. Notify appropriate authorities.

Consider use of local, regional, or national air resource or meteorological specialists (Air Resource Advisors (THSP), Incident Meteorologist (IMET)).

Last Resort Survival

Escape if you can.

- Utilize all your PPE and act immediately on your best option.
- Drop your gear to increase escape speed. Keep your fire shelter and, if time allows, your hand tool, water, and radio.
- You may be able to use the fire shelter for a heat shield as you move.
- In LIGHT FUELS, you may be able to move through the flames into the black.
- If you are on the flank of the fire, try to get below the fire.
- Consider vehicles or helicopters for escape.

Find a survivable area.

- Stay out of hazardous terrain features.
- Use bodies of water.
- In LIGHT FUELS, you may be able to light an escape fire. In other fuels, you may be able to light a backfire.
- Call for helicopter or retardant drops.
- Cut and scatter fuels if there is time.
- Use any available heat barriers such as large rocks and dozer berms.
- Consider vehicle traffic hazards on roads.
- Structures and vehicles may be an option for temporary refuge.

Pick a fire shelter deployment site.

- Your first priority is to maximize distance from nearest surface fuels.
- Find the lowest point available.
- If possible, pick a surface that allows the fire shelter to seal and remove ground fuels.
- Get into the fire shelter before the flame front hits.
- Position your feet toward the fire and hold down the fire shelter.
- Keep your face pressed into the ground and protect your airway.
- Deploy next to each other and keep talking.

Expect:

- Extremely heavy ember showers.
- Superheated air blast to hit before the flame front.
- Noise and turbulent powerful winds hitting the fire shelter.
- Heat and fire glow inside the fire shelter.
- Long deployment times…WHEN IN DOUBT WAIT IT OUT.
- Do not expect radio communication capabilities.
- Do not expect water or retardant from aerial resources.

NOTES

Vehicle Accident Operations

Report on Conditions

- Hazards (fuel, electrical, traffic, access, etc.).
- Need for law enforcement, ambulance, helicopter, tow truck, extrication tools.
- Injuries (number of victims, severity).
- Vehicles (number, type).

Establish Traffic Control

- Place apparatus between oncoming traffic and rescuers. Keep exhaust from pointing at scene and victims.
- Place warning devices.
- Establish positive communications.
- Consider the use of high visibility vests.

Assess Fire Hazard or Potential

- Take suppression action as needed if trained, equipped and authorized.
- Be aware of fuels running downgrade.

Perform Patient Assessment

- Provide first aid or triage assessment.
- If there are fatalities, do not give names or other information over radio that would reveal identity, and do not move body.

Keep dispatcher advised of changes.
Document all actions taken.

HazMat Incident Operations

Think Safety

- Assess situation.
- Safe approach: upwind/upgrade/upstream.
- Identify, isolate, establish perimeter, and deny entry.
- Notify agency dispatcher.
- Exact location, use GPS.
- Request needed assistance: identify a safe route.

Scene Management

- Goal is to protect life, environment and property.
- Attempt to identify substance using 2112 *Emergency Response Guide* (use binoculars, placards/labels, container shapes/colors, Material Safety Data Sheets, shipping papers, or license plate).
- Assess quantity of material involved.
- Identify exposures and hazards surrounding the site.
- Anticipate weather influences.

Organizational Responsibilities

- Establish command including an IC and Safety Officer.
- Develop action plan for area security and evacuation.
- Advise all on scene and responding resources of changes in situation.
- Keep dispatcher advised of changes.
- Document all actions taken.
- Make special note of any responder exposures.

HazMat Isolation Distances

- Minor event (1 drum, 1 bag, etc.) = 150 feet
- Major event (1 drum or more, etc.) = 500 feet
- Residential and light commercial = 300 feet
- Open areas = 1,000 feet
- BLEVE (Boiling Liquid Expanding Vapor Explosion) potential = 2,500 feet (one-half mile)
- Stage arriving units 2,500 feet upwind
- Position vehicles headed out

The following 24-hour emergency response communication services have agreed to provide immediate information about chemicals and/or assistance from a manufacturer:

CHEMTREC	**1-800-424-9300**
CHEMTEL	**1-800-255-3924**
INFOTRAC	**1-800-535-5053**
3E COMPANY	**1-800-451-8346**

U.S. Army Operations Center for incidents involving explosives and ammunition: **(703) 697-0218**

24-hour emergency and information calls to the nearest Poison Center: **1-800-222-1222**

Federal law requires that all spills of hazardous substances must be immediately reported to the U.S. Coast Guard/National Response Center: **1-800-424-8802**

HazMat Classification for Fixed Facilities

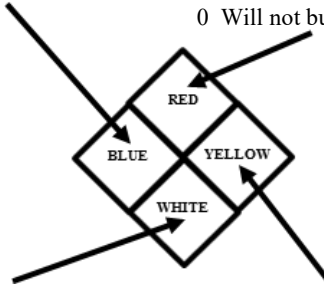
Based on NFPA 704

HEALTH HAZARD

4 Deadly
3 Extreme Danger
2 Hazardous
1 Slightly Hazardous
0 Normal Material

FIRE HAZARD

4 Below 73ºF
3 Below 100ºF
2 Above 100ºF not exceeding 200ºF
1 Above 200ºF
0 Will not burn



SPECIFIC HAZARD

ACID – Acid
ALK – Alkali
COR – Corrosive
OX – Oxidizer
☢ – Radioactive
~~W~~ – Use no water
SA – Simple asphyxiant
POI – Poisonous

REACTIVITY

4 May detonate
3 Shock and heat may detonate
2 Violent chemical change
1 Unstable if heated
0 Stable

Local Disaster Response

- Assess crew for injuries.
- Move apparatus out of station if possible.
- Determine if phones are working.
- Check for power.
- Assess the station for damage.
- Monitor phone and radio for dispatch information.
- Report by radio to dispatch or IC if established.
- Initiate a “windshield survey” of first response area.
- Do not fully commit to any incident.
  - Prioritize incidents with respect to life, hazard, and property.
  - Note any damage to infrastructure (roads, bridges, etc.).
  - Check for hazardous utility situations (gas, electric, water).
  - Note structural instability/collapse of any buildings.
  - Expect malfunctioning automatic alarms.
  - Use “negative reporting.” Only report things out of the ordinary.
- Follow local disaster plans.

All Hazard Incident Response

Wildland firefighters often respond to large scale disasters that can cover extensive geographic areas and impact many people. Often times these impacts are to large urban centers. Typical assignment tasks include search and rescue, debris clearing, and distribution of basic necessities. When responding, consider that basic services, utilities, transportation, medical care, credit card/ATM capability and law enforcement and security will likely be disrupted. Be considerate of those impacted by the disaster.

- Plan to be self-sufficient for 24 to 48 hours.
- Bring a GPS unit if possible.
- Be prepared for extreme weather conditions associated with storm disasters.
- Establish central rally points for assigned responders.
- Develop local contacts for information gathering.
- Dust and debris may interfere with respiration and visibility.
- Weakened structures, fires, leaking hazardous materials, raw sewage contamination, and waterborne diseases may pose additional risks.
- Mobility and access may be impaired by critical infrastructure damage, disrupted utilities, structural collapse, flooding, ice covered roads, or other barriers.
- In the case of natural disasters, be aware of the additional threats following the initial storm or earthquake.

Structure Hazard Marking System

Never enter a damaged structure unless trained, equipped, and authorized. You may find a 2' x 2' box at the entrance to indicate the condition of the structure. Use orange spray paint or a lumber crayon to mark inside the box.

☐ Structure is safe for Search and Rescue (SAR) with minor damage, or structure is fully collapsed.

☑ Structure is significantly damaged with some safe areas but other areas which need to be shored up or braced. Falling and collapse hazards need to be removed.

☒ Structure is unsafe and may collapse suddenly.

🡐 Entrance is located in direction of the arrow.

HM Hazardous material is present.

This information should be found outside the upper right portion of the box:

- Specialist ID
- Time and date of assessment
- Hazardous materials identified

SAR teams should also mark structures as they conduct operations.

/ Single slash (2' long) indicates SAR Team is currently in structure conducting operations.

✕ Cross/slash (2' x 2') indicates SAR Team has left structure/area.

This information should be found in the four quadrants of the cross slash:

- SAR Team ID — Left quadrant
- Time and date team left structure — Upper quadrant
- Personnel hazards — Right quadrant
- Number of victims still inside — Lower quadrant

structure ("X" indicates no victims remaining)

Missing Person Search Urgency

Factor	Rating
AGE	
Very young	
Very old	1
Other	1
MEDICAL CONDITION	2-3
Known/suspected injured, ill or mental problem	
Healthy	1-2
Know Fatality	3
NUMBER OF SUBJECTS	3
One alone	
More than one (unless separated)	1
SUBJECT EXPERIENCE PROFILE	2-3
Inexperienced, does not know area	
Not experienced, knows area	1
Experienced, not familiar with area	1-2
Experienced, knows area	2
WEATHER PROFILE	3
Past and/or existing hazardous weather	
Predicted hazardous weather (less than 8 hours away)	1
Predicted hazardous weather (more than 8 hours away)	1-2
No hazardous weather predicted	2
EQUIPMENT PROFILE	3
Inadequate for environment and weather	
Questionable for environment and weather	1
Adequate for environment and weather	1-2
TERRAIN/HAZARDS PROFILE	3
Known terrain or other hazards	
Few or no hazards	1
TOTAL	2-3

(Range = 7-21, with 7 the highest urgency and 21 the lowest urgency)

NOTES

NOTES

Aviation User Checklist

- Pilot/ Aircraft Data Card—Approved and current for aircraft type, contract and mission?
- Flight Plan/Flight Following—Initiated and confirmed with agency/bureau?
- PPE —available and worn by all passengers and pilot as required for the mission?
- Pilot briefed on mission objectives, flight route, known flight hazards, and aerial hazard map?
- Pilot or flight manager safety briefing provided to passengers? To include:
    - Aircraft hazards
    - Seatbelt or harness
    - Fuel and electrical shutoff
    - ELT and survival kit
    - Oxygen (if applicable)
    - First aid kit
    - Gear and cargo storage
    - Emergency seating position
    - Emergency exit(s)
    - Fire extinguisher
    - No smoking

Aviation Watch Out Situations

- Is this flight necessary?
- Who is in charge?
- Are all hazards identified and have you made them known?
- Should you stop the operation or flight due to change in conditions?
  - Communications
  - Confusion
  - Conflicting Priorities
  - Weather
  - Turbulence
  - Personnel
- Is there a better way to do it?
- Are you driven by an overwhelming sense of urgency?
- Can you justify your actions?
- Are there other aircraft in the area?
- Do you have an escape route?
- Are any rules being broken?
- Are communications getting tense?
- Are you deviating from the assigned operation or flight?

Anyone can refuse or curtail a flight when an unsafe condition may exist. Never let undue pressure (expressed or implied) influence your judgment or decisions. Avoid mistakes; don't hurry!

Helicopter Passenger Briefing and PPE

Pilot or designated helitack must brief all passengers prior to flight.

Personal Protective Equipment (PPE)

- Flame resistant clothing (long-sleeved shirt and pants, or flight suit).
- Approved helicopter flight helmet, or hardhats for fire crew transport from managed sites.
- All-leather boots.
- Hearing protection.
- Eye protection.
- Flame resistant or leather gloves.

Approach and Departure

- Stay clear of landing area during approach/ departure.
- Always approach/depart from the downslope (lower) side as directed by pilot/ helitack.
- Approach/ depart helicopter in a crouch position.
- Do not run.
- Keep in pilot's view at all times.
- Do not reach up or chase after loose objects.
- Never approach the tail section of the helicopter.
- **NO SMOKING** within 50 feet of the aircraft.

Tools and Equipment

- Secure light/loose items awaiting transport.
- Assign personnel for carrying tools and equipment to and from helicopter.
- Carry tools and long objects parallel to the ground, never on shoulder.
- All tools and equipment loaded/unloaded by qualified personnel.
- Portable radios turned off.

Helicopter Doors

- Location and how to operate.

In-Flight Discipline

- Follow pilot instructions.
- Loose items inside of aircraft secured and manageable.
- All baggage secured in aircraft or cargo compartment.
- No movement inside aircraft once seated.
- Never throw objects from the helicopter.
- Keep clear of the flight controls at all times.
- Unbuckle only when directed to do so by pilot or helitack.
- Wait for helitack personnel to open/close doors.
- Know location of first aid kit, survival kit, fire extinguisher, ELT (emergency locator transmitter), fuel and battery shutoff switch location and operation, radio operation.

In-Flight Emergency Procedures

- Emergency exit location and how to operate.
- Follow instructions of pilot/ helitack personnel.
- Snug seat belt and shoulder harness (know how to operate); secure gear.
- Emergency Seating Positions:
  - Forward Facing Seat:
    - Press your lower torso firmly against the seat back.
    - Lower your chin to chest. Grip the seat edge with your hands or place them under your legs.
    - Do not grasp the restraint harness.
  - Rear Facing Seat:
    - Same as Forward Facing Seat except, place your head back against the head rest or bulkhead.
  - Side Facing Seat:
    - Lean toward the front of the aircraft and brace your upper torso and head against whatever might be contacted, or move the head in the direction of impact to reduce flailing.
- Move clear of the aircraft only after rotor blades stop or when instructed by the pilot or helicopter crew.
- Assist injured personnel.
- Assess situation, remove first aid kit, survival kit, radio, ELT, and fire extinguisher. Render first aid. Attempt to establish contact.

Helicopter Landing Area Selection

Choosing a Landing Area

- Locate a reasonably flat area clear of people, vehicles, and obstructions such as trees, poles, and overhead wires.
- The area must be free of stumps, brush, posts, large rocks, and anything over 18 inches high.
- Consider the wind direction. Helicopters land and take off into the wind. Choose an approach free of obstructions.
- Any obstruction should be relayed to the helicopter crew on initial radio contact.
- Remove or secure any loose items in and around the landing area such as trash, blankets, hats, or equipment.
- Wet down the landing area if dusty conditions are present.
- Address LCES prior to staffing existing or proposed helicopter landing areas.

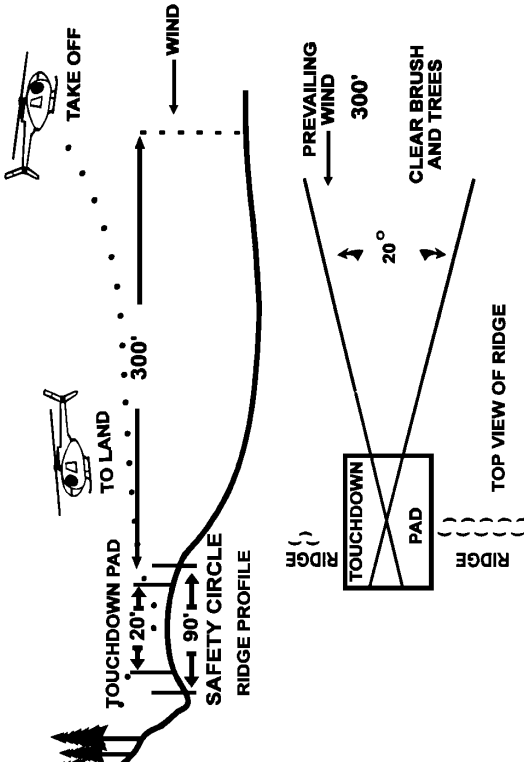
Fixed Helispots

- Type I Helicopters:
  - Safety circle: 110′
  - Touchdown pad: 30′ x 30′, clear and level
- Type II Helicopters:
  - Safety circle: 90′
  - Touchdown pad: 20′ x 20′, clear and level
- Type III Helicopters:
  - Safety circle: 75′
  - Touchdown Pad: 15′ x 15′ clear and level

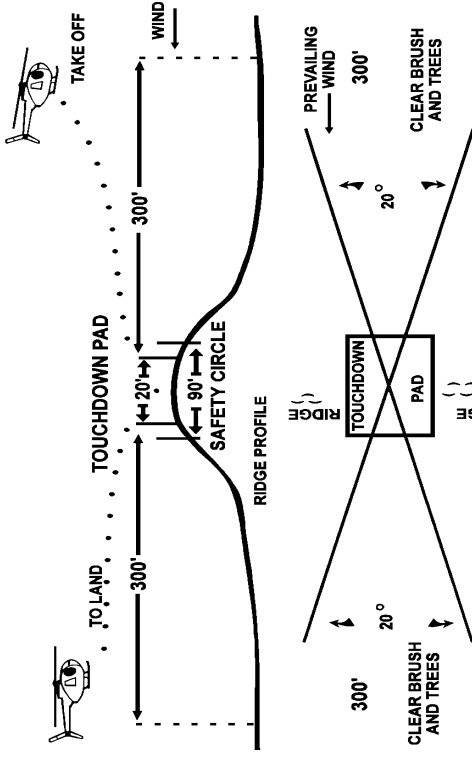
Items Needed

- 40 BC fire extinguisher (20 lb.)
- Wind Indicator
- Radio (compatible with helicopter)
- Pad marker
- Allowable payloads (HIGE & HOGE) for all helicopters using helispot
- Passenger/cargo manifest book
- Dust abatement, as needed

One-Way Helispot



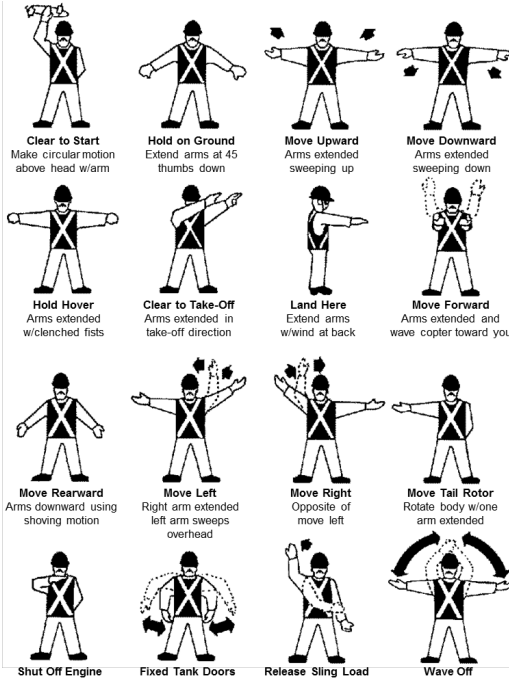
Two-Way Helispot



Longline Mission

- All individuals involved in longline missions will have been trained in longline operations.
- If you are on the receiving end or backhaul end of a longline load, you must be able to communicate to the pilot where you want the load delivered or picked up.
- Use a signal mirror to identify your position to the pilot.
- The drop-off/pick-up area should be as open and free of obstacles as possible.
- Once you have contacted the pilot by radio, provide specific load and site information (cargo weight, any hazardous materials, wind speed and direction, etc.).
- Mark the drop-off spot with flagging (large "X" on the ground) if possible.
- Keep pilot informed of load status (height above the ground, clear of obstacles, etc.).
- Let the hook land on the ground before attaching load.
- If the electrical release does not release the load, you must manually release it; wait until the hook lands on the ground before releasing.
- For ALL backhaul, a "swivel" must be connected to the cargo/longline hook. NO EXCEPTIONS! (When you request nets, request swivels also.)
- Load cargo net with heavy items in the center, light items on top. Tape all boxes and loose items.
- Pull the "purse strings" of the cargo net to equal length and attach a swivel to the steel rings. It's not necessary to "cross" the purse strings with an overhand wrap.

Helicopter Hand Signals



Clear to Start
Make circular motion above head w/arm

Hold on Ground
Extend arms at 45 thumbs down

Move Upward
Arms extended sweeping up

Move Downward
Arms extended sweeping down

Hold Hover
Arms extended w/clenched fists

Clear to Take-Off
Arms extended in take-off direction

Land Here
Extend arms w/wind at back

Move Forward
Arms extended and wave copter toward you

Move Rearward
Arms downward using shoving motion

Move Left
Right arm extended left arm sweeps overhead

Move Right
Opposite of move left

Move Tail Rotor
Rotate body w/one arm extended

Shut Off Engine
Cross neck w/hand palm down

Fixed Tank Doors
Open arms outward
Close arms inward

Release Sling Load
Contact forearm w/other hand

Wave Off
Don't Land
Wave arms and cross overhead

Paracargo Operations Safety

- Mark the target area with a large “X” using visible flagging in an open or cleared area.
- The drop site should be roughly an acre in size, depending on terrain and vegetation. Most helispots, ridge tops, and meadows work well.
- Camps should be at least 600' from target area.
- All persons, vehicles, and animals should be cleared from the drop site prior to arrival of the cargo aircraft.
- An individual should be in charge at drop site.
- The individual in charge should relay the following information to the cargo aircraft:
  - Confirm drop location.
  - Winds at ground level.
  - Any specific hazards in the area.
  - Individuals on the ground are clear and ready to receive cargo.
- The individual in charge should alert all personnel around the drop site that cargo operations are about to begin.
- All personnel in the vicinity should be “heads up” in the rare event that a parachute doesn’t open.
- All personnel should remain clear of the drop site until paracargo operations are complete.
- Treat cargo parachutes with care and return them to their respective bases at the earliest convenience.

Weight Estimates

(use only if scale is not available)

Item	Weight
Backpack pump (full)	45 lbs.
Cargo net 12'x12'	20 lbs.
Cargo net 20'x20'	45 lbs.
Cargo net (fish net)	5 lbs.
Cargo hook (1 hook)	35 lbs.
Jerry can/fuel (5 gal.)	45 lbs.
Canteen (1 gal.)	10 lbs.
Dolmar (full)	15 lbs.
Drip torch (full)	15 lbs.
Fusee (1 case)	36 lbs.
Hand tool (each)	8 lbs.
Lead line (12 ft.)	10 lbs.
Long line (50 ft.)	30 lbs.
Swivel	5 lbs.
Chain saw	25 lbs.
Hose, 1½" syn. 100'	23 lbs.
Hose, 1" syn. 100'	11 lbs.
Hose, 3/4" syn. (1,000'/case)	30 lbs.
Hose, suction, 8 ft.	10 lbs.
Mark 3 – Pump w/kit	150 lbs.
Stokes w/ backboard	40 lbs.
Trauma bag	35 lbs.
MRE, 1 case	25 lbs.
Cubee/water (5 gal.)	45 lbs.

Aerial Retardant Safety

Clear personnel out of target area prior to drops. If you can't escape:

- Hold your hand tool away from your body.
- Lie face down with head toward oncoming aircraft and hardhat in place. Grasp something firm to prevent being carried or rolled about by the dropped liquid.
- Do not run unless escape is assured.
- Get clear of dead snags, tops, and limbs in drop area.
- Working in an area covered by wet retardant should be done with caution due to slippery surfaces.

Directing Retardant and Bucket Drops

- **Give general location** on incident to aerial resource– division/head/heel/flank.
- **Identify any flight hazards** to the ATGS, ASM/LP, airtanker pilot or helicopter pilot.
- **Finalize location** with:
  - Clock position from pilot's perspective (see IRPG front cover).
  - Description of prominent landmarks.
  - Target position on slope – lower 1/3, upper 1/3, mid-slope, top of ridge, etc.
  - **Utilize signal mirrors whenever possible.**
  - Utilize panels or flagging to mark target as needed.
- **Describe target** from your location and explain mission. The pilot will decide drop technique and flight path.
- **Know the pilot's intentions** prior to the drop. Clear the area to avoid direct flights over ground personnel and equipment.
- **Give feedback** to pilot about drop accuracy. Be honest and constructive. Let pilot know if drop is early, late, uphill, downhill, on target, too high, too low, etc. Report low drops immediately.

Principles for Airtanker and Water Scooper Use

- Determine tactics, direct or indirect, based on fire sizeup and resources available.
- Discuss strategy, tactics, wind conditions, and hazards with ATGS, ASM/LP, or airtanker pilot.
  - Establish a clear, obtainable objective for retardant use with aerial supervision.
- Maintain effective communication with ATGS, ASM, or airtanker pilot.
- Establish an anchor point and work from it.
- Order appropriate aircraft for mission based on objectives, terrain and supporting ground resource tactics.
- Use the appropriate coverage levels for the fuel type. See chart on page 61.
- Drop downhill, into the wind and away from the sun if possible.
- Order airtankers early; aircraft are most effective during initial attack and early and late in the day.
- Let ground resources know when there is an airtanker inbound.
- Ensure approach, departure, and line is clear of personnel and equipment.
- Inform ATGS, ASM/LP, or pilot when the area drop area is clear.
- Let ground resources know when drops are completed.
- Get feedback from on-scene ground resources regarding drop effectiveness.
- Relay feedback to aerial resource(s).

Retardant and Suppressant Use Reminders

- Suppressant (water, foam or water enhancer) = Direct attack with close ground support.
- Retardant = Indirect attack, point protection and direct attack ahead of ground support.
- Retardant use should coincide with ground support within 24 hours.

Minimum Drop Heights for Airtankers and Water Scoopers

- SEAT/Amphibious SEAT = Min. 60 ft. (optimum 90 ft.) above the vegetation
- LAT = 150 ft. above the vegetation
- VLAT = 200 ft. above the vegetation
- Water Scooper (CL 215/415) = 150 ft. above the vegetation

ATGS = Air Tactical Group Supervisor

ASM/LP = Aerial Supervision Module/ Lead plane

Type 3 Airtanker = 800-1,799 gallons (S-2T, SEAT)

Type 2 Airtanker = 1,800-2,999 gallons (Convair 580, Q-400)

Type 1 or Large Airtanker (LAT) = 3,000-5,000 gallons (BAe-146, RJ85, MD87, C-130)

VLAT = Very Large Airtanker = >8,000 gallons (DC10, 747)

Recommended Retardant Coverage Levels

Coverage Level	Fuel Model Description
CL1	Short/Medium grasses and tundra
CL2	Conifer with grass Shortneedle closed conifer; summer hardwood Longneedle conifer; fall hardwood
CL3	Sagebrush with grass Sawgrass and tall grass Intermediate brush (green) Light Slash
CL4	Shortneedle conifer (heavy dead litter)
CL6	Southern Rough Intermediate brush (cured); Alaska Black Spruce
>CL6	California mixed chaparral; high pocosin Medium to heavy slash

Aircraft Mishap Response Actions

Time is extremely critical when responding to an emergency. Immediate positive action is necessary; delay may effect someone's survival.

Rescue Operations

- Preserve life.
- Do whatever is necessary to extricate injured occupants and to extinguish fires.
- Secure the area.
- Document and/or photograph the location of any debris that must be disturbed in order to carry out rescue and/or fire suppression activities.
- Identify witnesses and get contact information.

Site Safety Precaution

Aircraft wreckage sites can be hazardous for many reasons other than adverse terrain or climatic conditions. Personnel involved in the recovery, examination, and documentation of wreckage may be exposed to physical hazards such as hazardous cargo, flammable and toxic fluids, sharp or heavy objects, and disease. It's important to exercise good judgment, use available protective devices and clothing, and use extreme caution when working in the wreckage.

SAFECOM Reporting System

The purpose of the SAFECOM system is for accident prevention. It is a tool used to encourage the reporting of any condition, observance, act, maintenance problem, or circumstance that has the potential to cause an aviation or aviation-related accident. It can also be used for reporting positive safety actions and mishap prevention measures.

Submitting a SAFECOM is **not** a substitute for on-the-spot correction(s) to a safety concern. While it is imperative that problems and issues be addressed at the local level, it is beneficial to share problems and solutions system wide.

The SAFECOM system is **not** intended for initiating punitive actions. SAFECOM managers are responsible for protecting personal data and sanitizing SAFECOMs prior to posting to the public.

Submit SAFECOMs online at https://www.safecom.gov/.

FAX hard copies to OAS 208-433-5007 or USFS 208-387-5735.

Report any interagency aircraft mishap to 888-464-7427 (888-4MISHAP).

NOTES

Spot Weather Forecast

Spot weather forecasts should always be requested for fires that have the potential for active fire behavior, exceed initial attack, or are located in areas where Red Flag Warnings have been issued.

In addition, personnel should consider requesting a spot weather forecast for non-fire incidents including HazMat or search and rescue activities.

The basic elements needed for a spot weather request include:

- Location by street address/zip code/city name, latitude/longitude, US National Grid, or drag to a location using the spot forecast request webpage https://www.weather.gov/spot/
- Type of incident (wildfire, prescribed burn, HazMat, SAR)
- Project/Incident Name
- Requesting Agency/Official, email address and phone number
- Elevation (at top and bottom of incident)
- Drainage name, size, aspect, fuel type and sheltering (full, partial, unsheltered)
- Forecast delivery time (i.e. as soon as possible or a later time), time forecast should start, and time zone
- Any remarks that can help meteorologists forecast the site, pertinent feedback information (i.e. humidity values were lower than predicted), or special requests (i.e. very interested in potential wind shifts)

Weather observations need to include:

- Site location on the fire
- Date of observation
- Time of observation
- Elevation
- Wind direction
- Wind speed
- Dry bulb temp
- Wet bulb temp
- RH
- Dewpoint temp (Td)
- Sky cover
- Weather (Wx)
- Any special remarks for the observation time which could include fire behavior or describe wind/weather changes

It is important weather feedback is provided to meteorologists who are completing the spot forecast request, either during or soon after the operational period is completed. If conditions on the ground do not match the forecast for a period of time you should request an updated or new spot forecast. Weather feedback can be provided several ways including:

- Feedback text box found at the bottom of the spot forecast webpage for each specific incident.
- Remarks/weather observation boxes prior to submitting a new request.
- Fax fireline observations to local NWS office or call to relay the information.

Weather Watch/Weather Warning

A **Watch** is used when the risk of a hazardous weather or hydrologic event has increased significantly, but its occurrence, location, and/or timing is still uncertain.

A **Warning** is issued when a hazardous weather or hydrologic event is occurring, is imminent, or has a very high probability of occurring. A warning is used for conditions posing a threat to life or property.

Energy Release Component (ERC)

The ERC serves as a good characterization of local seasonal fire danger trends resulting from the area's fuel moisture conditions. The ERC is a relative index and should be compared to historic trends and thresholds on the corresponding area's pocket card. The ERC relies heavily on large and live fuels, has low variability, and is not affected by wind speed.

Burning Index (BI)

The BI reflects the changes in fine fuel moisture content and wind speed and is highly variable day-to-day. The BI is more appropriate for short-term fire danger and can be loosely associated with flame length by dividing the BI by 10. The BI is readily affected by wind speed and fine fuel moisture.

Haines Index (HI)

The HI is used to indicate the potential for rapid fire growth due to dry and unstable atmospheric conditions over a fire area. The index is a simple way to measure the atmosphere's contribution to the fire's growth potential. A high Haines Index is correlated with large fire growth where winds do not dominate fire behavior.

Index	Fire's Growth Potential
2	Very Low Potential (Moist and stable lower atmosphere)
3	Very Low Potential
4	Low Potential
5	Moderate Potential
6	High Potential (Dry and unstable lower atmosphere)

Keetch-Byram Drought Index (KBDI)

The KBDI is a daily value representative of the water balance where yesterday's drought index is balanced with today's drought factor (precipitation and soil moisture). The drought index ranges from 0 to 800; an index of 0 represents no moisture depletion and an index of 800 represents absolutely dry conditions.

Index	KBDI Indicators
0-200	Soil and large class fuel moistures are high. Most fuels will not readily ignite or burn.
200-400	Lower litter and duff layers are drying and beginning to contribute to fire intensity. Heavier fuels will still not readily ignite and burn.
400-600	Lower litter and duff layers actively contribute to fire intensity and will burn actively. Expect complete consumption of all but the largest fuels. Drying of soil will lower live fuel moistures allowing live fuels to become available to burn.
600-800	Often associated with severe drought and increased wildfire occurrence. Expect intense deep burning fires with significant spotting problems. Live fuels will burn actively at these levels and expect fires to be difficult to contain and control.

Lightning Activity Level (LAL)

Level	LAL Indicators
LAL 1	• No thunderstorms
LAL 2	• Isolated thunderstorms. • Light rain occasionally reaches the ground. • Lightning very infrequent. • 1-5 strikes in 5 minutes.
LAL 3	• Widely scattered thunderstorms. • Light to moderate rain will reach the ground. • Lightning is infrequent. • 6-10 strikes in 5 minutes.
LAL 4	• Scattered thunderstorms. • Moderate rain is commonly produced. • Lightning is frequent. • 11-15 strikes in 5 minutes.
LAL 5	• Numerous thunderstorms. • Rainfall is moderate to heavy. • Lightning is frequent and intense. • More than 15 strikes in 5 minutes.
LAL 6	• Widely scattered dry thunderstorms. • No rain reaches the ground. • Lightning is infrequent. • May constitute the issuance of a Red Flag Warning.

Important Winds to Firefighters

Wind Type	Typical Wind Speed Ranges	Notes
Critical Winds		
Thunderstorm (a.k.a. outflow and downdraft)	25-35 mph can exceed 60 mph	Gusty/erratic in nature. Blow from the direction of the thunderstorm.
Frontal	20-30 mph can exceed 50 mph	Also note shift in wind direction with frontal passage.
Foehn Winds (Chinook, Santa Ana, Mono, Wasatch, East, and North)	20-60 mph can exceed 90 mph	Warming and drying winds blowing from high elevation to low elevation.
Surfacing or low level jets	25-45 mph	Generally occur 100's of feet above the ground. Can enhance fire plume.
Whirlwinds	50+ mph	Dust devils and fire whirls.
Glacier	30-50 mph	Occur down slope from glaciers.

Wind Type	Typical Wind Speed Ranges	Notes
Local Winds		
Upslope	3-8 mph	Late morning into early afternoon.
Up-valley	10-15 mph	Mid- to late afternoon.
Downslope	2-5 mph	Late evening through midnight.
Downvalley	5-10 mph	Late night into very early morning.
Sea Breeze	10-20 mph can exceed 30 mph	Daytime: Blows from the sea toward the land.
Land Breeze	3-10 mph	Nighttime: Blows from the land toward the sea.

Source: S-290, *Intermediate Fire Behavior*

Beaufort Scale

FOR ESTIMATING 20-FT WIND SPEED

Wind Class	Wind Speed (mph)	Nomenclature
1	<3	Very light – smoke rises nearly vertically. Leaves of quaking aspen in constant motion; small branches sway; slender branches and twigs of trees move gently; tall grasses and weeds sway and bend with wind; wind vane barely moves.
2	4-7	Light – trees of pole size in the open sway gently; wind felt distinctly on face; loose scraps of paper move; wind flutters small flag.
3	8-12	Gentle breeze – trees of pole size in the open sway very noticeably; large branches of pole size trees in the open toss; tops of trees in dense stands sway; wind extends small flag; a few crested waves form on lakes.
4	13-18	Moderate breeze – trees of pole size in the open sway violently; whole trees in dense stands sway noticeable; dust is raised on the road.
5	19-24	Fresh – branchlets are broken from trees; inconvenience is felt in walking against wind.
6	25-31	Strong – tree damage increases with occasional breaking of exposed tops and branches; progress impeded when walking against wind; light structural damage to buildings.
7	32-38	Moderate gale – severe damage to tree tops; very difficult to walk into wind; significant structural damage occurs.
8	>39	Fresh gale – surfaced strong Santa Ana; intense stress on all exposed objects, vegetation, buildings; canopy offers virtually no protection; wind flow is systematic in disturbing everything in its path.

Source: *Fire Behavior Field Reference,* PMS 437

Alignments and Patterns for Dangerous Fire Behavior

Drought

- Short-term or "Flash"
  - "snap-crackle-pop"
    - Do sticks **snap** with ease?
    - Does the timber litter **crackle** while you walk?
    - Do the leaves **pop** back in place after being crumpled?
  - Dust in the duff
  - ERC values at the 90th percentile or greater
- Long term
  - Mortality-red needles

Hot-Dry-Unstable Days

- Plenty of sun during the morning
- Temperatures above normal
- Critically low humidity determined by regional climatology
- High mixing heights
- Haines Index values that are unusually high for the region.

Inversion Breaks

- Timing can vary based on terrain type, seasonality, latitude and day-to-day weather pattern changes
- Quick jump in temperature, lowering humidity, and increased wind

Windy-Dry-Unstable Days

- Wide gust spreads (difference between gusts and sustained wind)
  - Difference range: 15 to 20 mph (battling-shifting wind)
- Mostly sunny/high mixing heights/above normal surface temperatures

- Leading edge of cold frontal passages
- Low humidity for the area

Thunderstorms (outflows/microbursts/gust fronts)

- Cloud to ground lightning from fast moving and/or drier storms
- Outflow boundaries that significantly raise wind speeds during hot-dry-unstable days
- Outflow boundaries that quickly alter wind direction by 90 to 180 degrees

Foehn/Downslope and Mountain Wave Events

- Sudden bursts of wind especially during overnight hours that can lead to accelerated down slope/down canyon fire spread
- Reversal of normal day/night (diurnal) wind flows
- Rapid warming/drying

Firefighters are encouraged to review and understand atmospheric patterns that lead to these critical weather alignments. They include:

- Cold frontal passages
- Break-down of the upper level ridge
- Monsoon bursts
- Thermal lows/troughs
- Mid-level dry intrusions/slots
- Migrating surface dry line
- Upper and low level jets
- Subsidence-windy sector of Tropical Storms
- Foehn downslope wind events (i.e. Santa Ana and Chinook)

Consult National Weather Service and GACC Predictive Service meteorologists if there are any questions about the predicted patterns.

Fire Behavior Hauling Chart

Tactical Interpretations from Flame Length

Flame Length	Interpretations
Less than 4 feet	Fires can generally be attacked at the head or flanks by firefighters using hand tools. Handline should hold fire.
4 to 8 feet	Fires are too intense for direct attack on the head with hand tools. Handline cannot be relied on to hold the fire. Dozers, tractor-plows, engines, and retardant drops can be effective.
8 to 11 feet	Fire may present serious control problems: torching, crowning, and spotting. Control efforts at the head will probably be ineffective.
Over 11 feet	Crowning, spotting, and major fire runs are probable. Control efforts at the head of the fire are ineffective.

Relative Humidity: 1,400-4,999' Elevation

1. Find current dry bulb reading in left column.
2. For wet bulb depression on top-subtract wet bulb reading from dry bulb reading.
3. Read RH% where they intersect.

DRY BULB	WET BULB DEPRESSION, DEGREES F.																													
t °F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
34	91	82	73	64	55	46	38	30	21	13	5																				
35	91	82	74	65	56	48	40	32	24	16	8	0																			
36	91	83	75	66	58	50	42	34	26	18	10	3																			
37	92	84	75	67	59	51	43	35	28	20	13	5																			
38	92	84	76	68	61	53	45	37	30	22	15	8	1																		
39	92	84	76	69	62	54	47	39	32	24	17	10	3																		
40	92	84	77	69	62	55	48	41	33	26	19	13	6																		
41	92	85	77	70	63	56	49	42	35	28	22	15	8	2																	
42	92	85	78	71	64	57	50	44	37	30	24	17	11	4																	
44	93	86	78	71	65	58	51	45	38	32	26	19	13	7	1																
44	93	86	79	72	66	59	52	46	40	33	27	21	15	9	3																
45	93	86	79	72	66	60	53	47	41	35	29	23	17	11	5																
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48	93	87	80	74	68	62	56	50	44	39	33	27	22	17	11	6	1														
49	93	87	81	74	69	63	57	51	45	40	34	29	24	18	13	8	3														
50	94	87	81	75	69	63	57	52	46	41	35	30	25	20	15	10	5	0													
51	94	88	82	76	70	64	58	53	47	42	37	31	26	21	17	12	7	2													
52	94	88	82	76	70	65	59	53	48	43	38	33	28	23	18	13	9	4													
53	94	88	82	76	71	65	60	54	49	44	39	34	29	24	20	15	10	6	2												
54	94	88	82	77	71	66	60	55	50	45	40	35	30	26	21	17	12	8	3												
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56	94	89	83	77	72	67	62	57	52	47	42	37	33	28	24	20	15	11	7	3											
57	94	89	83	78	72	67	62	57	52	48	43	38	34	30	25	21	17	12	8	4	0										
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59	95	89	84	78	74	68	64	59	54	49	45	40	36	32	28	24	19	15	11	8	4	0									
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61	95	90	84	79	74	69	65	60	55	51	46	42	38	34	30	26	22	18	14	11	7	3									
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67	95	90	85	81	76	72	68	63	59	55	51	47	43	40	36	32	29	25	22	18	15	12	9	6	3						
68	95	90	86	81	77	72	68	64	60	56	52	48	44	40	37	33	30	26	23	20	16	13	10	7	4	1					
69	95	91	86	81	77	73	68	64	60	56	52	49	45	41	38	34	31	27	24	21	17	14	11	8	5	2					
70	95	91	86	82	77	73	69	65	61	57	53	49	46	42	39	35	32	28	25	22	19	16	13	10	7	4	1				
71	95	91	86	82	77	73	69	65	61	57	54	50	46	43	39	36	32	29	26	23	20	17	14	11	8	5	2				
72	95	91	86	82	78	74	70	66	62	58	54	50	47	44	40	37	33	30	27	24	21	18	15	12	9	6	4	1			
73	95	91	87	82	78	74	70	66	62	59	55	51	48	44	41	38	34	31	28	25	22	19	16	13	10	8	5	2			
74	95	91	87	83	78	74	70	66	63	59	55	52	48	45	42	38	35	32	29	26	23	20	17	14	12	9	6	4	1		
75	96	91	87	83	79	75	71	67	63	59	56	52	49	46	42	39	36	33	30	27	24	21	18	15	13	10	7	5	2		
76	96	91	87	83	79	75	71	67	64	60	56	53	50	46	43	40	37	34	30	27	25	22	19	16	14	11	9	6	4	1	
77	96	91	87	83	79	75	71	68	64	60	57	53	50	47	44	40	37	34	31	28	25	23	20	17	15	12	10	7	5	2	
78	96	91	87	83	79	75	72	68	64	61	58	54	51	48	44	41	38	35	32	29	26	24	21	18	16	13	11	8	6	4	1
79	96	92	88	84	80	76	72	69	65	61	58	55	52	49	45	42	39	36	33	30	27	25	22	19	17	14	12	9	7	5	2
80	96	92	88	84	80	76	72	69	65	62	58	55	52	49	45	42	39	36	34	31	28	26	23	20	18	15	13	10	8	6	4
82	96	92	88	84	80	77	73	69	66	62	59	56	53	50	47	44	41	38	35	32	30	27	24	22	20	17	15	12	10	8	6
84	96	92	88	84	81	77	74	70	67	63	60	57	54	51	48	45	42	39	36	34	31	29	26	24	21	19	17	14	12	10	8
86	96	92	88	85	81	77	74	71	67	64	61	58	55	52	49	46	43	40	38	35	33	30	28	25	23	21	18	16	14	12	10
88	96	92	89	85	82	78	75	72	68	65	62	59	56	53	50	47	44	42	39	36	34	32	29	27	25	22	20	18	16	14	12
90	96	92	89	85	82	79	75	72	69	66	63	60	57	54	51	48	46	43	41	38	36	34	32	29	27	25	23	21	19	17	15
92	96	92	89	85	82	79	75	72	69	66	63	60	57	54	52	49	46	44	41	39	36	34	32	29	27	25	23	21	19	17	15
94	96	93	89	86	82	79	76	73	69	66	64	61	58	55	52	50	47	45	42	40	37	35	33	31	28	26	24	22	20	18	16
96	96	93	89	86	83	79	76	73	70	67	64	61	59	56	53	51	48	46	43	41	38	36	34	32	30	28	26	24	22	20	18
98	96	93	90	86	83	80	77	74	71	68	65	62	60	57	54	52	49	46	44	42	39	37	35	33	31	29	27	25	23	21	19
100	96	93	90	86	83	80	77	74	71	68	65	63	60	57	55	52	50	47	45	43	40	38	36	34	32	30	28	26	24	22	21
102	97	93	90	87	83	80	77	74	71	69	66	63	61	58	55	53	50	48	46	44	41	39	37	35	33	31	29	27	25	23	22
104	97	93	90	87	84	81	78	75	72	69	66	64	61	59	56	54	51	49	47	44	42	40	38	36	34	32	30	28	26	25	23
106	97	93	90	87	84	81	78	75	72	70	67	64	62	59	57	54	52	50	47	45	43	41	39	37	35	33	31	29	28	26	24
108	97	93	90	87	84	81	78	75	73	70	67	65	62	60	57	55	53	50	48	46	44	42	40	38	36	34	32	30	29	27	25
110	97	94	90	87	84	81	79	76	73	70	68	65	63	60	58	56	53	51	49	47	45	43	41	39	37	35	33	31	29	28	26

Relative Humidity: 5,000-9,200' Elevation

1. Find current dry bulb reading in left column.
2. For wet bulb depression on top-subtract wet bulb reading from dry bulb reading.
3. Read RH% where they intersect.

DRY BULB	WET BULB DEPRESSION, DEGREES F.																													
t °F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
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51	94	88	83	77	72	66	61	56	51	46	41	36	32	27	23	18	14	9	5	1											
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53	94	89	83	78	72	67	62	57	52	48	43	38	34	29	25	21	17	13	9	5	1										
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55	95	89	84	78	73	69	63	59	54	49	45	40	36	32	28	24	20	16	12	8	4	0									
56	95	89	84	79	74	69	64	59	55	50	46	41	37	33	29	25	21	17	13	9	6	2									
57	95	89	84	79	74	69	65	60	55	51	47	42	38	34	30	26	22	18	14	11	7	3									
58	95	89	84	79	74	70	65	61	56	52	48	43	39	35	31	27	23	20	16	12	9	5	2								
59	95	90	85	80	75	70	65	61	57	53	48	44	40	36	32	28	24	21	17	14	10	6	3								
60	95	90	85	80	75	71	66	62	57	53	49	45	41	37	33	29	26	22	18	15	11	8	5	1							
61	95	90	85	80	75	71	66	62	58	54	50	46	42	38	34	30	27	23	20	16	13	9	6	3							
62	95	90	85	81	76	72	67	63	59	54	50	46	43	39	35	31	28	24	21	17	14	11	8	4	1						
63	95	90	85	81	76	72	67	63	59	55	51	47	43	40	36	32	29	25	22	19	15	12	9	6	3						
64	95	90	86	81	77	72	68	64	60	56	52	48	44	40	37	33	30	26	23	20	16	13	10	7	4	1					
65	95	91	86	81	77	73	69	64	61	57	53	49	46	42	38	35	31	28	24	21	18	15	12	9	6	3					
66	95	91	86	82	78	73	69	65	62	58	54	50	47	43	40	36	33	29	26	23	20	17	14	11	8	5	3	0			
67	96	91	87	83	78	74	70	66	63	59	55	52	48	45	42	38	35	32	29	26	23	20	17	14	12	9	6	4	1		
68	96	91	87	83	79	74	71	67	63	60	56	53	49	46	43	40	37	34	31	28	25	22	19	17	14	11	9	6	4	1	
69	96	91	87	83	79	75	71	68	64	61	57	54	51	47	44	41	38	35	32	29	27	24	21	18	15	13	10	8	5	3	
70	96	91	87	83	79	75	72	68	65	61	58	55	51	48	45	42	39	36	33	30	27	25	22	19	17	14	12	9	6	4	2
71	96	91	87	84	80	76	72	69	65	62	59	55	52	49	46	43	40	37	34	31	29	26	23	20	18	15	13	10	8	5	3
72	96	92	88	84	80	76	73	69	66	63	59	56	53	50	47	44	41	38	35	33	30	27	24	22	19	16	14	11	9	7	4
73	96	92	88	84	81	77	73	70	66	63	60	57	54	51	48	45	42	39	37	34	31	28	26	23	20	18	15	13	10	8	6
74	96	92	88	85	81	77	74	70	67	64	61	58	55	52	49	46	43	41	38	35	32	30	27	24	22	19	17	14	12	9	7
75	96	92	88	85	81	78	74	71	68	64	61	58	56	53	50	47	44	42	39	36	33	31	28	25	23	20	18	16	13	11	9
76	96	92	88	84	80	76	72	69	65	62	58	55	52	49	45	42	39	37	34	31	28	22	23	20	18	15	13	10	8	6	4
77	96	92	88	84	80	76	72	69	66	62	59	55	52	49	46	43	40	37	34	32	29	26	24	21	19	16	14	12	9	7	5
78	96	92	88	84	80	76	73	69	66	62	59	56	53	50	47	44	41	38	35	32	29	27	25	22	20	17	15	13	10	8	6
79	96	92	88	84	80	77	73	70	66	63	60	56	53	50	47	44	41	39	36	33	30	28	25	23	21	18	16	14	11	9	7
80	96	92	88	84	80	77	73	70	67	63	60	57	54	51	48	45	42	39	37	34	31	29	26	24	21	19	17	14	12	10	8
82	96	92	88	85	81	77	74	71	67	64	61	58	55	52	49	46	43	40	38	35	33	30	28	25	23	21	19	16	14	12	10
84	96	92	89	85	81	78	74	71	68	65	61	58	55	53	50	47	44	42	39	36	34	31	29	27	24	22	20	18	16	14	12
86	96	92	89	85	81	78	75	71	68	65	62	59	56	53	50	48	45	43	40	38	35	33	30	28	26	24	22	20	17	15	13
88	96	93	89	85	82	79	75	72	69	66	63	60	57	54	51	49	46	44	41	39	36	34	32	29	27	25	23	21	19	17	15
90	96	93	89	86	82	79	76	73	69	66	63	61	58	55	52	50	47	45	42	40	37	35	33	31	28	26	24	22	20	18	16
92	96	92	89	86	83	79	76	73	70	67	64	61	58	56	53	51	48	46	43	41	38	36	34	32	30	28	26	24	22	20	18
94	96	93	89	86	83	80	76	73	70	67	65	62	59	56	54	51	49	46	44	42	39	37	35	33	31	29	27	25	23	21	19
96	96	93	90	86	83	80	77	74	71	68	65	62	60	57	55	52	50	47	45	43	40	38	36	34	32	30	28	26	24	22	20
98	97	93	90	87	83	80	77	74	72	69	66	64	61	58	56	53	51	49	46	44	42	40	38	36	34	32	30	28	26	24	22
100	97	93	90	87	84	80	77	75	72	69	66	64	61	58	56	53	51	49	46	44	42	40	38	36	34	32	30	28	26	25	23
102	97	93	90	87	84	81	78	75	72	69	67	64	61	59	57	54	52	50	47	45	43	41	39	37	35	33	31	29	27	26	24
104	97	93	90	87	84	81	78	75	72	70	67	65	62	59	57	55	52	50	48	46	44	42	40	38	36	34	32	30	28	27	25
106	97	94	90	87	84	81	78	76	73	70	68	65	62	60	58	55	53	51	49	47	44	42	40	38	37	35	33	31	29	28	26
108	97	94	90	87	84	82	79	76	73	71	68	65	63	61	58	56	54	51	49	47	45	43	41	39	37	36	34	32	30	29	27
110	97	94	91	88	85	82	79	76	74	71	68	66	63	61	59	56	54	52	50	48	46	44	42	40	38	36	35	33	31	30	28

Probability of Ignition Tables

1. Using Table A, determine Reference Fuel Moisture (RFM) % from intersection of temperature and relative humidity. Record this RFM percentage.

2. Select Table B, C, or D to adjust RFM for local conditions by finding current month in table title.

    - Are the fine fuels more than 50% shaded by canopies and clouds? If yes, use bottom (**shaded**) portion of table. If no, use top (**exposed**) portion of table.

    - Determine the appropriate row based on aspect and slope. Determine the appropriate column based on time of day and elevation of area of concern when compared to the weather site elevation.

    - Obtain the Dead Fuel Moisture Content Correction (%) from the intersection of row and column.

3. Add the resulting Dead Fuel Moisture Content Correction (%) to the Reference Fuel Moisture (%).

Table A

REFERENCE FUEL MOISTURE

Day Time 0800 - 1959

Dry Bulb Temperature (F)	Relative Humidity (Percent)																				
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	36-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	100
10 - 29	1	2	2	3	4	5	5	6	7	8	8	8	9	9	10	11	12	12	13	13	14
30 - 49	1	2	2	3	4	5	5	6	7	7	7	8	9	9	10	10	11	12	13	13	13
50 - 69	1	2	2	3	4	5	5	6	6	7	7	8	8	9	9	10	11	12	12	12	13
70 - 89	1	1	2	2	3	4	5	5	6	7	7	8	8	8	9	10	10	11	12	12	13
90 - 109	1	1	2	2	3	4	4	5	6	7	7	8	8	8	9	10	10	11	12	12	13
109+	1	1	2	2	3	4	4	5	6	7	7	8	8	8	9	10	10	11	12	12	12

Go to Tables B, C, or D for Corrections

Table B
DEAD FUEL MOISTURE CONTENT CORRECTIONS
MAY JUNE JULY

Exposed – Less than 50% Shading of Surface Fuels																				
		>0800			>1000			>1200			>1400			>1600			>1800		
Aspect	% Slope	B	L	A	B	L	A	B	L	A	B	L	A	B	L	A	B	L	A
N	0-30%	2	3	4	1	1	1	0	0	1	0	0	1	1	1	1	2	3	4
	31%+	3	4	4	1	2	2	1	1	2	1	1	2	1	2	2	3	4	4
E	0-30%	2	2	3	1	1	1	0	0	1	0	0	1	1	1	2	3	4	4
	31%+	1	2	2	0	0	1	0	0	1	1	1	2	2	3	4	4	5	6
S	0-30%	2	3	3	1	1	1	0	0	1	0	0	1	1	1	1	2	3	3
	31%+	2	3	3	1	1	2	0	1	1	0	1	1	1	1	2	2	3	3
W	0-30%	2	3	4	1	1	2	0	0	1	0	0	1	0	1	1	2	3	3
	31%+	4	5	6	2	3	4	1	1	2	0	0	1	0	0	1	1	2	2
Shaded – Greater than or Equal to 50% Shading of Surface Fuels																				
Aspect	% Slope	B	L	A	B	L	A	B	L	A	B	L	A	B	L	A	B	L	A
N	0%+	4	5	5	3	4	5	3	3	4	3	3	4	3	4	5	4	5	5
E	0%+	4	4	5	3	4	5	3	3	4	3	4	4	3	4	5	4	5	6
S	0%+	4	4	5	3	4	5	3	3	4	3	3	4	3	4	5	4	5	5
W	0%+	4	5	6	3	4	5	3	3	4	3	3	4	3	4	5	4	4	5

B = Area of concern 1000'-2000' below wx site location
L = Area of concern within +/- 1000' of wx site location
A = Area of concern 1000'-2000' above wx site location

Table C
DEAD FUEL MOISTURE CONTENT CORRECTIONS
FEBRUARY MARCH APRIL/AUGUST SEPTEMBER OCTOBER

Exposed – Less than 50% Shading of Surface Fuels																				
		>0800			>1000			>1200			>1400			>1600			>1800		
Aspect	% Slope	B	L	A	B	L	A	B	L	A	B	L	A	B	L	A	B	L	A
N	0-30%	3	4	5	1	2	3	1	1	2	1	1	2	1	2	3	3	4	5
	31%+	3	4	5	3	3	4	2	3	4	2	3	4	3	3	4	3	4	5
E	0-30%	3	4	5	1	2	3	1	1	1	1	1	2	1	2	3	3	4	5
	31%+	3	3	4	1	1	1	1	1	1	1	2	3	3	4	5	4	5	6
S	0-30%	3	4	5	1	2	2	1	1	1	1	1	1	1	2	3	3	4	5
	31%+	3	4	5	1	2	2	0	1	1	0	1	1	1	2	2	3	4	5
W	0-30%	3	4	5	1	2	3	1	1	1	1	1	1	1	2	3	3	4	5
	31%+	4	5	6	3	4	5	1	2	3	1	1	1	1	1	1	3	3	4
Shaded – Greater than or Equal to 50% Shading of Surface Fuels																				
Aspect	% Slope	B	L	A	B	L	A	B	L	A	B	L	A	B	L	A	B	L	A
N	0%+	4	5	6	4	5	5	3	4	5	3	4	5	4	5	5	4	5	6
E	0%+	4	5	6	3	4	5	3	4	5	3	4	5	4	5	6	4	5	6
S	0%+	4	5	6	3	4	5	3	4	5	3	4	5	3	4	5	4	5	6
W	0%+	4	5	6	4	5	6	3	4	5	3	4	5	3	4	5	4	5	6

B = Area of concern 1000'-2000' below wx site location
L = Area of concern within +/- 1000' of wx site location
A = Area of concern 1000'-2000' above wx site location

Table D
DEAD FUEL MOISTURE CONTENT CORRECTIONS
NOVEMBER DECEMBER JANUARY

Exposed – Less than 50% Shading of Surface Fuels																		
		>0800			>1000			>1200			>1400			>1600			>1800	
Aspect	% Slope	B	L	A	B	L	A	B	L	A	B	L	A	B	L	A	B	L	A
N	0-30%	4	5	6	3	4	5	2	3	4	2	3	4	3	4	5	4	5	6
	31%+	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6
E	0-30%	4	5	6	3	4	4	2	3	3	2	3	3	3	4	5	4	5	6
	31%+	4	5	6	2	3	4	2	2	3	3	4	4	4	5	6	4	5	6
S	0-30%	4	5	6	3	4	5	2	3	3	2	2	3	3	4	4	4	5	6
	31%+	4	5	6	2	3	3	1	1	2	1	1	2	2	3	3	4	5	6
W	0-30%	4	5	6	3	4	5	2	3	3	2	3	3	3	4	4	4	5	6
	31%+	4	5	6	4	5	6	3	4	4	2	2	3	2	3	4	4	5	6
Shaded – Greater than or Equal to 50% Shading of Surface Fuels																			
Aspect	% Slope	B	L	A	B	L	A	B	L	A	B	L	A	B	L	A	B	L	A
N	0%+	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6
E	0%+	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6
S	0%+	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6
W	0%+	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6

B = Area of concern 1000'-2000' below wx site location
L = Area of concern within +/- 1000' of wx site location
A = Area of concern 1000'-2000' above wx site location

Table E
PROBABILITY OF IGNITION TABLE

Shading (Percent): Unshaded <50%

	FINE DEAD FUEL MOISTURE PERCENT																
Dry Bulb Temp (F)	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
110+	100	100	80	70	60	60	50	40	40	30	30	20	20	20	20	10
100-109	100	90	80	70	60	60	50	40	40	30	30	20	20	20	10	10
90-99	100	90	80	70	60	50	40	40	30	30	30	20	20	20	10	10
80-89	100	90	80	70	60	50	40	40	30	30	20	20	20	10	10	10
70-79	100	80	70	60	60	50	40	40	30	30	20	20	20	10	10	10
60-69	90	80	70	60	50	50	40	30	30	20	20	20	20	10	10	10
50-59	90	80	70	60	50	40	40	30	30	20	20	20	10	10	10	10
40-49	90	80	70	60	50	40	40	30	30	20	20	20	10	10	10	10
30-39	80	70	60	50	50	40	30	30	20	20	20	10	10	10	10	10

Shading (Percent): Shaded >50%

	FINE DEAD FUEL MOISTURE PERCENT																
Dry Bulb Temp (F)	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
110+	100	90	80	70	60	50	50	40	40	30	30	20	20	20	10	10
100-109	100	90	80	70	60	50	50	40	30	30	30	20	20	20	10	10
90-99	100	90	80	70	60	50	40	40	30	30	20	20	20	20	10	10
80-89	100	80	70	60	60	50	40	40	30	30	20	20	20	10	10	10
70-79	90	80	70	60	50	50	40	30	30	30	20	20	20	10	10	10
60-69	90	80	70	60	50	40	40	30	30	20	20	20	10	10	10	10
50-59	90	80	70	60	50	40	40	30	30	20	20	20	10	10	10	10
40-49	90	80	60	50	50	40	30	30	30	20	20	20	10	10	10	10
30-39	80	80	60	50	50	40	30	30	20	20	20	10	10	10	10	10

Strategy – *Direct* Attack

Advantages:

- Minimal area is burned; no additional area is intentionally burned.
- Safest place to work; firefighters can usually escape into the burned area.
- The uncertainties of firing operations can be reduced/eliminated.

Disadvantages:

- Firefighters can be hampered by heat, smoke, and flames.
- Control lines can be very long and irregular.
- Burning material can easily spread across mid-slope lines.
- May not be able to use natural or existing barriers.
- More mop up and patrol is usually required.

Strategy – *Indirect* Attack

Advantages:

- Control lines can be located using favorable topography.
- Natural or existing barriers can be used.
- Firefighters may not have to work in smoke and heat.
- Control lines can be constructed in lighter fuels.
- There may be less danger of slopovers.

Disadvantages:

- More area will be burned.
- Must be able to trade time and space for line to be constructed and fired.
- Firefighters may be in more danger because they are distant from the fire and have unburned fuels between them and the fire.
- There may be some dangers related to firing operations.
- Firing operations may leave unburned islands of fuel.
- May not be able to use control line already built.

Fireline Location

- The first consideration of line location is firefighter safety.
- Whenever possible, use direct attack and build line as close to fire edge as conditions safely permit.
- If indirect attack is required, locate line an adequate distance from the main fire so it can be completed, fired, and held considering the predicted rate of spread of the main fire.
- Allow adequate time to permit forces to complete the line and conduct any firing operations in advance of severe burning conditions.
- Make the line as short and straight as practical, using topography to your advantage.
- Use easiest routes, taking advantage of light fuels, without sacrificing holding capability or significant resource values.
- Use existing natural and human-made barriers.
- Eliminate potential hazards from the fireline area whenever possible. If hazards must be left in the fire area, locate line a safe distance away.
- Avoid undercut and mid-slope line in steep terrain.
- Avoid sharp turns in the line.
- Encircle area where spot fires are so numerous that they are impractical to handle as individual fires, then burn out the unburned fuels.
- Lines that run along ridges should be located on the ridgetop or slightly to the lee side away from the main fire.
- Use the Downhill Checklist (pg. 9) when considering building downhill line in steep terrain.

Procedural Felling Operations

Assess the situation, complete a hazard analysis, and establish cutting area control.

Situation Awareness
- Evaluate tree characteristics
- Determine soundness or defects
- Analyze the tree base
- Check surrounding terrain
- Examine work area

Hazard Assessment
- Overhead hazards
- Ground hazards
- Environmental hazards
- Mental/physical hazards

Felling Operation Controls
- Use a lookout to help control felling area
- Check for nearby hazard trees (domino effect)
- Assess lean(s) and lay
- Swamp out base and escape route
- Brief swamper (role/responsibility)
- Face tree with adequate undercut
- Give warning yell
- Maintain holding wood and stump shot
- Frequently look up while cutting
- Use proper wedging procedure
- Use established escape route
- Analyze stump for lessons learned

Working with Heavy Equipment

- When working around heavy equipment stay at least 100 feet in front and 50 feet behind the equipment. In timber, distances should be increased to 2½ times the canopy height.
- No one but the operator should ride on the equipment.
- Never approach equipment until you have eye contact with the operator, all implements have been lowered to the ground, and equipment is idled down.
- Avoid working downhill from equipment where rolling material could jeopardize your safety.
- Night work is more dangerous due to reduced visibility. Use headlamp and/or glow sticks so the operator can see you.
- Establish visual and radio communication methods prior to engaging.
- Communicate all hazards to the operator (spot fires, firing operations, and obstacles).
- Equipment operators have difficulty seeing ground personnel; take responsibility for your safety and all those around you.

Water Delivery Information

- Pump Discharge Pressure (PDP) = Nozzle Pressure (NP) + Friction Loss (FL) of Hoselay ± Head Pressure (HP)
- Gallons per Minute (GPM) and NP:

  Forester

  3/16 tip: 7 gpm (50 psi NP)
  3/8 tip: 30 gpm (50 psi NP)

  Variable Pattern (Adjustable Barrel)

  1 inch: 20 gpm (100 psi NP)
  1½ inch: 60 gpm (100 psi NP)
- FL for 1" hose:

  10 gpm = 5* psi per 100'
  20 gpm = 10 psi per 100'
  30 gpm = 20* psi per 100'
- FL for 1½" hose:

  20 gpm = 1 psi per 100'
  30 gpm = 5* psi per 100'
  60 gpm = 15* psi per 100'

  * Numbers rounded for easier math
- HP: Add or subtract 1 psi for every 2' elevation change.
- Gallons of water to fill 100' of hose:

  ¾" hose ≈ 2 gals.
  1" hose ≈ 4 gals.
  1½" hose ≈ 9 gals.
- Maximum effective lift for drafting = 22' at sea level, 14' at 8,000' elevation.
- Loss of 1' draft per 1,000' elevation.
- Use check and bleeder valve on pump discharge when pumping uphill to prevent back flow into the pump.
- A parallel hose lay will have ¼ the friction loss of a single hose lay.

Engine ICS Typing

	Engine Type						
	Structure		Wildland				
Requirements	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Tank minimum capacity (gal)	300	300	500	750	400	150	50
Pump minimum flow (gpm)	1,000	500	150	50	50	50	10
@ rated pressure (psi)	150	150	250	100	100	100	100
Hose 2½"	1,200	1,000	–	–	–	–	–
1½"	500	500	1,000	300	300	300	–
1"	–	–	500	300	300	300	200
Ladders per NFPA 1901	Yes	Yes	–	–	–	–	–
Master stream 500 (gpm)	Yes	–	–	–	–	–	–
Pump and roll	–	–	Yes	Yes	Yes	Yes	Yes
Maximum GVWR (lbs.)	–	–	–	–	26,000	19,500	14,000
Personnel (min)	4	3	3	2	2	2	2

Water Tender ICS Typing

	Water Tender Type				
	Support			Tactical	
Requirements	**S1**	**S2**	**S3**	**T1**	**T2**
Tank capacity	4,000	2,500	1,000	2,000	1,000
Pump minimum flow (gpm)	300	200	200	250	250
At rated pressure (psi)	50	50	50	150	150
Maximum refill time (minutes)	30	20	15	–	–
Pump and roll	–	–	–	Yes	Yes
Personnel (minimum)	1	1	1	2	2

High Pressure Pump Information

Max pressure: 360 to 380 psi

Weight: 60 lbs. maximum (without fuel can)

Fuel Consumption: ≈ 1.2 gal/hr.

Minimum Pump Performance at Sea Level:

78 gpm at 100 psi

65 gpm at 150 psi

32 gpm at 250 psi

18 gpm at 300 psi

High Pressure Pump Starting Procedures:

- Verify correct fuel/oil mixture in fuel tank. Attach fuel line to tank and pump.
- Open fuel supply line valve and fuel tank vent.
- Attach discharge and suction hose with foot valve and prime pump head.
- Move throttle lever to “Start” and “Warm Up” position (center).
- Slowly pump fuel bulb until fuel mixture is just touching the bottom of carburetor.
- If pump is equipped with on/off switch, turn it on.
- On Mark 3 pump, ensure over-speed reset rod is pushed in.
- Close choke if engine is cold.

- Pull starter rope with short quick pulls until engine “pops.”
- Immediately set choke lever to run position.
- Pull starter rope approximately 1 to 3 more times and engine should start.
- Allow engine to warm up for at least 2 minutes before moving the throttle to the “run” position.
- Water must flow through the pump head at all times. Run pump at full throttle, open check and bleeder valve to maintain flow through pump and to control pressure. Use 1” port on check and bleeder valve to re-circulate water back to water source.

Mixed Fuel Ratios:

- High pressure pumps (all years) – 24:1
- 2 stroke lightweight pumps – 50:1
- Stihl and Husqvarna chainsaws (all years) – 50:1

Troubleshooting a High Pressure Pump

Symptom: Engine backfires.

Possible Cause	Remedy
Spark plug fouled or defective.	Clean or replace.

Symptom: Engine does not start or starts momentarily and then stops.

Possible Cause	Remedy
Fuel supply tank empty.	Refill fuel tank.
Fuel supply valve closed.	Open supply valve.
Air vent on fuel tank closed.	Open air vent or unscrew cap.
Defective fuel supply hose.	Replace.
Dirty fuel strainer screen.	Clean or replace.
Leak in fuel supply system.	Tighten or replace fittings.
Carburetor mountings loose.	Tighten mountings.
Water or dirt in fuel system.	Drain, then flush thoroughly.
Too much oil in fuel mixture.	Mix new batch of fuel.
Engine flooded.	Dry the engine.
Air filter dirty.	Clean or replace.
Spark plug fouled or defective.	Clean or replace.
No spark.	Cannot repair in field. Use flagging to identify problem, and return the pump to warehouse.

Symptom: Engine runs irregularly or misfires.

Possible Cause	Remedy
Defective fuel supply hose.	Replace.
Dirty fuel strainer screen.	Clean or replace.
Leak in fuel supply system.	Tighten or replace fittings.
Carburetor mountings loose.	Tighten mountings.
Water or dirt in fuel system.	Drain, then flush thoroughly.
Wrong gasoline in fuel mixture.	Mix new batch of fuel.
Too much oil in fuel mixture.	Mix new batch of fuel.
Air filter dirty.	Clean or replace.
Spark plug fouled or defective.	Clean or replace.
Wrong type spark plug.	Use recommended plug.

Symptom: Engine sounds like a four stroke engine.

Possible Cause	Remedy
Too much oil in fuel mixture.	Mix new batch of fuel.
Engine not warmed up properly.	Allow longer warm up period.
Air filter dirty.	Clean or replace.

Symptom: Engine does not idle properly.

Possible Cause	Remedy
Carburetor mountings loose.	Tighten mountings.
Too much oil in fuel mixture.	Mix new batch of fuel.
Spark plug fouled or defective.	Clean or replace.
Wrong type spark plug.	Use recommended plug.

Symptom: Engine does not develop normal power, overheats, or both.

Possible Cause	Remedy
Carburetor mounting loose.	Tighten mountings.
Wrong gasoline in fuel mixture.	Mix new batch of fuel.
Wrong oil in fuel mixture.	Mix new batch of fuel.
Not enough oil in fuel mixture.	Mix new batch of fuel.
Too much oil in fuel mixture.	Mix new batch of fuel.
Air filter dirty.	Replace.
Spark plug fouled or defective.	Clean or replace.
Wrong type of spark plug.	Use recommended plug.
Muffler blocked or dirty.	Replace.

Average Perimeter in Chains

Acres	Perimeter	Acres	Perimeter
1	17	75	150
2	24	100	170
3	29	150	200
4	34	200	240
5	38	300	300
7	45	400	350
10	53	500	375
15	65	600	425
20	75	700	450
25	85	800	475
30	90	900	500
40	105	1,000	525
50	120		
One Chain = 66 feet			

Fire Size Class

Class	Fire Size
A	0 – ¼ acre
B	¼ – 10 acres
C	10 – 99 acres
D	100 – 299 acres
E	300 – 999 acres
F	1,000 – 4,999 acres
G	5,000+ acres

Line Spike

The "Line Spike," or "Coyote," is a progressive line construction technique in which self-sufficient crews build fireline until the end of an operational period, remain overnight (RON) at or near that point, and then begin again the next operational period. Crews should be properly equipped and prepared to spend two or three shifts on the line with minimal support from the incident base.

Safety Considerations

- Can line spike locations maintain LCES at all times?
- Can emergency medical technicians be on the line?
- Can a timely medevac plan be implemented?
- Can daily communications (verbal and written) be maintained?
- Can food and water be provided daily?
- Is each crew boss comfortable with the assignment?

Operational Considerations

- Meals during line spike operational periods may consist of rations and/or sack lunches.
- The line spike generally will not last more than two or three operational periods for any one crew.
- Division Supervisors will be responsible for establishing on and off operational period times.
- Crews working line spike operational periods will be resupplied on the fireline as close as possible to the RON point.

Logistical Considerations

- Bringing toothbrush/paste, extra socks/underwear, light coat, double lunch, space blanket, etc.
- Considering early in the operational period where the crew(s) will RON and that the location provides for safety and logistical needs of the crew (main fire poses no threat, helicopters can longline or land at site, personnel are provided semi-flat ground to sleep on, adequate firewood exists for warming fires, etc.).
- Anticipating resupply needs and placing those orders early in the operational period. Crew leaders should make arrangements to have qualified individuals at RON locations to accept those orders by longline or internal helicopter operations.
- Take measures to prevent problems with food, trash, etc., in areas where bears are a concern. It's a common practice to leave one or more individuals with radio communications at the RON location to coordinate the back haul of trash or the pre-positioning of reusable supplies to advanced RON locations.
- Determine how crew time and commissary items will be managed. Normally this function can be provided using inbound/outbound helicopter flights at the RON location, or the time is turned in upon returning to the incident base.
- Determine how medical emergencies will be managed. An emergency medical technician may be needed at the RON location.

Minimum Impact Suppression Tactics

The intent of minimum impact suppression tactics (MIST) is to manage a wildland fire with the least impact to natural and cultural resources. Firefighter safety, fire conditions, and good judgment dictate the actions taken.

By minimizing impacts of fire management actions, unnecessary resource damage is prevented and cost savings can be realized. These actions include, but are not limited to:

Line Construction and Mop Up

- Consider:
  - Cold-trailing fireline.
  - Using wetline or sprinklers as control line.
  - Using natural or human-made barriers to limit fire spread.
  - Burning out sections of fireline.
  - Limiting width and depth of fireline necessary to limit fire spread.
- Locate pumps and fuel sources to minimize impacts to streams.
- Minimize cutting of trees and snags to those that pose safety or line construction concerns.
- Move or roll downed material out of fireline construction area.
- In areas of low spotting potential, allow large-diameter logs to burn out.

- Limb only fuels adjacent to the fireline with potential to spread outside the line or produce spotting issues.
- Scrape around tree bases near fireline likely to cause fire spread or act as ladder fuel.
- Minimize bucking of logs to check/extinguish hot spots; preferably roll logs to extinguish and return logs to original position.
- Utilize extensive cold-trailing and/or hot-spot detection devices along perimeter.
- Increased use of fireline patrols/monitoring.
- Flush-cut stumps after securing fireline.

Long Term Incidents

- Consult with Resource Advisor to locate suitable campsites. Scout thoroughly to avoid hazards (bee's nests, widow-makers, etc.).
- Plan for appropriate methods of:
  - Helispot locations
  - Supply deliveries
  - Trash backhaul
  - Disposal of human waste
- Minimize ground and vegetation disturbance when establishing sleeping areas.
- Use locally approved storage methods to animal-proof food and trash.
- When abandoning camp, rehab impacts created by fire personnel.

Reporting Fire Chemical Introductions

Reporting is required for all introductions of wildland fire chemicals into waterways, or within 300 feet of a waterway if aerially applied.

Waterway is any body of water including lakes, rivers, streams and ponds – whether or not they contain aquatic life.

Some agencies also require reporting for wildland fire chemicals applied in the habitats of specific threatened and endangered species (TES) identified by the U.S. Fish and Wildlife Service.

- If you see anything that suggests fire chemicals may have been introduced into a waterway, the 300-foot buffer zone, or a TES habitat, regardless of delivery method, inform your supervisor.
- Information is to be forwarded through the chain of command to the Incident Commander, local Agency Administrator, and/or the Resource Advisor.

Fire Origin Protection Checklist

- Request wildland fire investigator or law enforcement.
- Make notes of all your actions and findings:
  - ☐ Identify and ask the responsible party and witnesses to remain on scene until fire investigator arrives.
  - ☐ Name and identification of reporting party.
  - ☐ En route observations. Include people or vehicles and smoke column color and direction.
  - ☐ First resources on scene.
  - ☐ Name and identification of persons or vehicles in vicinity of fire origin.
  - ☐ Weather observations.
- Locate and **protect** fire origin.
  - ☐ Do not contaminate area of origin or evidence with trash, cigarette butts, or foot and tire traffic.
  - ☐ Avoid suppression impacts to origin area, including charred vegetation:
    - Use fog nozzle.
    - Establish containment lines to protect area.
    - Allow heavier fuels to burn down.
    - Focus on securing the fire perimeter until investigations are complete.
- Protect physical evidence. Do not remove unless necessary to prevent destruction.
- Take photographs, including close-up views of fire origin area and evidence, if able.
- Turn over all notes, information, and physical evidence to fire investigator or law enforcement.
- Follow local procedures and policy regarding reporting of cause information.

Media Interviews

- Ensure that the appropriate Public Information Officer or the local Public Affairs office is aware of media visits.
- Be prepared. Know the facts. Develop a few key messages and deliver them. Prepare responses to potential tough questions. If possible, talk to reporter beforehand to get an idea of subjects, direction, and slant of the interview.
- Be concise. Give simple answers (10-20 seconds), and when you're done, be quiet. If you botch the answer, simply ask to start again.
- Be honest, personable, professional, and presentable (remove sunglasses and hats).
- Look at the reporter, not the camera.
- Ensure media are escorted and wearing PPE when going to the fireline or hazardous sites.
- NEVER talk "off the record," exaggerate, or try to be cute or funny.
- DON'T guess or speculate or say "no comment." Either explain why you can't answer the question or offer to track down the answer.
- DON'T disagree with the reporter. Instead, tactfully and immediately clarify and correct the information.
- DON'T speak for other agencies or offices.
- DON'T use jargon or acronyms.

Phonetic Alphabet

Letter	Law Enforcement	International
A	Adam	Alpha
B	Boy	Bravo
C	Charles	Charlie
D	David	Delta
E	Edward	Echo
F	Frank	Foxtrot
G	George	Golf
H	Henry	Hotel
I	Ida	India
J	John	Juliet
K	King	Kilo
L	Lincoln	Lima
M	Mary	Mike
N	Nora	November
O	Ocean	Oscar
P	Paul	Papa
Q	Queen	Quebec
R	Robert	Romeo
S	Sam	Sierra
T	Tom	Tango
U	Union	Uniform
V	Victor	Victor
W	William	Whiskey
X	X-Ray	X-Ray
Y	Young	Yankee
Z	Zebra	Zulu

NOTES

NOTES

Emergency Medical Care Guidelines

Legality: Do only what you are trained and authorized to do. Keep records of what you do for the patient.

Blood-Borne Pathogens

Use PPE (pocket mask, waterproof gloves, goggles) if contact with body fluids is possible.

Treatment Principles

- Prevent further injury by removing from danger.
- Rapid assessment: Airway, Breathing, Circulation, and life-threatening injuries.
- Thorough exam: Look for method of injury. Check for deformities, contusions, abrasions, punctures, burns, tenderness, lacerations, or swelling.
- Stabilize patient.
- Transport decision: Air or Ground Extraction.
- Document on-scene observations and treatment (send with patient).

Medical Response Procedures

- All injuries must be reported to direct supervisor.
- In case of medical emergency, contact incident supervisor or communications dispatcher using the Medical Incident Report on page 118.
- Medevac is an incident within an incident. One person needs to become the on-scene incident commander and transfer command later if necessary.
- Identify nature of incident, number injured, patient assessment(s), and location (geographic and GPS coordinates).
- Do not use patient names on the radio.
- Determine transport plan (limited visibility or darkness may delay or negate air transport).

Patient Assessment

Initial Patient Assessment

- General impression of patient
- Major bleeding control
- Airway
- Breathing
- Circulation
- Wrist or neck pulse

Patient Information

- Chief complaint
- Age & weight

Level of Consciousness

- Alert & oriented
- Verbal (responds to voice)
- Pain (responds to painful stimuli)
- Unresponsive

Breathing

- Normal
- Difficult/labored breathing
- Not breathing? Start rescue breathing

Pulse

- Present
- Absent – **Start CPR** (pg. 108)

Skin Color

- Normal
- Pale
- Bluish
- Flushed/red

Skin Moisture

- Normal
- Dry
- Moist/clammy
- Profuse sweating

Skin Temperature

- Normal/warm
- Hot
- Cool
- Cold

Pupils

- Equal or Unequal?
- Reactive to light
- Fixed or Slow response
- Dilated or Constricted

Make a transport decision

Specific Treatments

The following injuries may merit immediate transport.

Bleeding: Direct pressure, elevate, and tourniquet if the first two actions fail to control extremity bleeding.

Shock: Lay patient down, elevate feet, and keep warm.

Fractures: Splint joints above and below injury. Monitor pulse and sensation before and after splinting the limb.

Head Injury: Stabilize patient's head and neck, maintain airway.

Bee Sting: (or other allergic reaction with rash, face or airway swelling, difficulty talking/breathing): If the patient has an epi kit, assist them in using the medication.

Burns: Remove heat source, cool with water, dry wrap, and give fluids if conscious.

Eye Injuries: Wash out foreign material. Don't open swollen eyes. Bandage impaled objects in place, and bandage both eyes if possible.

Heat Stroke: Cool body as quickly as possible. See page 109 for additional information.

CPR

1. **Scene Safety:** Look for any dangers or hazards.
2. **Determine Responsiveness:** Tap on both of the victim's shoulders and shout, "Are you OK?" Look for chest rise and fall. If the patient is not breathing, continue with steps 3 and 4. If the patient is breathing and no spinal injury is suspected, place patient on his/her side. Continue to monitor breathing.
3. **Call for Help:** Activate Emergency Response. If possible, obtain an automated external defibrillator (AED).
4. **Chest Compressions:** Place the heel of one hand on the center of the victim's chest. Place the other hand over the first and interlock the fingers. Perform compressions at a rate of 100 to 120 per minute, compressing the victim's chest at least two inches. Push hard and fast. Perform 30 compressions.
5. **Airway:** Open the victim's airway by tilting the head back and lifting the chin. If trauma is suspected and you are trained, use the jaw thrust.
6. **Breathing:** If possible, use a barrier device. Place the barrier device over the victim's nose and mouth. Pinch the victim's nose and give 2 breaths, making the chest rise. If no barrier device is available, perform continuous compressions with no breaks or perform mouth-to-mouth. To perform mouth-to-mouth, pinch the victim's nose and cover the victim's mouth with your mouth. Form an airtight seal and give two breaths.
7. **Continue CPR:** Continue alternating 30 compressions and two breaths. If a second rescuer arrives, one person can perform ventilations and one person can perform compressions. Maintain the same 30:2 ratio.
8. **AED:** If an AED arrives, turn the AED on and follow the instructions provided.

Heat-Related Injury

Definition and Symptoms:

- A heat-related injury (HRI) is a potentially fatal condition caused by elevated body temperatures from internal heat produced by activity or external environmental heat added to the body that cannot be removed to maintain a normal body temperature.
- Symptoms of an HRI may be difficult to recognize and may occur in no particular order. If an individual shows any of the symptoms below they should seek medical attention.
    - Profuse sweating with warm or cool, clammy skin leading to hot dry skin
    - Muscle cramps and weakness
    - Dizziness, headache, and irritability
    - Rapid, weak pulse
    - Vomiting
    - Mental status change, as simple as not talking as much
    - Loss of consciousness

Steps to take if a HRI is suspected:

- Cool the body as quickly as possible, then treat other conditions.
    - Cooling levels will depend on severity

- Recovery of high body temperature requires:
  - Reduction of work output
  - Removal from sources of heat
  - Proper nutrition and hydration strategies

Considerations for mitigation during firefighting activity:

- Heat stress mitigations are not just a shift-to-shift concept. It is also task-to-task and even a minute-to-minute process.
- Ability to handle heat is different between individuals and varies on a daily basis.
- Performing physical tasks, such as hiking up hills, is our largest producer of body heat.
  - Hikes into a fire typically raise your body temperature 1–2 ° F from your pre-hike level.
- At elevated body temperatures, risk of heat-related injury has a lesser margin of error.
- Maintain low skin temperature when possible, as it allows heat transfer from the body.
- Pack weights exceeding 25% of body weight add to the demand of an activity.
- Work expectations above physical fitness levels can increase risk of HRI.

Burn Injuries

- INITIATE MEDEVAC IMMEDIATELY.
- Remove person from heat source while looking for signs of a burned airway (e.g., singed facial hair, nasal hairs, soot, or burns around or in nose, mouth, black sooty sputum, etc.).
- Apply cool, clear water over burned area. **Do not** soak person or use cold water and ice packs, as this may cause hypothermia.
- Examine for other injuries.
  - Provide basic first aid.
  - Monitor airway, breathing, circulation (ABCs).
  - Treat for shock by keeping person warm, feet elevated.
  - Provide oxygen, if available and trained to administer.
- Assess degree of burn and area affected.
  - □ **First Degree** (Superficial) Red, mild to moderate pain.
  - □ **Second Degree** (Partial Thickness) Skin may be red and raw, blistered, swollen, painful to very painful.

- □ **Third Degree** (Full Thickness) Whitish, charred, or translucent, no pin prick sensation in burned area.
- □ **Rule of Palms:** Patient's palm = 1% of their body surface. Estimate how many times the patient's palm could be placed over the burned areas to estimate the % of body that has been burned.

- Cut away only burned clothing. **Do not** cut away clothing stuck to burned skin. Remove jewelry near injured area.
- Cover burned area with clean, dry dressing, and moisten with clean water, and apply dry dressing on top.
- For severe burns or burns covering large area of body:
  - Wrap with a clean sheet followed by plastic sheet.
  - Place inside sleeping bag or cover with insulated blanket.
- Monitor ABCs and keep burn areas moist with clean water.
- Avoid hypothermia and overheating.

Multi-Casualty Triage System

Color	Priority	Description
Red	Immediate	Serious, life-threatening injury. Breathing but unconscious; respirations more than 30/minute. Radial pulse absent, capillary refill more than 2 seconds. **Or** can't follow simple commands.
Yellow	Delayed	Treatment and transport delayed. Respirations less than 30/minute. Radial pulse present, capillary refill less than 2 seconds. **And** can follow simple commands.
Green	Minor	All walking wounded; treatment can be delayed.
Black	Deceased/ Dying	Dead or with injuries not compatible with life. No respirations after repositioning airway.

Injury/Fatality Procedures

Serious Injury:

- Give first aid - call for medical aid and transportation if needed.
- Do not release victim's name except to authorities.
- **Never broadcast victim's name on the radio.**
- Do not allow unauthorized picture taking or release of pictures.
- Notify Incident Commander, who will:
  - Assign a person to supervise evacuation, if necessary, and stay with the victim until under medical care. In rough terrain, at least 15 workers will be required to carry a stretcher.
  - Assign person to get facts and witness statements and preserve evidence until investigation can be taken over by the Safety Officer or appointed investigating team.
  - Notify the Agency Administrator.

Fatality:

- Do not move the body unless it is in a location where it could be burned or otherwise destroyed. Secure accident scene.
- Do not release victim's name except to authorities.
- **Never broadcast victim's name on air.**
- Do not allow unauthorized picture taking or release of pictures.
- Notify Incident Commander, who will:
  - Assign person to start investigation until relieved by appointed investigating team.
  - Notify Agency Administrator and report essential facts. The Agency Administrator will notify proper authorities and next of kin as prescribed by agency regulations.
  - If requested, assist authorities in transporting remains.
  - Mark location of body on ground. Note location of tools, equipment, or personal gear.
  - Retain PPE as evidence.

Helicopter Extraction Operations

The intent of helicopter extraction operations is to insert qualified personnel into inaccessible areas to extract a patient for transport to the nearest medical facility. These operations are not meant to be a medical transport resource; life flight or ground transport should be ordered in addition to the extraction aircraft and crew.

ORDERING:

- On-scene EMT or Medical Incident IC determines/ requests that medical extraction is required and coordinates the order through the IMT or local dispatch.
- Use the Medical Incident Report (p.118). Include the patient weight and name of on-scene radio contact.
- Establish communications with incoming aircrew. Provide the following information: known hazards, terrain, wind speed/direction, patient update.

CONSIDERATIONS:

- Choose extraction site away from fireline or black edge.
- Ensure the area is clear of non-essential items and personnel. Follow the directions of the aircrew.

- Rotor wash may affect overhead hazards and blowing dust/debris can create “brown out” conditions.
- Aerial Supervision is valuable for coordinating aviation medevac missions.
- The aircrew will make the final assessment regarding the safety of the mission. Always have a contingency plan in case a helicopter cannot be used.
- It is easy to become caught up in the urgency of a mission, especially those involving life-threatening situations. Regardless of the emergency, follow basic fireline and aviation safety procedures.

Rescue Hoist: A cable winching device mounted to the helicopter that is capable of lowering/raising persons attached to the cable.

Short-haul: To transport one or more persons suspended on a fixed line beneath a helicopter. The intent is to transport persons a short distance (short-haul), normally from a limited or inaccessible location to a safe landing area.

Medical Incident Report

FOR A NON-EMERGENCY INCIDENT, WORK THROUGH CHAIN OF COMMAND TO REPORT AND TRANSPORT INJURED PERSONNEL AS NECESSARY.
FOR A MEDICAL EMERGENCY: IDENTIFY ON-SCENE INCIDENT COMMANDER BY NAME AND POSITION AND ANNOUNCE **"MEDICAL EMERGENCY"** TO INITIATE RESPONSE FROM IMT COMMUNICATIONS/DISPATCH.

Use the following items to communicate situation to communications/dispatch.

1. **CONTACT COMMUNICATIONS / DISPATCH** (Verify correct frequency prior to starting report) *Ex: "Communications, Div. Alpha. Stand-by for Emergency Traffic."*
2. **INCIDENT STATUS:** Provide incident summary (including number of patients) and command structure. *.Ex: "Communications, I have a Red priority patient, unconscious, struck by a falling tree. Requesting air ambulance to Forest Road 1 at (Lat. / Long.) This will be the Trout Meadow Medical, IC is TFLD Jones. EMT Smith is providing medical care."*

Severity of Emergency / Transport Priority	☐ **RED / PRIORITY 1 Life or limb threatening injury or illness. Evacuation need is IMMEDIATE.** *Ex: Unconscious, difficulty breathing, bleeding severely, 2° – 3° burns more than 4 palm sizes, heat stroke, disoriented.* ☐ **YELLOW / PRIORITY 2 Serious Injury or illness. Evacuation may be DELAYED if necessary.** *Ex: Significant trauma, unable to walk, 2° – 3° burns not more than 1-3 palm sizes.* ☐ **GREEN / PRIORITY 3 Minor Injury or illness. Non-Emergency transport.** *Ex: Sprains, strains, minor heat-related illness.*	
Nature of Injury or Illness & Mechanism of Injury		*Brief Summary of Injury or Illness (Ex: Unconscious, Struck by Falling Tree)*
Transport Request		*Air Ambulance / Short-Haul/Hoist/ Ground Ambulance / Other*
Patient Location		*Descriptive Location & Lat. / Long. (WGS84)*

Incident Name		*Geographic Name + "Medical" (Ex: Trout Meadow Medical)*
On-Scene Incident Commander		*Name of on-scene IC of Incident within an Incident (Ex: TFLD Jones)*
Patient Care		*Name of Care Provider (Ex: EMT Smith)*

3. **INITIAL PATIENT ASSESSMENT:** Complete this section for each patient as applicable (start with the most severe patient).

Patient Assessment: See IRPG page 106
Treatment:

4. **TRANSPORT PLAN:**

Evacuation Location (if different): (Descriptive Location (drop point, intersection, etc.) or Lat. / Long.) Patient's ETA to Evacuation Location:
Helispot / Extraction Site Size and Hazards:

5. **ADDITIONAL RESOURCES / EQUIPMENT NEEDS:**

Example: Paramedic/EMT, Crews, Immobilization Devices, AED, Oxygen, Trauma Bag, IV/Fluid(s), Splints, Rope rescue, Wheeled litter, HAZMAT, Extrication

6. **COMMUNICATIONS:** Identify State Air/Ground EMS Frequencies and Hospital Contacts as applicable.

Function	Channel Name/#	Receive (RX)	Tone/ NAC*	Transmit (TX)	Tone/ NAC
COMMAND					
AIR-TO-GROUND					
TACTICAL					

7. **CONTINGENCY:** Considerations: If primary options fail, what actions can be implemented in conjunction with primary evacuation method? Be thinking ahead.

8. **ADDITIONAL INFORMATION**: Updates/Changes, etc.

REMEMBER:

- **Confirm ETA's of resources ordered.**
- **Act according to your level of training.**
- **Be Alert. Keep Calm. Think Clearly. Act Decisively**

The *Incident Response Pocket Guide (IRPG)* is developed and maintained by the Operations and Training Committee (OTC), an entity of the National Wildfire Coordinating Group (NWCG).

Previous editions: 2014, 2010, 2006, 2004, 2002, 1999.

While they may still contain current or useful information, previous editions are obsolete. The user of this information is responsible for confirming that they have the most up-to-date version. NWCG is the sole source for this publication.

This publication is available electronically at.
https://www.nwcg.gov/sites/default/files/publications/pms461.pdf

Printed copies of this guide may be ordered from the Great Basin Cache at the National Interagency Fire Center in Boise, Idaho. Refer to the annual *NFES Catalog Part 2: Publications* and find ordering procedures at https://www.nwcg.gov/catalogs-ordering-quicklinks.

Comments or questions may be submitted to the appropriate agency program manager assigned to OTC. View the complete roster at https://www.nwcg.gov/committees/operations-and-training-committee.

BRIEFING CHECKLIST

Situation

- ☐ Fire name, location, map orientation, other incidents in area
- ☐ Terrain influences
- ☐ Fuel type and conditions
- ☐ Fire weather (previous, current, and expected)
- ☐ Winds, RH, temperature, etc.
- ☐ Fire behavior (previous, current, and expected)
  Time of day, alignment of slope and wind, etc.

Mission/Execution

- ☐ Command
  Incident Commander/immediate supervisor
- ☐ Leader's intent
  Overall objectives/strategy
- ☐ Specific tactical assignments
- ☐ Contingency plans
- ☐ Medevac plan: Personnel, equipment, transport options, contingency plans

Communications

- ☐ Communication plan
  Tactical, command, air-to-ground frequencies
  Cell phone numbers

Service/Support

- ☐ Other resources
  Working adjacent and those available to order
  Aviation operations
- ☐ Logistics
  Transportation
  Supplies and equipment

Risk Management

- ☐ Identify known hazards and risks
- ☐ Identify control measures to mitigate hazards/reduce risk
  - Include LCES
- ☐ Identify trigger points for reevaluating operations

Questions or Concerns?

STANDARD FIREFIGHTING ORDERS

1. Keep informed on fire weather conditions and forecasts.
2. Know what your fire is doing at all times.
3. Base all actions on current and expected behavior of the fire.
4. Identify escape routes and safety zones, and make them known.
5. Post lookouts when there is possible danger.
6. Be alert. Keep calm. Think clearly. Act decisively.
7. Maintain prompt communications with your forces, your supervisor, and adjoining forces.
8. Give clear instructions and be sure they are understood.
9. Maintain control of your forces at all times.
10. Fight fire aggressively, having provided for safety first.

WATCH OUT SITUATIONS

1. Fire not scouted and sized up.
2. In country not seen in daylight.
3. Safety zones and escape routes not identified.
4. Unfamiliar with weather and local factors influencing fire behavior.
5. Uninformed on strategy, tactics, and hazards.
6. Instructions and assignments not clear.
7. No communication link with crewmembers or supervisor.
8. Constructing line without safe anchor point.
9. Building fireline downhill with fire below.
10. Attempting frontal assault on fire.
11. Unburned fuel between you and fire.
12. Cannot see main fire; not in contact with someone who can.
13. On a hillside where rolling material can ignite fuel below.
14. Weather becoming hotter and drier.
15. Wind increases and/or changes direction.
16. Getting frequent spot fires across line.
17. Terrain and fuels make escape to safety zones difficult.
18. Taking a nap near fireline.