A publication of the
National Wildfire Coordinating Group

NWCG Incident Response Pocket Guide (IRPG)

PMS 461 **JANUARY 2025**
NFES 001077

SIZEUP REPORT

- Incident Type (wildland fire, vehicle accident, hazmat spill, search and rescue, etc.)
- Location/Jurisdiction
- Incident Size
- Incident Status
- Establish Incident Commander (IC)
- Incident 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 *NWCG Incident Response Pocket Guide* (*IRPG*) establishes standards for wildland fire incident response. The guide provides critical information on operational engagement, risk management, fire environment, all hazard response, and aviation management. It is a collection of guidelines, checklists, and best practices that have evolved over time within wildland fire operations.

The intended target audience of the *IRPG* is field-going wildland fire and aviation personnel from the Incident Commander Type 3 (ICT3) and Division/Group Supervisor (DIVS) level and down. The size makes it easy to fit in a firefighter's pocket, staying true to the purpose and intent.

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, creativity, and collaboration — skills developed through extensive training, dedicated practice, and experience, which the guide facilitates.

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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.

DUTY

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.

RESPECT

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.

INTEGRITY

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

Additionally, 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 should it 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 (IWI).

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.

Firefighter Stress Management

Wildland firefighting is often stressful and sometimes traumatic. It can take a toll on mental health. It is normal to feel overwhelmed sometimes and it is vital to address these thoughts before they become a mental health issue. Mental fitness for duty is just as essential as physical fitness for duty.

AWARENESS – Stress Injuries can be caused by:

- *A Life Threat*: Due to an experience of death-provoking terror, horror, or helplessness.
- *A Loss Injury*: A grief injury due to the loss of cherished people, things, or parts of oneself.
- *A Moral Injury*: Due to behaviors or the witnessing of behaviors that violate moral values.
- *Cumulative Stress*: Due to the accumulation of stress from all sources over time without sufficient rest and recovery.

RECOGNITION – Stress Sizeup:

Monitor yourself and others for:

- Hazardous attitudes and stress reactions (see page xi).
- Behavior changes (not talking, isolating, outbursts, increased use of substances, making mistakes).
- Troubling feelings (fear, anger, anxiety, sadness, guilt, shame).
- Thoughts or mention of self-harm or suicide.

MITIGATION – Stress First Aid:

- Shrink the stigma – talk about it!
- Provide opportunities to calm:
  - Take a tactical stress pause.
  - Refocus; identify what really matters.
  - Try tactical breathing or similar techniques.
  - Get additional time off if needed.
- Get help: just like in a medical incident, a higher level of care may be necessary.
- Reach out to friends, peers, loved ones, etc., for support.

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 Process

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, and 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
    - Personal Protective Equipment (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 (ICs), 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 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.

Reference Medical Incident Report, ICS 206 WF, on page 120.

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, herbaceous fuels, 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. During 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 situation 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 (WUI) 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

Lookouts, Communications, Escape Routes, Safety Zones

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, Incident Action Plan (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, 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’	40’	$^{1}/_{10}$ acre
20’	80’	½ acre
50’	200’	3 acres
100’	400’	12 acres
200’	800’	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’ by 208’). 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 Fireline Construction 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 are required:

1. Discuss assignments with crew supervisor(s) and fireline overhead prior to committing crew(s). Responsible overhead individual stays with job until completed (Task Force Leader [TFLD] or Incident Commander Type 4 [ICT4] qualified at minimum).
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) 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; threat to life, environment and property; political sensitivity, organizational complexity, jurisdictional boundaries, values at risk, and weather. Most indicators are common to all incidents, but some may be unique to a particular type of incident. The following are common contributing indicators of incident complexity.

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. • Resources vary from two to six firefighters. • 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 and 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 may be needed. • Resources may require limited logistical support. • Formal Incident Planning Process not needed. • Written Incident Action Plan (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 normally not filled to reduce workload or span of control. • General Staff position(s) normally not 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 Incident Action Plan (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 may be filled to reduce workload or span of control. • General Staff position(s) may be 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.

Source: *Interagency Standards for Fire and Fire Aviation Operations, Appendix F*

Firing Operations

Successful firing operations must be both well timed and coordinated. Adequate resources must be present for both firing *and* holding. Always have a contingency plan and ensure the following are met before conducting firing operations:

- All personnel briefed
- Spot forecast requested
- Weather forecast reviewed
- Frequency management established
- Lookouts posted as needed
- Anchor/termination firing points identified
- Notifications made:
  - Division resources
  - Adjoining resources
  - Fireline supervisors
  - Aerial supervisors
- All resources in place identified

Escape routes and safety zones identified and made known to all resources.

Night Shift / Day Shift Transitions

Effective transitions must occur between night and day shifts. Items to consider when transitioning:

- Plan to transition in daylight.
- Transitions should occur between operationally knowledgeable individuals from both shifts.
- Transition briefings should include:
  - Weather
  - Line location
  - Significant events
  - Terrain features
  - Fire behavior
  - Hazards
  - Expected concerns

Wildland Urban Interface (WUI) 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.
- Smoke byproducts often laced with chemical compounds not found in 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 those with disabilities). 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 Class A 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

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. Pick a place that 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.

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:

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

Steps to Follow When Turning Down Risk:

- The individual directly informs their supervisor they are turning down the assignment as given. Use the criteria outlined in the Risk Management Process (10 Standard Firefighting Orders, 18 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 IC 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.

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 scan overhead to identify any trees that are leaning over their work area.

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, map, and communicate).
- 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.
- Fireproof 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 powerline 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

- Any time 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 the risk it poses.
- Many types of UXO may be encountered:
  - Small arms munitions
  - Grenades
  - Mortars
  - Bombs
  - Projectiles
  - Rockets
  - Guided missiles
  - Submunitions
- 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 and/or dispatch.
- U.S. Army Operations Center for incidents involving explosives and ammunition: **1-703-697-0218**.

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 on 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

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.

ICP/Spike Camps

- Ensure adequate rest and recovery from on-shift exposure to smoke. Avoid locating fire camps in drainages, valleys, or low-lying areas where smoke can concentrate at night or under inversion conditions. If camps can't be moved, provide appropriate mitigation to ensure adequate rest and recovery from smoke exposure (e.g., clean-air sleeping trailer or hotel rooms).

Public

- Identify possible smoke sensitive areas (roads, communities, schools, hospitals, etc.) that may be impacted by smoke. Monitor smoke impacts. When heavy smoke is expected or present, notify authorities such as the air regulatory agency, health department, or public safety, either 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 10 miles away. Identify drainages/topographic features that may allow for smoke to impact roadways during the night and early morning.

2. Thresholds that, when combined with smoke, indicate potential for reduced roadway visibility.

Key Weather Variables	Watch Out	Critical
Surface Temperature	≤ 70 °F	≤ 55 °F
Relative Humidity (RH)	≥ 70 %	> 90 %
Surface Wind Speed	< 7 mph	≤ 4 mph
Cloud Cover	≤ 60 %	< 40 %

3. Hazard Control

Mitigate when roadway visibility is expected to be impacted. Depending on thresholds projected and risk assessment, 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]).

For in-depth information, see *Road and Smoke Safety Guide*, PMS 477, https://www.nwcg.gov/publications/pms477, and NWCG Roads, Smoke, and Safety video, https://www.nwcg.gov/training-courses/rt-130/hazards/haz511.

Last Resort Survival

Escape if you can.

- Utilize all your Personal Protective Equipment (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

Fire Assessment Process

Each Operational Period, Before Assigned

- Review fire weather forecast, noting National Weather Service (NWS) Watches and Warnings and key discussion terminology.
- Review recent fire activity and notable fire behavior.
- Compare current fire danger levels to historic trends and thresholds on local PocketCard to assess season severity.
- Consider critical fire weather patterns with fire weather forecast and predictive services 7-day outlook.

Once Assigned and En Route to the Fire

- Take weather forecast along; consider spot forecast needs.
- Recall weather from yesterday, overnight, and now.
- Utilize maps of the fire area to evaluate what has burned and what may be ahead.
- Interpret sky and smoke conditions for stability, wind speed and direction, and signs of intense burning.

On-Scene Fire Assessment

- Validate forecast with current on-site weather conditions, especially windspeed and direction.
- Determine where, what, and how the fire is burning.
- Identify hazardous fuels and significant terrain ahead of the fire.
- Anticipate rapidly changing fire behavior.
- Continue to monitor the sky for cloud and smoke indicators.

Determine Decision Thresholds and Ensure LCES

- Recognize how changes impact objectives, strategies, and tactics.
- Establish escape routes, time frames, and triggers for escape to safety zones.
- Identify best lookout locations to monitor for changes.
- Communicate weather and fire behavior observations.

Document Your Assessment

- Record your observations and assumptions.
- Include assessments and decisions in personal logs.

Look Up, Down, and Around

Fire Environment Factor: Weather

Indicators

Wind

- Speeds above 10 mph
- Lenticular clouds
- Fast moving clouds
- Cold frontal passage indicated by weak vortices and changing temps
- Cumulonimbus clouds
- Dust clouds approaching
- Battling or shifting winds

Temp/RH

- Above normal temperatures
- Critically low humidity based on local thresholds

Atmospheric Instability

- Instability concerns reported in the forecast or observed in the field
- Good visibility
- Dust devils
- Cumulus clouds
- Castellanus clouds in the morning
- Smoke rising straight up
- Inversion begins to lift

Start with the forecast. Review headlines and discussions for mention of critical weather factors, indicators, and patterns.

Anticipate what you will find while en route. Visually estimate windspeed and direction. Read sky for visibility, haze, and breaking inversions, cloud cover, and cloud types, dust devils, and other instability factors for wind changes.

Validate the forecast with the situation on scene and current weather observations. Request updated forecast as needed.

Fire Environment Factor: Topography

Indicators

- Steep slopes (>45%)
- Chutes/chimneys/passes/saddles
- Box and narrow canyons
- Slope reversals
- Critical aspects and times on sunny days
- Thermal belts

Steep slopes, enhanced by drainages, draws, chutes, and chimneys, can produce instability over your fire and extreme upslope spread events.

Gap winds (saddles and passes) can be gusty and erratic.

Box and narrow canyons can hold heat, funnel winds, and support rapid increase in fire activity when inversion breaks.

Slope reversals in narrow canyons can change backing fire to head fire. Be mindful of spotting potential and sunny aspects on the other side.

Critical south and west aspects are in the sun during the peak burning conditions. Will fire be burning there then?

Thermal belts should be factored into night operations. Learn the elevation of concern and when they set up.

Dry fuels to burn intensely, wind to push them, instability factors from the sky, from the terrain, or from the fire itself. If they seem to align and raise your concerns, say something.

Fire Environment Factor: Fuel Characteristics

Indicators

- Cured or curing grasses and leaves
- Continuous loads of dead fine fuels
- Heavy dead and down fuel loads
- Tight crown spacing (<20')
- Tall (deep) grass and shrub fuel beds
- Unusually low dead and live fuel moisture estimates (locally defined)

Special Conditions

- Efficient firebrand sources
- Numerous snags
- Ladder fuel loads
- Flammable needle and leaf foliage
- Fire damage and preheated canopy
- Frost damage and bug-kill
- Blowdown and slash accumulations

Scout your assignment for where most burnable fuels are.

What will carry the fire? Grass/shrub/litter/slash, its continuity, and how dry (drought, Energy Release Component (ERC), snap of sticks, crackle of litter, pop vs crumble of leaves, dust in duff).

Is crown fire possible? Will fire in shrubs and trees breach your line and can surface/ladder fuels torch them?

What damage do you see? Frost, scorch, slash, bug-kill.

Dry fuels to burn intensely, wind to push them, instability factors from the sky, from the terrain, or from the fire itself. If they seem to align and raise your concerns, say something.

Fire Environment Factor: Plume Dynamics

Indicators

- Well developed, near vertical column
- Pyrocumulus or ice cap on column
- Thunder/lightning flashes
- Sprinkles of rain
- Sudden calm
- Becoming hazy, smoke at your feet
- Changing column, alternating and strengthening inflows, and outflows

First view of the fire is of the column while en route. Look for plume factors as indicators of instability, critical winds such as downdrafts and outflows. Read smoke column for what is burning, how intensely it is burning.

On-scene factors (thunder/lightning, sprinkles, sudden calm, smoke at your feet) mean imminent wind changes.

Fire Environment Factor: Rapidly Changing Fire Behavior

Indicators

- Smoldering fires pick up
- Trees begin to torch
- Firewhirls beginning
- Leaning or sheared column
- Increased frequency of spot fires

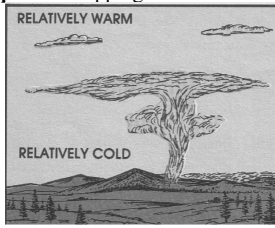
Be mindful of critical burn period between 1400 and 1700.

Monitor fire activity for notable changes. When does smoldering become spreading? First torching tree, first dust devil, first spot discovered. Increasing flame length.

Dry fuels to burn intensely, wind to push them, instability factors from the sky, from the terrain, or from the fire itself. If they seem to align and raise your concerns, say something.

Interpret the Smoke Column

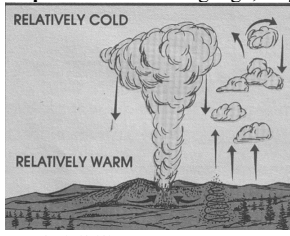
Stable Atmosphere: Trapping smoke under an inversion.



Limited vertical motion of smoke, steady winds, higher smoke exposure levels, visibility likely reduced, and lower fire behavior.

Watch Out: Smoke begins to boil through the inversion overcoming the stable layer. Expect lowering RH, possible wind shifts, and increasing flames, spread, and spotting.

Unstable Atmosphere: Smoke rising high, disperses.



Gusty winds, good visibility.

Watch Out: Active spread, intense burning, large fire growth.

Fire Danger Ratings and Interpretations

Fire danger ratings are used in daily risk assessments and for operational preparedness by fire management agencies. Temperature, RH, winds, solar radiation, and precipitation estimates are the primary inputs.

Fire danger information is useful during initial fire sizeup, initial attack, extended attack, and in fire prescriptions.

Both the U.S. National Fire Danger Rating System (NFDRS) and Canadian Forest Fire Danger Rating System's Fire Weather Index (CFFDRS FWI) System are used in the U.S.

Energy Release Component (ERC-NFDRS) and **Buildup Index (BUI-CFFDRS)** serve as good indicators of local seasonal fire danger trends resulting from the cumulative drying of fuels over days and weeks. They depend heavily on slower drying 100-hr., 1000-hr., and duff fuels.

Burning Index (BI-NFDRS) and **Fire Weather Index (FWI-CFFDRS)** reflect changes in fine fuel moistures and windspeed and are highly variable day to day. They represent fireline intensity/flame length in a general sense.

These are relative indices and should be compared to historic trends and thresholds on local area PocketCards. They can and should be reviewed along with morning forecasts.

PocketCards are a tool for field personnel to locally track key fire danger outputs. PocketCards for a given area can be found at https://www.wildfire.gov/application/pocket-cards or by searching for Fire Danger PocketCard on the internet. Do not use the PocketCards for site-specific fire behavior predictions or fireline actions without an interpretative briefing.

Critical Fire Weather

The primary method NWS conveys critical fire weather patterns is by issuing **Red Flag Warnings** and **Fire Weather Watches**. Predictive service meteorologists issue **High Risks**.

The four critical weather elements:

- *Low RH*
- *Unstable air*
- *Strong surface wind*
- *Drought*

Critical fire weather patterns that support extreme fire behavior conditions can be separated into two primary categories: those that produce strong surface winds and those that induce atmospheric instability. Consider alignments.

Drought: look for ERC/BUI at 90th percentile or greater.

Hot-Dry-Unstable: Look for terms in forecast, observed conditions.

- Sunny for AM hours
- Temps above normal
- Poor RH recoveries
- Weak inversion
- Mid-level dry intrusion/slot
- Thermal low/trough
- High mixing heights/steep lapse rates
- Heat wave

Windy-Dry-Unstable: Look for terms in forecast, observed conditions.

- Subsidence sector of tropical storms
- Dry cold front passage/ wide gust spreads
- Outflow, microburst, gust front, downdraft
- Breakdown of upper-level ridge
- Downslope
- Offshore
- Mountain wave
- Strong jet
- Monsoon burst
- Land-sea breeze front
- Migrating surface dry line

Inversion Breaks: Fires become more active, perhaps rapidly.

- Quick jump in temps, drop in RH, increased wind
- Timing can vary by terrain, seasonality, latitude, and weather pattern change

Important Winds for Interpreting Forecasts

Critical Winds

Thunderstorm and Pyrocumulus induced outflows and downdrafts	25-35 mph, can exceed 60 mph	Gusty and erratic in nature, winds radiate from center of storm, strongest push in direction of storm movement
Frontal Winds	20-30 mph, can exceed 50 mph	Note timing and significance of shifting wind direction with frontal passage, usually in a clockwise direction
Foehn Winds (Chinook, Santa Ana, Mono, Wasatch, East, and North Winds)	20-60 mph, can exceed 90 mph	Warming and drying winds blowing from high elevation downslope, often toward values at risk
Surfacing or Low Level Jets	25-45 mph	Generally occur hundreds of feet above ground, can enhance fire plume
Whirlwinds	50 mph and higher	Mature dust devils and fire whirls, inflow winds from around the whirl can be significant, strong winds in outer portion of whirl can lift large embers
Glacier Winds	30-50 mph	Occur as downslope winds from glaciers and can extend well down from snow and ice cover

Local Winds

Upslope	3-8 mph	Follows sun on slopes
Upvalley	10-15 mph	Peaks in the afternoon, tied to upslope winds
Downslope	2-5 mph	Follows evening end of upslope winds
Downvalley	5-10 mph	Peaks late night, tied to downslope winds
Sea (Onshore) Breeze	10-20 mph, can be 30+ mph	Onshore wind direction, strongest on sunny days
Land (Offshore) Breeze	3-10 mph	Offshore wind direction at night, consistent seasonally

Interpreting the winds you measure: Winds you measure on the fireline may differ significantly from what is in your forecast. Use Important Winds for Interpreting Forecasts (page 41) to consider when significant changes might happen and to determine if a new forecast is needed for your location.

Surface Wind at Your Location	Weak Forecast Winds	Strong Forecast Winds
Flat or gently rolling terrain	Typically feel weak surface (20') winds	Typically feel strong surface (20') winds
Hilly or mountainous terrain	Surface (20') winds dominated by local winds (slope/valley winds or land/sea breezes)	Surface (20') winds will be a complex and changing combination of general and local windspeeds and directions

Visual Estimate of Surface Windspeed

Terms	Wind Speed	Visual Indicator
Calm	<1 mph	Calm, smoke rises vertically
Very Light Breeze	1-3 mph	Deciduous leaves are in constant motion, small branches sway, tall grasses and weeds sway and bend with wind
Light Breeze	4-7 mph	Trees of pole size in the open sway gently, wind felt on face, leaves rustle, loose scraps of paper move, small flags flutter
Light Wind	8-12 mph	Leaves, small twigs in constant motion, tops of trees in dense stands sway, light flags extended
Windy	13-18 mph	Pole-sized trees in open sway vigorously, whole trees in dense stands sway, dust raised on road
Very Windy	19-24 mph	Branchlets are broken from trees, resistance or difficulty is felt when walking against wind
Strong Wind	25-31 mph	Tree damage in exposed tops and branches increases, progress when walking against wind impeded
Very Strong Wind	32-39 mph	Severe damage to treetops, very difficult to walk against the wind
Slightly Damaging Wind	39-46 mph	Surfaced strong Santa Ana, intense stress on all exposed objects, vegetation, buildings, tree canopy offers no protection
Dangerous Wind	47+ mph	Structural damage occurs, slate blown from roofs

Source: Adapted from Beaufort Wind Scale

Fine Fuel Moisture (FFM) and Probability of Ignition (PIG)

PIG helps assess hourly and day-to-day changes in expected fire behavior. Estimate FFM first.

1. With table A (page 45), estimate reference fuel moisture.
2. Choose Table B, C, or D from following pages for estimating FM correction based on the month of the year. With selected table, determine FM correction based on local factors (shading as more or less than 50%, aspect and slope, time of day, and elevation difference).
3. Add Ref. Fuel Moisture (1) and Correction Factor (2).
4. Estimate PIG from temp and FFM.

PROBABILITY OF IGNITION TABLE

Shading (Percent): Unshaded < 50%

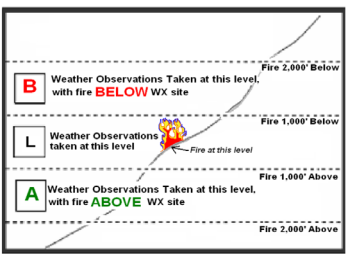
	FINE DEAD FUEL MOISTURE PERCENT															
Dry Bulb Temp (F)	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
110+	100	100	80	70	60	60	50	40	40	30	30	20	20	20	20	10
100-109	100	90	80	70	60	60	50	40	40	30	30	20	20	20	10	10
90-99	100	90	80	70	60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

Table A. Reference Fuel Moisture

Dry Bulb Temp (°F)	Relative Humidity (%)																			
	0 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 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



For Nighttime Estimates:

- Use Table A to obtain a Reference Fuel Moisture Value.
- Add 5 to the value that you get in Table A. This is your nighttime fuel moisture.

Table B. 1-hr Fuel Moisture Corrections-May-June-July

Unshaded – Less than 50% shading of surface fuels

Aspect	Slope	0800-0959			1000-1159			1200-1359			1400-1559			1600-1759			1800-1959		
		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 – 50 % or more shading of surface fuels due to canopy and/or cloud cover

N	All	4	5*	5	3	4	5	3	3	4	3	3	4	3	4	5	4	5	5
E	All	4	4*	5	3	4	5	3	3	4	3	4	4	3	4	5	4	5	6
S	All	4	4*	5	3	4	5	3	3	4	3	3	4	3	4	5	4	5	5
W	All	4	5*	6	3	4	5	3	3	4	3	3	4	3	4	5	4	4	5

B = Area of concern is 1,000’ to 2,000’ below the weather site location
L = Area of concern is within 1,000’ of the weather site location
A = Area of concern is 1,000’ to 2,000’ above the weather site location

Table C. 1-hr Fuel Moisture Corrections-Feb-Mar-Apr and Aug-Sep-Oct

Unshaded – Less than 50% shading of surface fuels

Aspect	Slope	0800-0959			1000-1159			1200-1359			1400-1559			1600-1759			1800-1959		
		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	4	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 – 50 % or more shading of surface fuels due to canopy and/or cloud cover																			
N	All	4	5*	6	4	5	5	3	4	5	3	4	5	4	5	5	4	5	6
E	All	4	5*	6	3	4	5	3	4	5	3	4	5	4	5	6	4	5	6
S	All	4	5*	6	3	4	5	3	4	5	3	4	5	3	4	5	4	5	6
W	All	4	5*	6	4	5	6	3	4	5	3	4	5	3	4	5	4	5	6

B = Area of concern is 1,000' to 2,000' below the weather site location
L = Area of concern is within 1,000' of the weather site location
A = Area of concern is 1,000' to 2,000' above the weather site location

Table D. 1-hr Fuel Moisture Corrections-Nov-Dec-Jan

Unshaded – Less than 50% shading of surface fuels

Aspect	Slope	0800-0959 (+ night)			1000-1159			1200-1359			1400-1559			1600-1759			1800-1959		
		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 – 50 % or more shading of surface fuels due to canopy and/or cloud cover

N	All	4	5*	6	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6
E	All	4	5*	6	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6
S	All	4	5*	6	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6
W	All	4	5*	6	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6

B = Area of concern is 1,000’ to 2,000’ below the weather site location
L = Area of concern is within 1,000’ of the weather site location
A = Area of concern is 1,000’ to 2,000’ above the weather site location

Fine Fuel Moisture and Fire Behavior

RH	TL FM	FFMC	PIG	Interpretation
>60%	1h>20% 10h>15%	<80	<10%	Very low ignition, some spotting may occur with wind
45 to 60%	1h 15-19% 10h 12-15%	80-84	10 to 20%	Low ignition, campfires can be hazardous
30 to 45%	1h 11-14% 10h 10-12%	85-88	20 to 30%	Medium ignition, matches hazardous, easy burning
26 to 40%	1h 8-10% 10h 8-9%	89-92	30 to 50%	High ignition, matches dangerous, spotting possible with wind, medium burning conditions
15 to 30%	1h 5-7% 10h 6-7%	93-95	50 to 70%	Very high ignition, rapid buildup, extensive spotting and crowning, and loss of control
<15%	1h<5% 10h<6%	>95	80 to 100%	Extreme ignition and initial spread, frequent spots, critical fire conditions

Use these thresholds with caution; consult local experts.

Fire Behavior Observations & Interpretations

Flame Length	Fire Behavior Class	Rate of Spread	Tactical Interpretation
<1'	Very low, smoldering	0 to 2 ch/hr	Not spreading. Limited flaming. Handline holds.
1-4'	Low, creeping, spreading	2 to 5 ch/hr	Fires can be attacked at the head or flanks with handtools. Handline should hold.
4-8'	Moderate, running	6 to 20 ch/hr	Fires too intense for direct attack with handtools. Heavy equipment line construction and holding with water may be effective.
8-11'	High, torching and spotting	20 to 50 ch/hr	Serious control problems: torching and spotting. Control efforts at head are ineffective.
11–25'	Very high, active crown fire	50 ch/hr to 150 ch/hr	Crowning, spotting, and large fire growth expected. Control efforts at head are ineffective.
>25'	Extreme and erratic	>150 ch/hr	Extreme intensity, turbulent fire, chaotic spread. Escape to safety should be considered.

1 chain (ch) = 66 feet

Source: *Fire Behavior Field Reference Guide*, PMS 437

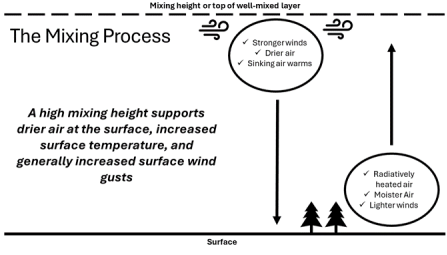
In Your Fire Weather Forecast

Assessing the Potential for Lightning:

- Are thunderstorm chances (in %) given in Sky/Weather section?
- Higher percentages mean higher odds for storms and lightning.
- Compare to Chance of Wetting Rain (CWR). A high thunderstorm chance with low CWR may imply dry thunderstorms.
- Remember any thunderstorm can lead to ignitions from lightning.

Assessing Impacts of the Mixing Height:

- Mixing height represents the top of the near-surface, well-mixed layer expressed in feet above ground level (ft-agl).
- A high or strong mixing height supports warmer, drier, and windier conditions at the surface.
- High mixing height implies near-surface instability with gusting winds supporting erratic fire behavior potential.
- Categorical high mixing height varies across the country. You need to assess if your mixing height forecast is high, average, or low for the time of year at your location.



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 patients, severity).
- Vehicles (number, type).

Establish Traffic Control

- Place apparatus between oncoming traffic and rescuers. Keep exhaust from pointing at scene and patients.
- 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 downslope.

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 *Emergency Response Guidebook* (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'
- Major event (>1 drum, etc.) = 500'
- Residential and light commercial = 300'
- Open areas = 1,000'
- Boiling Liquid Expanding Vapor Explosion (BLEVE) potential = 2,500'(one-half mile)
- Stage arriving units = 2,500' 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**
INFOTRAC	**1-800-535-5053**
3E COMPANY	**1-800-451-8346**

U.S. Army Operations Center for incidents involving explosives and ammunition: **1-703-697-0218**

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

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

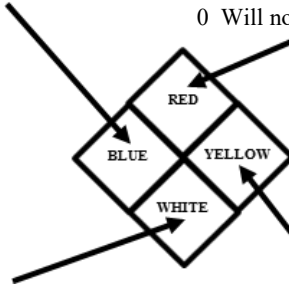
HazMat Classification for Fixed Facilities Based on NFPA 704

HEALTH HAZARD

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

FIRE HAZARD

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



SPECIFIC HAZARD

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

INSTABILITY

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:

- Left quadrant = SAR Team ID
- Upper quadrant = Time and date team left structure
- Right quadrant = Personnel hazards
- Lower quadrant = Number of patients still inside structure (X indicates no patients remaining)

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
  - Time of Arrival
  - 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 personnel must brief all passengers prior to flight.

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. (Gloves should fit snugly, with adequate dexterity, to enhance operation of seat belts and emergency exits.)

Approach and Departure

- Stay clear of landing area during approach/ departure.
- Always approach/depart from the downslope (lower) side as directed by pilot/helitack personnel.
- 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.

Helicopter Seat Belts

- Buckle function and lap/shoulder strap fitting adjustments for all passengers.

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, emergency locator transmitter (ELT), fuel and battery shutoff switch location and operation, and 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.

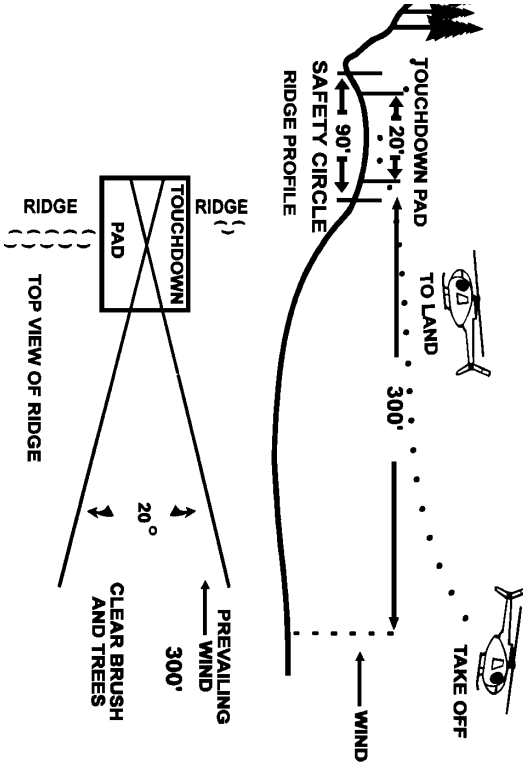
Fixed Helispots

- Type 1 Helicopters
  - Safety circle: 110'
  - Touchdown pad: 30' x 30', clear and level
- Type 2 Helicopters
  - Safety circle: 90'
  - Touchdown pad: 20' x 20', clear and level
- Type 3 Helicopters
  - Safety circle: 75'
  - Touchdown Pad: 15' x 15' clear and level

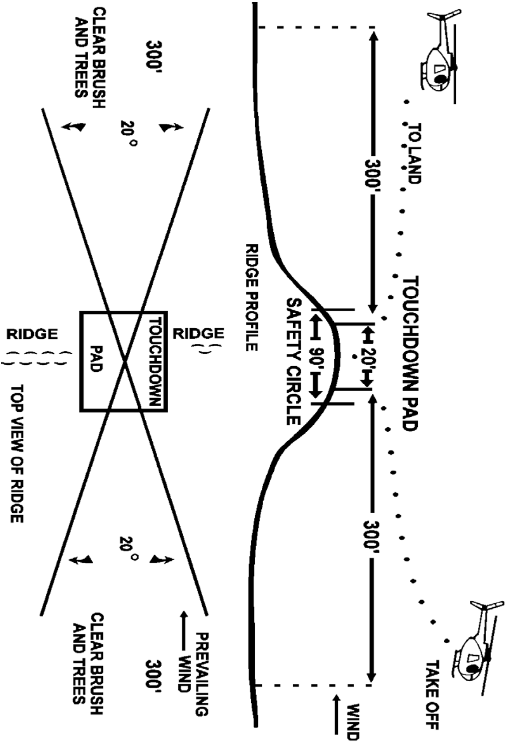
Items Needed

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

One-Way Helispot



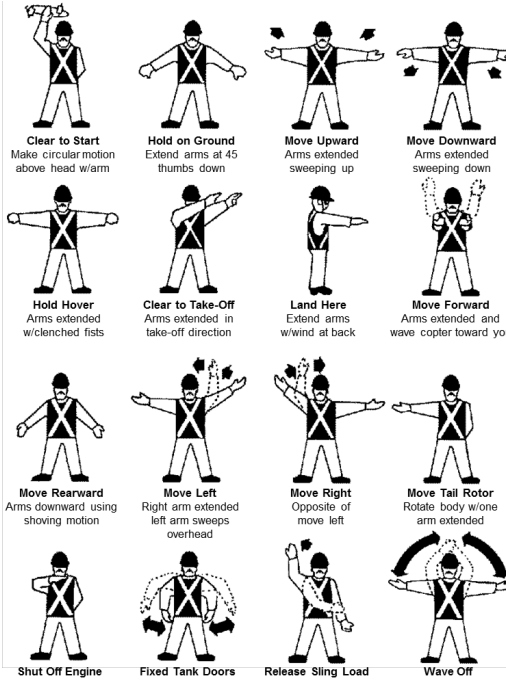
Two-Way Helispot



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.
- 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 the 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’ x 12’)	20 lbs.
Cargo net (20’ x 20’)	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’)	10 lbs.
Long line (50’)	30 lbs.
Swivel	5 lbs.
Chainsaw	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’	10 lbs.
Mark 3 – Pump with kit	150 lbs.
Stokes w/ backboard	40 lbs.
Trauma bag	35 lbs.
MRE (1 case)	25 lbs.
Cubee/water (5 gal.)	45 lbs

Aerial Delivered Retardant/ Water Drop Zone Considerations

- Maintain prompt communications with aerial resources. Prioritize using the air-to-ground frequency as appropriate.
- Keep informed of the aerial firefighting objectives, tempo, and aircraft type.
- Evaluate your environment for gravity hazards (tree limbs, rocks, logs, and dispensed retardant/water).
- If clearance is impractical, where fuels and/or terrain obstruct lateral movement from the path of the aircraft, notify the aerial supervisor immediately.

If escape is not possible:

- Lie face-down with head toward incoming aircraft with hardhat in place.
- Hold hand tool away from your body.
- If possible, grasp something firm to prevent being carried or rolled by the dropped liquid.

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 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/strobe lights 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 pilot.
  - Establish a clear, obtainable objective for retardant use with aerial supervision.
- Maintain effective communication with ATGS, ASM/LP, or 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 77.
- 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 are clear of personnel and equipment.
- Inform ATGS, ASM/LP, or pilot when the 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 = 60’ (optimum 90’) above the vegetation
- LAT = 150’ above the vegetation
- VLAT = 200’ above the vegetation
- Water Scooper (CL 215/415) = 150’ 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 Large Airtanker (LAT) = 1,800-2,999 gallons (Q-400)

Type 1 Large Airtanker (LAT) = 3,000-5,999 gallons (BAe-146, RJ85, MD87, C-130, B-737)

VLAT = Very Large Airtanker = >6,000 gallons (DC10)

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 affect 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 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 at https://www.safecom.gov/.

Report any interagency aircraft mishap to: 1-888-464-7427 (1-888-4MISHAP).

Unmanned Aircraft Systems (UAS) in Wildland Fire Operations

Key Considerations for UAS Operations in Wildland Fire:

- Awareness: Be aware of the presence of UAS in the operational area and their role in providing aerial support to firefighting efforts. Prioritize safety by following established protocols for interacting with UAS and respecting their operational space.
- Compliance: All UAS operations must be authorized and comply with agency aviation/UAS policies, Federal carding requirements, and Federal Aviation Administration (FAA) regulations. All UAS/Remote Pilots are required to possess current FAA Airmen Certificate and agency approved Pilot Card for the assigned mission.
- Communication: Communications with UAS are conducted on approved FM frequencies, UAS will not launch until positive communication has been established.
- Launch and Recovery Sites: Type 3 and 4 UAS can be launched from multiple locations based on mission type. When possible, find sites with a clear operational view and outside of heavily traveled areas.

Prior to requesting UAS consider the following:

- Mission Objective – Situational awareness, imagery (stills/video), spatial data, aerial ignition.
- Mission Timing – Optimal shift based on priorities and aviation activities. (Day/Night/Swing).
- Product Delivery – How/when will information be shared.
- Location of Line Personnel – Where are other ground resources working.

Aerial Ignitions Using UAS in Wildland Fire Operations:

UAS Aerial Ignitions (Ai): Ai operations require a dedicated firing boss/aerial ignition supervisor to direct UAS ignitions and coordinate with ground resources. These duties cannot be transferred to a UAS pilot during ignition operations.

UAS Aerial Ignition (Ai) Capabilities:

- Flight Time: 15-30 minutes with PSD.
- Sphere Capacity: 450.
- Camera: IR/EO video.
- Within a TFR UAS can fly beyond visual line of sight (BVLOS).
- Without a TFR UAS need to remain within sight or extended line of site (ELOS).

Refer to https://uas.nifc.gov/ and the *NWCG Standards for Fire UAS Operations,* PMS 515, for further information on UAS operations.

NOTES

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

- Firefighter safety is the first consideration of line location.
- 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 Fireline Construction Checklist (page 7) when considering building downhill line in steep terrain.

Chainsaw Operations

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

Indicators of Complexity

- Evaluate sawyer fatigue
- Evaluate tree stand health
- Evaluate pace of operations
- Evaluate effects of terrain
- Evaluate weather factors
- Evaluate objective difficulty

Chainsaw Operation Standards

- Establish cutting area control/brief cutting area resources
- Determine objective–where each cut piece will end up
- Assess hazards
- Overhead/ground hazards
- Species specific hazards
- Determine tree soundness or defects
- Measure lean/bind(s), determine good side/bad side
- Develop an escape plan for the cutting situation
- Establish cut plan/wedge plan
- Establish complexity of the cutting operation
- Complete go/no-go decision
- Communicate and execute cut plan
- Maintain situational awareness while cutting
- Utilize a safe escape path
- Give all-clear
- Analyze operation 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.

NWCG Dozer Typing Standard

Requirements	Type 1	Type 2	Type 3	Type 4
Net HP Range	>240	150-250	99-165	50-110
Min Base Weight (lbs)	60,000	35,000	20,000	10,000

Dozer must meet both weight and horsepower criteria.
Source: *NWCG Standards for Wildfire Resource Typing*, PMS 200

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": 20 gpm (100 psi NP)

  1½": 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.

NWCG Engine Typing Standard

	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
At rated pressure (psi)	150	150	250	100	100	100	100
Hose 2½"	1,200	1,000	–	–	–	–	–
Hose 1½"	500	500	1,000	300	300	300	–
Hose 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

NWCG Water Tender Typing Standards

	Water Tender Type				
	Support			Tactical	
Requirements	**S1**	**S2**	**S3**	**T1**	**T2**
Tank capacity (gal)	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

Source: *NWCG Standards for Wildfire Resource Typing*, PMS 200

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
- Two-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		

1 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 (EMTs) 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 leader 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

- Bring toothbrush/paste, extra socks/underwear, light coat, double lunch, space blanket, etc.
- Consider early in the operational period where the crew(s) will RON and ensure 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.).
- Anticipate resupply needs and place 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 backhaul of trash or the pre-positioning of reusable supplies to advanced RON locations.
- Determine how crew time 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 EMT may be needed at the RON location.

Minimum Impact Strategy Tactics

Minimum Impact Strategy Tactics (MIST) is used to meet management objectives that seek to reduce environmental, cultural, and social impacts caused by typical suppression techniques. MIST can both limit resource damage and provide cost savings. Resource Advisors (READ/F) should be consulted regarding MIST implementation. However, the fireline supervisor will determine the tactics used based on firefighter safety, weather, fire conditions, and good judgment.

MIST actions include but are not limited to:

Line Construction and Mopup

- Consider:
  - Cold trailing the fire's edge.
  - Using wetline or sprinklers as control line.
  - Using natural or human-made barriers.
  - 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 water sources.
  - Utilize containment berms around pump and fuel tank.
- Minimize cutting of trees and snags to those that pose safety or holding 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 with the potential to spread outside the line or pose spotting issues.
- Scrape around tree bases near fireline to eliminate ladder fuel.
- Minimize bucking of logs to check/extinguish hotspots, preferably roll logs to extinguish and return to original position.
- Utilize extensive cold trailing and/or hotspot detection devices along perimeter.
- Increase use of fireline patrol/monitoring.
- Flush-cut stumps after securing fireline.

Long-Term Incidents

- Consult with READ/F to locate suitable campsites. Avoid areas with hazards (snags, bee nests, etc.).
- Plan for appropriate methods of:
  - Helispots
  - Supply deliveries
  - Trash/Backhaul
  - Disposal of human waste
- Minimize ground and vegetation disturbance when establishing sleeping areas.
- Minimize disturbance of cultural resources.
- Prevent spread of invasive species by checking/washing vehicles, cargo nets, and equipment.
- Use locally approved storage methods to animal proof food and trash.
- When abandoning camp, rehab impacts by fire personnel.

Reporting Fire Chemical Misapplication

Wildland fire chemicals can have substantial negative impacts on aquatic life as well as some terrestrial species and cultural values. Therefore, it is very important to avoid application of fire chemicals into waterways and maintain familiarity with agency and local jurisdiction policies for aerial and ground delivery of wildland fire chemicals.

Some agencies require avoidance and reporting for all wildland fire chemical misapplications into waterways, 300-foot riparian buffer zones, threatened and endangered species habitat, or mapped avoidance areas. Inform your supervisor and/or READ/F if you encounter fire chemicals which may have been misapplied into any of these locations.

- A waterway is any body of water including lakes, rivers, streams, and ponds – whether or not they contain aquatic life.
- The *2009 Interagency Federal Policy for Aerial Delivery of Wildland Fire Chemicals near Waterways* provides additional details, including exceptions.

Aquatic Invasive Species

To minimize potential transmission of aquatic invasive species, it is recommended that you:

- Consult with local resources, biologists, READ/Fs about known aquatic invasive species locations.
- Draft/fill tanks from municipal or treated water sources when possible.
- Avoid transfers of water between drainages/unconnected waters.
- When drafting, avoid sucking organic and bottom material from a water source.
- Use single water source if possible. Allow time for equipment decontamination/drying.
- Remove all organic material/mud from equipment/gear external surfaces when possible.
- Carry spare, clean, dry helicopter buckets, draft hoses, and foot valves to switch out with used ones when moving to a new water source. Decontaminate/dry the wet gear while spares are being used. Adhere to corrosion requirements for aluminum on aircraft fuselages or water delivery components such as helicopter buckets and foot valves when using chemicals.
- If gear contacts untreated water, decontaminate gear before moving to new drainages. Applicable gear includes helicopter buckets, snorkel ends, foot valves, and draft hoses. Water delivery equipment and accessories that do not transfer tank water to waterbodies do not need to be disinfected (e.g., fireline hoses, wye valves, nozzles).

For further direction refer to NWCG Invasive Species Subcommittee *Guide to Preventing Aquatic Invasive Species Transport by Wildland Fire Operations*, PMS 444, or local area or agency direction.

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.

Fire Information is Everyone's Job

Notify chain of command and incident Public Information/ Affairs Officer (PIO/PAO) if media arrives unescorted. Provide for their safety until an escort arrives.

Media Interviews:

- Develop and deliver key factual messages; anticipate tough questions.
- Give simple answers (10-20 sec.) and avoid using jargon or acronyms.
- Stick to *your* knowledge and avoid speaking for other incident personnel.
- Never speak off the record, exaggerate, or try to be cute or funny.
- Keep quiet in between questions; if you misspeak, ask to start again.
- Be personable, professional, and presentable (remove sunglasses and hat).
- Conclude with a safety or wildfire prevention message.

Social Media – PAUSE Before Posting:

- PERCEPTION – You are representing the jurisdictional agency and your home unit.
- AUTHORITY – Be aware of federal and host agency social media policies.
- UNDERSTANDING – Know the incident objectives. Never post negative, controversial, or unsafe messages to personal accounts. Ask a PIO/PAO or supervisor for clarification.
- SAFETY – Do not compromise your safety while taking photos and always wear proper PPE. Never post photos of children, inmates, investigations, or cultural sites; be sensitive to burned structures and private information.
- EXPECTATION – Share relevant content or photos with PIOs/PAOs to help tell the incident story.

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, and use the Medical Incident Report on page 120.
- Medevac is an Incident Within an Incident (IWI). One person needs to become the on-scene IC 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 name(s) 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 and weight

Level of Consciousness

- Alert and 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** (page 111)

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.

NOTES

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 112 for additional information.

CPR

1. **Scene Safety:** Look for any dangers or hazards.
2. **Determine Responsiveness:** Tap on the patient'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 their 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 patient'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 patient's chest at least two inches. Push hard and fast. Perform 30 compressions.
5. **Airway:** Open the patient'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 patient's nose and mouth. Pinch the patient'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 patient's nose and cover the patient's mouth with your mouth. Form an airtight seal and give two breaths.
7. **Continue CPR:** Continue alternating 30 compressions and 2 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 an 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:

- 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 HRI 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 an HRI.

Burn Injuries

INITIATE MEDICAL EVACUATION IMMEDIATELY.

- Remove person from heat source while looking for signs of a burned airway (e.g., singed facial or 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.
- Loosely wrap 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 the body:
  - Loosely cover burned area with clean, dry dressing if available.
  - If dressings are unavailable, mylar blankets, plastic wrap, or clean blankets or clothing can be used.
- Monitor ABCs.
- Keep patient warm and dry. **DO NOT** use wet dressings or blankets.
- 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.

Fatality Procedures

- Never broadcast patient's name on the radio or release to anyone except authorities.
- Do not allow unauthorized picture taking or release of pictures.
- Do not move the body unless it is in a location where it could be burned or otherwise destroyed. If movement is necessary, mark body location. Secure accident scene.
- Notify IC, who will:
  - Assign an individual to supervise evacuation in the event evacuation is needed, (See Medical Incident Report, page 120) and secure the scene after evacuation is complete.
  - Assign an individual to get facts and witness statements and preserve evidence, such as PPE involved in the incident (helmet, Nomex, chaps, etc.), until investigation can be taken over by the Safety Officer or appointed investigating team.
  - Notify Agency Administrator.

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 Incident Management Team (IMT) or local dispatch.
- Use the Medical Incident Report (page 120). 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 and Mechanism of Injury		*Brief Summary of Injury or Illness (Ex: Unconscious, Struck by Falling Tree)*
Evacuation Request		*Air Ambulance / Short-Haul/Hoist/ Ground Ambulance / Other*
Patient Location		*Descriptive Location and 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 108
Treatment:

4. **EVACUATION 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? Think ahead.
8. **ADDITIONAL INFORMATION**: Updates/Changes, etc.

REMEMBER:

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

The *NWCG Incident Response Pocket Guide* (*IRPG*) is developed and maintained by the Incident Operations Subcommittee (IOSC), under the direction of the Incident and Position Standards Committee (IPSC), an entity of the National Wildfire Coordinating Group (NWCG).

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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
  - ○ IC/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?

10 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.

18 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.