

8 - Suppression Resources



Introduction

Leadership

Fireline Leadership is the process of influencing firefighters to accomplish their mission by providing them with purpose, direction and motivation.

Purpose You must establish priorities, explain the importance of the mission, and focus the firefighters to the task so they will function safely and efficiently.

Direction gives firefighters an orientation to the tasks to be accomplished based on priorities set by the leader.

Motivation gives firefighters the drive and desire to do everything they are capable of doing to accomplish a mission.

Principles of the Fireline Leader

- Know yourself and seek improvement.
- Be technically and tactically proficient.
- Seek responsibility and take responsibility for your actions.
- Make sound and timely decisions.
- Set a good example.
- Know your firefighters and take care of them.
- Develop a sense of responsibility in your subordinates.
- Ensure the task is understood, supervised, and accomplished.
- Build your team.
- Keep your firefighters informed.
- Use your firefighters in accordance with their level of training and experience.

Engines

Engine modules are organized, highly trained, and efficient local and national resources which can be utilized in all fire management operations, including initial attack, extended attack, and fire use activities. The primary purpose of these engine modules is to staff and manage the fire apparatus in the BLM fleet.

Policy

Each state will comply with established engine module standards. Standardized training, equipment, communications, organization, and operating procedures are required to effectively perform arduous duties in multi-agency environments and various geographic areas. Approved Class A foam concentrate will be used to improve the efficiency of water--except near watercourses where accidental spillage or over spray of the chemical could be harmful to the aquatic ecosystem.

Safety

All engine personnel will promote and maintain a passion for safety. Deployment of crews will not be initiated or continued without strict adherence to the 10 Standard Fire Orders, 18 Watch Out Situations, and principles of LCES. Engine module members will receive training in hazardous materials, vehicle fires, and incidents located in the wildland/urban interface. Engine Operators must consider maintaining at least 10 percent of the pumpable capacity of the water tank for emergency engine protection and drafting.

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Fire Engine Module Staffing

Type 6 and 7 engines will have a minimum crew of two – an Engine Module Leader (EML) or Engine Operator (ENOP), and an Engine Module Member.

Type 3, 4, or 5 engines will have a minimum crew size of three:

- Single resource engines will be comprised of an EML, an Engine Operator, and one or more module members.
- Task force engines will have an Engine Operator and the appropriate number of module members. The EML position is not required on each engine, but must be filled within the task force.

Performance Requirements for Engine Modules

The following performance requirements are based on the daily duties of engine module personnel and may exceed the standards listed in the *Wildland Fire Qualifications Subsystem Guide's* (NWCG 310-1). The bureau has established an Engine Operator (ENOP) position and associated task book to meet field needs. These performance requirements will be evaluated during the Preparedness Review process.

*Engine Module Member***Minimum Qualifications:** FFT2**Additional Required Training:** I-100**Additional Performance Requirements:**

Apparatus Appearance—Ability to keep the vehicle clean and presentable to local standards.

Apparatus Inventory—Ability to maintain inventory in a constant state of fire readiness. All tools and equipment must meet refurbishment standards specified in NFES 2249, *Fire Equipment Storage and Refurbishment*.

Tool and Equipment Standards—Ability to use, check condition of, and identify repair/replacement needs as identified in NFES 1571, *Firefighters Guide*.

Hose Packs—Working knowledge of hose pack types and how to safely and efficiently deliver water to the fire.

Types of Hose—Working knowledge of hose identification and use. See NFES 1308, *Wildland Fire Hose Guide*.

Fittings/Nozzles—Ability to identify fittings and nozzles, understand use, capabilities, limitations, and perform maintenance.

*Engine Operator (ENOP)***Minimum Qualifications:** CDL, FFT1**Additional Required Training:** S-281, BLM Engine Operator Task Book**Recommended Training:** BLM Engine Operator Course**Additional Performance Requirements:** Same as for Engine Module Member, plus the following:

Stationary Pumping—Ability to set up stationary pumping operations to safely and efficiently deliver water to a fire through a hoselay.

Mobile Attack—Ability to set up and perform running attack safely and efficiently. Understand roles and responsibilities associated with multi-engine mobile attack.

Urban Interface—Understand strategies and tactics, recognize hazards, and know agency policy with regards to urban interface situations

Interface with Municipal Fire Apparatus—Understand capabilities and limitations and how to effectively interface with equipment. Be aware of the

pressures and flow rates used with municipal apparatus and their potential effects on wildland fire equipment.

Engine Protection—Ability to protect engine by positioning in a fire safe area; set up and use engine protection lines.

Pump Theory and Operation—Ability to effectively apply this knowledge to fire situations most commonly encountered. Must be able to troubleshoot pump/valve problems in various fire and drill situations.

Pump Package Maintenance Procedures—Ability to maintain pump package per manufacturer's/agency standards. Pump package must be in a constant state of fire readiness. Ability to troubleshoot equipment problems and develop solutions/repair needs. Ability to perform required pump test to assure pump/plumbing are operating to specifications, and maintain log.

Hydraulics—Ability to effectively apply calculations and formulas relating to fire hydraulics, including friction loss. Must understand pump capabilities and limitations (i.e. GPM, PSI, elevation gain and loss, etc.)

Simple Hoselays—Ability to perform initial lay out and extend a simple hoselay delivering water to fire safely and efficiently.

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Progressive Hoselays—Ability to perform initial lay out and extend a progressive hoselay delivering water to fire safely and efficiently.

Hoselay Troubleshooting—Ability to troubleshoot hoselay evolution problems and develop solutions.

Foam Equipment Maintenance—Ability to flush the engine foam proportioner according to the manufacturer's recommended procedures.

Foam—Ability to efficiently produce different types of foam from nozzle(s) appropriate for different fire situations. Understand the principles of compressed air foam generation and foam generation through a proportioner.

Drafting Theory—Ability to draft from external source and fill engine tank, and draft from external source and deliver water through a hose lay.

Hydrant Use—Understand and apply the safe and effective operation of fire hydrants and be able to set up an engine for hydrant water delivery.

Vehicle Maintenance Procedures—Ability to maintain vehicle per manufacturer's/agency standards, keeping vehicle in a constant state of fire readiness. Ability to troubleshoot equipment problems, develop solutions/repair needs.

Winterization—Ability to properly winterize apparatus and pump package to protect from potential freeze damage.

Radio Use—Understand and apply bureau policy regarding radio use and protocol; be proficient at radio programming.

Engine Module Leader (EML)

Minimum Qualifications: ICT4, ENGB

Additional Training Required: I-200, S-200, S-231, S-234, S-260, S-270, S-381

Additional Performance Requirements: Same as for ENOP, plus the following:

Equipment Capability—Understand equipment capabilities and limitations, and their relationship to fuels, topography, and fire behavior.

Crew Qualifications/Experience—Ability to direct crews commensurate with qualifications and experience.

Interface with Municipal Fire Personnel—Understand municipal personnel capabilities and limitations, and how to effectively manage these resources in wildland fire situations.

Global Positioning System (GPS)—Ability to input and extract information for GPS point plotting and point location on resource maps and grids. Be able to navigate from point-to-point using a GPS unit.

Supervision—Direct supervision of firefighters performing wildland fire suppression activities. Direct supervision of personnel including project work, time and attendance, performance evaluations, safety meetings, and post-incident reviews. Organize crew into configurations that meet incident and tactical objectives. Train, test, and evaluate module members to ensure required skill and knowledge meets all performance tasks and requirements.

Physical Fitness Standards

Satisfactory completion of the Work Capacity Test (WCT) at the arduous level is required for all positions assigned to bureau engines. The physical fitness level will be maintained throughout the fire season.

The following physical fitness elements are recommended goals for engine module members. These fitness targets have been extrapolated from *Fitness and Work Capacity*, 2nd ed. (1997), Tables 7.1 and 7.3, p. 51.

- 1.5 mile run in 11:40 minutes or less
- Bench Press, 0.8(lb) x body weight
- Leg Press, 2.0(lb) x body weight
- 30 situps
- 5 pullups
- 20 pushups

Driving Standards

See Chapter 4, Safety.

Gross Vehicle Weight (GVW) It is bureau policy to have an annual certified weight slip documenting that the actual GVW (including gear, personnel, and fuel) does not exceed the manufacturer's recommended GVW. Operators of engines and water tenders must ensure the maximum certified GVW is never exceeded.

Speed Limits Posted speed limits will not be exceeded under any circumstances. In addition, engines will not exceed 65 mph or the appropriate speed limit (which ever is more restrictive), even if the posted speed limit is greater than 65 mph.

Fire Engine Maintenance Procedure and Record Apparatus safety and operational inspections will be accomplished either on a post-fire or daily basis. Offices are required to use this document for guidelines and record keeping. Periodic maintenance (as required by the manufacturer) shall be performed at the intervals recommended and properly documented. All annual inspections should include a pump test to assure the pump/plumbing system is operating at desired specifications.

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Lighting All new orders for fire engine apparatus will include an overhead lighting package in accordance with statewide standards (if established). It is highly recommended, but not required, that the lighting package meet NFPA 1906 standards. FMOs may equip engines in service with overhead lighting packages.

While off-road and/or during suppression activities, headlights and taillights shall remain illuminated at all times the vehicle is in operation. In addition, overhead lighting (or other appropriate emergency lights) shall be illuminated whenever visibility is reduced to less than 300 feet. Light bars, flashing lights, strobe lights, and other lighting equipment designed for emergency use, shall only be used for designated purposes during suppression operations and emergencies. Specific approval and training must be provided for these special uses.

Chocks At least one chock will be carried on each engine and will be properly installed whenever the engine is parked or left unattended. This includes engine operation in a stationary mode without a driver "in place."

Fire Extinguishers All engines will have at least one 5 lb. ABC-rated (minimum) fire extinguisher, either in full view or in a clearly marked compartment.

On-Board Flammable Liquid Storage and other Flammables

OSHA regulations state, “only **approved metal containers**, of not more than 5 gallons capacity, having a spring-closing lid and spout cover and so designed that it will safely relieve internal pressure when subject to fire exposure, be used for storing or transporting flammable liquids.” (29 CFR 1910.106)

To comply with OSHA requirements and bureau directives, only OSHA approved, type II metal safety cans should replace plastic containers and traditional metal “Jerry cans.” (This does not apply to the 2-in-1 polyethylene containers used to fill chain saws nor to the Jerry cans used to fuel Mark III pumps.)

All flammable liquids and solids carried on engines will be stored in appropriate containers clearly marked as to their contents.

First-Aid Equipment Each engine shall carry, at a minimum, a properly equipped 10-person first aid kit. It is strongly recommended that an adequate number of Water Jel burn packs be included.

Operational Procedures

All engines will be equipped, operated, and maintained within guidelines established by the DOT, state/local operating plans, and procedures outlined in BLM Manual H-9216, *Fire Equipment and Supply Management*. All personnel assigned to BLM fire engine modules will meet all gear weight, cube, and manifest requirements specified in the national mobilization guide.

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Noxious Weed Prevention

To reduce the transporting, introduction, and establishment of noxious weeds on the landscape due to fire suppression activities, fire suppression and support vehicles should be cleaned at a pre-designated area prior to leaving the incident.

On-site fire equipment should be used to **thoroughly clean the undercarriage, fender wells, tires, radiator, and exterior of the vehicle**. The cleaning area should also be clearly marked to identify the area for post-fire weed control treatments, as needed. Fire personnel are encouraged to become more familiar with the noxious weeds found in their home units.

Engine Inventories

An inventory of supplies and equipment carried on each vehicle is required to maintain accountability and to obtain replacement items lost on incidents.

The following chart shows the NUS minimum stocking levels required for bureau engines.

Category	Item Description	NFES #	Type	
			3, 4 & 5	6
Fire Tools & Equipment	McLeod	0296	1	
	Combination Tool	0346	1	1
	Shovel	0171	3	2
	Pulaski	0146	3	2
	Backpack Pump	1149	3	2
	Fusees (case)	0105	1	½
	Foam, concentrate, Class A (5-gallon)	1145	1	1
	Chain Saw (and chaps)		1	1
	Chain Saw Tool Kit	0342	1	1
	Drip Torch	0241	2	1
Portable Pump		*	*	
Medical	First Aid Kit, 10-person	0068	1	1
	Burn Kit		1	1
	Body Fluids Barrier Kit	0640	1	1
General Supplies	Flashlight, general service	0069	1	1
	Chock Blocks		1	1
	Tow Chain or Cable	1856	1	1
	Jack, hydraulic (comply w/ GVW)		1	1
	Lug Wrench		1	1
	Pliers, fence		1	1
	Food (48-hour supply)	1842	1	1
	Rags	3309	*	*
	Rope/Cord (feet)		50	50
	Sheeting, plastic, 10' x 20'	1287	1	1
	Tape, Duct	0071	1	1
	Tape, filament (roll)	0222	2	2
	Water (gallon/person) minimum		2	2
	Bolt Cutters		1	1
	Toilet Paper (roll)	0142	*	*
	Cooler or Ice Chest	0557	*	*
	General Supplies (continued)	Hand Primer, Mark III	0145	*
Hose Clamp		0046	2	1
Gaskets (set)			1	1
Pail, collapsible		0141	1	1

Category	Item Description	NFES #	Type	
			3, 4 & 5	6
	Hose Reel Crank		*	*
Safety	Fire Extinguisher (5 lb)	2143	1	1
	Flagging, lime green (roll)	0258	*	*
	Flagging, yellow w/black stripes (roll)	0267	*	*
	Fuel safety can (OSHA, metal, 5-gallon)	1291	*	*
	Reflector Set		*	*
Vehicle & Pump Support	General Tool Kit (5180-00-177-7033/GSA)		1	1
	Oil, automotive, quart		4	2
	Oil, penetrating, can		1	1
	Oil, automatic transmission, quart		1	1
	Brake Fluid, pint		1	1
	Filter, gas		1	1
	Fan belts		1	1
	Spark plugs		1	1
	Hose, air compressor w / adapters		1	0
	Fuses (set)		1	1
	Tire Pressure Gauge		1	1
	Jumper Cables		1	1
	Battery Terminal Cleaner		*	*
	Tape, electrical, plastic	0619	1	1
	Tape, Teflon		1	1
Personal Gear (Extra Supply)	File, mill, bastard	0060	*	*
	Head Lamp	0713	1	1
	Hard Hat	0109	1	1
	Goggles	1024	2	2
	Gloves		*	*
	First Aid Kit, individual	0067	1	1
	Fire Shirt		*	*
	Fire Shelter w/ case & liner	0169	2	1
	Packsack	0744	2	1
	Batteries, headlamp (pkg)	0030	6	4
	Ear Plugs (pair)	1027	3	3
Radio	Dust Mask	0131	6	4
	Portable		1	1

Category	Item Description	NFES #	Type	
			3, 4 & 5	6
	Mobile		1	1
	Batteries (for portable radio)		2	2
Hose	Booster (feet/reel)	1220	100	100
	Suction (length, 8' or 10')		2	2
	1" NPSH (feet)	0966	300	300
	1½" NH (feet)	0967	300	300
	¾" NH, garden (feet)	1016	300	300
	1½" NH, engine protection(feet)		20	20
	1½" NH, refill (feet)		15	15
8	Forester, 1" NPSH	0024	3	2
	Adjustable, 1" NPSH	0138	4	2
	Adjustable, 1½" NH	0137	5	3
	Adjustable, ¾" NH	0136	4	2
	Foam, ¾" NH	0627	1	1
	Foam, 1½" NH	0628	1	1
	Mopup Wand	0720	2	1
	Tip, Mopup Wand	0735	4	2
Nozzle	Tip, forester nozzle, fog	0903	*	*
	Tip, forester nozzle, straight stream	0638	*	*
Wye	1" NPSH, Two-Way, Gated	0259	2	1
	1½" NH, Two-Way, Gated	0231	4	2
	¾" NH w/ Ball Valve, Gated	0739	6	4
Adapter	1" NPSH-F to 1" NH-M	0003	*	*
	1" NH-F to 1" NPSH-M	0004	1	1
	1½" NPSH-F to 1½" NH-M	0007	1	1
	1½" NH-F to 1½" NPSH-M	0006	*	*
Increaser	¾" NH-F to 1" NPSH-M	2235	1	1
	1" NPSH-F to 1½" NH-M	0416	2	1
Coupling	1" NPSH, Double Female	0710	1	1
	1" NPSH, Double Male	0916	1	1
	1½" NH, Double Female	0857	2	2
	1½" NH, Double Male	0856	1	1
Reducer/ Adapter	1" NPSH-F to ¾" NH-M	0733	3	3
	1½" NH-F to 1" NPSH-M	0010	6	4

Category	Item Description	NFES #	Type	
			3, 4 & 5	6
	2" NPSH-F to 1½" NH-M	0417	*	*
	2½" NPSH-F to 1½" NH-M	2229	*	*
Reducer	1½" NH-F to 1" NH-M	0009	1	1
	2.5" NH-F to 1½" NH-M	2230	1	1
Tee	1"NPSH-F x 1" NPSH-M x 1" NPSH-M, w/cap	2240	2	2
	1½" NH-F x 1½" NH-M x 1" NPSH-M w/cap	0731	2	2
	1½" NH-F x 1½" NH-M x 1" NPSH-M w/valve	0230	2	2
Valve	1½" NH-F, Automatic Check and Bleeder	0228	1	1
	¾" NH, Shut Off	0738	5	5
	1", Shut Off	1201	1	1
	1½", Shut Off	1207	1	1
	Foot, w/ strainer		1	1
Ejector	1" NPSH x 1½" NH x 1½" NH, Jet Refill	7429	*	*
Wrench	Hydrant, adjustable, 8"	0688	1	1
	Spanner, 5", 1" to 1½" hose size	0234	4	1
	Spanner, 11", 1½" to 2½" hose size	0235	2	2
	Pipe, 14"	0934	1	1
	Pipe, 20"		1	1
Engine	Fireline Handbook	0065	1	1
	Belt Weather Kit	1050	1	1
	Binoculars		1	1
	Map Case w / maps		1	1
	Inventory List		1	1
	<i>Standards For Fire and Aviation Operations</i>		1	1

*No minimums – carried by engines as an option, within weight limitations

Water Tender Operators

Water Tender Operator (Support)

Qualifications: CDL (tank endorsement), Hazmat awareness.

A water tender may be staffed with a crew of one (a driver/operator) when it is used in a support role as a fire engine refill unit or for dust abatement.

Water Tender Operator (Tactical)

Qualifications: ENOP, CDL (tank endorsement).

When tactically deployed, a BLM water tender will carry a minimum crew of two, with the same qualifications as for a Type 6 engine (one ENOP and one Engine

Module Member). Tactical deployment is defined as direct fire suppression missions such as pumping hoselays, live reel use, running attack, and use of spray bars and monitors to suppress fires.

Other Water Tenders Contract water tenders will meet the specifications identified in their agreement/contract. All water tenders from other agencies will meet the requirements of their agency.

Smokejumpers

BLM Smoke jumpers provide wildland fire suppression and hazardous fuels reduction services to bureau and interagency land managers.

Policy

Each BLM base will comply with BLM smokejumper operations standards. The arduous duties and specialized assignments and operations in a variety of geographic areas require smokejumpers to have uniform training, equipment, communications, organization, and operating procedures.

Concurrence with NICC must be obtained prior to configuring them as a Type 1 crew. BLM smokejumpers use the ram air (square) parachute exclusively.

8 Smoke jumper Bases

Location	No.	Approx. Availability
Fairbanks, AK	68	May 1 - Oct 1
Boise, ID	64	May 20 - Oct 1

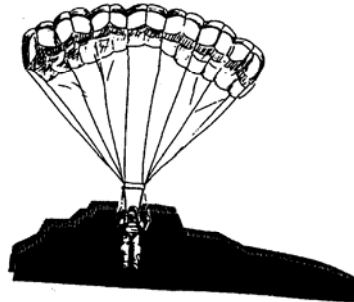
Primary Spike Bases

Alaska

Fort Yukon
McGrath
Palmer

Great Basin

Grand Junction, Colorado
Battle Mtn, Elko, Ely, Las Vegas,
Reno/Stead, & Winnemucca, Nevada
Boise, Pocatello, & Twin Falls, Idaho
Cedar City & Salt Lake City, Utah



Operational Procedures

Coordination & Dispatch Smokejumpers are ordered according to area or national mobilization guides. Specific information on the coordination, dispatch, ordering, and use of BLM Smokejumpers in the contiguous 48 states can be

found in the BLM *Boise Smokejumpers User Guide*, and in the Alaska Fire Service operational procedures, policies, and guidelines. Contact the BLM Smokejumpers in Boise at (208) 387-5426 or the Alaska Smokejumpers in Ft. Wainwright at (907) 356-5670 for these publications.

Communications All smokejumpers will carry a programmable radio and be proficient in its use and programming procedures.

Transportation Smokejumper retrieval is accomplished by coordinating with the requesting dispatch center. More detailed information can be found in the guides mentioned above.

Smoke jumper Organization

The operational unit for BLM Smoke jumpers is “one load,” which consists of one plane with pilot(s), one or two spotter(s), and eight smokejumpers.

The BLM operates two smokejumper bases. Sixty-four smokejumpers and three smokejumper aircraft are stationed at the National Interagency Fire Center in Boise, Idaho. Sixty-eight smokejumpers and five smokejumper aircraft are stationed at the Alaska Fire Service in Ft. Wainwright, Alaska.

Safety

All smoke jumpers will consider risks and take appropriate action in order to fight fire safely. Tactical decisions will be made in accordance with the **10 Standard Fire Orders, 18 Watch Out Situations, and principles of LCES**. All aviation and parachute operations will be accomplished with the highest regard for safety and in accordance with standard operating procedures and regulations.

Training

To ensure proficiency and safety, BLM Smokejumpers complete annual training that covers aspects of aviation, parachuting, fire suppression tactics, administrative procedures, and safety related to the smokejumper mission and fire operations.

The training program for first-year smokejumpers is four weeks long. Candidates are evaluated to determine:

- Level of physical fitness.
- Ability to learn and perform smokejumper skills.
- Ability to work as a team member.
- Attitude.

- Ability to think clearly and remain productive in a stressful environment.

The following are ICS qualifications for smokejumpers:

Position	Minimum Qualifications	Target Qualifications
Overhead Cadre	ICT3, DIVS	OSC2, ATGS
Spotter	ICT3, DIVS	ATGS
Squad Leader	STCR, ICT4	DIVS, ICT3
GS-6 Smokejumper	CRWB	ICT4, STCR, RXB2, RXI2
GS-5 Smokejumper	FFT1, FFT2	CRWB, RXFM

Physical Fitness Standards

The national minimum standards for smokejumpers:

- 1.5 mile run in 11:00 minutes or less
- 45 situps in 60 seconds
- 25 pushups in 60 seconds
- 7 pull-ups
- 110 lb. packout over 3 miles/level terrain/90 minutes

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In addition to these national standards, BLM Smokejumpers have an established fitness goal. Although these goals are voluntary, smokejumpers are strongly encouraged to meet them:

- 1.5 mile run in 9:30 minutes or less
- 3 mile run in 22:30 minutes or less
- 60 situps
- 35 pushups
- 10 pullups

In addition to these physical fitness standards, BLM smokejumpers are required to pass the Pack Test.

Interagency Hotshot Crews

Interagency Hotshot Crews (IHCs) provide a safe, organized, mobile, and highly-skilled hand crew for all phases of wildfire suppression.

Policy

IHC standards provide consistent planning, funding, organization, and management of the bureau IHCs. The sponsoring unit will ensure compliance with the established standards. The arduous duties, specialized assignments, and operations in a variety of geographic areas required of IHCs dictate that training, equipment, communications, transportation, organization, and operating procedures are consistent for all BLM IHCs.

It is bureau policy to adopt the guidance found in the *Interagency Hotshot Crew Operations Guide* for minimum requirements concerning training and qualifications, physical fitness standards, operational procedures, and transportation.

IHC Organization

Individual crew structure will be based on local needs using the following standard positions: Superintendent, Assistant Superintendent, Squad Leader, Skilled Firefighter, and Crew Member.

BLM Type 1 IHCs

Diamond Mountain	Susanville, CA
Silver State	Carson City, NV
Kern Valley	Bakersfield, CA
Chena	Fairbanks, AK
Midnight Suns	Fairbanks, AK
Denali	Fairbanks, AK
Jackson	Jackson, MS
Vale	Vale, OR



New BLM Type 1 IHCs

Four new BLM IHCs will be established for the 2001 field season. Progress of these crews to the Type 1 status will be monitored and evaluated before they are designated as Type 1 crews. Agency administrators are responsible for ensuring crew qualification and certification at the appropriate crew type.

Winter Valley	Craig, CO
Snake River	Pocatello, ID

Ruby Mountain Elko, NV
Bonneville Salt Lake City, UT

Safety

BLM IHCs will promote and maintain a passion for safety. Tactical assignments for crews will not be initiated or continued without strict adherence to the **10 Standard Fire Orders, 18 Watch Out Situations, and principles of LCES**. It is the responsibility of each crew member to function safely.

Training

All members of an IHC must receive an annual minimum of 80 hours of training. All returning members of an IHC must receive 24 hours of critical training before their first assignment in a fire season. All new members of an IHC must receive the required training of an IHC crew member prior to being dispatched as a member of an IHC.

Critical training will include, but is not limited to, crew safety, risk management, firefighter safety, fire behavior, communications, and organization. The final responsibility for crew availability will rest with the Superintendent's certification to management that all training is complete.

Physical Fitness Standards

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The Pack Test is the minimum physical fitness requirement for BLM IHCs.

Operational Procedures

The minimum tour of availability—**excluding required training periods**—for BLM IHCs will be 130 calendar days for crews in the lower 48 states and 90 calendar days for crews in Alaska. Forest Service IHC length of availability varies by geographic area.

Communications

BLM IHCs will provide a minimum of five programmable multi-channel radios per crew.

Transportation

Crews will be provided adequate transportation. This should not exceed four vehicles. All vehicles must adhere to the certified maximum GVW limitations.

Type 2 Crews

Type 2 hand crews consist of agency personnel, state crews, contract crews, casuals, or emergency firefighters. These crews will be formed into 20-person (16-person in Alaska) firefighting crews for fireline duties. Individuals must have knowledge of handline construction techniques, fire tool use, mopup, and fire behavior.



The bureau sponsors two Type 2 crew programs:

- Vale District Snake River Valley Crews.
- Alaska Fire Service EFF Crews.

Snake River Valley Crews (SRV) All assignments for the crew will be placed through the SRV crew representative (CREP). The CREP is responsible for the crew's safety and supervision and will accompany the crew on all fireline assignments and during travel to and from the incident(s). Other responsibilities include: paperwork that pertains to the crew (i.e., time sheets, medical and accident forms); to act as a liaison between crew, the incident, and Vale Dispatch; to attend all incident briefings and relay assignments, instructions, and safety issues to the crew chief--who will brief the crew.

There are 25 Snake River Valley crews in Oregon. Crews come with a crew representative, a crew chief, lead crew people, a qualified chainsaw operator, crew members, and the following:

- Available for 14 days.
- Equipped with all PPE, including shelters.
- Two radios per crew. If the CREP determines additional radios are needed, the hosting unit will provide the radios.
- Handtools (if requested); no chainsaws.
- Ground transportation will be provided by the Vale District and charged to the incident.
- One interagency resource representative (IARR) per four crews.

Alaska Fire Service EFF Crews

Alaska has a total of 73 Type 2 crews. For assignments within the state, the crew is made up of 16 individuals with a crew boss, three squad bosses, and 12 crew members. During the fire season, Alaska supports the need for national Type 2 crews by maintaining 40 crews—25 maintained by the Alaska Fire Service and 15 maintained by the Alaska Division of Forestry. Alaska Type 2 crews assigned to the lower 48 states will come with a crew representative, a crew boss, three squad bosses, 15 crew members, and the following:

- Available for 14 day assignment.
- Equipped with all PPE including shelters.
- Four radios per crew.
- No handtools or chainsaws.
- One interagency resource representative (IARR) with administrative assistant per five crews.

Other agency sponsored Type 2 crews are available from a variety of sources ordered through the Geographic Area Coordination Center (GACC). Specific information about Type 2 crews can be obtained from the GACC.

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National Minimum Standards (Physical and Training)

- Assigned crew overhead (crew boss / squad boss) must meet the minimum standards set forth in NWCG 310-1.
- Individuals must meet the arduous physical fitness level.
- Individuals must be available for 14-day minimum assignments.
- Crew members are required to complete S-130 and S-190 prior to crew assignment. Field exercise using classroom training experience is recommended.

Suppression Chemicals & Delivery Systems

Foam

Technical guidelines for equipment operations and general principles of foam application are discussed in *Foam vs Fire, Class A Foam for Wildland Fires*. NWCG, PMS 446-1, NFES 2246, 2nd ed., October 1993, and *Foam vs Fire, Aerial Applications*. NWCG, PMS 446-3, NFES 1845, October 1995.

Policy Standard operating procedures for fire management and suppression activities involving water as the suppression or protection agent delivered by engines and portable pumps, shall include the use of an approved Class A foam concentrate to improve the efficiency of water—except near watercourses where accidental spillage or over spray of the chemical could be harmful to the aquatic ecosystem. (See environmental guidelines, page 117.) Foam can also be delivered by helicopters and SEATs.

Operational Guidelines

Proportioners – Bureau standards for foam proportioners on engines is an automatically regulated pressure bladder system (Robwen Flowmix 500). These devices are available as a foam kit for use with portable pumps. Automatic proportioners are required for compressed air foam systems to prevent slug flow.

Manually regulated proportioners, such as around-the-pump proportioners, in-line and by-pass eductors, and suction-side regulators, are acceptable for remote portable pump use when the operator understands the device limitations.

Proportioners should be flushed after every operational period of use.

Conventional Nozzles and Backpack Pumps – Mix ratio is 0.1-0.3%. Hydraulic considerations are the same as water.

Aspirating Nozzles – Mix ratio is 0.2 - 1.0%, but generally 0.5%, depending on nozzle, “foaminess” of concentrate used, and type of application. Adjust the ratio to best meet needs and objectives. Foam production and delivery should occur as readily as would water delivery.

Compressed Air Foam Systems (CAFS)

- 1) Keep static air and water pressures equal.
- 2) Start with a 0.3% mix ratio; adjust if necessary.

- 3) Generally operate with 1 cfm of air for every gpm of water; adjust if necessary.
- 4) Employ a motionless mixer or 100 feet of hose to develop foam in the hose.
- 5) Foam production and delivery should occur as readily as water delivery.

Wildland/Urban Interface and Vehicle Fires – 1.5 inches is the recommended minimum hose diameter when using foam on wildland/urban interface and vehicle fires according to bureau policy.

Safety

Personal Safety and Protection – Foam concentrates and solutions must be tested to meet minimum requirements with regard to mammalian toxicity, acute oral toxicity, acute dermal toxicity, primary skin irritation, and primary eye irritation (*International Specification for Class A Foam for Wildland Fires, Aircraft or Ground Application*, August 1993).

Personnel involved in handling, mixing, and applying foam concentrates or solutions should be trained in proper procedures to protect both their health and safety as well as that of the environment.

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Personnel must follow the manufacturer's recommendations as found on the product label and product material safety data sheet (MSDS).

Approved foam concentrates are mildly to severely irritating to the eyes. Anyone involved with or working in the vicinity of foam concentrates should use protective splash goggles.

Containers of foam concentrate or solutions, including backpack pumps and engine tanks, should be labeled to alert personnel that they do not contain plain water, and that the contents must not be used for drinking purposes.

Slickness is a hazard at storage areas and unloading and mixing sites. Because foam concentrates and solutions contribute to slippery conditions, all spills must be cleaned up immediately.

Personnel applying foam should stand in untreated areas. A foam blanket can be dangerous to walk through because it conceals ground hazards. Also, foam readily penetrates and corrodes leather boots, resulting in wet feet and potentially ruined leather.

All safety precautions associated with ground crews near retardant drops also apply to aerial foam drops.

CAFS Safety – Personnel assigned to operate a compressed air foam system must be trained in safe CAFS operations, including operating the nozzle, working around charged hose lays, and how to prevent slug flow.

Long-Term Retardant

Principles of application and coverage levels are outlined in NFES 2048, PMS 440-2.

Policy Using approved long-term retardants in wildland fire suppression efforts is standard in fire management and planning. The retardants are most often delivered in fixed- or rotor-wing aircraft. Approved retardants currently contain sulfate or phosphate salts.

Environmental Guidelines for Delivery of Retardant or Foam near Waterways

Definition:

Waterway - Any body of water including lakes, rivers, streams and ponds whether or not they contain aquatic life.

Guidelines: Avoid aerial or ground application of retardant or foam within 300 feet of waterways. These guidelines do not require the pilot-in-command to fly in such a way as to endanger his or her aircraft, other aircraft, structures, or compromise ground personnel safety.

Guidance for pilots: To meet the 300-foot buffer zone guideline, implement the following.

Medium/Heavy Airtankers: when approaching a waterway visible to the pilot, the pilot shall terminate the application of retardant approximately 300 feet before reaching the waterway. When flying over a waterway, pilots shall wait one second after crossing the far bank or shore of a waterway before applying retardant. Pilots shall make adjustments for airspeed and ambient conditions such as wind to avoid the application of retardant within the 300 foot buffer zone.

Single Engine Airtankers/Helicopters: When approaching a waterway visible to the pilot, the pilot shall terminate application of retardant or foam approximately 300 feet before reaching the waterway. When flying over a waterway, the pilot shall not begin application of foam or retardant until 300 feet after crossing the far bank or shore. The pilot shall make adjustments for airspeed and ambient conditions such as wind to avoid the application of retardant or foam within the 300 foot buffer zone.

Exceptions: When alternative line construction tactics are not available due to terrain constraints, congested area, life and property concerns or lack of ground personnel, it is acceptable to anchor the foam or retardant application to the

waterway. When anchoring a retardant or foam line to a waterway, use the most accurate method of delivery in order to minimize placement of retardant or foam in the waterway (e.g. a helicopter rather than a heavy airtanker).

Deviations from these guideline are acceptable when life or property is threatened and the use of retardant or foam can be reasonably expected to alleviate the threat.

When potential damage to natural resources outweighs possible loss of aquatic life, the unit administrator may approve a deviation from these guidelines.

Threatened and Endangered (T&E) Species: The following provisions are guidance for complying with the emergency section 7 consultation procedures of the Endangered Species Act (ESA) with respect to aquatic species. These provisions do not alter or diminish an action agency's responsibilities under the ESA.

Where aquatic T&E species or their habitats are potentially affected by aerial application of retardant or foam, the following additional procedures apply:

1. As soon as practical after the aerial application of retardant or foam near waterways, determine whether the aerial application has caused any adverse effects to a T&E species or their habitat. This can be accomplished by the following:
 - a. Aerial application of retardant or foam outside 300 feet of a waterway is presumed to avoid adverse effects to aquatic species and no further consultation for aquatic species is necessary.
 - b. Aerial application of retardant or foam within 300 feet of a waterway requires that the unit administrator determine whether there have been any adverse effects to T&E species with the waterway.

These procedures shall be documented in fire reports.

2. If there were no adverse effects to aquatic T&E species or their habitats, there is no additional requirement to consult on aquatic species with Fish and Wildlife Service (FWS) or National Marine Fisheries Service (NMFS).
3. If the action agency determines that there were adverse effects on T&E species or their habitats then the action agency must consult with FWS and NMFS, as required by 50 CFR 402.05 (Emergencies). Procedures for emergency consultation are described in the Interagency Consultation Handbook, Chapter 8 (March 1998). In the case of a long duration incident, emergency consultation should be initiated as soon as practical during the event. Otherwise, post event consultation is appropriate. The initiation of the consultation is the responsibility of the unit administrator.

Operational Principles

- Use retardant drops before an immediate need is recognized; pretreat according to expected fire behavior.
- Retardant dropped in the morning will still be effective in the afternoon.
- Build progressive retardant line.
- Use retardant drops to cool areas (reduce flame length), as necessary, in support of ground forces.
- Be sure the line is clear of personnel prior to dropping retardant.
- Be alert for gaps in retardant lines.
- Expect fixed-wing vortices and rotor-wing down wash.
- Wildland fire can burn around, under, spot over, and with enough intensity, through retardant lines.

Safety Approved long-term retardants are tested to meet specific minimum requirements regarding mammalian toxicity in the following areas: acute oral toxicity, acute dermal toxicity, primary skin irritation, and primary eye irritation.

Some approved long-term retardants are mildly irritating to the eyes. Personnel that mixes or handles retardants, and those near retardant drops, should use protective goggles.

Retardant drops can cause slippery footing and slippery tool handles. Take care when walking through areas that have had retardant applied; tool handles should be wiped clean of retardant.

Personnel involved in handling, mixing, and loading retardant should be trained in proper procedures to protect their health and safety.

Personnel should not be under a retardant drop. The target or drop area must be clear of personnel prior to the drop.

Persons downrange, but in the flight path of intended retardant drops, should also move to a location that will decrease the possibility of being hit with retardant if a drop goes long.

Persons near retardant drops should be alert for objects (tree limbs, rocks, etc.) that the drop could dislodge.

During training or briefings, inform field personnel of environmental guidelines and requirements for fire chemicals application

Locate foam and retardant mixing and loading areas and dip-tank sites to eliminate contact with natural bodies of water.

Exercise care to avoid spills at mixing, loading, and application area.

Notify incident or host agency authorities promptly of any accidental foam or retardant drop within 300 feet of or spill into a water body.

Avoid dipping from rivers or lakes with a helicopter bucket containing residual foam or retardant. Set up an adjacent reload site and manage the foam and retardant in portable tanks, or terminate the use of chemicals for that application.

Dozers

BLM dozers and operators provide safe and efficient suppression and support capability for local and project fires.

Policy

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BLM personnel assigned as dozer operators will meet the training standards for a Firefighter 2 (FFT2). This includes all safety and refresher training, including annual review of the **10 Standard Fire Orders, 18 Watch Out Situations, and principles of LCES**, and fire shelter use and deployment. While on fire assignments, all operators and support crew will meet PPE requirements including the use of aramid fiber clothing, hard hats, fire shelters, etc.

Operational Procedures

Since dozers operate independently, communication is essential between operators, support crew, and supervisors. BLM dozers will be equipped with programmable two-way radios, configured to allow the operator to monitor radio traffic. A BLM dozer is defined as a dozer identified in a unit's fire management plan, is commonly used for initial attack, and the fixed ownership rate may be paid out of preparedness funds.



Contract or offer-for-hire dozers must also be provided with radio communications, either through a qualified dozer boss or an agency-supplied radio. Contract dozers will meet the specifications identified in their agreement/contract. Other agency dozers will meet the requirements of their agency.

Operators of dozers and transport equipment will meet the Department of Transportation (DOT) certifications and requirements regarding the use and movement of heavy equipment—including driving limitations, CDL requirements, and pilot car use.

Physical Fitness Standards

There are no physical fitness standards for dozer operators.

Radio Communications

Good radio communications are key to safe and effective operations during incidents. Radio communications provide for the flow of tactical information needed for the command/control of personnel and resources.

Policy

Type 1 crews will have a minimum of five handheld radios per crew. Type 2 crews will have a minimum of one radio per crew. Engine modules will have a minimum of one handheld radio per crew, in addition to the mobile radio in the engine. During incident response, operational supervisory positions will be equipped with a handheld radio.

Dispatch Recorders

Recording devices will be used by each BLM dispatch office or an interagency office dispatching BLM resources. The purpose is to record all radio communications during emergency operations. This will ensure that in the event of an accident, investigators will be provided with an accurate record of events during reviews of those incidents.

If there is an accident or event that requires an investigation from the state or national office, the tape covering that time period will be included in the investigation file. Barring any such event, the tapes can be re-used.

Radio Frequency Management

Frequency assignments for normal operations or initial attack are made on a permanent basis and are requested through the state office or regional telecommunications manager to the Washington Office frequency manager.

Mutual-aid agreements for frequency sharing can be made at the local level. NIIMS form PMS 903-1/NFES 1519 "Radio Frequency Sharing Agreement" is available and should be used for this purpose.

A mutual-aid frequency sharing agreement is valid only in the specific locale it originates in. These agreements do not authorize the use of a shared frequency in any other area.

Do not use a frequency unless authorized to do so by communications personnel at the local, state, regional or national level.

On an incident, the Communications Unit Leader (COML) will assign frequencies on the Communications Plan (ICS-205) for incident use. The ICS-205 is always a part of the Incident Action Plan (IAP) and distributed at every operational period briefing.

When incident management teams are pre-positioned in a field unit or geographical area, consideration should be given to also pre-positioning a radio kit for immediate use by the team when assigned.

Frequencies for Type 1 and Type 2 incidents are assigned through the National Incident Radio Support Cache (NIRSC) located at NIFC. Frequencies are a limited resource and have to be assigned to each incident to prevent interference. More complex situations that involve two or more incidents within the same geographic area require detailed coordination.

During severe situations and/or when there are significant numbers of large incidents, additional frequencies can be assigned. These are temporary assignments, and are requested by NIRSC-NIFC from Washington Office telecommunications managers. This applies to frequencies for command, ground tactical, and aviation operations.

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Additional frequencies are provided in the following circumstances:

- The NIRSC national frequencies are all committed within a specific geographic area.
- The requests continue for frequencies to support new incidents within a specific complex.
- The fire danger rating is extreme and the potential for additional new incidents is high.

Pre-assigned National Frequencies

National Air Guard - **168.625 MHz** is a National Air Guard frequency for government aircraft assigned to incidents. It is used in emergency communications for aviation. A separate receiver is required to permit continuous monitoring. Transmitters on this frequency should be equipped with an encoder on 110.9 Hz.

Restrictions for use are:

- 1) Air-to-air emergency contact and coordination.

- 2) Ground-to-air emergency contact.
- 3) Initial call, recall, and re-direction of aircraft when no other contact frequency is available.

National Flight Following - **168.650 MHz** is the National Interagency Air Net frequency. It is used for flight-following of official aircraft. **The intent is not to use this frequency for local large incidents unless necessary.**

Restrictions for use are:

- 1) Flight-following, dispatch, and/or re-direction of aircraft.
- 2) Air-to-ground and ground-to-air administrative traffic.
- 3) **Not authorized** for ground-to-ground traffic.

National Interagency Air Tactics - **166.675 MHz, 167.950 MHz, 169.150 MHz, 169.200 MHz, 170.000 MHz** are frequencies used to support air-to-air or ground-to-air communications on incidents west of the 95th meridian.

Restrictions for use are:

- 1) These frequencies shall be used for air-to-air and ground-to-air communications only.

NOTE: Pacific Southwest Geographic Region exception: 166.675 MHz, 169.150 MHz, and 169.200 MHz will be used for air-to-air only; 170.000 MHz will be used for ground-to-air only.

Pacific Northwest Geographic Region exception: 170.000 MHz frequency cannot be used in Columbia River Gorge area (located between Oregon and Washington).

- 2) Interagency geographic area coordination centers assign these frequencies. Assignment must be coordinated through the NIFC, communications duty officer (CDO).
- 3) Transmitter power output of radios installed in aircraft operating on these frequencies shall be limited to 10 watts.
- 4) Base stations and repeaters are prohibited on these frequencies.

National Airtanker Initial Call - 123.975 MHz is the national interagency frequency assigned to all airtanker bases for their exclusive use. No other use outside of airtanker bases is authorized.

National Government All-Call Frequencies - 163.100 MHz and 168.350 MHz are for use anywhere, any time. They are good choices as travel frequencies for strike teams moving between assignments. They are available for ground tactical frequencies during initial attack or incident operations.

NOTE: When you are traveling between incidents, be sure to monitor for incident radio traffic in area before using these frequencies.

Incident Radio Support

All cache communications equipment should be returned to NIRSC at NIFC immediately after the incident is turned over to the jurisdictional agency. The only exception is the five Pacific Southwest Regional Starter Systems, which must be returned to their designated home unit.

Cache equipment includes kit accessory items. Shortages can occur at critical times during severe fire load, causing kits to be sent without accessories. These accessory items are expensive and can contribute to higher incident cost.

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No cache communication equipment should be moved from one incident to another without being first returned to NIFC for refurbishment. However, equipment unused and red sealed may be moved, if approval is given by the NIRSC-CDO at NIFC.

Battery orders should be realistic. Over ordering causes shortages to occur. All incident communications resource orders should be coordinated with and approved by the communication coordinator (COMC). This will help to keep even distribution of batteries as well as other communications resources. All battery orders can be consolidated by COMC to simplify and reduce the number of resource orders.

Radio Coverage

There are only three ways to increase communication system coverage:

- Increase the transmitter power.
- Increase the height of the communication system antennas.
- Increase the number of transmitters and receivers within a system.

Note: All three can lead to severe system interference problems when done without proper planning or coordination.

Scarce or Limited Communications Resources

The following options should be considered when there are radio resource shortages:

- The priority should always go to operations personnel or those personnel who are going to be in a hazardous environment and cannot be with someone carrying a radio. All other personnel should share radios, if possible, or team up with someone who is carrying a radio.
- When frequencies are in short supply, use human relay to get messages back to dispatch or ICP.
- On Type 1 or Type 2 incidents, move the communications center to a prominent location to gain access to line. From the communications center, relays can be used to cover medical or operational emergencies from the operational area. For logistic or routine communications, some type of phone or satellite access or a vehicle to and from a contact point can be utilized.
- Request additional frequencies for short-term use.
- Re-use tactical (single frequencies) whenever possible. If care is taken and these frequencies are assigned in areas of low terrain, they can be re-assigned and used by other nearby incidents.

Equipment Installation & Operation

Communications equipment such as repeaters should be placed in locations that provide maximum coverage for operations. Additional repeaters should be ordered, if terrain conditions warrant.

If frequencies are limited, the COML can place communications personnel in strategic locations to act as relays through an existing repeater.

Crews can improve their access into existing communications systems by placing personnel as relays. This is very effective in areas requiring short duration operations. Personnel used as relays must be trained and reliable.

All emergency communications equipment should be kept away from sources of possible interference. Existing radio communications sites are the best example of where **not** to place this equipment.

Military Communications on an Incident

Military units assigned to an incident already have radios. Each battalion is assigned 48 handheld radios. Sixteen of these radios are used by military crew liaisons. Intercrew communications within a military unit is provided by the military

on its radios using its frequencies. All frequency assignments at the incident will be made by the COML in accordance with the ICS 205.

Some active military and guard units have 9600 channel VHF-FM radios compatible with civilian systems. Other units are adapting their aircraft for the civilian radios and can be easily outfitted prior to dispatch to an incident. A limited number of wiring harnesses are available at NIFC for those military aircraft that do not have civilian VHF-FM capability.

Cellular Communications

Cellular telephones will not be used to communicate tactical operations, unless they are the **only** means possible. Because phone communication is a closed-loop conversation between two parties, it does not allow others to share critical information. This lack of open communications can contribute to any number of dangerous, undesirable situations. Phones can be used for logistical purposes, if warranted. A taped recording of these conversations is not critical. The decision to record phone conversations can be left up to local units.

Cellular telephone coverage is not available in all locations and is not always effective in areas with coverage. This is especially true in the western states.

Cellular enhancer systems can be used to expand coverage; they can have from 6 to 10 channels. This means only 6 to 10 phone calls can be made at any one time. The enhancers have to get these channels from an existing cell site which adds an additional system load. This results in a cascading effect which can reduce overall cell site performance.

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Communication is from one cellular radio to another or to a telephone on the public switch network. There is no broadcast capability.

Access is not universal. Some cell providers do not allow a competitor's cellular customers use of their systems without a charge card number. (Most do not accept calling cards of any type.)

Cell systems get overloaded with calls during emergencies—making access virtually impossible. Since all systems are interconnected in some form or another, problems that occur in one system can cause problems in other cell system(s), which can shut down all or part of an entire network.

Effective Radio Use

Keep the antenna as high as possible and in a vertical position.

- Canting or tilting the radio 45 degrees lowers the effective transmitting power by half, so that a two-watt radio performs as a one-watt radio.

- Use of a chest harness reduces the effectiveness of the radio; since the radio is held at a 45 degree angle, the effective transmit power of the radio is reduced. There is also a decrease in transmitting and receiving capabilities due to shielding from your body.
- To increase communications in marginal coverage areas, raise the radio antenna in the following ways:
 - Remove the radio from chest harness and hold it in an upright position.
 - Use a speaker microphone and lift the radio above your head to the full extent of your arm.
 - Walk up the side of a hill. A 10-foot rise in elevation can make the difference.
- When using a mobile radio, repositioning the vehicle can improve communications in marginal coverage areas. This is especially true if you are parked under power lines or behind an obstacle such as a hill.

General Communication System Facts

If the personnel using the system do not follow basic guidelines and use the system properly, the best system, even with full coverage, will not meet the requirements of the situation or incident.

Consider the following prior to adding additional radios to a system:

- An increase in radio traffic may overload the communication system.
- Sufficient radios must be provided to operations personnel. However, it is far easier to manage a communication system with fewer radios.
- In a crisis situation, once radio discipline breaks down and everyone tries to talk at the same time, regaining control is difficult.

As with radio numbers, the number of frequencies used within a given communication system has an effect on operational safety as well. Adding more frequencies will make the use of the system more complicated.

Even with multiple frequencies, everyone with a radio can end up on the same channel (frequency) when there is no radio discipline. Maintaining control of personnel using the radio system is easier when a limited number of frequencies or channel options is available.

Frequencies are a finite resource. There is a limited number available for initial attack and/or incident communications. At the same time, the nature of their

physical properties is that radio frequencies are, in a sense, boundless. Care must be taken how and where they are assigned to minimize the possibility of interference.

The use of the scan feature on a radio may increase as the number of frequencies increase. To be effective with the scanning function, all users have to let everyone know what channel they are using. **During a crisis or critical situation, all radio users have to remember to end each message with the radio channel identifier being used. This is still required even with more sophisticated radios.**

The more channels that are scanned, the busier the radio receiver becomes. In the case of inexperienced radio users, the communication system will appear to be overloaded because the radio is never quiet.

Without scheduled periodic maintenance, communications equipment will lose reliability. Communications equipment must be properly maintained.

