Chapter 06
Fire Fighting Equipment and Materials

Engines

Engine Crew Staffing

Type 6 and 7 engines will have a minimum crew of two - an engine boss (ENGB) and a firefighter Type II (FFT2).

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

- Single resource engines will be comprised of an ENGB, and two or more FFT2s.
- Task force engines will have an ENGB and the appropriate number of FFT2s.

Performance Requirements for Engine Crews

The following performance requirements are based on the daily duties of engine crew personnel and may exceed the standards listed in the National Wildland Fire Coordinating Group (NWCG), Wildland Fire Qualification System Guide (PMS 310-1). These performance requirements must be evaluated during the Preparedness Review process.

Policy

The following regulations, in conjunction with the work/rest guidelines (see Chapter 9, Driving Limitations), can help Agency Administrators/Line Officers and fire managers to provide for the safety of fire personnel who ride in or operate Bureau fire apparatus.

- The Federal Motor Carriers Safety Regulations apply to commercial vehicles and interstate transportation. However, the federal government is exempt from 49 CFR 390. This exemption is found in Part 390.3, General Applications, which states: (f) Exceptions. Unless otherwise specifically provided, the rules in the sub-chapter do not apply to... (5) The operation of fire trucks and rescue vehicles while involved in emergency and related operations. The current Bureau manual (9210.53) defines “driving” as the operation of a fire apparatus to or from an incident on a designated highway or roadway. This language is consistent with 49 CFR 390.3.

Casuals Hired as Drivers When Employed By BIA

See Chapter 10 Business Management and Administration.

BIA employees as drivers for wildland fire operations

See Chapter 10 Business Management and Administration.

Commercial Driver's License (CDL)

- Although 390.3 exempts fire vehicles, BIA policy requires a CDL for all operators of vehicles 26,001 GVW and over.

Driving Limits

- Federal law restricts those driver's whose assignment requires a CDL, vehicles over 26,001 lbs. and buses, to no more than 10 hours driving time in a duty period with 8 hours between shifts.
- Drivers who's duty period is not limited by law may not exceed 10 hours of driving time in a within any duty day with 8 hours between shifts.
- Multiple drivers in a single vehicle may drive up to the duty-day limitation provided no driver exceeds the individual driving (behind the wheel) time limitation of 10 hours.
- A driver shall drive only if they have had at least 8 consecutive hours off duty before beginning a shift.
    - Exception: Exception to the minimum off-duty hour requirement is allowed when essential to 1) accomplish immediate and critical suppression objectives, or 2) address immediate and critical firefighter or public safety issues. A driver shall drive only if they have had at least 8 consecutive hours off duty before beginning a shift.
- Documentation of mitigation measures implemented to manage fatigue, as provided by the existing work rest guidelines, is also required for drivers who exceed 16 hour work shifts. This is required regardless of whether the driver is still compliant with the 10 hour individual (behind the wheel) driving time limitations

Speed Limits/State Laws

Operation of all vehicles must abide by state traffic regulations. Operations of all vehicles will be conducted within the limits specified by the manufacturer. Limitations based on tire maximum speed ratings and Gross Vehicle Weight (GVW) must be followed. It is the vehicle operator's responsibility to ensure vehicles meet these and any other limitations specified by the Bureau or state regulations.

Standards for Wildland Engines

Engine Typing and respective standards are identified in the NWCG Fireline Handbook, (PMS 410-1).

- 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.

Lighting

It is highly recommended, but not required, that the lighting package meet National Fire Protection Association (NFPA) standards. Fire Management Officers (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

Office of Safety and Health Administration (OSHA) regulations state that only approved metal containers, of not more than 5 gallons capacity, having a spring-closing lid and spout cover and so designated that it will safety 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 can 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 property 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 Department of Transportation (DOT) and state/local operating plans, (including weight). All personnel assigned to BIA fire engine modules will meet all gear weight, cube, and manifest requirements specified in the national mobilization guide.

Engine Equipment Inventory

An inventory of supplies and equipment carried on each vehicle is required to maintain accountability and to obtain replacement items lost or destroyed on incidents. Recommended stocking for Bureau engines is shown in Appendix D-1.

Suppression Chemicals & Delivery Systems

Foam

Technical guidelines for equipment operations and general principals 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. Foam can also be delivered by helicopters and Single Engine Airtankers (SEAT's).

Proportioners and Nozzles

- Proportions are designed to provide an appropriate mix of foam concentrate and water during pumping operations rather relying on batch mixing to prepare foam solutions. Both manual and automatic proportioner systems are available. Specific agency standards may require the used of a specific type system. Manually regulated proportioners, such as around-the-pump proportioners, in-line and by-bass educators, and suction-side regulators, are acceptable for remote portable pump and wildland fire engine operations when the operator understands the device limitations. These devices are available as a foam kit for use with portable pumps. Around-the-pump proportioners are common on BIA Model 52 wildland fire engines.

- Automatic proportioners are required for compressed air foam systems to prevent slug flow. Automatically regulated proportioners, such as Robwen Flowmix 500 or Foam Pro 1600 are recommended.
- 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.
- Aspiring Nozzles - Mixture 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)

- Keep Static air and water pressure equal.
- Start with a 0.3% mix ratio; adjust if necessary
- Generally operate with 1 cfm of air for every gpm of water; adjust if necessary.
- Employ a motionless mixer or 100 feet of hose to develop foam in the hose.
- Foam production and delivery should occur as readily as water delivery.

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 Specifications 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 their health and safety as well as that of the environment.
- 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 cleared 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.
- Personnel assigned to operate a compressed air foam system must be trained in safety 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 environmentally approved long-term retardants in wildfire suppression efforts is standard in fire management and planning. The retardants are most often delivered in fixed-or-roto-wing aircraft. Environmentally approved retardants currently contain sulfate or phosphate salts.

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 lines.
- 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.
- Wildfires can burn around, under, spot over, and with enough intensity, through retardant lines.

Safety

- Environmentally 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 environmentally approved long-term retardants are mildly irritating to the eyes. Personnel that mixes or handles retardants, and those near retardants 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.

Environmental Guidelines

Due to the sensitivity of aquatic habitats, the application of foam and retardant into bodies of water must be avoided. Leave at least a 300-foot buffer zone from the water.

To reduce impacts to the environment:

- During training or briefings, inform field personnel of the potential danger of fire chemicals, especially concentrates, in streams and lakes.
- Locate foam and retardant mixing and loading areas and dip-tank sites to minimize contact with natural bodies of water.
- Exercise care to avoid spills at mixing, loading, and application areas– especially near streams.
- Notify authorities promptly of any fish kill or spill into a water body. Under the Endangered Species Act (ESP) federal agencies are required to consult with the National Marine Fisheries Service (NMFS) on any action that may affect listed species.
- Minimize or avoid dipping from rivers or lakes with a helicopter during foam and retardant operations. Set up an adjacent reload site and manage the foam and retardant in portable tanks, or terminate the use of chemicals for that application.

National Model 52 Wildland Engine Program

The Model 52 Wildland Engine program was embraced by the BIA in 1996. The objective of the program is to provide replacement parts (charged to a respective account), refurbishing, training and fabrication of Model 52 pumping systems through a centralized process. Detailed information on the program can be found in the BIA National Model 52 Wildland Engine Program Operations Guide.

Mission/Policy

- Provide a standardized Model 52 for the participating Agency or Tribe.
- Provide an opportunity to supply trucks for Model 52 pumping systems.
- Provide refurbishments and repair services for Fire Management Planning Analysis (FMPA) approved number of engines.
- Provide training in the use and maintenance of the Model 52 pumping system.
- Evaluate new equipment and Model 52 improvements to meet the wildland fire program needs.
- Provide emergency repair services or replacements for Model 52s.

Organization

The program is organized into three geographical areas.

- Northern Center (Missoula, MT) covers the Northwest, Rocky Mountain, and Pacific Regions.
- Northern Center (Eagle Butte, SD) covers the Great Plains, Midwest and Eastern Regions.
- Southwest Center (Dulce, NM) covers the Southwest, Western, Navajo, Eastern Oklahoma and Southern Plains Regions.

Administration

The program is administered through the National Wildland Fire Management Office at the National Interagency Fire Center, Boise, Idaho.
A Board has been established to plan, develop and budget for the annual operations of the program. The board is comprised of the Model 52 Program Leads at each center and the Assistant Director, Fire Operations.

Trucks and fabrication supplies for the Model 52 is procured through the BIA-National Interagency Fire Center office.

Dozers

Policy

Personnel assigned as Agency/Tribal dozer operators will meet the training standards for a 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 assignment, 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. BIA dozers will be equipped with programmable two-way radios, configured to allow the operator to monitor radio traffic. If not addressed in the contract, contract dozers or offer-for-hire dozers must also be provided with radio communications, either through a qualified dozer boss or an agency-supplied radio.

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

Physical Fitness Standards

Physical Fitness Standards will be defined locally.

All-Terrain Vehicles/Utility Terrain Vehicles

The operation of an All-Terrain Vehicle (ATV), and Utility Terrain Vehicles (UTV) is considered high risk and should be utilized only when essential to accomplishment of the mission and not as a matter of convenience. Because of the high risk nature of ATV/UTV operations, BIA wildland fire personnel will follow the specific operational policy as highlighted below:

Definitions

ATV: A motorized off-highway vehicle 50 inches or less in width, traveling on four tires low-pressure tires, having a single seat to be straddled by the operator and a handlebar for steering control

UTV: A motorized vehicle designed for off-highway use and capable of maneuvering over uneven terrain, designed with side by side seats, seatbelts, steering wheel, for or more low-pressure tires, and a Rollover Protection System (ROPS).

Administrative Use ATV/UTV Operation: ATV/UTV operation soley for the purpose of short distance localized transportation within a defined, developed facility such as a campground, field office complex, or warehouse area at speeds not exceeding 15 mph on flat or nearly flat surfaces of smooth asphalt, concrete, or compacted dirt or gravel, such as road surfaces or parking lots.

Maximum Manufacturer's Cargo Rack Weight Limitation: Specified by the manufacturer in the ATV/UTV operator's manual for front and rear cargo racks.

ATV/UTV Operator Requirements

- Administrative use UTV operators must be licensed to drive in their state, authorized to operate a motor vehicle on government duty, and briefed on the safe operation of the specific vehicle they will be operating.
- Operators must hold a valid Motor Vehicle Operator's identification OF-346, or equivalent.

ATV/UTV Requirements

- Cargo capacity adequate to carry load required for task being accomplished (see manufacturer's specifications).
- Rack capacity is adequate (see manufacturer's specifications).

Heavy duty or puncture resistant tires

- Fire Extinguisher 2.5 lbs, Type B-C
- First-Aid Kit
- Personnel Communication Device: Defined as a two-way radio, cellular or satellite phone
- Manufacturer's tool kit, including low pressure tire gauge

PPE Requirements

- Nomex shirt and pants
- 8" leather boots
- Leather gloves
- Eye protection (goggles, face shield or safety glasses)
- Fire shelter
- ATV Helmet meeting DOT, ANSI-90, or SNELL M-95 approved are required
- UTV Head Protection – Helmets meeting DOT, ANSI-90, or SNELL M-95 approved are required unless
    - Cab/Brush cage is permanently installed on the vehicle, then a hard hat meeting NFPA 1977 and ANSI Z 89.1 standards may be worn with chin straps secured in place under chin.
    - UTV is equipped with Roll Over Protections (ROPS) and is operated on moderate terrain (<15% slope) at moderate speeds (15 mph) then a hard hat meeting NFPA 1977 and ANSI Z 89.1 standards may be worn with chin straps secured in place under chin.
    - Administrative use (low speeds on smooth travel surfaces) e.g. campgrounds, base camps operators are not required to wear hard hats or a helmet.

Operations

- The standard wildland hardhat is not acceptable protection for ATV use, and will not be worn as a substitute for an approved helmet while operating an ATV.
- No passengers will be carried except in emergency situations or if the vehicle was originally designed for more than one rider.
- Operating speed will be appropriate for the conditions and terrain.
- Loads shall be mounted and secured so as to not affect the vehicle's center of gravity.
- Load weights shall not exceed manufacturer's recommendations.
- A risk assessment must be completed and approved by the supervisor prior to vehicle operation. (ATV JHA in Appendix D.2 may be used as an example)
- All containers used for externally transporting fuel must meet specification requirements stipulated in the interagency Transportation Guide for Gasoline, Mixed Gas, Drip torch fuel, and diesel prepared by the Missoula Technology Development Center.
- Pre-ride Inspection. Operators shall perform and document a pre-ride safety and mechanical inspection prior to using ATV/UTV using the T-C-L-O-C method. Refer to Appendix D-3.

Training

ATV operators are required to attend a basic agency or industry- provided ATV Operator Safety Course before being awarded the competency of ATVO in IQCS. Instructors will be certified as an instructor by the ATV Safety Institute (ASI)