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Direction générale
de la Sécurité civile
et de la gestion des crises

Fighting Forest and Wildland Fires

2021

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Fighting Forest and Wildland Fires

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**Direction générale
de la sécurité civile
et de la gestion des crises**

DIRECTION DES SAPEURS-POMPIERS
Sous-direction de la doctrine et des ressources humaines
Bureau de la doctrine, de la formation et des équipements

Preface

The fight against forest and wildland fires engages considerable commitment from firefighters and requires respecting commitment rules, safety measures and fighting techniques which have been put to test for over 25 years.

The latter form the foundation of the French School of Forest Fires; a school which has been exported worldwide, in particular thanks to the know-how of men and women who fight these fires every year.

This guide describes the operational methods and techniques linked to this fight and highlights the action which needs to be put in place to reach the objectives defined by the Rescue Operations Commander.

This guide will constitute a reference which can be adapted to each situation and will be updated according to feedback based on the experience of fire departments as well as the results of research and development work in the field.

Le préfet, directeur général
de la sécurité civile
et de la gestion des crises

Alain THIRION

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CHAPTER 1 – Equipment and Means of Fighting

Bastien Guerche © DGSCGC

Fighting forest and wildland fires is done among others by land using machines which are able, due to staff, equipment, capability in terms of extinguishing agents and their hydraulic possibilities as well as ability to move on rough terrain, to fight wildfires, while at a standstill or at low speed.

1. Support and Fighting Machines

1.1. Forest fires trucks

There are several types of Forest Fires Trucks[1] :

- Light Forest Fires Truck (LFFT): 3 t < Maximum Loaded Mass (MLM) ≤ 7.5 t.
- Medium Forest Fires Truck (FFT): 7.5t < MLM ≤ 16 t
- Heavy Forest Fires Truck (HFFT): 16 t < MLM
- Light and Super Forest Fires Trucks can be classified in category 2 (rural)[2] or 3 (off-road)[3] according to Regulation 1846-1.

Medium Forest Fires Trucks (FFT) are classified in category 3 (off-road) according to Regulation 1846-1.

[1] Machine classification (FFTL, FFT, FFTH) only concerns a regulatory classification according to the MLM and does not reflect the vehicles' operational abilities.
[2] i.e. able to use all types of roads as well as moderately rough terrain.
[3] i.e. able to use all types of roads as well as move on rough terrain.

Example of Forest Fires Truck used to fight on land.
© Aurelien Dheilly – SDIS 60

In some forest areas[4], the fight against forest and wildland fires consists of attacking the fire from the cabins of the specially adapted FFTs. These FFTs are referred to in this guide as 'Penetrating FFTs'. Penetrating FFTs permits mobile action inside the forest area.

Several Penetrating Forest Fires Trucks in a fighting operation in the Landes area (sylviculture forests of maritime pines in South West of France) ©SDIS 40

The FFT may be used as an isolated fire-fighting means, or be integrated to a unit or group.

[4] In particular in South-West France.

Depending on their class and the commitment rules established by the FDs, Forest Fires Trucks are manned with 2, 3 or 4 fire-fighters shared[5] at least, as follows:

- One Device Commander (FDF2) ;
- One Driver (FDF1-COD2) ;
- Two Team members (FDF1).

1.2. Rural Pumper Tanker Trucks

Rural Pumper Tanker Trucks (RPPTs) are used amongst others to fight structural fires and some wildland fires, except for missions specifically allocated to the Forest Fires Trucks. Rural Pumper Tanker Trucks are classified in category 2 according to Regulation standard 1846-1, limiting its use on moderately rough terrain.

There are also, in paragraph 4.1 specific prescriptions for RPPTs– general information[6], that RPPTs shall not have thermal fire protection and breathable air systems in the cabins.

These types of machines is used in particular to fight standing crop fires. RPPT teams are selected by the FDs covering the mission.

A Rural Pumper Tanker Truck during a mop-up operation in a field fire
© Julien Rousset – SDIS 21

1.3. Means of Support

In addition to fire-fighting machines, support machines may be used to fight fires in geographical areas with low water resources to guarantee continued supply to the machines.

Equipment guaranteeing means of supply and continuity of water during operations can be grouped in specific strike teams (floating, immersed, tractable motor pumps). Civil engineering equipment such as Bulldozers, are likely to be used by the IC in a fire to provide penetrating routes, fords, secure the edges of fires.

© SDIS 33

[5] This distribution is adapted according to the type of machine and the number of seats, in compliance with the provisions made by the Fire Department.
[6] NF S 61-517: 2019 Regulation referring to Rural Pumper Tanker Trucks

1.4. Means of Transport for Firefigthing Teams

FCVs are specific to mountains and can be equipped with wildland firefighting equipment and carry 2 to 4 firefighters.

The latter carry out on-foot interventions which do not require a pumping machine.

FCVs equipped in such a way should be fully considered as firefighting devices.

© Philippe Dupont

1.5. Urban Fire Pumper Trucks

The use of Urban Fire Pumper Trucks to fight wildland fires is limited by the evolving adaptability of their chassis.

Thus, if the first machine arriving on location cannot reach the fire (FEs, etc.), it should be used to protect sensitive areas (habitats, farm, etc.), equipment or to replenish adapted machines (FFTs, etc.).

© Bastien Guerche- DGSCGC

2. Vehicle Strike Teams

In the framework of preventive provisions or when the evolving damage or needs in water exceed the hydraulic possibilities of a single FFT, the deployment of several FFTs at the same time is necessary.

This teaming into a vehicle strike team may come in various formats presented form smallest to largest as follows:

- The unit;
- The strike team;
- The squad.

2.1. Forest Fire Unit

© Philippe Granados – ENSOSP

Forest Fires Units (FFU) are made up of 2 M or S class FFTs. The unit[7] is usually made up of so-called equipped 'penetrating' FFTs, with 2 or 3 fire fighters[8]. This module is placed under the sole commandment of a Forest Fire Unit Commander at the same level as a Forest Fire Machine Commander (FF2).

As part of the elaboration of the operational response from the Fire Department (harvest or straw fires for example), or of a prepositioned team in the form of a Medium Strike Team Half, this mobile and adapted set guarantees :

- A massive and dynamic attack in contact with fire;
- An efficient water spray;
- Multi-functionality (attacking from the FFT or with hose reels) ;
- Staff safety.

This vehicle strike team can be reinforced with an S-class FFT and become a Heavy Forest Fire Fighting Unit (HFFU).

2.2. Mountain Forest Fires Unit

Forest Fires Units (FFU) dedicated to mountain fires are made up of :

- A Forest Fires Command Vehicle equipped with fighting equipment and transporting a team of 2 to 4 fire fighters who are able to carry out on-foot operations which do not require the support of a pumping device.
- A FFT equipped with 2-4 firefighters.

This set helps:

- Access mountain fires more easily.
- Provide great multi-functionality between on-foot and hose reel operations.
- Guarantee safety for all the staff involved.

2.3. (Forest Fires) Medium Strike Teams (MSTs)

© Philippe Granados – ENSOSP

[7] The origin of FFU sis linked to the operations in the forests of South-West France. The principle is also used in the rest of the country.
[8] This concept can also be applied to equipped machines with 4 firefighters.

Medium Strike Teams are made up of one Forest Fires Command Vehicle and 4 M-class FFTs, under the orders of a Forest Fire Group Leader. (FF3)

Depending on the Fire Department, the FFTs may be replaced by other types of water carriers with the adequate fire protection safety specifications. If necessary, the strike team's operational capability and operations will be adapted.

It is important to note that depending on the departmental operational organisation and depending on the types of machines and equipment available, other units or Strike Teams may be able to be set up.

For safety and efficiency reasons, the IC will try to regroup the isolated vehicles with a Strike Team Leader or and existing MST.

2.4. Wildland Urban Interfaces Strike Team

© Philippe Granados – ENSOSP

Strike Teams which are specifically dedicated to defending homes located near the interface between forests and homes can be created. Their existence, number, composition, and use may vary depending on the departments.

They help guarantee the presence of firefighters in various districts and allotments made up of permanent habitat (traditional constructions where confinement is possible) threatened by fire without specifically mobilising MSTs or urban Strike Teams.

These Strike Teams may be equipped with hydraulic means, enabling operations with a nozzle from a water source (swimming pool, hydrant, etc.), to protect the home and perfect the extinguishing after the end of the fire.

The missions of these Strike Teams are :

- To guarantee protection for the population and possessions in the 'forest/habitat' interface when threatened by fire, by:
    - Carrying out reconnaissance of the threatened habitat ;
    - Informing the population on necessary behaviour ;
    - Evacuating the population or confining them in safety inside ;
    - Preparing the places threatened by the fire: closing the openings, placing flammable equipment away from walls and roofs of the home, placing vehicles and animals in safe spaces, finding water sources and potential alternative safety areas ;
- To develop, where necessary, means of fire fighting when safety conditions are acceptable to :
    - Protect homes and other possessions ;
    - Manage and extinguish residual fires after the fire has been extinguished ;

- To guide reinforcement means ;
- To treat garden fires or structural fires ;
- To collaborate with the population, police forces, municipal authorities and associations, during the fire, in particular when the inhabitants return.

These Strike Teams are in no way able to carry out offensive fire fighting operations against forest fires.

The efficacy of these Strike Teams strictly relies on:

- Efficient brush clearing around the concerned homes;
- Homes with openings (windows and shutters) and roofs in good condition;
- Easy access (roads which are cleared and suitable for vehicles, open gates, etc.);
- The presence of water sources (hydrants, tanks, swimming pools, natural water sources) which can be directly used by light means (motor pumps), near the homes to be protected.

2.5. Forest Fires Column

© Bastien Guerche- DGSCGC

Forest Fires Column can be made up of at least 3 Medium Strike Teams and one commanding and support unit, commanded by a Forest Fire (FF4) Column Commander.

At the same time, to meet the needs expressed by a department, a unit may be made up of Strike Teams of different types and/or not belonging to the same Fire Department.
The name of this unit will be based on the district or zone code.

The staff taking part in the reinforcement columns must have followed FF1 and FF2 training courses respectively for team members and Fire Truck Commanders, and FF3 for Strike Team Leaders, FF4 for Column Commanders, as well as COD2 for FFT Drivers.

The Columns may be reinforced, if necessary, with:

- A command post & command team;
- Health support means;
- Logistics and technical means;
- Other specialized teams

3. Specialised Operational Means

In addition to traditional fighting methods, supplementary tactics and tools may be used to extinguish forest and wildland fires.

3.1. Specialised Operational Means

3.1.1. Backburns[9] Teams

Backburns and controlled fires operations consist of lighting a second fire opposite the fire, to reduce its fuel. When the two fires meet, the fire extinguishes itself, as it runs out of fuel.

This can be used to slow down the fire's progress, or even to stop it.
It can also be used to channel a hillside, to realign a boundary, create or improve a support zone, to protect a sensitive area, or to create a relocation area refuge zone.

© Entente

In compliance with article L131-3 of the Forestry Code, the Incident Commander may, even in the absence of an authorisation of the landlord or occupants, use backburns when required for fighting purposes.'

3.1.2. Foresting Teams

Foresting consists of using heavy civil engineering machines of the private and public sector, such as bulldozers or plant shredders, as well as portable equipment such as chainsaws and brushcutters, to create access to the fire or a forest aisle in the brush to create a gap from the fuel.

These machines can be equipped with specific protection equipment to help them treat active boundaries.

[9] Cf. Chapter 6

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3.1.3. Wildland Fire Retardant Teams

Packed into heavy carriers, these teams will help create a retarding support line downstream from the front of the fire in order to reinforce the control line. They can also be used to complete foresting means to deal with the boundaries. There are long term retardants (LTR) and short-term retardants (foam) (CTR).

3.1.4. Helitack Team[10]

Helitack Teams (HELITACK) are an independent and enduring. They receive their operational mission from the IC, however the feasibility and conducting of the operations rely entirely on the head of the HELITACK's initiative, after consulting the helicopter crew.

The HELITACK can take part, among others, in the following missions :

- Attacking growing fires on difficult terrain fast (lightning, etc...) ;
- Fires which cannot be accessed by land ;
- Fires on sites which are difficult to access altogether (islands, cliffs, rocky peaks, etc.) ;
- Supplying one or more FFTs using the aerial reel ;
- Possibly saving people who are threatened by fire.

Regarding the use of helicopters, the notion of HELITACK concerns very specific missions, in particular:

- Transporting loads with a lanyard;
- Creating a collecting or drop-off zone;
- Dropping off staff from a helicopter on the move.

[10] HELITACK operations are defined by the FDs depending on the equipment used.

The setups is only carried out during the hours of the aeronautical day. HELITACK missions may be delayed in the event of unfavourable meteorological conditions or when the spread is too violent.

In addition to fire extinguishing equipment used by firefighters, Helitack teams have at least all the following equipment :

- A set of nets and covers;
- A set of specific equipment (connecting pieces, hydraulic accessories);
- Radio means;
- A safety set and climbing ropes to advance in difficult spaces;
- Portable motorpumps for bridging.

The aerial Ø 70 nozzle reel helps guarantee a permanent water supply and greater safety for the ground crew compared to rotating flexxible water tanks, in particular during for long operations.

3.1.5. Specialised Resources Strike Team

The Specialised Resource Strike Team (SRST) is in charge of supporting the units engaged in the active fighting phase, with the help of specific means, in particular to:

- Monitor the area;
- Treat fumaroles or hotspots;
- Fully extinguish the boundary;
- Create access to the boundary or support zone or even to set up a supply point.

Its mission is to participate in preventive and monitoring action, offer its added value to the extinguishing and boundary-treating phase, and possibly to participate in the defense action of sensitive points in the wildland urban interfaces (WUI).

This team can create access to the fire by opening a path and setting up setups, opening support zones by clearing the bush, setting up supply zones for the, or creating appropriate landing zones for helicopters.

3.2. Specialised National Operational Means

3.2.1. National Helitack Team

The National Helitack Team (NHT) operates primarily to fight unreachable fires.

The crew in this unit is specifically trained and experienced to operate in difficult conditions and can thus continue the fight in unreachable areas.

The NHT is an independent unit able to fight fires in areas which cannot be reached by conventional means. It can, amongst others, carry out the following missions :

- Attacking incipient fires in difficult or unreachable areas;
- Operating on fires which are far from any track or road ;
- Operating on fires on difficult sites (cliffs, rocky peaks, islands, etc.);
- Emergency evacuations (exceptionally): of people threatened by fire, or in health situations.

The added-value of these crews and the heavy helicopters help set up an setup in important sectors (2 kilometres) with permanent water supply for the extended-length instalment (ELI).

© DICOD - MINARM

The presence of helicopters also provides the IC with and air and land capability in the event of required emergency evacuation.

Like all aerial means, helicopters have a capability limit if the weather or aerological conditions are very poor.

© Jean Rocha – MIINT

The Helicopter Team Commander, a member of the army in the context of the national protocol, is in charge of all the aircraft safety. He is the lasty decision maker for so-called exceptional evacuation missions of staff with or without an escape basket.

3.2.2. Fire Retardant Strike Team

The mission of the Fire Retardant Strike Team (FRST) consists of anticipating the fire's progress by setting up a fire retardant line. Setting up a fire retardant line is done by using an existing support line or one that will be set up by the support strike team. The Fire Retardant Strike Team is led by a Column Commander (FF4) who will advise the IC on use and will coordinate the full setup of the fire retardant.

There are 2 possible tasks for the fire retardant team :

- **Preventive action** by setting up the fire retardant on a support zone to stop the fire;

- **Curative action** to attack an existing fire directly (frontal, side attack, support line) or by enhancing a support line to contain the fire, favouring, and facilitating the work of The Strike Teams in defensive action including while defending a sensitive point.

The detachment's capacity is to set up a 1 km by 6-meter line in 1 hour.

The FRMU is made up of a commanding module and setup machines and a product manufacturing unit.
© Patrice Goubeau – François Peillier MIINT

The setup can be done by day or by night in all meteorological conditions. The unit thus guarantees continuity in the aerial means' action after nightfall. The unit's initial capacity is 80,000 litres of fire retardant solution, permitting the setup of a 2.7 km boundary after completing the Fire Retardant Manufacturing Unit (FRMU).

The team capability[11] is adapted to the type of terrain (plant density, wind speed etc.). The application rate and the width of the setup will be adapted according to the parameters.

3.2.3. Support strike team

The support strike team can operate for the Fire Retardant Strike Team (FRST) it usually partners with, or with any other Medium Strike Team depending on the operational situation.

© FORMISC

Its mission is to support the fire fighting action by:

- Creating or enhancing support works (firebreaks, fire breaks (FBs), turning over zone);
- Opening penetrating routes or ring roads;
- Separating fuel (in particular in conductive ground fire zones).

The strike team works day and night and can create 300 metres of openings in 1 hour, or a 1-km path in 1 day.The strike team has 2 compact track loaders on a hitch, and travels in a special convoy. Anticipation is thus necessary to give it enough time to reach the site.

[11] If the unit is not used in its fire retardant version, it can be used as a medium strike team.

As much as possible, the Commander of the Support strike team will be in contact upstream with the IC, to carry out reconnaissance and permit machines to be engaged as early as possible.

With the increased continuity of crops observed (alternative crops, fallow land etc.) the use of a support strike team may help contain the fire inside a perimeter pre-determined by the IC.

The strike team has a protection FFT and, if it isn't engaged in direct contact with the fire, it is thus independent in its direct protection.

3.2.4. Specialised Operations Team

© FORMISC

The mission of the national Specialised Resources Strike Team (SRST) is to support the engaged units in the active fire fighting phase by:

- Monitoring the area;
- Treating fumaroles or hotspots;
- Fully extinguishing the boundary;
- Creating access to the boundary or support line or even to set up a supply point.

Its mission is to participate in :

- participate in preventive and monitoring action;
- offer its added value to the extinguishing and boundary-treating phase;
- participate in the defense action of sensitive points in the habitat/forest interfaces.

This team can create access to the fire by opening a path and setting up hose reels, opening support zones by clearing the bush, setting up supply zones for the HELITACK, or creating appropriate landing zones for helicopters.

4. The Various Equipment Used in Fire-Fighting Operations

There are equipment used in the framework of the manoeuvres which are presented in this guide.

4.1. Nozzles

Various types of nozzles are used during the setups of wild land fire fighting. The most common are:

- Variable flow nozzles supplied by a Ø 45mm flexible nozzle with a maximum flow rate of 500 litres per minute. They are referred to as 'nozzle 500' in this guide;
- Variable flow nozzles supplied by a Ø 25mm flexible nozzle with a maximum flow rate of 150 litres per minute. They are referred to as 'nozzle 150' in this guide;
- Flow conical shaped nozzles supplied by a Ø 25mm flexible nozzle with a maximum flow rate of 150 litres per minute. They have a jet nozzle. They are referred to as '20/7 nozzle' in this guide.

Water curtain nozzles have the specificity that they create a water curtain which is used in self-protection manoeuvres for a strike team, but also:

- Protecting buildings, vehicles, crew from spreading,
- Limiting the risk of fires spreading to buildings, etc.

The 500 l/min water curtain nozzles, supplied by a Ø 45 flexible nozzle, help create a protection screen measuring approximately 7 metres in height and 25 metres in width. The one supplied by a Ø 70 flexible nozzle, with a 1000 l/mm flow, helps create a protection screen measuring approximately 10 metres in height and 30 metres in width.

4.2. Hoses

The hoses used primarily in fire fighting and flooding operations are Ø 45 or Ø 25-diametre flexible hoses. They are either coiled up or rolled up on a mobile reel, or transported on a back-pack.

4.3. Shut-Off Valves

FF shut-off valves set up on the hose reel help maintain the water while proceeding with the following operations:

- Disconnecting or reconnecting a nozzle;
- Setting up the number of hoses corresponding to the extension or transformation;
- Interrupting or pursuing the process of extinguishing the fire by opening the valve;
- Maintaining permanent water as much as possible.

4.4. FF Valve Breechings

FF check-valve maintains the water in extensive-length setup on positive slopes in the event of a hose being ruptured to avoid losing the water column located upstream from the flap, also saving precious time during the discharge (approximately one minute per hundred metres).

This breeching also helps extend the setup of Ø45 hoses, setting up one or more 150 nozzles when getting closer to the fire spot in addition to the 500l/min nozzle to protect the setup, selecting one or two attack points or additional flooding to perfect the extinction, treating the boundaries, etc.

4.5. Other Equipment

Backpack tank pumps are a variant of portable pumps. They are used to extinguish smaller fires, bushes, and other plants as well as for surveillance and to fully extinguish peripheral zones affected by forest fires.

Hydro-ejectors help supply machines from natural or artificial water spots when it is impossible to use suction hoses.
This manoeuvre requires a sufficient supply of water in a water tank (300 litres).

© Yvan Kasparoff – SDIS 83

4.6. Backpack Fire Hose Racks

Backpack fire hose racks help carry heavy and bulky loads on your back. They are used in particular for longer setups.

4.7. Foresting Equipment

Foresting equipment comes in three categories of tools:

- Manual cutting tools (bill hooks, sickles, hatchets, etc.)
- Manual non-cutting tools (spades, pickaxes, Halligan bars, fire rakes, etc.)
- Mechanical portable tools (chainsaws, brushcutters, etc.)

Foresting tools can be used in all phases of forest fire fighting, in particular:

- Creating an access;
- Creating paths (limited in importance);
- Preventive bruschcutting;
- Setting up the terrain (touchdown zone, support line...);

In support to the extinguishing task, they are sometimes the only means of fire fighting on terrain which is unreachable traditional tools or in humus fires. When using mechanical tools, a security perimeter needs to be drawn, and necessary individual protection working equipment needs to be used.

4.8. Drip Torches

Drip torches are used to light backburns during forest fires or during stubble-burning campaigns; they have an aluminium tank to carry fuel.

They have a security flap to avoid flashback flames.

4.9. Forest Fire Pocket Grid

Forest Fire Pocket Grids are a rapid measuring device to track the direction and record the main direction of the fire's progress on a map. It has two scales (1/25000 and 1/100000) to make the estimation of the speed of the theoretical spread much easier.

© Julien Rousset –SDIS 21

4.10. Firefighter Bags[12]

Teams who are engaged in a forest fire fighting operation can remain on location for more than 24 hours. Similarly, preventive operations may be extended through the night.

For this reason, members must be able to have a number of personal belongings available for hygiene purposes, in particular :

- A sleeping bag,
- A change of clothes (operation and service uniform, underwear, socks, polo shirts, etc.),
- toiletries (toothpaste, toothbrush, soap, towel),
- toilet paper, tissues,
- a source of light, spare batteries,
- a water bottle,
- Energy food. (Gas cookers are prohibited)

[12] This list is not regulatory and provided for information purposes only, it may be amended to suit each team, provided they respect space limitation in the machines.

CHAPTER 2 - Individual and Collective Safety Rules

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Safety measures are both individual and collective. Respecting them must be a priority for the Incident Commander and all participants.

1. Individual Safety

Forest and wildland fire fighting generates many risks for staff. It is important not expose oneself unnecessarily and/or to be negligent. We can define four classes of risk[13]:

- **Risks Relating to the Mechanisms of Forest and Wildland Fires**

SOURCE	RISK	PROTECTION
Speed of progress, reach, projection of inflamed or incandescent particles, smoke and hot gases	Burns, intoxication, physiological disruption, ocular discomfort	Wearing individual protective equipment Respecting rules of individual safety Staff positioning regarding front line

[13] Non-exhaustive list

- **Risks Relating to the Terrain and Environment**

SOURCE	RISK	PROTECTION
Rough terrain, wet soil	People falling	Move slowly, Watch your step. Lighting is essential at night.
High-voltage lines	Electrical arc ignited by high temperature and smoke	Do not stay under the powered VHV lines, Inform the Fire Truck Commander of their presence.
Danger Zone	Ammunition explosions in military camps or areas that haven't been cleared after wars (old ammunition warehouses, hideous, etc.)	Stay on designated itineraries and follow instructions given by the site commander.
Rubbish dumps, random storage	Toxic smoke, explosions of various objects, falls in voids created by subsurface combustion.	Employ minimum number of staff. Do not expose staff to smoke. Keep staff away from the fire outbreak. Move extremely carefully.

- **Risked Relating to The Equipment Used**

SOURCE	RISK	PROTECTION
Helicopter Rotors	Projected material, Falls following loss of balance due to wind	Wear your helmet with your visor down. Stay down low as long as rotor is still moving. Never stay under the machine and in the operating zone.
Material falling from aircraft		For all apparatus, evacuate the airdrop axis (40 metres on each side). Retardants are viscous and may lead to falls.
Moving vehicles	Overturned vehicles, Impact with another vehicle or others, falling staff on disembarking, impact with elements inside the vehicle	Respecting traffic regulations and rules of conduct Regularly monitoring safety organs (tyres, hoses, etc.) Disembark passengers for difficult passageways Wearing a helmet inside the vehicle when driving off-road Avoid driving with a half-full tank
Backpack Fire Hose Racks	Fatigue et trauma from the locomotor apparatus	Following the instructions for use of each type of equipment.
Foresting tools	Wounds on limbs	
Traction appliances (winch)	Cable breakage	

- Risks Relating to Life on The Field

SOURCE	RISK	PROTECTION
Using the water in the vehicle's tank	Infection, intoxication	Do not use it on wounds, Do not drink it,
Dirty hands	Intoxication	Wash your hands before every meal (bring soap, hand gel)
Heat, effort	Dehydration	Drink before you feel thirsty (bring water bottles)
Effort	Lack of energy Fatigue	Balanced diet, daily meals Rapid sugar intake (bring non-chocolate energy bars)
Sweat, smoke	Irritations	Have a daily wash, even if a quick one (respect other people's privacy, bring a toiletry bag)
Inadequate clothing	Blisters, irritations, Trauma	Wear cotton underwear Tie your Ranger shoelaces tightly, set your feet comfortably in the shoes
Unusual effort, Hostile environment	Fatigue	Make the most of rest periods.

The IC and the support staff may occasionally, according to the risks linked to the sites, to the activities and to the vehicles used, complete or adapt the general safety measures listed below to preserve the integrity of the participants.

All participants must:

- Wear individual equipment defined by the Team Commander;
- Close the vehicle's windows and doors;
- Inform their immediate hierarchy of any difficulty or problem.

1.1. Crewman and Driver

The crewman maintains contact with his team partner and the Fire Truck Commander. The driver is in charge of:

- making sure the safety setups of the vehicle are functioning;
- the tank's water supply;
- closing the vehicle's windows, doors and ventilation flaps.

He receives guidance during high-risk travel and vehicle manoeuvres and parks his vehicle on the side of the track to avoid getting in the way of other vehicles.

He will position his vehicle ready for departure and with the engine on and block it if necessary. He will monitor the radio, water supply and be in charge of the FFT protection using the nozzle on the booster reel or the truck self-protection system.

1.2. The Fire Truck Commander

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In terms of managing his vehicle, the Fire Truck Commander will :

- Remind the team that the self-protected cabin is like a fire shelter;
- Indicate before acting where the fallback zone is;
- Check that the safety equipment is present and functioning;
- Check the windows and doors of the vehicle are closed;
- Monitors that individual and collective safety measures are followed;

If necessary :

- Manages radio contact with the superior commanding level ;
- Monitors safe driving both on the road and on tracks ;
- Guides or makes sure the driver is guided in vehicle manoeuvres;
- Makes sure his staff is in good shape ;
- Manages change of staff in the event of fatigue ;
- Makes sure the equipment is always operational ;
- Reports to his hierarchy ;
- Launches the fire protection device and breathable air system.

In the event of the unit or FFT acting alone, the Fire Truck Commander will adapt his/er operations depending on the size of the fire and will plan an itinerary or a fallback zone.

He will manage radio contact with the pilots of the aircrafts if there are any and indicate obstacles to them (relay antennas, HV lines, etc.).

He gives permission to drop, after verifying that no staff is present in the drop zone and makes sure his teams are sheltered during safety water drops.

In the event of FFT Strike Team action, the Fire Truck Commander will be aware of the directives of the Strike Team Leader, and will wait for his orders before setting up the hydraulic resources.

1.3. The Strike Team Leader (STL)

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When commanding their Strike Team, they will :

- Check that the safety equipment is present and functioning ;
- Define a fallback itinerary and/or zone ;
- Follow and monitoring that individual and collective safety measures are followed ;
- Define specific safety measures if necessary ;
- Order the strike team to go into self-protection mode if necessary ;
- Guarantee front and back radio contact ;
- Know the IC or Unit Commander's manoeuvre idea ;
- Carry out a reconnaissance before the strike team starts.
- Make sure any FFT in action away from the strike team is only temporary and guarantee radio contact with them. Vehicles should all work in a strike team as soon as possible again to respect MSF regulations ;
- Make sure his staff is in good shape ;
- Manage change of staff in the event of fatigue ;
- Make sure the equipment is always operational ;
- Make sure attach vehicles have permanent water supply ;
- Present himself at the transit point as soon as it is activated (compulsory) ;
- Inform each Fire Truck Commander of the water points and safety zones to be used in the event of danger ;
- Report to his hierarchy.

The Strike Team Leader can also act as Incident Commander when on scene before the arrival of the designated IC. In that case, when aircraft are on the zone, Strike Team Leader (as IC) guarantees radio contact both with the aircrafts and with the Fire Truck Commanders (i.e. two

radios – two channels in parallel). He indicates obstacles to the pilots (relay antennas, HV lines, etc.) and gives permission to drop after having placed all staff in the trucks for protection.

If he is not the Incident Commander, he will guarantee radio contact with both his division supervisor or the IC, and the Fire Truck Commanders (i.e. two radios – two channels in parallel).

1.4. The Column Commander

When managing their unit, they will:

- Check that the safety equipment is present and functioning ;
- Establish the inventory of human and material means made available ;
- Monitor that individual and collective safety measures are followed ;
- Define specific safety measures if necessary ;
- Know the IC's plan ;
- Inform each Strike Team Leader of the water spots and safety zones to be used in case of danger ;
- Ensure the earliest setup of one or more transit points as soon as the resources are launched into action ;
- Make sure their staff is in good shape ;
- Manage change of staff in the event of fatigue ;
- Make sure the equipment is always operational ;
- Guarantee front and back radio contact.

In the event of participation from aircraft, the Column Commander, acting as IC, will:

- Guarantee or supervise the setup by the Air Operation Director (AIROPS) of radio contact with the aircraft and the division supervisor;
- Indicate obstacles to pilots (relay antennas, power lines, etc.) ;
- Make sure teams are sheltered during air drop operations ;
- Give permission to drop ;
- Report to their hierarchy.

1.5. The Large Forest Fire Site Commander

The Large Forest Fires Commander will :

- Monitor that individual and collective safety measures are followed;
- Define specific safety measures if necessary ;
- Establish necessary radio contact ;
- Make sure their staff is in good shape ;
- Manage change of staff in the event of fatigue.

In the event of participation from aircraft, the Large Forest Fires Commander will:

- Supervise the setup of radio contact with the aircraft as well as with the division supervisors;

Under the authority of the Large Forest Fires Commander, the Air Operation Director (AIROPS) will :

- Indicate obstacles to pilots (relay antennas, power lines, etc.) ;
- Make sure teams are sheltered during air drop operations;
- Give permission to drop.

2. Protecting Ground FF Teams

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Forest and wildland fires can generate rapid and even brutal phenomena causing :

- Flames leaping, even if this is several hundred metres from the attack point or vehicle parking, can cause a powerful new fire front close to the crew in action (setup, bringing equipment, foresting, managing vehicles, etc.) ;
- A flare-up: a sudden intense acceleration of the fire, the height of the flames, the power of the front, and in particular the speed of the spread can increase very fast ;
- A change in the direction of the spread and/or of the direction of the front line of its flames, fire is subject to complex aerology phenomena depending on topography and wind, and it influences these phenomena itself with the power of its convection.

All these phenomena can occur simultaneously and/or in consequence, thus causing:

- Staff to find themselves in direct danger;
- Destruction of the setup trapping the staff and making them unable to return rapidly to the vehicle;
- Staff being very rapidly surrounded by fire on the setups.

The outdoor lightening flare-up is the most extreme and the most violent phenomenon. It is difficult to anticipate sue to the complexity in reading it, even for the most experienced firemen.

2.1. General Information

During the setup and fighting phases, the Fire Truck Commanders will inform their staff:

- If there is a fire-resistant (protective) zone close by. The burnt zone still needs to be prioritised, any hut, house, swimming pool or water spot should be taken advantage of;
- Of the fallback itinerary to return to the vehicle.

Similarly, Fire Truck Commanders must be informed of the rescue itinerary (escaping the vehicle) by the Strike Team Leader or the Division Supervisor in the event of isolated intervention.

These measures can be reinforced by :

- Creating a roughly cleared path[14], enabling a rapid return to the vehicle, reducing the risk of disorientation, and making it easier to supply additional equipment;
- Flanking all along the setup with Ø 20/7 nozzles and 20-metre hoses appropriately layed out and indicated to staff. This setup helps protect the staff in the event in which the situation worsened between the vehicle and the point of attack (spot fires, rapid arrival behind the attack point, etc.)

Radio contact must be continuous between all levels of hierarchy. The N+1 warning level (Fire Truck Commander, Strike Teams Commander, Division Supervisor, etc.) must be immediately possible so that staff in danger can indicate :

- The situation ;
- The most precise possible position ;
- The temporary means of protection contemplated (fallback, finding shelter, refuge in the burnt land, etc.).

The cabin of the vehicle, with its staff protection equipment remains and will always remain the only survival space for staff encountering a brutal event.

2.2. Emergency Fallback

Emergency fallback enables the staff to return to the vehicle and find safety in the cabin.

It describes the action to be taken in the event of an emergency, in the aim of protecting staff in unfavourable conditions where their physical safety is at risk.

This action aims at optimising the safety of the staff and should be adapted according to the various opportunities of the terrain and operational situations encountered.

The following line-up <u>should not be considered</u> a manoeuvre strictly speaking. It's only aim is to help the team return to the FFT cabin easily.

[14] Called « draille » in Provence.

The Fire Truck Commander orders a fallback.

Firemen crouching down. The nozzle remains open in spray position for protection.

The men wear their face pieces to escape.
This isolating device is only for fallback or emergency escapes[15], **must not be used for rescue or reconnaissance operations.**
If the phenomenon is very rapid, the face piece can be used during the returning phase when the air becomes unbreathable

Lack of oxygen may cause panic and disorientation in space.

Breathing less contaminated air increases the chances of making it back to the cabin.

The Fire Truck Commander holds the hose used as a guide line.
The team member holds the Fire Truck Commander and the second team member.
Both hold on to the hose.

[15] The autonomy of this kind of IPE is 6 minutes.

From the start of the emergency situation, the driver launches the fire protection and stays at the back of the vehicle.
He puts on his face piece if necessary.

The driver and the Fire Truck Commander have a head count to make sure all staff is present.
The driver is in charge when the team partners arrive, and he leads them inside the cabin.

Depending on how the FFT Team is exposed, he will help all the staff enter by the side which is not exposed to the thermal flux.
The firemen follow the side of the FFT helped by the external marking, to reach the cabin.

The firemen launch the cabin's over pressurisation[16] along with the breathable air.
The firemen wear their face pieces with breathable air supply.
The driver triggers the sound warning.

© Matthieu Robert – SDIS 85

When staff cannot return to the cabin, these measures may help return to a pre-determined refuge zone (fire-resistant zone: grapevines, Scree paths, burnt zones etc.).

Following the various accidents during the fire-fighting operations and in application of the elements of feedback from experience, training in degraded and stressful conditions appears to be necessary.

To recreate one of the main difficulties, i.e. the lack of visibility due to smoke, a visual concealment system may be placed inside the helmet's goggles, during practice.

[16] If the vehicle has one.

3. Fire-Protection of Forest Fires Trucks

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Fire-protection of the Forest Fires Trucks consist of setting up layouts with integrated safety measures, in particular:

- A thermal protection system made up of an equipment set (films on the windows, protection of cables, etc.)
- A cabin-spraying device (self-protection system),
- A breathable-air system providing minimal autonomy of 10 minutes for 4 people using 30l/min per person.

3.1. Self-Protection Capability of FFTs

The Self-Protection Capability (SPC) of a Forest Fires Truck is a water tank reserved for the vehicle's thermal protection.
The useful capability of the tank (UC) is the one reserved for extinguishing operations. It excludes the capability dedicated to fire protection.

	FFTL	FFT	FFTH
Type of vehicle	MLM ≤7,5 T	7,5 T < MLM ≤ 16 T	MLM > 16 T
Minimum UC	600 litres	1,500 litres	5,000 litres
Maximum SPC	300 litres	300 litres	300 litres

3.2. Setting Up The Self-Protection system

When the firemen are directly threatened by the fire, the Fire Truck Commander, while keeping the situation in mind, will:

- anticipate the action to be carried out/clear the vehicle if possible closer to a safety zone which was identified earlier;
- Monitor the integrity of the cabin (windows, ventilation, hatches, etc.);
- Makes sure the suction and discharge valves are closed if necessary;
- Bring the staff together in the FFT;
- Sets up the FFT self-protection system (water sprays);
- Sets up the breathable air systems;
- Reports the situation to his hierarchy;
- Requests the land and/or air backup (safety water drops) ;
- Prevents any movements of panic;
- Triggers emergency communication (RCS emergency button, geolocalisation);
- Activates sound and light warnings.

4. Fire-Protection of Strike Teams

Fire-protection consists of setting up the safety device integrating in particular the position of the vehicles, fire protection of the FFTs for vehicles, by being equipped and using hydraulic means (nozzles, hoses, etc.) if necessary.

It may be active (using hydraulic means) or passive (without hydraulic means). If aircrafts are used, it will be associated with a request for safety water drop.

In the event of direct threat from the fire, and if one of the vehicles cannot manoeuvre itself to safety, a fire protection technique should be launched.

The setup is carried out as fast as possible and, for safety reasons, in a single manoeuvre for the vehicles if possible.

4.1. Common Principles

Terrain-type and time permitting, vehicles shall be positioned in such a way to protect the cabins from the thermal flux. If the vehicle strike team includes class HFFTs, the latter shall be used as a screen.

The Unit or Strike Team Leader must adapt his defense set-up to the situation. He informs the staff and makes sure they understand the set-up to guarantee its efficacy

In the phase preceding the fire protection, the Strike Team Leader will:

- Anticipate the evolution of the fire for manoeuvring purposes;
- Evacuate the danger zone;
- Maintain radio contact;
- Report the situation to their hierarchy on the appropriate channel;
- Choose the safest zone;
- Close its units, the FCV should be placed preferably between the FFTs, without blocking the access to the vehicle cabins;

- Bring the teams back inside the cabins;
- Prevent movements of panic;
- Requests the land and/or air backup (distress messages, safety water drops) ;

When the firemen are directly threatened by the fire, the Strike Team Leader should, depending on the situation:

- Anticipate the necessary action;
- Place the non-active staff in the FFTs;
- Choose the appropriate hydraulic means and have them prepared, taking into account the water supply available (one hose or water curtain nozzle in front of the vehicles to complete the protection, etc.);
- Launch the fire protection of the vehicles and the nozzles, at the appropriate time, depending on the water supply;
- Prevent movements of panic;
- Evaluate the situation;
- Report and maintain radio contact with their hierarchy.

The Fire Truck Commander will:

- Setup the hoses on their order;
- Monitor the radio;
- Apply safety regulations established by isolated FFTs.

When the terrain and the setup time do not make it possible to regroup appropriately, fire protection for the strike team can be done using the vehicles in a line.

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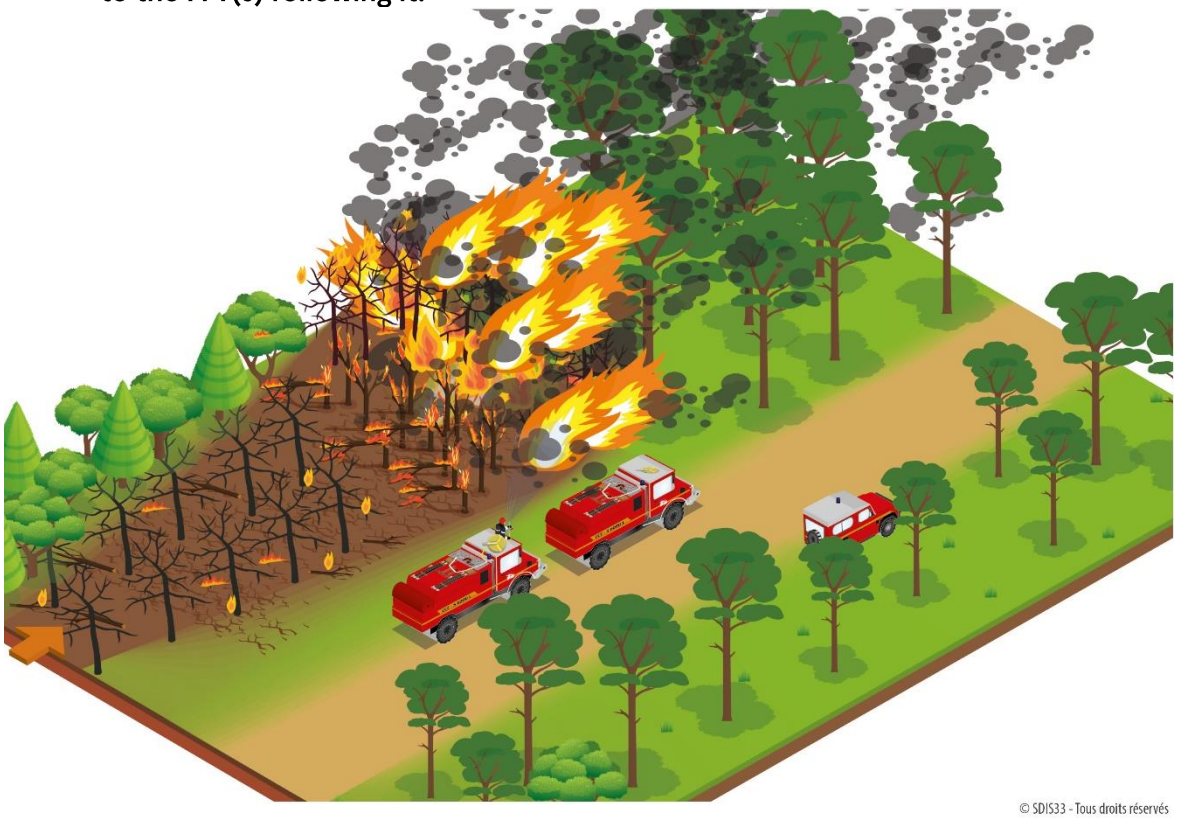
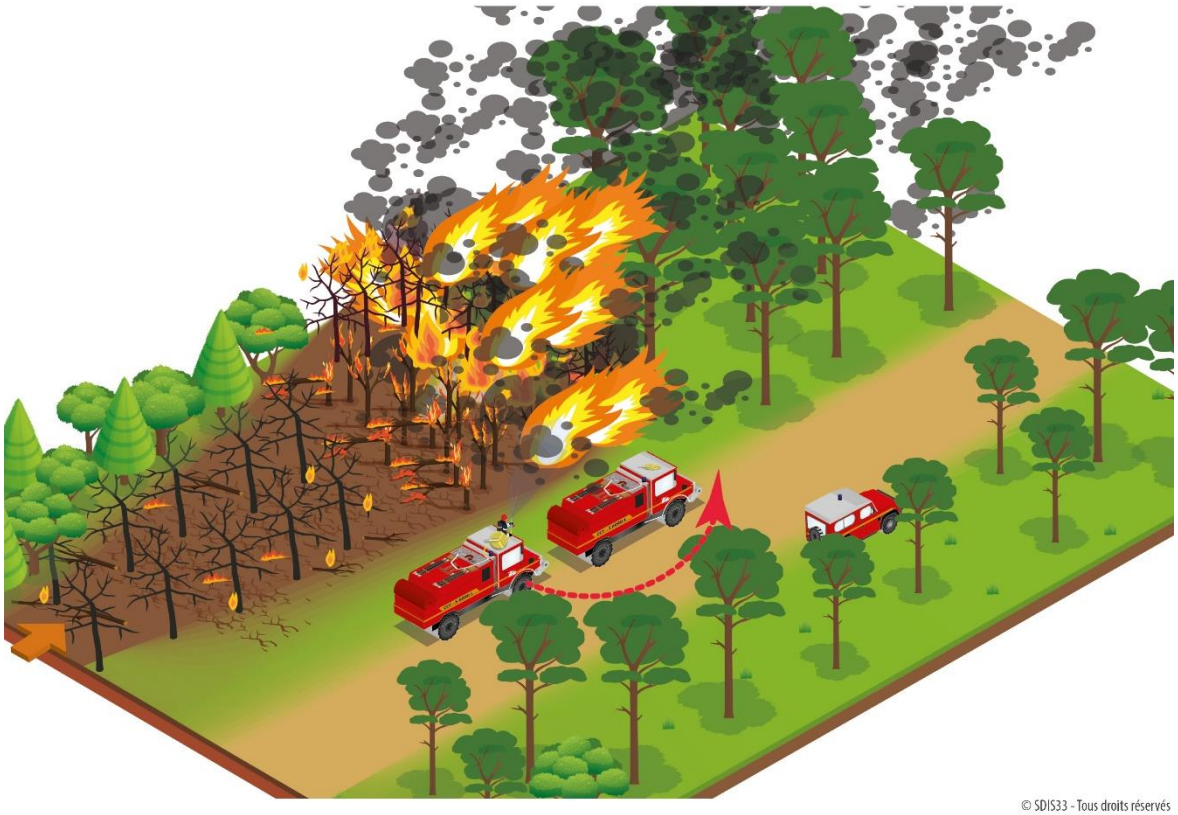
4.2. Fire-Protection of the Strike Teams On The Attack

- **If a FFT breaks down or is stuck during an attack, it reports to its hierarchy, as well as to the FFT(s) following it.**

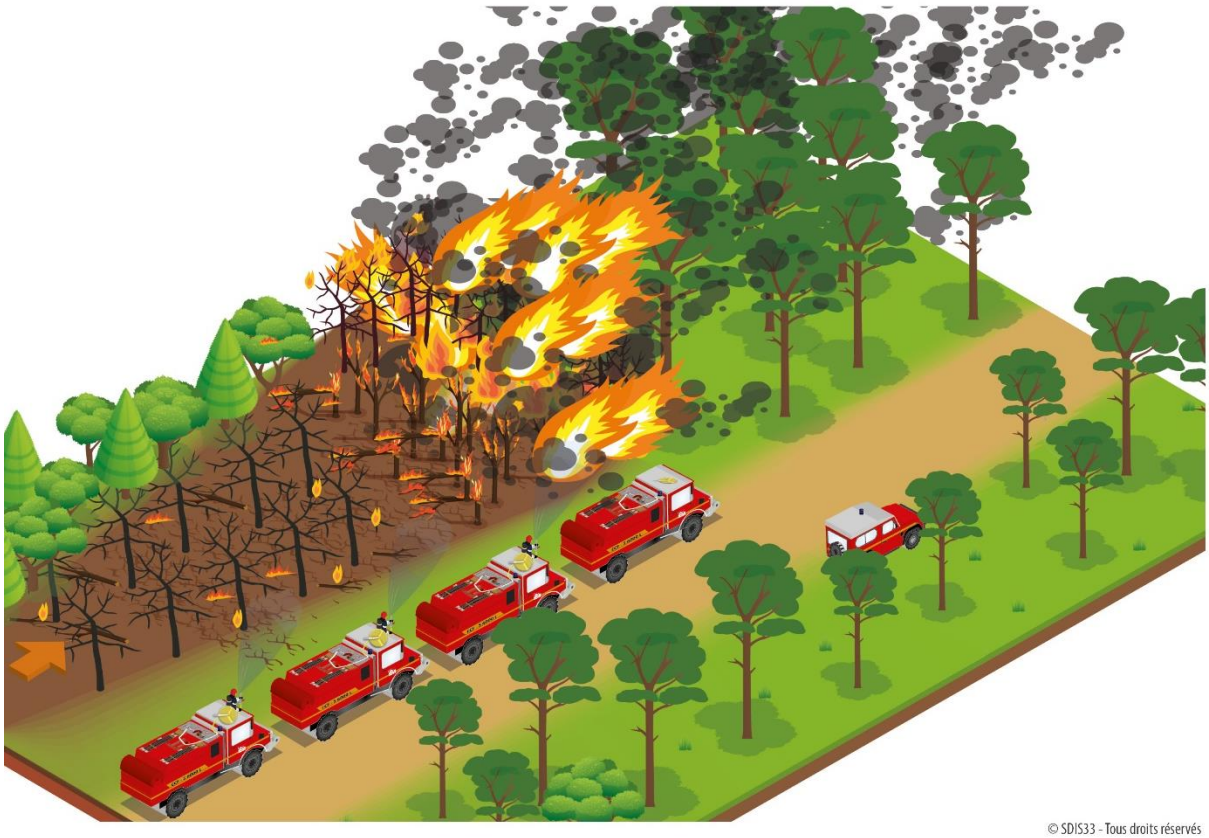


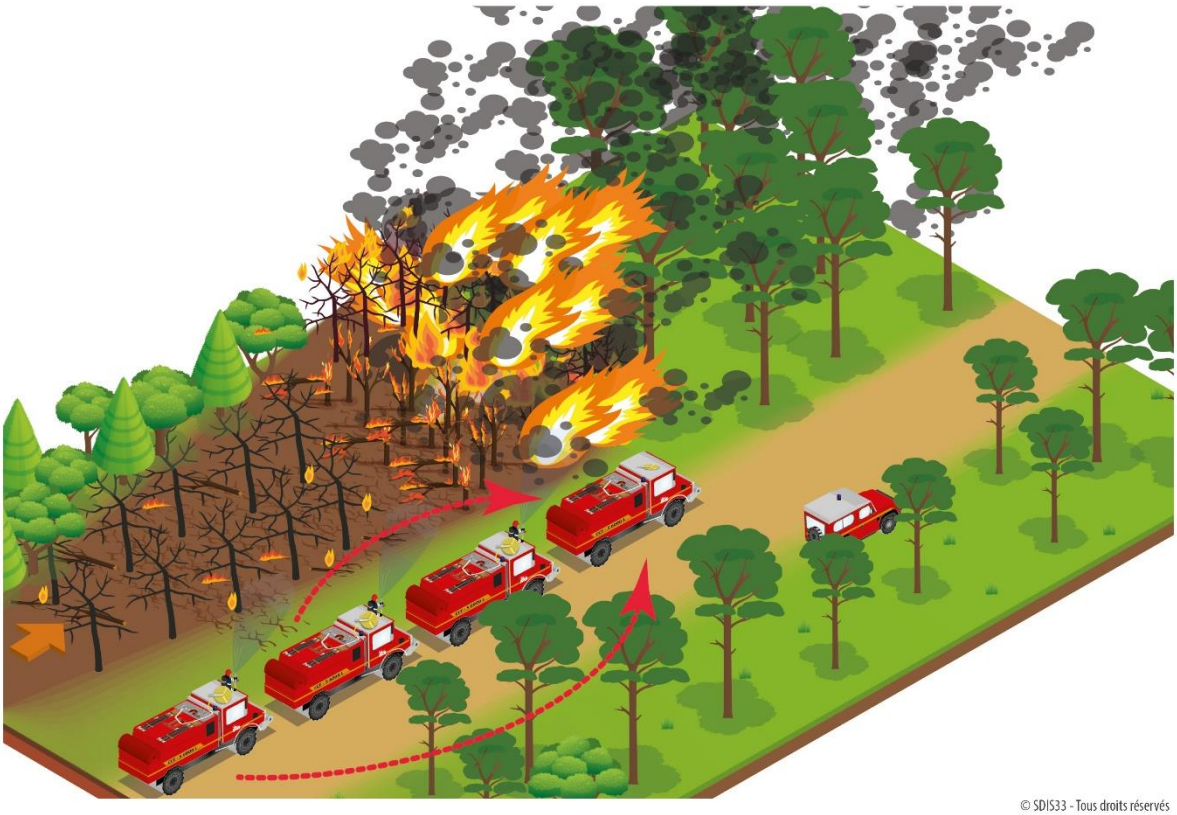


The 2nd FFT overtake immediately the 1st FFT on the non-burned fuel side to protect the FFT from the heat front.

The 2nd FFT stays to protect it until reinforcement arrives.

- **In the event of a fire attack in a line of more that 2 FFTs.**





The 3rd FFT moves to the burnt zone. The 4th FFT follows the 2nd FFT to encircle the 1st FFT and reconstitute a unit (FFT 2 and FFT 4)

4.3. Fire Protection of FFUs

In case of no fire protection system is implemented on the Fire Command Vehicle, and it staff won't be able to shelter inside the FFT, a water curtain nozzle is appropriately setup to provide the Fire Command Vehicle with water-protection.

Example of fire protection manoeuvre © SDIS 64

4.4. Fire Protection of the Strike Teams

In the event in which the strike team actions (support line in particular) were totally useless, the unit[17] at the front of the strike team should be used if possible, to let the front line of the fire through.

Some factors may slow down and/or prevent the escape process entirely, in particular:

- Low visibility;
- One vehicle breaking down (engine, flat tyre, etc.);
- The presence of another strike team on the track, blocking the passage way;
- One or more trees falling on the track;
- Deteriorated track;
- Front line of fire larger than escape ways.

The Strike Team Leader will determine the appropriate fire protection depending on the terrain and dynamics of the situation. Active or passive fire protection can be carried out in a square or in a line.

4.4.1. Active Fire-Protection of the Strike Teams

The strike team has the possibility and option to set up hydraulic means: use a hose, set up nozzles.[18]

In a Square
Questioning for the Strike Team Leader:

- Is the location enough and is it fire-resistant enough?
- Is the ratio between setup time /arrival of the fire long enough to set up?
- Are the tanks still full?

[17] 50 to 300 meters. Before all manoeuvres, The Strike Team Leader positions the vehicles ready to leave.

- **Fire Truck Commanders set up the nozzles**
- **Report strike team's position to obtain safety water drops.**

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In a Line

Questioning for the Strike Team Leader:

- Escape is no longer possible?
- **Position the FFTs with their bumpers less than 1m apart**
- **Fire Truck Commanders set up the nozzles**
- **Report strike team's position to obtain safety water drops.**

These situations[19] are extreme situations, which must be avoided.

When they occur, staff must react with cold feet. In particular, the chiefs of apparatus must give precise orders without panicking. The experience of the drivers will be very useful as they will have to operate the truck systems efficiently.

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[19] Only regular training can harden the staff to the reflex actions that will be implemented during a crisis situation

4.4.2. Passive Fire-Protection of the Strike Teams

The strike team no longer has enough water and/or time to set up the hydraulic means (nozzles, hoses, etc.). This fire protection is carried out thanks to the vehicles fire protection devices. The Fire Command Vehicle staff go back to the FFT cabins.

If the fire's virulence and the speed of its spread catches the Strike Team by surprise and prevents any manoeuvres: the vehicles should be 'regrouped' as much as possible to create a passive fire protection for the Strike Team in a line.

In a Square

Questioning for the Strike Team Leader:

- Is the location enough and is it fire-resistant enough?
- Not enough time to escape?
- **No team member must be exposed.**
- **Report strike team's position to obtain safety water drops.**

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In a Line

Questioning for the Strike Team Leader:

- Escape is no longer possible?
- **Position the FFTs with their bumpers less than 1m apart**
- **Report strike team's position to obtain safety water drops.**

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Fire-protecting and self-protection measures make up a strike team of actions to be carried out in an emergency situation, when fallbacks and clearing are not an option, aiming at protecting staff in an unfavorable situation putting their physical safety at risk.

4.5. Safety air drop

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In case of danger, the IC whatever his level (Fire Truck Commander to Large Incident Commander) may cancel an air drop or request a safety air drop. He as to control that the staff is in the truck for protection

A Safety air drop[20] is a delivered deliberately carried out on a vehicle or a strike team in danger to reduce the flames and the temperature and help the staff escape. It is carried out at sufficient height to avoid accidents (crushing the strike team of vehicles, falling trees, etc.).

It is carried out after being approved by the IC or Air Division/Branch Commander, in the event of extreme emergency for the beneficiary of the safety water drop.

The difficulty lies in identifying the strike team and the vehicle and repairing the latter. A helicopter on the zone is the appropriate tool for this kind of search. Its pilot, just like water bomber aircraft pilots, will need guidance from the caller (hour code methods, azimuth distance, visual guidance).

The air drop will benefit, as much as possible, from a helicopter marking.

This is not an 'aircraft support'. A safety air drop is consequently only requested for emergency protection of in danger staff.

[20] Definition of the instructions manuel for air assets in forest fires.

CHAPTER 3 - Setups

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Several types of setups are possible with a single vehicle, depending on the number of men present, the equipment in the vehicle and its packaging: hoses on fixed reels, pack folded, pre-connected, on backpack fire hose racks, nozzles, etc.

For all setups:

- The Fire Truck Commander and the driver must monitor the radio;
- All manoeuvres are carried out from the water point to the attack point. They have been designed to maintain permanent water supply throughout as the fire progresses;
- Team Member 2 sets up his hoses before Team Member 1 so that the latter can remain as close as possible to the attack point;
- All the actors must follow the collective and individual safety rules.

Manoeuvres are carried out faster when the vehicle is equipped with backpack fire hose racks and an additional auxiliary reel equipped with a Ø 45 mm hose, in addition to the Ø 45 mm hoses folded on themselves or pack folded.

The following manoeuvres have been simplified and are presented in the form of a principle. They enable all firemen and military unit staff employed on a permanent basis in civil safety missions to lead actions in a national and coherent national framework.

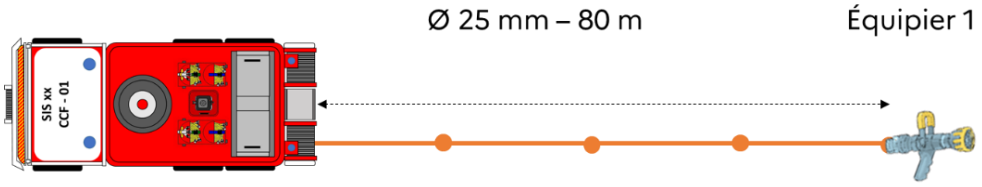
1. The Various FFT Setups

Five setups can be carried out by a wildland fire truck:

- Setup of the Ø 25mm hose reel;
- Setup of a 500 nozzle or water outlet;
- Extension of a 500 nozzle;
- Transforming a 500 nozzle into 2 150 nozzles with no extension;
- Transforming a 500 nozzle into 2 150 nozzles with an extension.

1.1. Setup of the Hose Reel

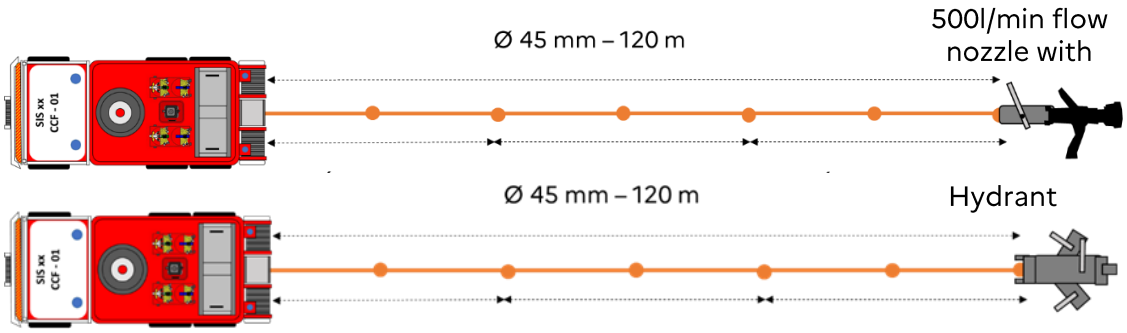
The Hose reel (HR) is mainly used by the driver to protect the FFT. It can also be used for other missions (extinguishing, treating spot fire spots, etc.). In the event in which, exceptionally, the setup of the HR is extended from the nozzle with flexible hoses, the nozzle will be manoeuvred by Team Member 1.



DRIVER	FIRE TRUCK COMMANDER	TEAM MEMBER 1	TEAM MEMBER 2
Sets up the pump	Chooses the attack point	Picks up the nozzle	Picks up the 1st extension
Pulls out the hose		Pulls out the hose line, and goes to the attack point	Pulls out the hose line
Launches the water without orders	Checks the action is efficient	Pursues extinguishing	Doubles the nozzle holder

When the rotating reel hose is used in the complete extinguishing phase of the boundaries (watering phase), the hose of the rotating reel is rolled out over a few metres, the team member follows the FFT it is leading by foot.

1.2. Setup of A 500 Nozzle/A Water Outlet Up To 120 Metres



- **Using the ∅ 45mm auxiliary reel**

Orders of the Fire Truck Commander: ***« For the setup of a 500 nozzle, XXX l/min flow or a water tap (division) using the ∅ 45mm auxiliary reel for reconnaissance »***

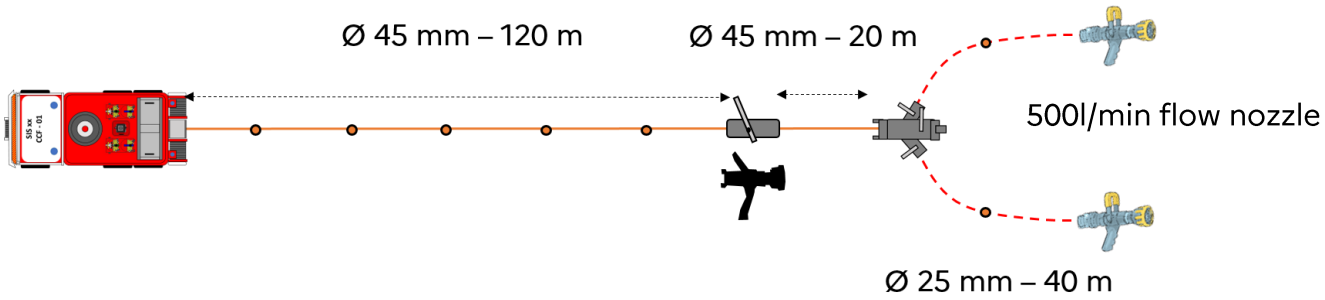
DRIVER	FIRE TRUCK COMMANDER	TEAM MEMBER 1	TEAM MEMBER 2
Sets up the pump		Picks up the 1st extension	Picks up the 2nd extension
Helps unroll the Ø 45 reel	Sets up the supply for the FFT		
Disconnects as soon as the fire hose reaches the attack point	Picks up the nozzle with the stop valve		
Connects and sends the water	Goes to the attack point by dragging the hose reel	Drags the hose reel, and goes to the attack point	Drags the hose reel
Makes sure there is permanent water supply in the setup	Handles the hose as soon as it reaches the attack point, then passes it to Team Member 1	Is handed the hose by the Fire Truck Commander and handles it	Goes back to the FFT and checks the setup
	Checks the pressure according to the topography of the terrain		Collects the ∅ 45 backpack and takes it to the attack point

- **With Folded or Pack Folded Hoses**

Order of the Fire Truck Commander who chooses the attack point or the setup point for the water supply: ***« For the setup of a 500 nozzle, XXX l/min flow or a water tap (division) using hoses for reconnaissance »***

DRIVER	FIRE TRUCK COMMANDER	TEAM MEMBER 1	TEAM MEMBER 2
Sets up the pump			Unfolds two ∅ 45 hoses
	Unfolds two Ø 45mm hoses and connects them to Team Member 1's hose	Takes two Ø 45mm hoses and a nozzle or a water tap	Gives the driver the extension
		Unfolds the hoses after the Fire Truck Commander	
		Connects the nozzle or the water tap	
Connects and sends the water when ordered to		Commands «open»	
Makes sure there is permanent water supply in the setup			Goes back to the FFT and checks the setup
	Checks the pressure according to the topography of the terrain		Collects the ∅ 45 backpack rack and takes it to the attack point

1.3. Transforming the 500l/min Hose into 2 x 150[21] Hoses without Extensions



- **With backpack Fire Hose Racks[22]**

Order of the Fire Truck Commander to transform the 500l/min hose into two 150l/min hoses and chooses the 2 attack points and the division's position: ***« For the setup of a 500 hose into 2x150 hoses, XXX l/min with a backpack fire hose rack, set up»***

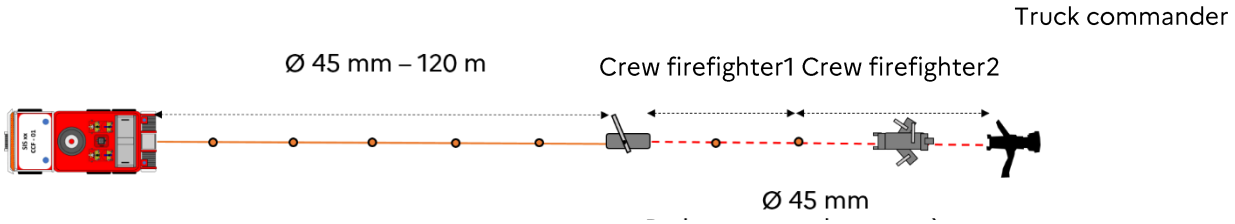
DRIVER	FIRE TRUCK COMMANDER	TEAM MEMBER 1	TEAM MEMBER 2
	Orders the transformation of the 500 hose into 2 hoses		Goes back to the FFT to collect the ∅ 25 backpack
Checks the pressure during the extension upon order or by sight	Indicates the 2 new attack points and the position of the division		Goes to Team Member 1
Reports to the Fire Truck Commander	Takes the 500 hose and pursues the action of Team Member 1 until transformation is ready	Gives the hose to the Fire Truck Commander	
		Takes one ∅ 45 hose and the 40/40 two ∅ 20 division from the backpack	
		Gives the 1/two ∅ 45 extension to the Fire Truck Commander	
	Connects the new hose reel to the 45mm hose	Sets up the ∅ 45 hose from the valve, and connects the closed division	Helps Team Member 1 to set up the ∅ 45 hose and the division
	As soon as one of the 2 hoses is set up: closes the valve, disconnects the hose, returns it to the division	Takes two ∅ 25 hoses and 1nozzle from the rack backpack Sets up his hose	Returns the rack backpack to the division Takes two ∅ 25 hoses and 1 nozzle, Sets up his hose
	Opens the stop valve	Opens the division, and goes to his attack point	
	Helps the team members' progress by monitoring the efficacy of their action	Reports to the Fire Truck Commander once his hose is set up Pursues extinguishing	

[21] The 150 hose can be replaced by a 20/7 nozzle
[22] if the Ø 25 backpack fire hose rack is equipped with an optional Ø 45mm hose, the team member takes it from the vehicle.

- **Without the backpack fire hose rack**[23]

Order of the Fire Truck Commander to transform the 500l/min hose into two 150l/min hoses and chooses the 2 attack points and the division's position: ***« For the setup of a 500 hose into 2x150 hoses, XXX l/min with a backpack fire hose rack, set up ».***

1.4. Extension of a 500 Hose



- **Extension of a 500l/min Hose with a backpack Fire Hose Rack**

Order of the Fire Truck Commander to extend[15] the hose reel and chooses the new attack point: ***« For the extension of « X metres » of the 500 hose, XXX l/min flow with a backpack fire hose rack, set up»***

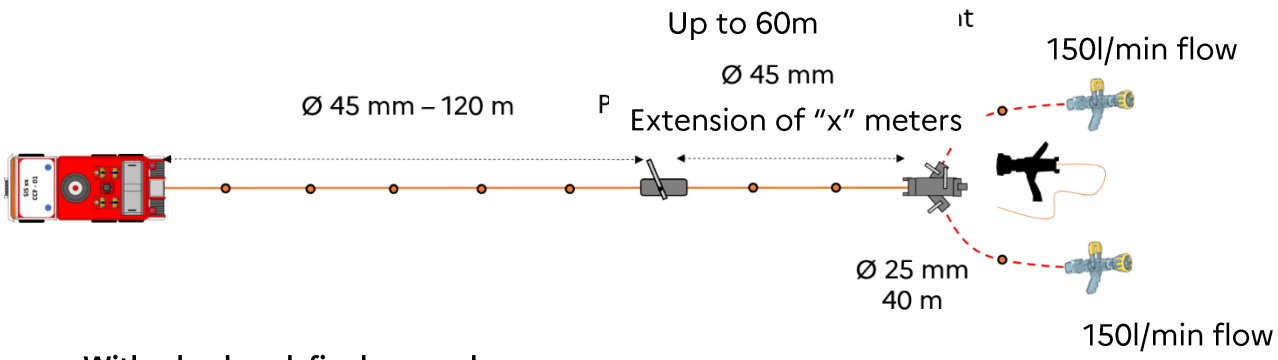
DRIVER	FIRE TRUCK COMMANDER	TEAM MEMBER 1	TEAM MEMBER 2
Hands out and collects the material	Orders the extension		Brings the ∅ 45 backpack to the stop valve if it hasn't already been done
Checks the pressure during the extension upon order or by sight	Choose the new attack point	Gives the nozzle to the Fire Truck Commander	
Reports to the Fire Truck Commander	Handles the hose until the extension arrives		Sets up two ∅ 45 hoses after the stop valve
	Closes the stop valve and disconnects the nozzle	Sets up one ∅ 45 hose after the Team Member's	
	Connects the ∅ 45 hose on the valve and opens it	Connects the closed 40/40 - two ∅ 20 division	
	Takes the nozzle to the attack point	Sets up a 2nd ∅ 45 hose after the division and returns to the division	
	Gives order to open on the division	Opens upon order of the Fire Truck Commander	Returns to the vehicle upon order to do so to collect the ∅ 45 backpack, in view of a possible transformation
	Manoeuvres the nozzle and passes it to Team Member 1 when the latter is ready	Goes to the attack point, picks up the hose and pursues the Fire Truck Commander's action	

[23] The manoeuvre is identical. Team Member 1 collects one 45mm hose, one division, one25mm hose and one nozzle. Team Member 2 collects 3 x Ø 25mm hoses and one nozzle.

- **Extension of a 500l/min Hose without a backpack fire hose rack**

Order of the Fire Truck Commander to extend[15] the hose reel and chooses the new attack point: ***« For the extension of « X metres » of the 500 hose, XXX l/min flow with a backpack fire hose rack, set up»***

1.5. Transforming a 500l/min Hose into 2 x 150 Hoses After Extension



- **With a backpack fire hose reel**

Order of the Fire Truck Commander to transform and chooses the new attack point: ***« For the transformation of the 500 hose into two 150 hoses, XXX l/min flow with a division supplied with a back pack fire hose rack, set up»***

DRIVER	FIRE TRUCK COMMANDER	TEAM MEMBER 1	TEAM MEMBER 2
	Orders the transformation of the 500 hose into 2 hoses		Goes back to the FFT to collect the 25 backpack
Checks the pressure during the extension upon order or by sight	Chooses the 2 new attack points		Goes to Team Member 1 1
Reports to the Fire Truck Commander	Takes the 500 hose and pursues the action of Team Member 1 until transformation is ready	Gives the hose to the Fire Truck Commander	
		Takes one Ø 45 hose and the 40/40 -two 20 division from the backpack	
		Gives the 1/two Ø 45 extension to the Fire Truck Commander	
	Closes the nozzle, connects the new hose reel to the nozzle and continues his action	Sets up the Ø 45 hose from the 500 hose, and connects the closed division	Helps Team Member 1 to set up the 45 hose and the division
	As soon as one of the 2 hoses is set up, he closes the hose and orders the Team Member to close the division	Takes two Ø 25 and 1x 150 hose from the Ø 25 rack Sets up his hose	Puts the rack at the point of separation Takes two Ø 25 hoses and 1 nozzle, Sets up the hose
	Disconnects the 500 hose, puts it on the division and connects the Ø 25 hose reels,		

	Orders the team member to open the division	
		Opens the division, and goes to his attack point
	Helps the team members' progress by monitoring the efficacy of their action	Reports to the Fire Truck Commander once the hose is set up Pursues extinguishing

- **Without a backpack fire reel**[24]

Order of the Fire Truck Commander to transform and chooses the new attack point: ***« For the transformation of the 500 hose into two 150 hoses, XXX l/min flow with a supplied division, set up»***

2. The water supply setups

The fighting tactics used may require the organisation of norias to supply the vehicles with water. The ai mis to guarantee permanent water supply on site.

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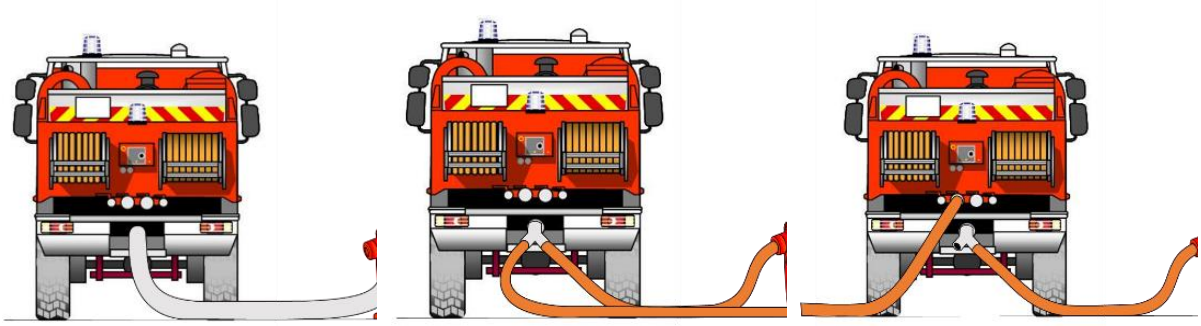
The FFT's water supply is carried out through one of the following orifices:

- The pump's supply orifice;
- The tank's supply orifice;
- The manhole.



Supply using a Ø 110mm-hose or Ø 70mm hoses
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In the case of a noria, the driver may, on order to so, move alone from the point of attack and the water supply point. In this case he will maintain radio contact with his hierarchy.

[24] The manoeuvre is the same. The team members take two 25mm-hoses and 1 nozzle each.

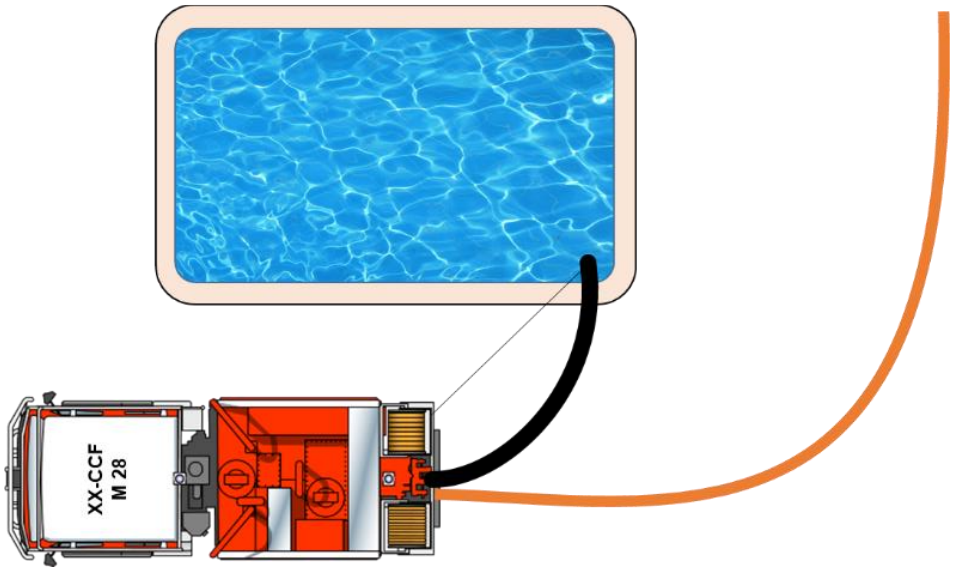
The various water points which can be used are:

- Natural points (lakes, lagunas, water courses, swamps, etc.) ;
- Artificial water points (water reserves, tanks, water towers, swimming pools, etc.) ;
- Boreholes to protect forests from fires (PFF) ;
- pillar hydrants (by default).

In as much as the vehicles' tanks may have carried sea water or water form natural or artificial sources, they must be rinsed and, if necessary, verify that a sediment or stone does not block the pump's openings or the nozzles (they may need to be dismantled).

Various solutions help limit the use of reserves of drinking water, for example:

- **by suction** (the vehicle's pump, floating motor pump, tractable submerged motor pump, exhaustion motor pump, etc.)



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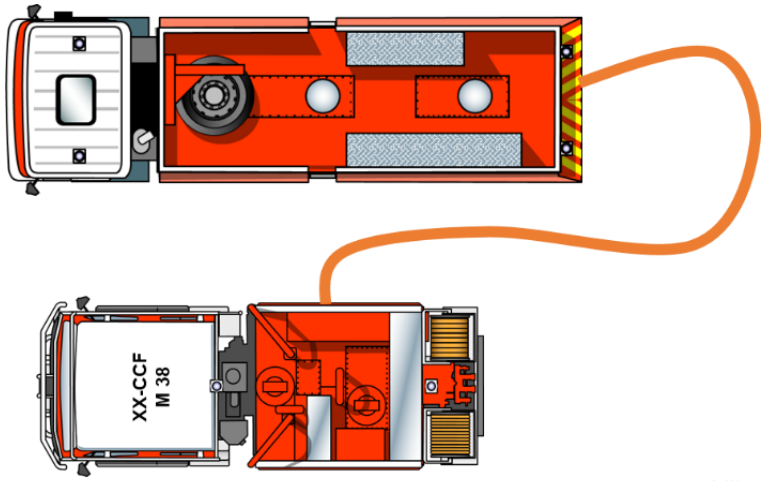
- **by vehicle** (water carriers, automobile reels (AR), large capacity Forest Fire Trucks (LCFFT), etc.).



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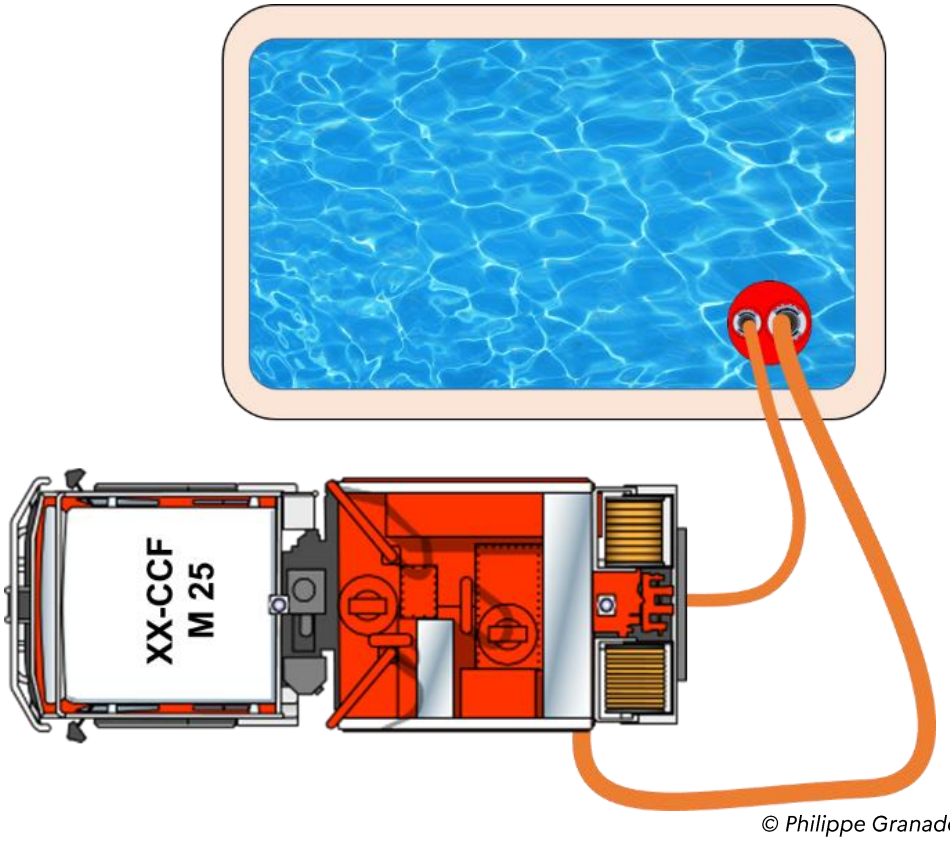
- **by hydro-ejector or similar means:** requires at least 300L reserve in the tank, etc.



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CHAPTER 4 - Manoeuvres in Vehicle Strike Teams

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1. Traffic Rules

The success of forest and wildland fire fighting operations lies greatly in managing to supply water in sufficient volume to the remote areas of the fire.The main traffic rules of convoy vehicles are highlighted here, for urban, rural and all-terrain vehicles.

1.1. Speed

The maximum speed is set by the Team Commander (unit, strike team or line). Safety distance between each vehicle during the convoy is approximately 50 metres on roads.

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The convoy is closer in cities and adapted on tracks.

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1.2. Markings

Headlights are on. The Team Commander sets the conditions for use of the vehicles' sound (two tones) and light (flashing lights) warnings.

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During vehicle manoeuvres, guiding is compulsory

2. The various convoys

2.1. Formation

2.1.1. Transit Formation

While traveling on the road, the slowest or the least manoeuvring vehicle follows the command car

Team Commander orders: **« Transit Formation positions».**

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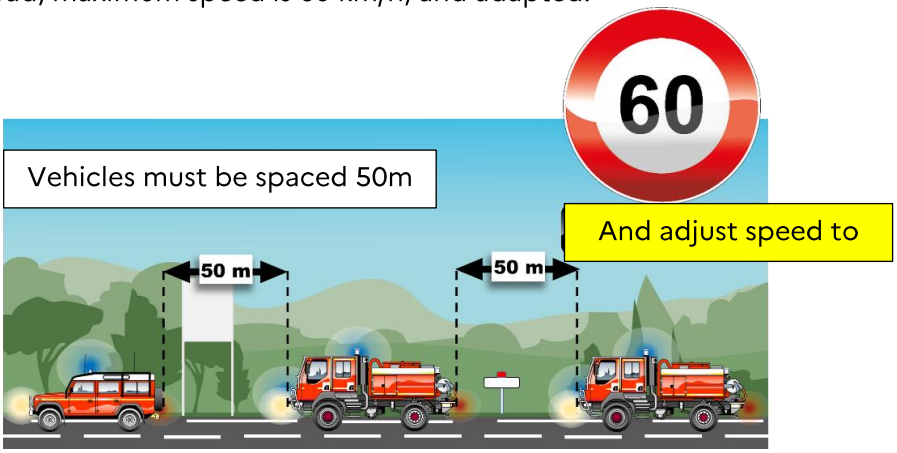
- On the road, maximum speed is 60 km/h, and adapted.



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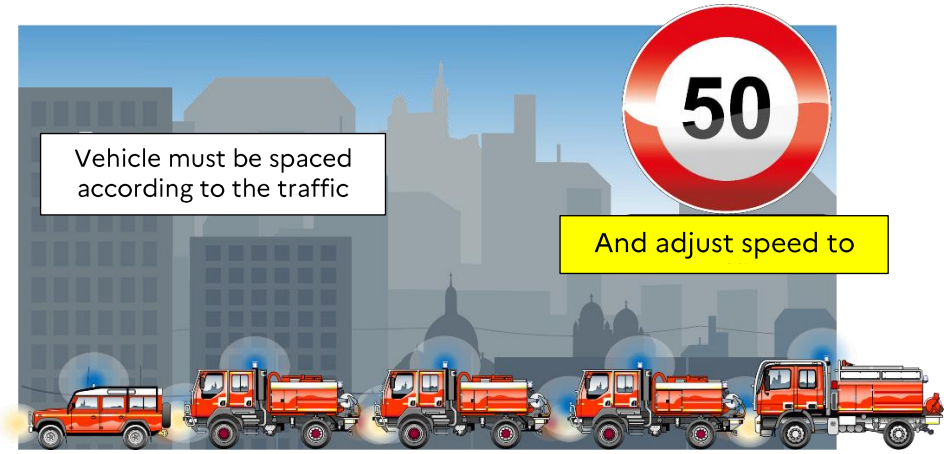
- In cities, maximum speed is 50 km/h, and adapted



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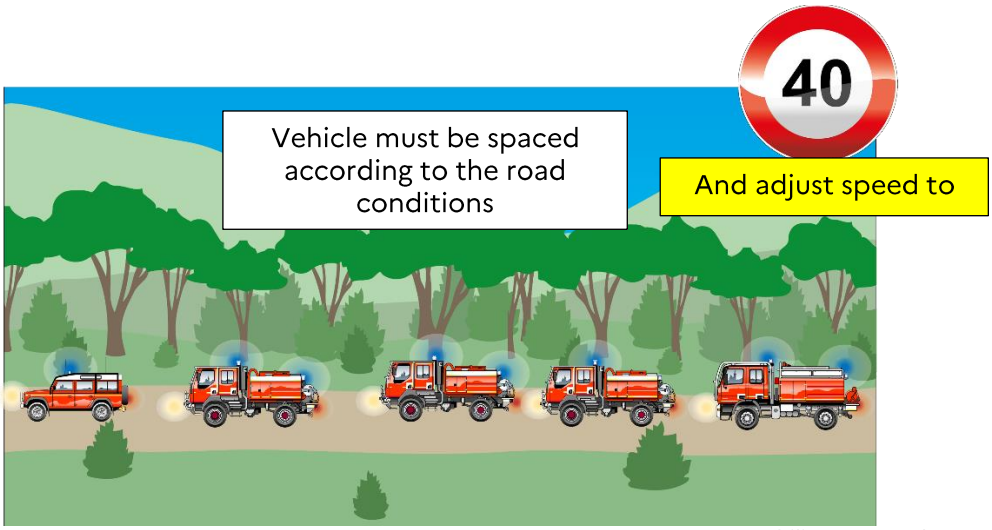
2.1.2. Tactical Formation

During convoys on tracks, the vehicle with the least manoeuvres is placed last in position. The Strike Team Leader orders**: « Tactical Formation position».**



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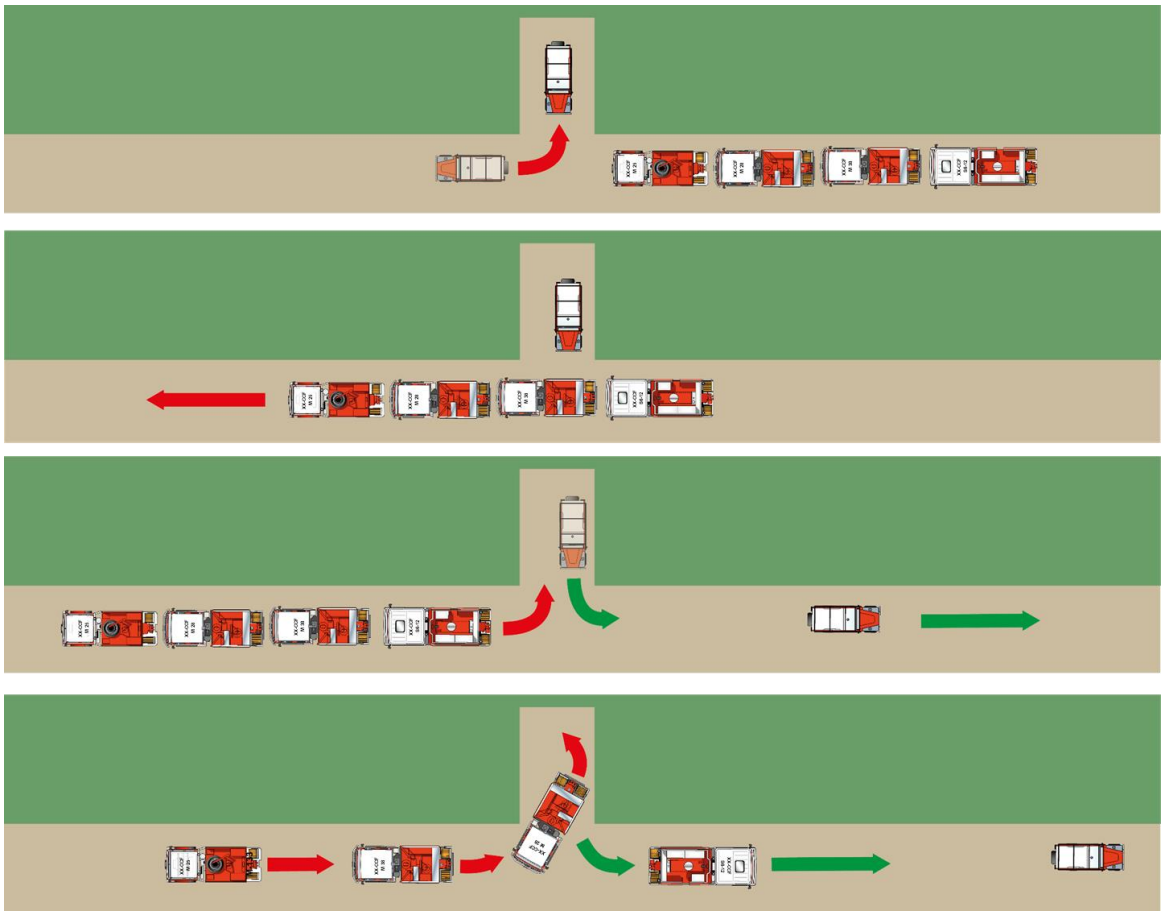
2.2. Reversal Manoeuvres

When the Strike Team Leader need to make his strike team reverse on a track, he will find:

- Either a manoeuvring area on the side of the track;
- Or an entrance to a path.

When the Strike Team Leader orders: **« Return to detachment, position marked by the FCV».**

- The Fire Command Vehicle marks the position to return to;
- The 4 vehicles go past the position;
- The Fire Command Vehicle carries out its reversal;
- The Fire Truck Commanders alight and guide the reversal of their vehicle;
- These reversals must be synchronises between the Fire Truck Commanders and the drivers in order to waste no time;
- As soon as possible, the vehicles return to their initial formation



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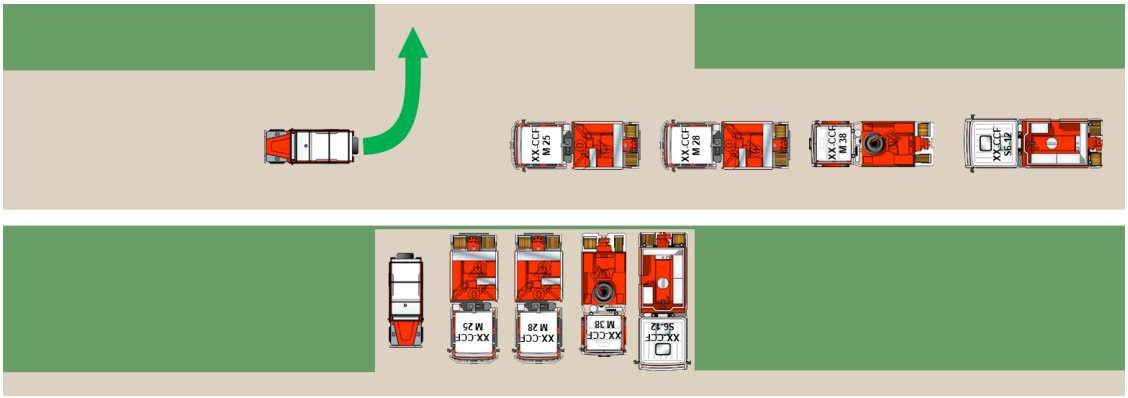
The Strike Team Leader and the Fire Truck Commanders make sure they leave as much room on the track as possible for vehicles to be able to cross, for reinforcement or water norias to arrive.

In an emergency, the Team Commander will adapt the manoeuvre according to the situation and the configuration of the site.

2.3. Stops

- Parallel Stops



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At the transit point or for longer parking, the team may be led to stop on a manoeuvre area to be ready for action.

The Team Commander orders: **« Parallel Stop» :**

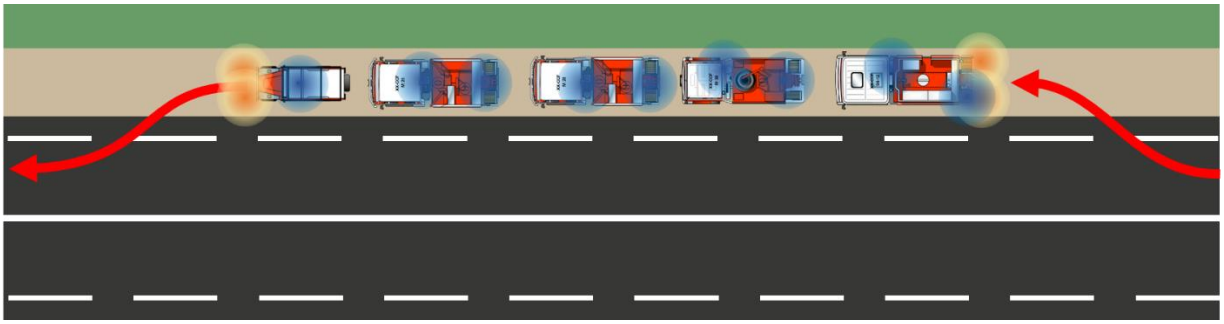
- The Fire Command Vehicle parks first;
- The Fire Truck Commanders alight and guide the reversal of their vehicle;
- The vehicles park parallel to the FCV;
- Staff alight upon order of the Team Commander.

- Column Stops

During the convoy, at transit point or on the side of the road, the team may be led to park for a short amount of time.

The Team Commander orders: **« Column Stop» :**

- Vehicles park behind the Fire Command Vehicle
- Staff alight upon order of the Team Commander.



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3. Rules for Driving On Rough Terrain

Safety and driving rules for vehicles on rough terrain are explained in the Rough Terrain Driving Training Guide[25]. It highlights the rules for convoys on tracks, guiding, concepts of crossing and the various crossing techniques.

As a reminder, if circumvention is not possible, reconnaissance is essential before crossing any obstacles.

Carried out by the Fire Truck Commander and the driver, it is based on the « STOGS » principle:

- S – Stop: in order to carry out a reconnaissance and alight staff before delicate manoeuvres;
- T – Terrain: according to its nature (material, humid, dry, etc.), adapt specific orders (tyre pressure, etc.) ;
- O – Obstacle: stump, rocks, ford, ditch, log, etc. ;
- G – Gradient: evaluated in percentage (%), it is crossed front-on and should not exceed 50% for a FFT;
- S – Slope: evaluated in percentage (%), it should not exceed 30% for a FFT.

[25] The Rough Terrain Driving Training Guide, DGSCGC-ECASC, February 2012.

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When the means are in the burnt zone, the 'thermal tyre-degradation' phenomenon should be kept in mind. Extended exposure to heat (even if it is moderate) may trigger chemical reactions which irrevocably reduce the tyres' mechanical properties.

4. Offensive Manoeuvres

It should be noted that the setups presented in this part are manoeuvres of principle; according to the available equipment, these setups may be extended. Lengths are provided for reference.

4.1. Unit Manoeuvres

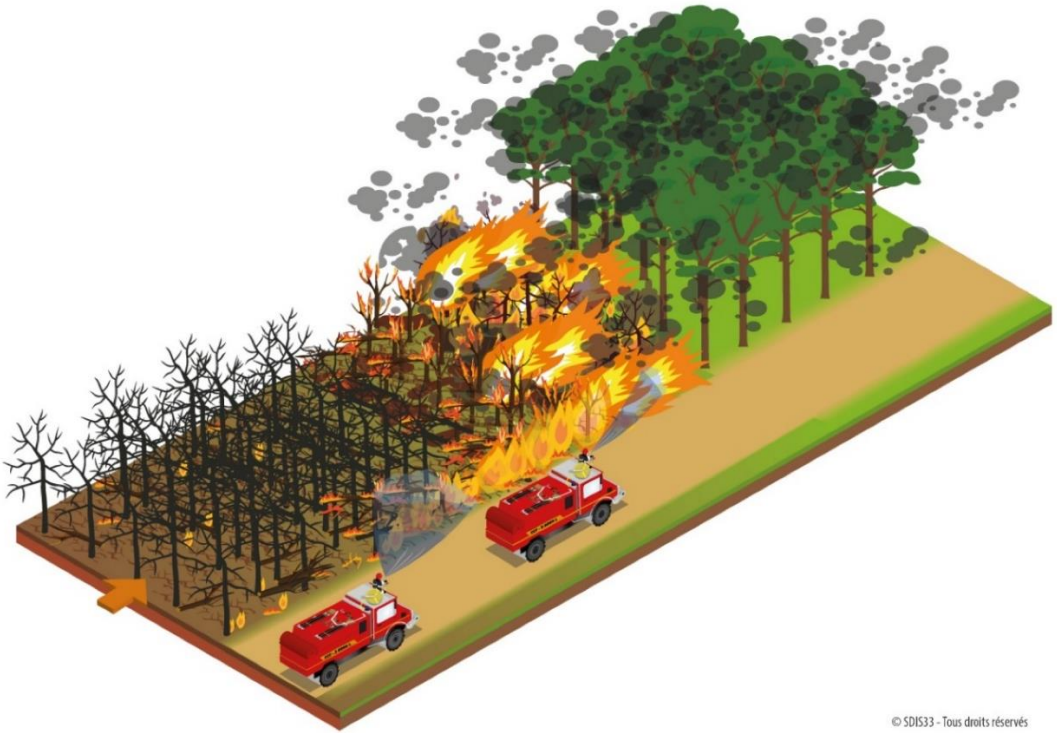
Using the FFU's land means is, up to a certain measure, linked to the topography of the forest massif, the nature of the soils and vegetation, and to the fire's evolution.

4.1.1. Offensive Mobile Manoeuvre From A Moving FFT

It consists of shooting down the flames with a fire hose, straight spray, installed from the cabin of the 1st FFT in motion or using a water canon ordered from the cabin.

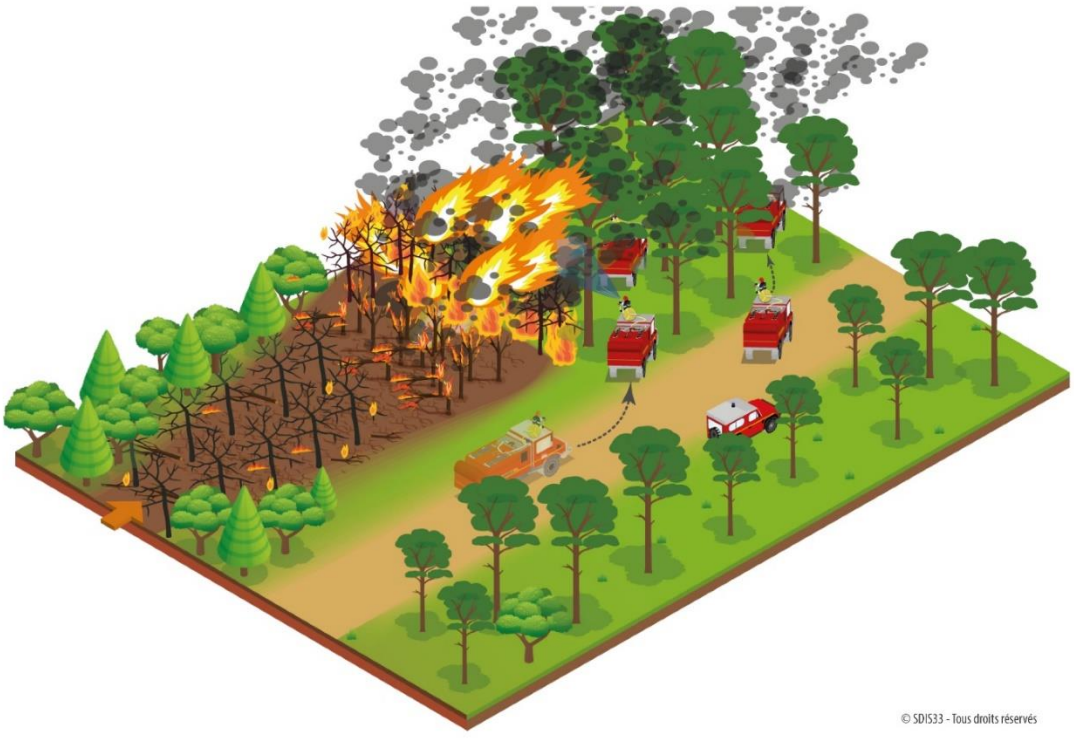
The 2nd FFT in motion completes the extinguishing using a hose installed from the cabin or a water cannon with a straight or diffused spray. The 2nd FFT is positioned behind the 1st FFT at an appropriate distance to guarantee efficacy of the manoeuvre. This distance varies according to visibility, terrain and the fire's behaviour.

To carry our offensive manoeuvres (head-on direct attacks, direct flanking attacks, direct attack through the flank) depending on the intensity of the outbreak, cannon hoses can be set up. In some cases, extinguishing will require hoses to be installed.



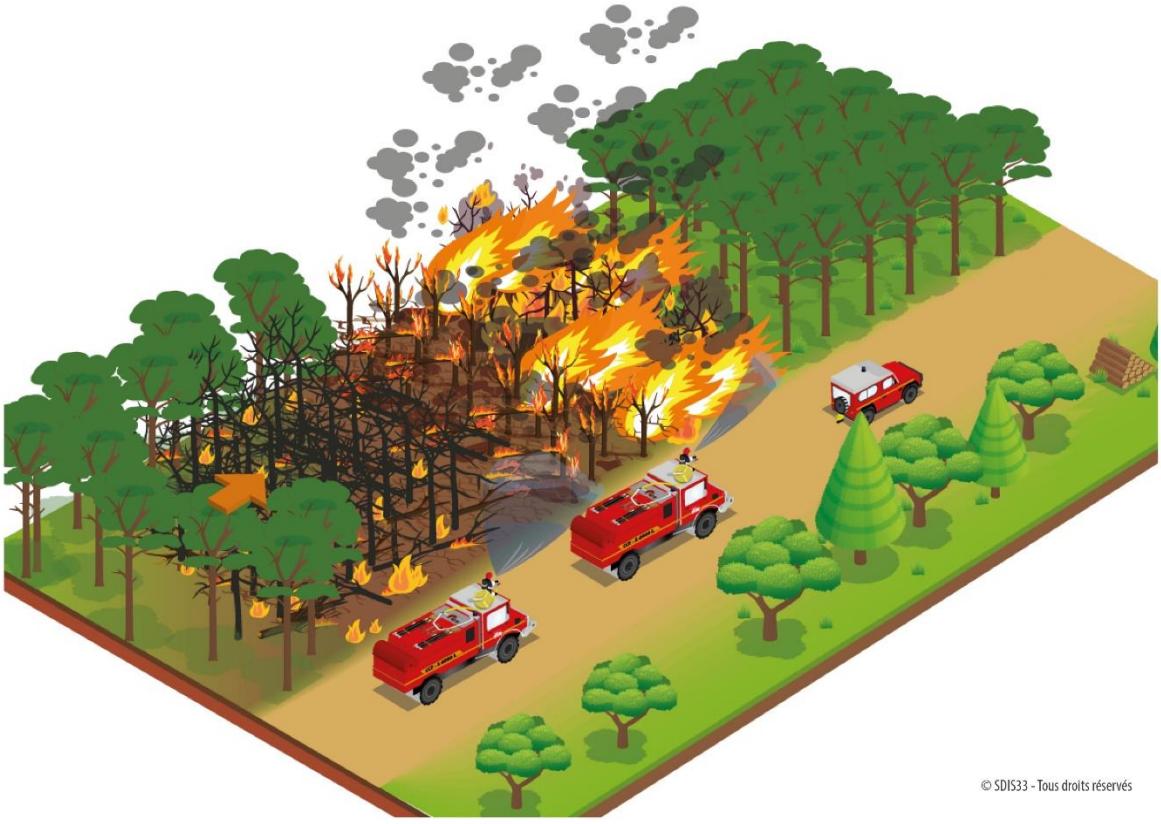
The preferred technique of action is usually the offensive, mobile one.

To carry out offensive mobile manoeuvres according to the intensity of the outbreak, cannon hoses can be set up. A 2nd Forest Fire Unit may follow the first to perfect the extinguishing or replace it as soon as a noria is required.



- Head-on direct attack

- Direct flanking attack



- Attacking through the direct flanking approach

STAFF	EQUIPMENT AND EXECUTION
FFU Commander	Adapts his plan according to the size of the fire. Chooses the attack point. Maintains visual and radio contact with the all the means in action. Makes sure safety regulations are followed during action. Reports to his hierarchy.
The Hose-Sprayer of the 1st FFT **Or Cannon Pilot**	Puts out the flames with a vertical movement, while spraying the active boundary by 1/3 in the burnt vegetation and 2/3 in the non-burnt vegetation. Guides and directs the driver. Keep permanent visual contact with the next FFT. Maintains a safe distance.
The next Hose-Sprayer(s)	Complete(s) the action of the 1st FFT by spraying the active boundary by 1/3 in the burnt vegetation and 2/3 in the non-burnt vegetation. Guide(s) and direct(s) the driver. Guarantees the safety if the FFT before him. Keep(s) permanent visual contact with the next FFT. Maintain(s) a safe distance. If he is the last FFT on the slope, he must make sure the boundary is completely extinguished.
The FFT Driver	Keeps control of his vehicle. Receives instructions from the Hose-Sprayer or Cannon Pilot. Maintains radio contact with the IC or Zone Commander and with the other FFTs. Maintain(s) a safe distance. Adapts tyre pressure (deflation) for sandy and slippery terrain. Activates the chassis protection if the FFT is equipped with one.

4.1.2. Fire Attack from FFTs at a Standstill

The Forest Fire Unit can carry out setups when the vehicles' penetration into the forest massif is not possible for the following reasons:

- The condition of the terrain would lead to the vehicles getting stuck in the sand (humid and sandy areas);
- The terrain's rugged topography;
- The density and nature of settlements which would cause serious deterioration to the vehicles;
- The presence of impassable obstacles.

This type of attack can only be carried out on a non-violent fire, working in pairs and in permanent visual contact with the FFU Commander. There are 3 types of setups:

- setup of the HR, FFT at a standstill ;
- setup of one 150/500l/min hose at 120m or two 150/500l/min hoses at 60m ;
- extension of the 150l/min hose.

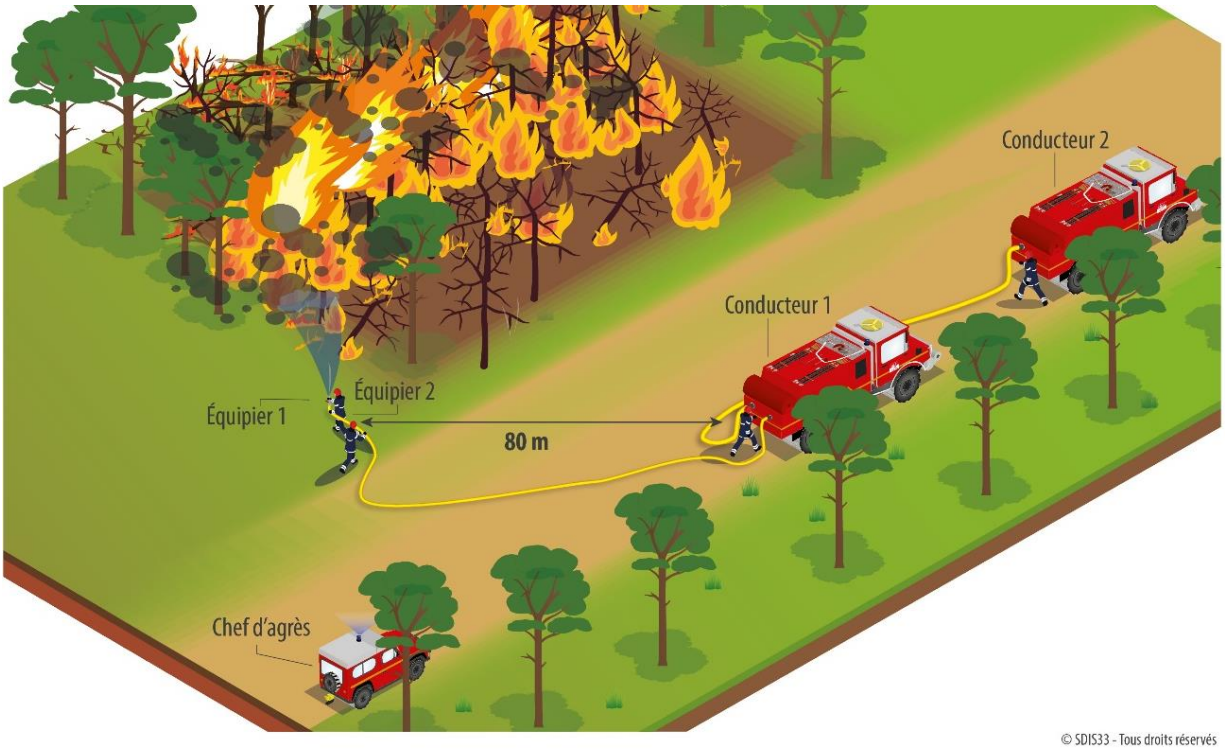
Their setup is carried out based on the Forest Fire Operation Unit (1 FCV, 2 FFTs, 5 staff). Only one FFT in the unit is used to supply the setup. The second FFT completes the apparatus in terms of staff and equipment. It guarantees constant supply.

In all cases, the FFU Commander will:

- Identify the zone of action and determine the attack point;
- Determine the position of the FFTs;
- Guarantee permanent water supply;
- Guarantee the connection between the staff and his hierarchy.

⇒ Setup of the Hose reel – FFT At A Standstill

This manoeuvre is limited to the setup of the hose reel equipping one of the FFTs. Order of the FFU Commander (Fire Truck Commander): ***«For the setup of the RHR of FFT FFT 1 or 2, in reconnaissance »***



FFT1 DRIVER	TEAM MEMBER 1	FFT2 DRIVER	TEAM MEMBER 2
Positions the FFT 1 at the place instructed by the FFU Commander		Positions the FFT 2 at the place instructed by the W`FFU Commander	
Informs the FDF Unit Commander and the Hose-Sprayer when the tank is ¾ empty. When the tank is empty, he disconnects the last extension and gives the semi-hose coupling to the FFT2 driver	Takes the hose from the rotating reel	If necessary, helps to install the hose of the rotating reel of the FFT 1 by positioning himself appropriately on the setup	Helps to install the RHR by placing himself at the first hose coupling
	Pulls the hose reel to the point of attack	Supplies the setup [26] as soon as the FFT1 driver hands him the semi-hose coupling	Helps the hose-sprayer and, if necessary, guarantees contact with the driver
	Pursues extinguishing		Monitors the setup

⇒ Setup of one 150/500l/min hose at 120m or two 150l/min hoses at 60m

This manoeuvre helps the Forest Fire Unit establish a 500l/min hose up to 120 metres or two 500l/min hoses up to 60 metres. According to the FFT equipment (hoses on fixed reels, pack folded or on a reel), the role of the staff described below will be adapted.

Order of the FFU Commander: ***«For the setup of the 500 hose, XXX L/min flow, in reconnaissance »***

FFT1 DRIVER	TEAM MEMBER 1	FFT2 DRIVER	TEAM MEMBER 2
Positions the FFT 1 at the place instructed by the FFU Commander		Positions the FFT 2 at the place instructed by the FFU Commander	
Hands the 500 hose and two 45 hoses to Team Member 1 Places the first 45 hose on the ground, hands a semi-hose coupling to Team Member 2	Receives the semi-hose coupling form the driver, rolls out the first hose towards the point of attack while carrying the tow other hoses and the 500 hose		Helps to install the hoses prepared by Team Member 1
Connects the other semi-hose coupling to the discharge exit point	Places the second hose on the ground, connects the two hoses and progresses towards the attack point Same for the rd hose if necessary	Supplies the setup of the FFT as soon as the driver hands him the semi-hose coupling	Helps the hose-sprayer and, if necessary, guarantees contact with the driver
Represses the setup by applying the pressure indicated by the FFU Commander	Once he has arrived at the attack, he connects the 500 hose and gives order to supply the setup		Monitors the setup
Reports to the Unit Commander and the hose-sprayer when the tank is ¾ empty	Attacks the fire hot spot while in contact with driver and the FFU Commander		If a 2nd hose is set up on a FFT, he proceeds like Team Member 1
When the tank is empty, he disconnects the semi-hose coupling		If a 2nd 500 hose is set up on his FFT, he	

[26] According to the configuration of the location, the FFT 2 may be able to directly fill the tank of the FFT 1 (see diagram), and carry out the norias.

of the discharge exit point and hands it to the driver of the FFT 2		proceeds like the driver of the FFT 1	
Fills the tank at the water spot indicated by the FFU Commander			

⇒ Extension of the 500l/min Hose

Order of the FFU Commander: **« Extension of the *500 hose*»**

The FFU Commander indicates the new attack point and helps, if necessary.

FFT1 DRIVER	TEAM MEMBER 1	FFT2 DRIVER	TEAM MEMBER 2
Closes then opens the discharge valve upon order of the hose-sprayer	Gives order to close as soon as the hoses are set up		Is handed the hose(s) by the driver of necessary
	Disconnects the 500l/min hose, goes to the new attack point and connects the 500l/min hose		Sets up the hose reel with the help of the FFU Commander, if necessary. Connects the setup once the 500 hose has been disconnected by Team Member 1.
	Gives the order to supply the setup		

4.2. Manoeuvres of the Forest Fire Unit

The FFU Commander can:

- Either engage all the unit's staff on manoeuvres on foot;
- Or carry out a setup manoeuvre for the isolated FFT jointly with a manoeuvre on foot.

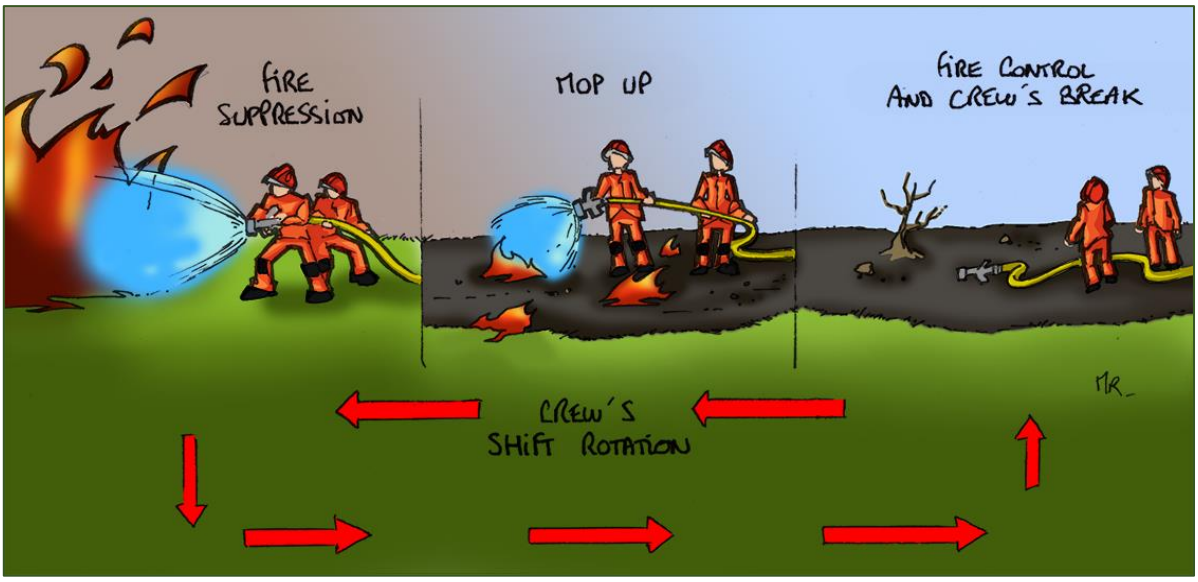
© SDIS 64

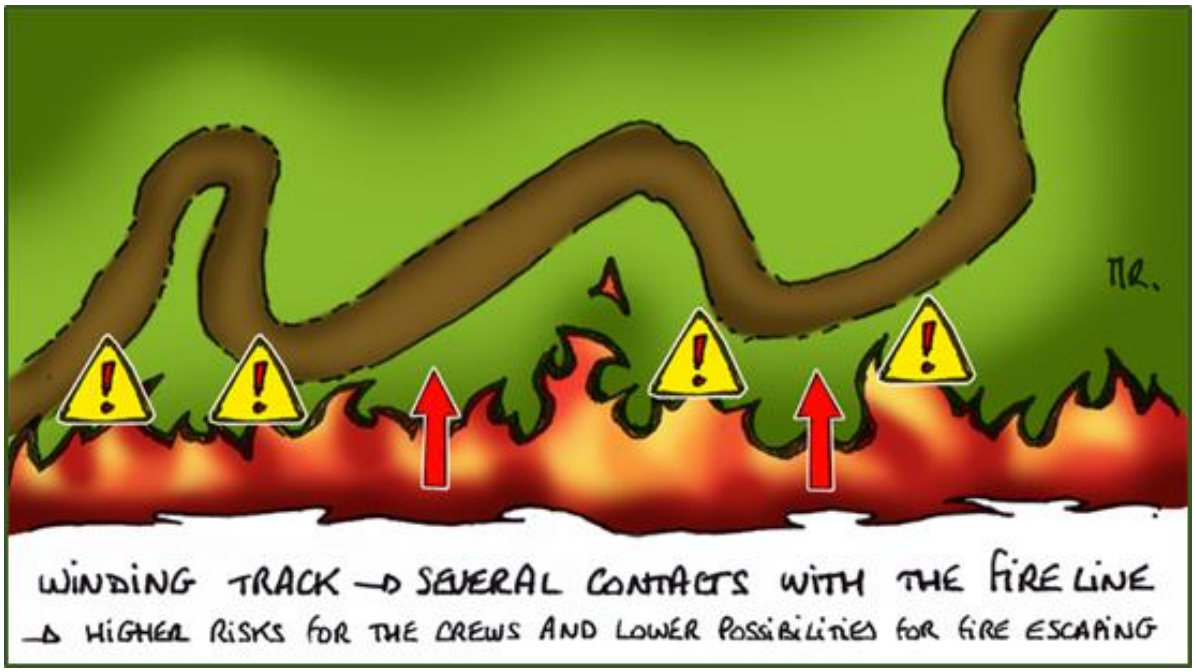
He must always keep visual contact with the two vehicles of the unit which must not be separated during the operation.

Carrying out extinguishing on foot with fire beaters, pump buckets and foresting tools requires all or part of the unit's staff.

The entire unit can treat up to 100 metres of fire front. The staff shares the pump buckets, fire beaters, pioneering tools, fire rakes and appropriate foresting equipment according to the nature of the terrain.

One of the recommended techniques is to open up a support path below the fire and proceed to extinguish it when it reaches the path. The terrain and slopes can be used for support.





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4.3. Strike Team Manoeuvres

Offensive manoeuvres (head-on direct attacks, direct flanking attacks, direct attack through the flank) enable the teams to go and meet the fire. In order to do this, there are **4 types of setups**:

- Setup of four 500 hoses up to 120m;
- Setup of two 500 hoses up to 280m;
- Setup of one 500 hose or two 150 hoses up to 440m;
- Setup greater than 440m (extensive length).

4.3.1. Setup of four 500 hoses up to 120 metres

Situation: the idea of the manoeuvre will be to go and set the fire with four 500 hoses with the risk of a lack of water if you are not supplied in time.

Tactical conditions: emerging fires, staking, head-on direct attack

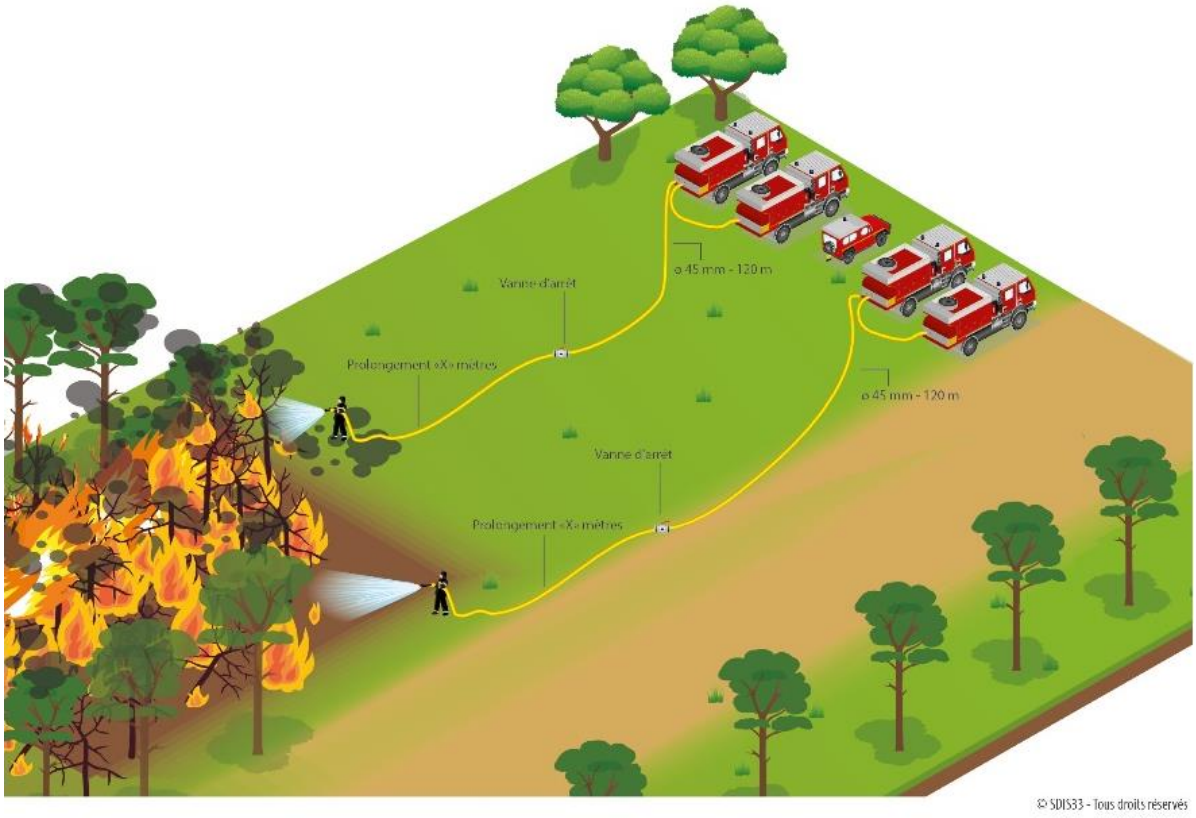
Principle: this manoeuvre is carried out simultaneously by 4 vehicles. Each Fire Truck Commander is in charge of setting up one 500l/min hose.

The distance covered by the strike team: 320m in staking and 100m in head-on direct attack

Order of the Strike Teams Commander : « For the setup of four 500 hoses, XXX l/min flow, set up»

If the manoeuvre does not require the setup of 4 hoses, the Strike Teams Commander will choose the Fire Truck Commanders in charge of the setup and those in charge of the supply.

4.3.2. Setup of two 500 hoses up to 280 metres



The Strike Teams Commander selects the FFTs for the setup of two 500 hoses.

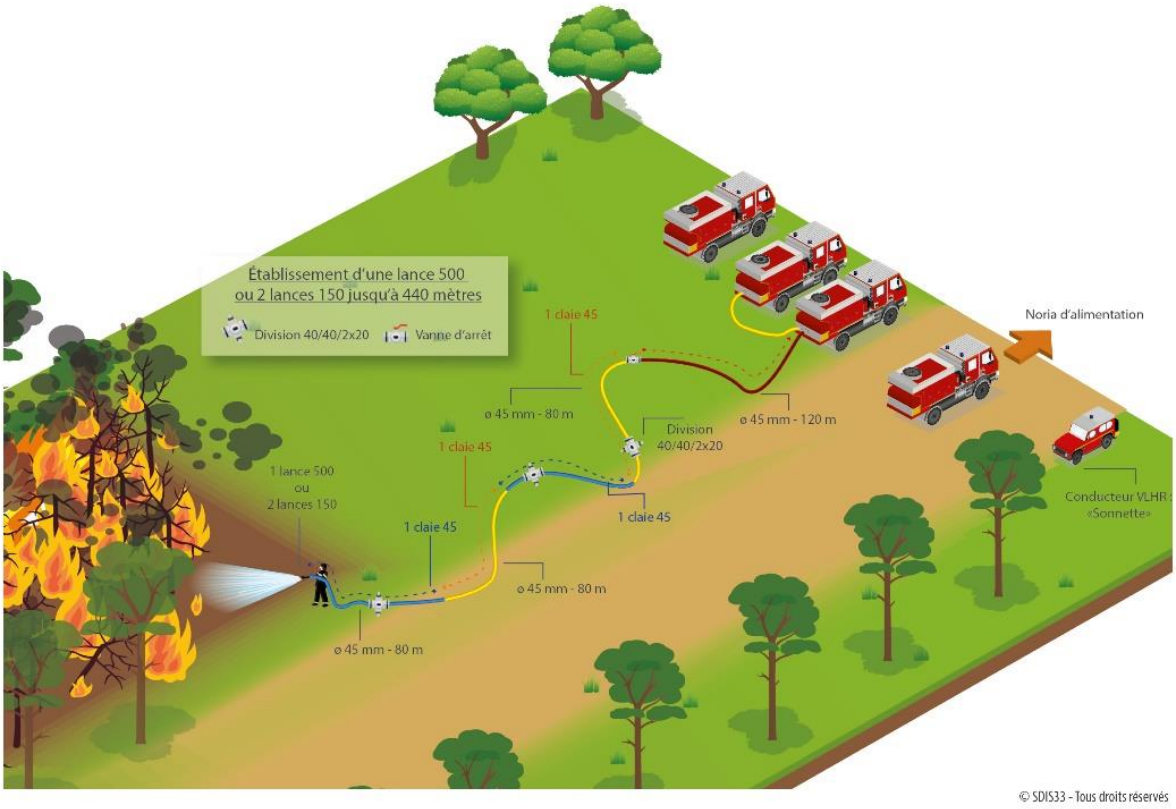
If possible, those with the greatest capacity and/or the best pump index should supply the setups. The other vehicles carry out the water supply.

Order of the Strike Teams Commander: ***« For the setup of two 500 hoses, XX* L/min *flow by the FFTs … at more than 120 m, set up»***

STAFF	EQUIPMENT AND EXECUTION
Staff of the FFT 1 and 3	Set up one 500 hose each.
Fire Truck Commander of the FFT 1	Orders the paired teams in FFT 1 and 2.
Fire Truck Commander of the FFT 3	Orders the paired teams in FFT 3 and 4.
Fire Truck Commander of the FFT 2	Offers his paired partner to the Fire Truck Commander of the FFT 1 Offers his help to the Strike Teams Commander.
Fire Truck Commander of the FFT 4	Offers his paired partner to the Fire Truck Commander of the FFT 3 Organises and monitors water permanence.
Drivers of FFT 1 and 3	Helps with the setup. Proceeds with supplying the setups.
Drivers of FFT 2 and 4	Supplies the pumps if FFT 1 and 3. Carries out the noria if necessary.

If the manoeuvre does not require the setup of 2 hoses, the Strike Teams Commander will choose the Fire Truck Commanders in charge of the setup and those in charge of the supply.

4.3.3. Setup of one 500 hose or two 150 hoses up to 440 metres



Tactical Context: fires are unreachable by vehicle

Principle: carrying out this manoeuvre requires all the staff of the vehicles.

Foresting equipment and backpack fire hose racks are used to help carry the equipment to the site.

The Strike Team Leader can have one 500 l/min hose or two 150 l/min hoses set up from the FFT with the largest capacity and/or the best pump index.

Order of the Strike Teams Commander: ***« For the setup of a 500 L/min flow hose up to 440 metres, (or two 150 l/mm hoses at 500 m). In reconnaissance »***

ROLE	STAFF	EQUIPMENT	MISSIONS
Commandment	**Strike Team Leader**	FCV Portable Radio Maps, Binoculars	Identifies his action zone. Commands the general manoeuvre. Selects the setup commanders, the point of gathering for the equipment and the supply. Identifies the attack point(s). Sets up the warning bell if necessary.
Warning bell	**Selected Fire Truck Commander**	Binoculars Portable Radio means	Places himself at the point indicated. Guide the teams' progress. Carefully monitors the fires progress in order to guarantee the operational staff's safety.
Supply	**FFT 4 Fire Truck Commander**	Radio means	Guarantees water permanence Manages the gathering of equipment
	FFT Drivers	3 FFTs	Manages the norias or the supply
Setup	**FFT 1, 2 and 3 staff** **Paired partner or team member of the FFT 4 (depending on the type of vehicle)**	Backpack fire hose racks Hoses Connecting pieces	Create an equipment park Install the first 120m of ø 45 mm hoses Place a water tap at the beginning of the 120m setup Extend the setup Add a division every 80m During set up, they monitor that the water rises to the hose reel progressively
	Selected Fire Truck Commander		Orders the water-setup manoeuvre

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4.3.4. So-Called Extensive Length Setups Greater Than 440 metres

Extensive length setups require additional equipment such as backpack fire hose racks, foresting equipment, motor pumps, hoses, etc.

Their set up is specific to restrictions of the terrain and equipment available in each fire department.

The forest fire division with a valve keeps the setups on positive slopes under water in case there is an accidental puncture in the hoses as well as the setup of one or two 150 hoses to protect the setup of hoses and/or treatment of the boundaries.

The two vehicles with the best pump index should be used, in a 'serie', to compress the setup.

The other vehicles carry out the norias.

When ordered by the IC, additional means can be used to help set up this hose reel (HELITACKs, SRSTs, forest fire support Strike Teams, roll-off containers).

ROLE	STAFF	EQUIPMENT	MISSIONS
Commandment	Strike Team Leader	FCV Portable Radio Maps, Binoculars	Identifies his action zone. Selects the point of gathering for the equipment. Selects the leaders among the Apparatus Commanders (Warning bell, penetration, supply and setup) and makes up the team according to execution restrictions (vegetation, topography…). Selects attack point(s). Activates the warning bell if necessary. Indicates the water point and safety zones.
Warning bell	Selected Fire Truck Commander	Binoculars Portable radio Means	Positions himself in an appropriate and safe place, and reports to the Strike Teams Commander. Guides the teams' progress. Carefully monitors the fires progress in order to guarantee the operational staff's safety.
Penetration	Selected Fire Truck Commander and staff	Radio means Foresting equipment Equipment to help make progress (commands…)	Creation of appropriate and safe pathways. Creation of equipment-gathering zones. On order, creation of safety zone(s).
Supply	Selected Fire Truck Commander	Radio means	In charge of water permanence (setup supply and vehicle supply). Manages the equipment-gathering point Organises the norias.
	FFT drivers	4 FFTs	2 FFTs in charge of the norias. 2 FFTs in charge of setup supply.
Setup	Strike Teams Deputy Commander	Radio means	Orders the setup manoeuvre. During set up, monitors that the water rises to the hose reel progressively.
	Selected staff	Motor pump(s) Backpack fire hose reels Hoses Connecting pieces	Create an equipment park Install the first 120m of ø 45 mm hoses Extend the setup Add a division every 80m.

5. Protective Manoeuvres

Protective manoeuvres are applicable both to FFUs (or FFUHs) and MSTs or to the wildland fire means.

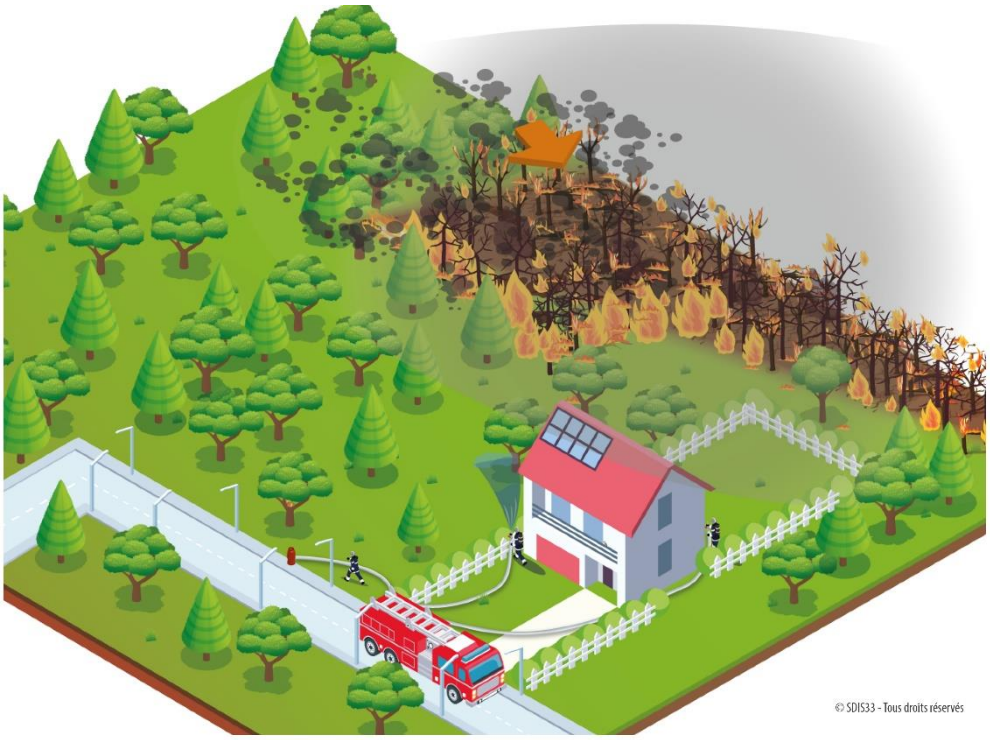
5.1. Protecting sensitive spots

During sensitive spot protection missions (SSPs), the IC or his representative will carry out if necessary, a reconnaissance in order to limit exposing his staff.

Whenever possible, the team will be supported by water points to reinforce its water action and its permanence.

WUI protection © SDIS 33

WUI protection externally by a strike team © SDIS 33



WUI protection using an urban water pump truck © SDIS 33

As much as possible, the vehicles are positioned on the opposite end to the fire.

According to the risks, the Team Commander will adapt his manoeuvre to the situation. He will apply and enforce safety measures. The action imposed may include:

- Confining the population ;
- Evacuating the population in particular in light-structured homes;
- Closing windows and shutters;
- Searching for potential water points;
- Setting up an appropriate hydraulic device according to the fire's virulence;
- Adapting the staff's outfits according to the operational situation;
- Etc.

5.2. Support Lines

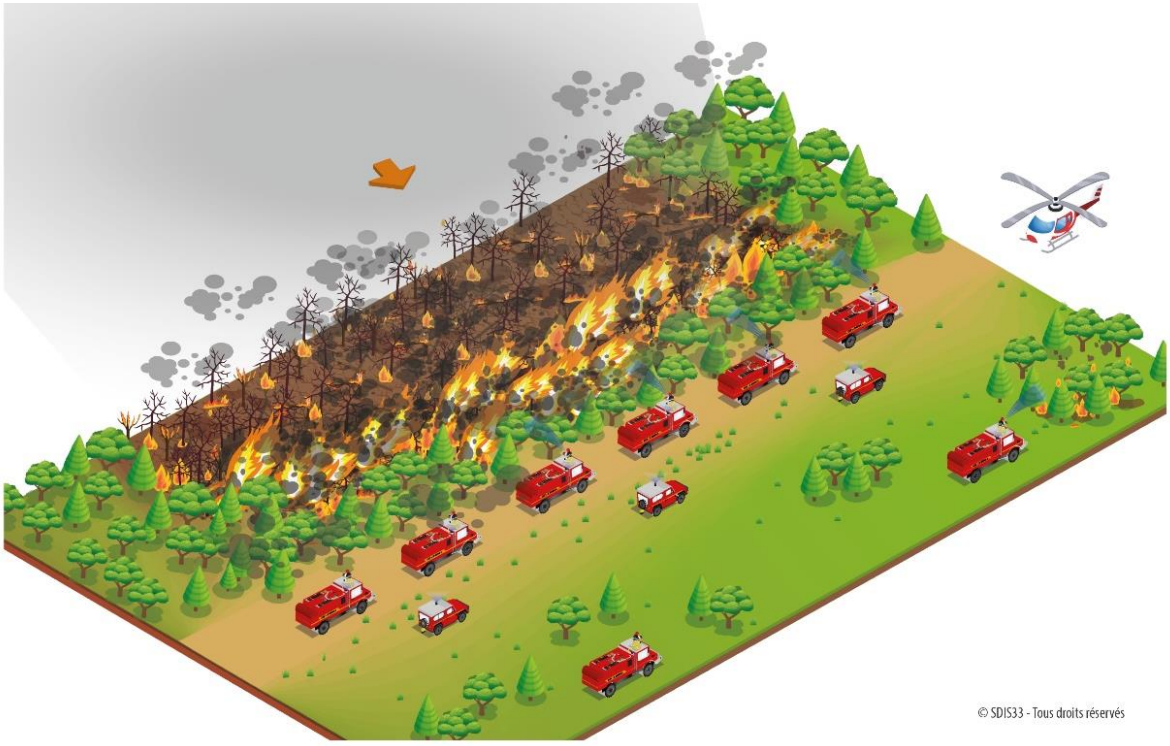
Support lines are used to stop the fire. They should, generally speaking, be carried out by several MSTs, making sure the operation zone effectively permits this major aim to be achieved.

The fire-fighting means **may be grouped**, with or without the support of large capacity wildland fire trucks, in order to set up a support line.

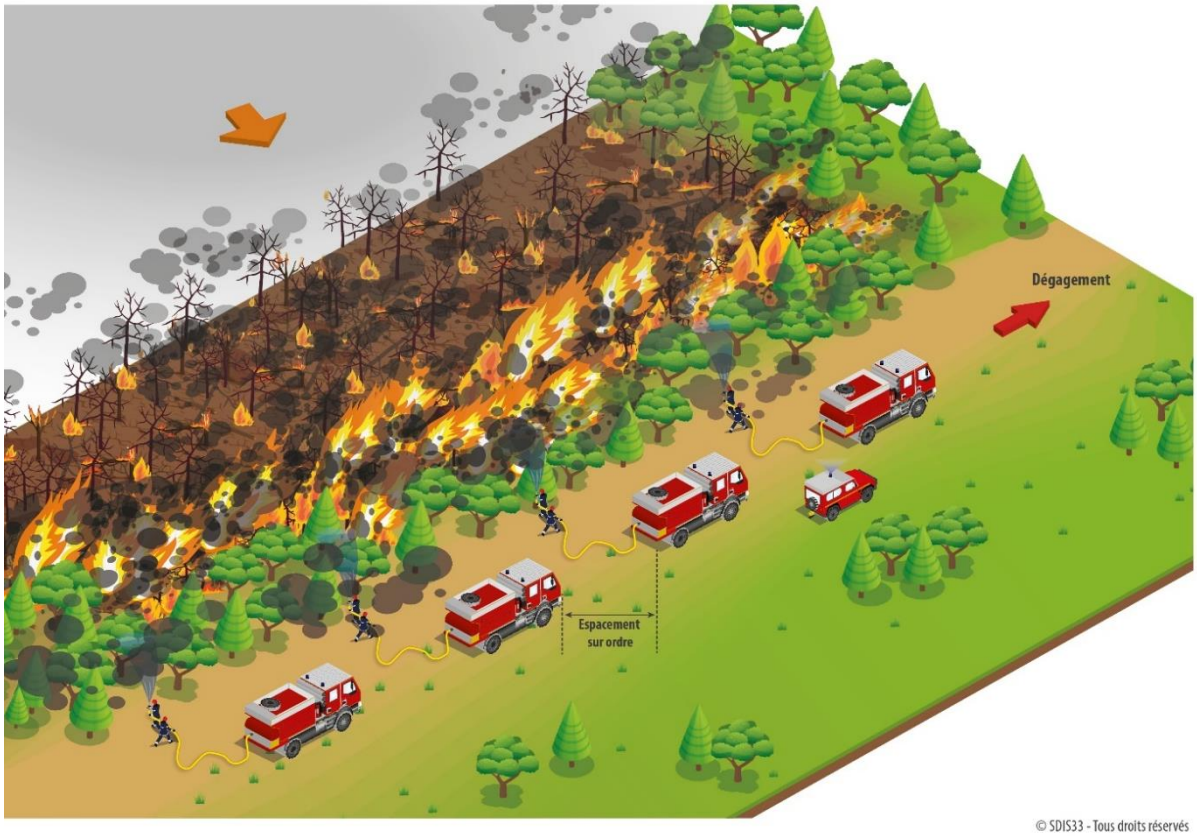
The set-up of a support line by order of the IC requires considerable anticipation in terms of important means to be gathered and set up. It is carried out over several hundred metres and often combined with the action of aircraft.

5.2.1. Static support lines using FFUs

Hoses (or cannons) are set up in the cabin, the hose-sprayers work through the open roof. The device thus maintains its mobility.



5.2.2. Static support lines using strike teams



The vehicles are positioned along one of the sides of the track (if possible, the one opposite the arriving fire) leaving a free passageway. They are spaced out regularly and appropriately according to the situation. Each FFT sets up a 500- minimum hose and a number of maximum hoses determined by the IC or his representative.

The Division supervisor, the Strike Team Leader and the Fire Truck Commanders monitor for possible spot fires which would jeopardise their safety.

For this purpose, the vehicles set up RHRs on the opposite side from the flame front. Opening the hoses is done following the orders of the Division Supervisor (or, in his absence, the ST Commander).

If part or all of the vehicles are equipped with cannons, these should be used in priority.

Order of the Strike Teams Commander: **« To execute a support line, park your vehicles on the right (on the left) every Xm, execute ».**

Manoeuvre carried out by each FFT

STAFF	EQUIPMENT AND EXECUTION
Strike Teams Commander	Monitors the safety of the device. Orders the opening of the hoses. Reports.
Fire Truck Commander	Orders the setup of a 500 hose. Helps with the setup of a 500 hose. orders the opening of the water following the order of the Strike Team Leader. Acts as a double, of necessary, to the hose-sprayer. For vehicles equipped with a cannon, orders its use or that of a 500l/min hose following the order of the Strike Teams Commander. Sets up the RHR in forecast of any spot fires. Monitors the radio. Monitors the safety of all the attacking staff.
Team Member 1	Sets up the 500l/min hose. Pursues extinguishing
Team Member 2	Sets up the RHR by placing to on standby behind the vehicle with a sufficient reserve. Treats any spot fires. Protects the vehicle.
Driver	Parks, ready for departure, according to the distance determined by the Strike Team Leader. Leaves the passageway free. Opens the water following the order of the Fire Truck Commander. Monitors the radio.

The Strike Teams Commander makes sure there is a safety zone between the vehicles and the fire front, and he tries to make sure the vehicles are positioned as far as possible from the vegetation.

5.2.3. The Dynamic Support Line

The vehicles advance in a convoy, while attacking with 500 l/min minimum hoses or cannon hoses from the FFTs (opened upon order).

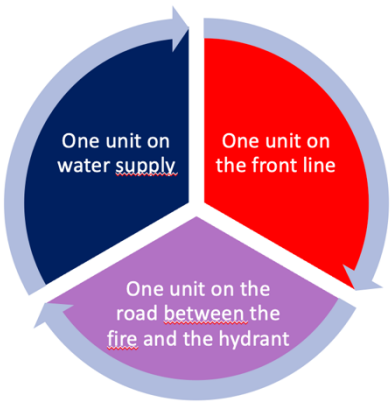
During the dynamic support line, the device keeps its mobility while carrying out its movement using 500l/min minimum hoses or cannons from the FFTs.

6. Supply Manoeuvres

These manoeuvres aim to guarantee water permanence on the operation. To do so, the IC must make sure an operational unit dedicated to this mission is constantly present.

6.1. Supplying the unit (FFU/ FFUH)

The theoretical organisation of a water point can be illustrated according to the following diagram:



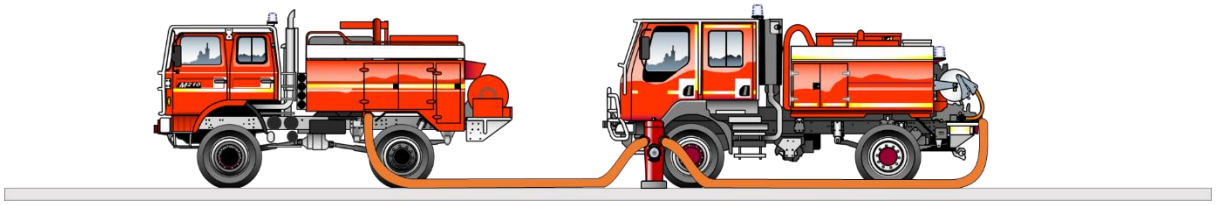
Principle of organisation of a balanced noria means aimed at not abandoning the fire by lack of water.

6.2. Supplying The Strike Teams

6.2.1. Simultaneous supply of 2 FFTs

In some cases, 2 FFTs will need to fill their tanks at the same time on the same water hydrant.

Each driver unrolls the hose, the diameter of which depends on the hydrant and supplies his vehicle.



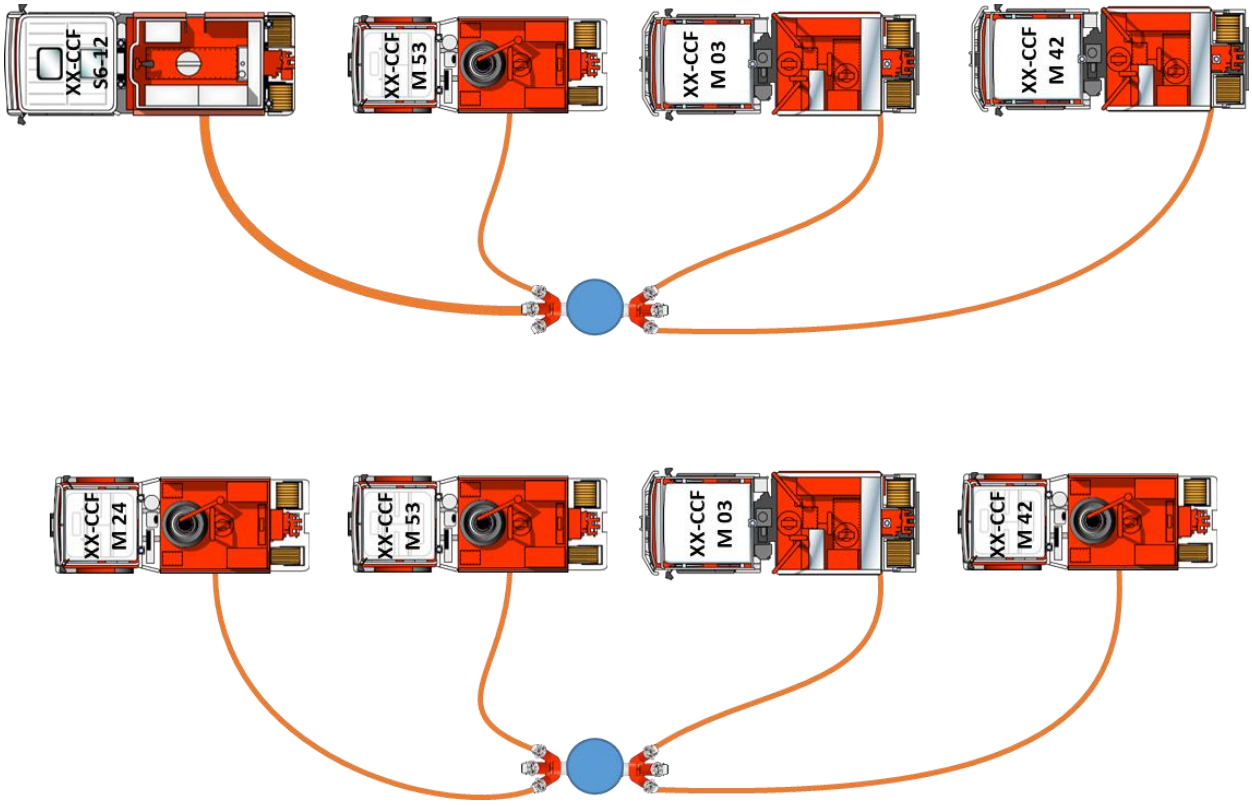
Simultaneous supply of 2 FFTs
© Philippe Granados - ENSOSP

6.2.2. Simultaneous supply of 4 FFTs from a Water Hydrant

Each driver unrolls a Ø 45mm hose. The 4 FFTs are supplied at the same time.

The manoeuvre may be carried out with Ø 70mm hoses, depending on the type of hydrant.

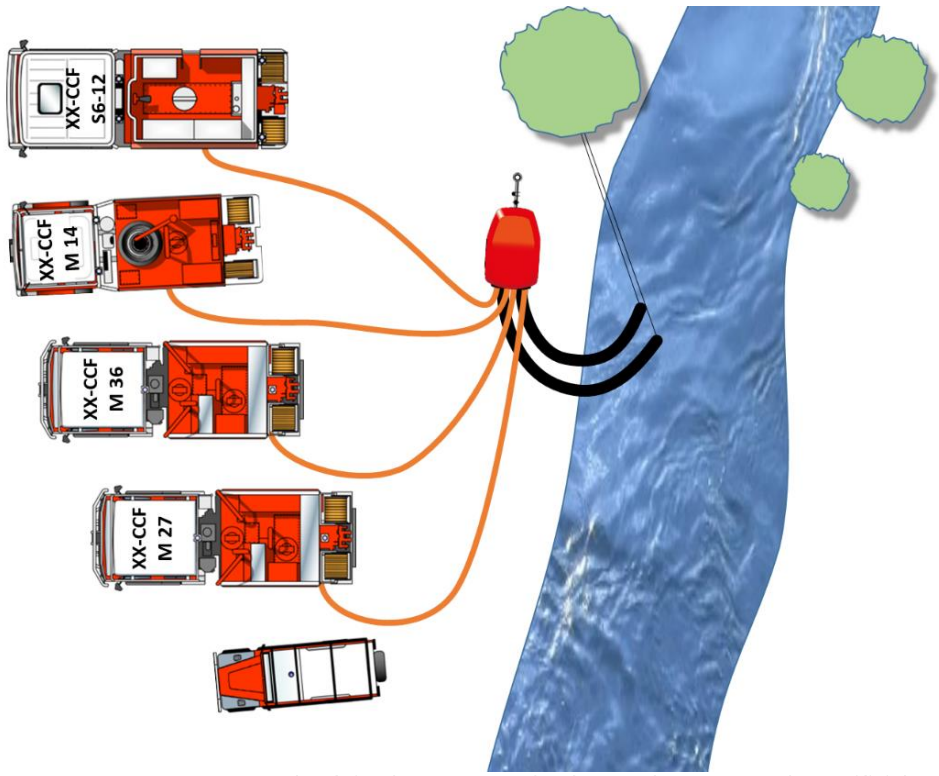
Order of the Strike Teams Commander: « **Supply the 4 FFTs on the pillar or hydrant»**



Simultaneous supply of 4 on a pillar or water hydrant
©Philippe Granados – ENSOSP

6.2.3. Simultaneous supply of 4 FFTs from a natural or artificial water spot

Supplying from a water spot can be carried out by pumping with a FFT or using another device (portable motor pump, floating or immersed motor pump, etc.).



Example of simultaneous supply of 4 FFTs from a natural or artificial water spot.
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CHAPTER 5 - Specific Provisions for Wildland Fires

Aurélien Dheilly © SDIS 60

When the Operations Commander finds himself in an unusual context with little topographical information, his challenge will lie in evaluating the stakes and organising the fight to determine the priorities.

This chapter does not address forest fires, scrubland fires or bush fires, except for those in mountain areas which have specificities to them which will are addressed.

Nonetheless, when there is a considerable threat of potential progress, most of the rules concerning forest fires apply in an identical manner:

- Use of aircraft to help understand the progress of the fire and locate the stakes as well as the means in action;
- Early request for aircraft, fighting means on land (attack and supply vehicles, preferably off track) and health support, as soon as the IC decides that the fire cannot be controlled in its initial stage and with unfavourable weather and dryness conditions;
- Support from police forces for evacuations ordered the IC, any water supply norias and markings, smoke usually blinding the roads;
- Presence with the IC of people who know the area: landlords, elected representatives, associations, etc. to make up for the lack of information;
- Use of collective protection devices,
- Wearing Personal Protective Equipment. Special attention should be nonetheless paid to the risk of hyperthermia in the staff in action.

1. Farmland Fires

© Djamel Ferrand – DGSCGC

1.1. Analysing the Zone of Action (ZA) and Reconnaissance

Just like for forest fires, analysing the ZA should be anticipated during transit. Nonetheless, for farmland with changing configurations and susceptibility to fire from one year to the next according to crops, it will be very useful to complete it onsite with the farmer who will indicate the fire-resistant zones (sunflower, corn, alfalfa crops etc.) for support as well as indicating the means he can provide (disks etc.).

Along with a reconnaissance, if possible, with the farmer, this analysis will help anticipate:

- The service area (type of roadway, difficult pathways, obstructions…);
- The stakes (habitat, farm buildings, various infrastructures);
- Water resources (FH)[27] ;
- Local weather conditions.

1.2. Rescue and Safety Operations

As soon as he arrives on location, the IC's priority is to order the rescue of people in danger using all available means.

Animal rescue may be the next priority; however it is the IC's responsibility to rapidly analyse the benefit/risk ratio before sending in his teams.

[27] Hydrant

1.3. The Attack

If access and circulation are possible and being careful with drainage ditches (risk of overturning):

- Assess the fire;
- Ask the farmers concerned to set up tools (in particular disks, presenting the best compromise between going deep in the soil and being quick), to create bare soil zones of 10 to 20m in width, wherever possible without exposing the vehicle driver (sides far enough form the front, back of the feu…);
- Preferably carry out offensive manoeuvres in direct flanking attacks (from the back zone, vehicle(s) on wheels;
- Penetrate from the burnt zone going into the burning areas with the staff inside the vehicle to reach the boundaries;
- Proceed to attack the fire front from behind, using spray nozzles, while driving. If the hose-sprayer is not walking alongside the vehicle, he must be hooked up to the FFT to avoid the risk of falling;
- Save water, favour speed and mobility to be able to respect an important timeline. Considering the small depth of the fire front, preferably use the RHR whenever the power of the fire does not require a VFN;
- Use artificial firebreaks wherever available (roads, ploughing, part of the fire created by farming vehicles etc.) or natural firebreaks (rivers, vines, green meadows, corn fields, etc.);
- Launch the vehicles progressively to preserve water permanence.

1.4. Special Cases

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- Thatch Fires : these are less virulent and can be treated using additional techniques to the ones described in this GOT, such as using « water wall nozzles » attached to the FFTs, to guarantee « dynamic» extinguishing from the burnt zone (attack through side-on

penetration). Furthermore, considering the reduced power, RHRs will be systematically used, with the vehicle driving.

- Vines covered in grass– Olive Orchards – Truffle fields : unlike cereals, these crops are generally not penetrable with fire fighting vehicles, however that have a low flammability (more often than not, only the grass participes in the combustion). Operations held in these areas will be carried out from peripheral service areas. These are usually smaller plots, separated by obstacles (low walls, terrasses, ditches etc.), the difficulty lies in carrying out continued action from one plot to the next.

© Bastien Guerche - DGSCGC

Miscanthus: considering the calory potential of this grass used for biomass production (comparable to that of high scrubland), the same rules as for wildland fires will be applied. In the absence of sufficient means and considering the contained character of this crop, the means of fire fighting action will be limited to the periphery of the plot concerned.

Action to be taken:

- Upon arrival on location, immediately review the situation with the farmer to define a common strategy. **Use the farming means available on site** (tractors and stubble ploughs, etc.), in order to assess the fire or circulate around it ;
- **Penetrate the field through the burnt zone ;**
- Go up to the fire front with all staff in the cabin ;
- While driving, proceed to attack the fire front from behind using spray nozzles. Proceed to attack the fire front from behind, using spray nozzles, while driving. If the hose-sprayer is not walking alongside the vehicle, he must be hooked up to the FFT to avoid the risk of falling ;
- Use artificial firebreaks where possible (road, ploughing, part of the fire created by farming vehicles, etc.) or natural firebreaks (rivers, vines, green meadows, corn fields, etc.) ;
- When the 1st FFT is empty, the next one picks up in order **to guarantee continuity in the attack ;**

- The hose-sprayer must return to the vehicle's cabin when the latter heads to the water spot;
- Considering the speed of the spread of this type of fire, the vehicles must act as soon as they arrive (there is no point trying to proceed to attack in a constituted group);
- **Never** attack a climbing fire front from above.

2. Fires on Abandoned Land

© Julien Rousset – SDIS 21

These provisions treat fires which are likely to develop on land made up of plots of ancient fallow areas, crops and thickets or hedges.

2.1. Analysing the Zone of Action (ZA) and the Reconnaissance

The specificity of these environments lies in the morphology of the territory (obstacles) and the uniqueness of the fires, which spread without following the rules studied in the development of wildland fires.

The absence of a dedicated cartography for the Defence of Forests Against Wildfires (DFAW) and of the usual partners present in the forest zone (communal committees, NFO patrollers…) limits the actors' ability to analyse the Zone of Action and the commandment of rescue operations. Water resources may be present, however that may not always be available for fire brigades (irrigation networks, if they are still exploitable).

Considering these parametres, the fires may spread very rapidly and impact people and their possessions just as rapidly. Particular attention should thus be paid to collecting and treating the information and assign a sufficient volume of staff to these missions very early on.

2.2. Rescue and Safety Operations

The IC always gives priority to rescue operations, even if it is worth the reminder that the notion of abandoned farmland any abandoned crop or breeding activity. However, it is

important to bear in mind that abandoned breeding buildings may be used by squatters or as precarious habitats.

2.3. The Attack

The operational technique in matters of fires underlines the fundamental elements of the General Conduct of Operations (GCO), with a differentiation which lies essentially in the attacking techniques.

The manoeuvres of the FF strike team are not necessarily adapted to the typology of these fires during which mobility should be favoured, and this could involve using isolated means.

The latter are collected, later on, by the Strike Team Leader, who may consequently be attributed more FFTs than the standard strike team if this is justified by their position. In any case, the position of all vehicles must be known to the IC and the Commanding post.

Each vehicle has significant autonomy, it is important, even more so than in the context of Strike Teams actions, that each Fire Truck Commander evaluates his vehicles capacity to carry out the required action (crossing, progress, autonomy, safety and fire-protection).

3. Fires in Suburban Interfaces

© Bastien Guerche -DGSCGC

The specificity of fires developing in these zones lies in the fact that protecting the human and building stakes is more important than the fire fighting action (even though they are often complimentary) and they use up most of the available means. Furthermore, use of aircraft is often very limited.

3.1. Analysing the Zone of Action (ZA) and Reconnaissance

This will focus mainly on the key sensitive points of this type of zone :

- The thoroughfares providing access to the zone;
- Water permanence, in particular to protect sensitive spots;
- Locating all sensitive points under threat:
- The possibility (or absence of possibility) of putting occupants in safety; this is the rule when the safety of the occupants is guaranteed in the home. As a reminder, the very large majority of deaths in forest fires occur when people move from one place to another;
- The conditions of a possible evacuation;
- The conditions by which fire fighting means can be used.

3.2. Rescue and Safety Operations

As soon as the IC arrives on location, he orders, as a priority and with all available means, the safety and evacuation action for those in danger whose homes do not guarantee protection. This will consistently be the case of hut or camping zones.

It will receive the support of all the available national police forces and/or local police forces, with which a perfect coordination will be required and made easier by the continued presence of a representative of the Commanding Post Services.

Early constitution of a one or more Personal Rescue (PR) Strike Teams may be considered, along with the creation of a Centre to support those concerned.

3.3. The Attack

If the fire rapidly reaches an interface zone and if The Strike Teams constitution leads to loss of time in the use of the means, it will often be necessary to use isolated FFTs to protective sensitive spots. They will be gathered later on by the Strike Teams Commander.

In the zones with an appropriate servicing area, the use of urban means will be considered, in order to save the use of FFTs to sectors with more difficult access and more exposed.

In municipal areas where specific infrastructures have been created (perimeter access, cleared and with a many hydrants) following a Forest Fire Risk Protection Plan (FFRPP), the use of a limited number of vehicles may be considered, to guarantee mobile and efficient action from the peripheral track, saving a large volume of FFT means.

In the other cases, the exposed front of the constructions will most often be accessed from inside the urban zone and the construction will be used as a shield from spreading if necessary.

In this configuration, the presence of fences, hedges, pools and various buildings makes it sometimes difficult to set up the required setups to protect the sensitive spot.

Once the fire front has passed, just liek all fires in homes, the means should not be used again on new stakes, without the Fire Truck Commander making sure any risk for the building has been set aside first.

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Some damage does in fact (at times even the entire destruction of some dwellings) occur as a consequence of the deferred combustion of pieces of the external frame or furniture in contact with vectors of the fire entering the building.

4. Vegetation Fires in Mountain Areas

Fires in mountain areas generally tend to occur between the beginning of winter and the beginning of spring, during a period when the vegetation is dormant and hygrometry is very low, in the presence of wind (northern or southern) and on the slopes most exposed to the sun (south).

They are more frequent during periods of foehn[28], during which the FDs concerned may be faced with several dozen fires at the same time, and they may not be able to take care of all of them.

4.1. Analysing the Zone of Action (ZA) and Reconnaissance

A reconnaissance (airborne if possible) will help establish a hierarchy in the operational priorities depending on the threatened stakes: villages, forest perimeters of Mountain Terrain Rehabilitation (MTR), strong surface development potential etc.

4.2. Rescue and Safety Operations

In the zones covered in hiking trails, taking into account human stakes may be the priority.[29]

[28] See GDO « Forest and Wildland Fires – Chapter 1

[29] See the fire in the Pyrénées-Altantiques, on 10th February 2000 which killed 5 and severely injured several people.

4.3. The Attack

© SIS 2B

From a certain altitude onwards, trees and shrub vegetation (heath, ferns) are replaced with a grass strata made up of lawns.

The fire will thus tend to slow down, helped by the presence at these altitudes by patches of snow and rocks. If it moves to the opposite slope, it will encounter a much more humid environment due to less exposure to the sun, this is a favourable factor to slow its progress.

The staff dropped off on these ZA or operating on land and walking up will need an autonomy in terms of food logistics (drinks and rations) as well as means of communication.

There are consequently two types of situations:

- Vehicles are able to drive close enough to treat the fire, using, if necessary, the extended length setup with a motor pump in relay;

- Vehicles can't drive close enough to treat the fire, backburns and aircraft means will be favoured (aircraft action with airdrops and/or use of HELITACK for the action of men on the terrain or closer to the fire) Fire bats, water carrying jackets, thermal blowers, rakes, will make up among others the basic equipment for the staff on the terrain during an offensive action.

The principle of treating fires remains identical to the offensive method of a direct flanking attack, the action starts at the base of the fire and consists in moving up to the head while reducing the sides.

The absence of a Water Hydrant can be compensated by the use of stream funnels or floating dams placed on a stream, combined with floating motor pumps.

It is important to note that in the specific context of mountain fires, and outside the risk periods, multidisciplinary evaluation teams may be set up locally.

These teams, under the orders of the IC who will be at least of a Forest Fire Column Commander level, can be defined locally and may be made up of:

- A backburn specialist;
- A forestry executive.

According to the analysis of the fire, the environment, the weather conditions (current and forecast), the operational constraints and the stakes presented by the situation, this team may suggest to the Safety Operations Commander (SOC) that part or all of the fire be left to spread freely.

In addition to protecting the operational potential of the fire fighting staff, these provisions will aim for the fundamental interest, in particular in the context of pastoral activity (principle of stubble burning/slash and burn) and the interest of preventing large fires (principle of land-use planning).

CHAPTER 6 - Specific Provisions for Wildland Fires

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Backburns comprise wildland fire fighting techniques, aiming at stopping the spread of a fire on the boundary, by depriving if it of its fuel. These techniques consist in lighting a secondary fire, in a support zone, facing a developing fire front, in order to deprive it of its fuel. When the two fires meet, the fire slows down in contact with the backburn, and extinguishes itself, as it runs out of fuel.

There are 2 backburns methods:

- Backburns on the fire line,
- Backburns for fire breaks improvement.

In compliance with article L131-3 of the Forestry Code, the Incident Commander may, even in the absence of an authorisation of the landlord or occupants, use backburns when required for fighting purposes.'

These techniques are applicable to all types of fires in plains and in mountain areas, both in summer and winter seasons, and they require light equipment such as drip torches, and extinguishing means according to the situation.

The pre-existing or created support zone to light the fire, must be reliable. It will be determined according to the configuration (path, trail, road, river, crop, track, highway, ...).

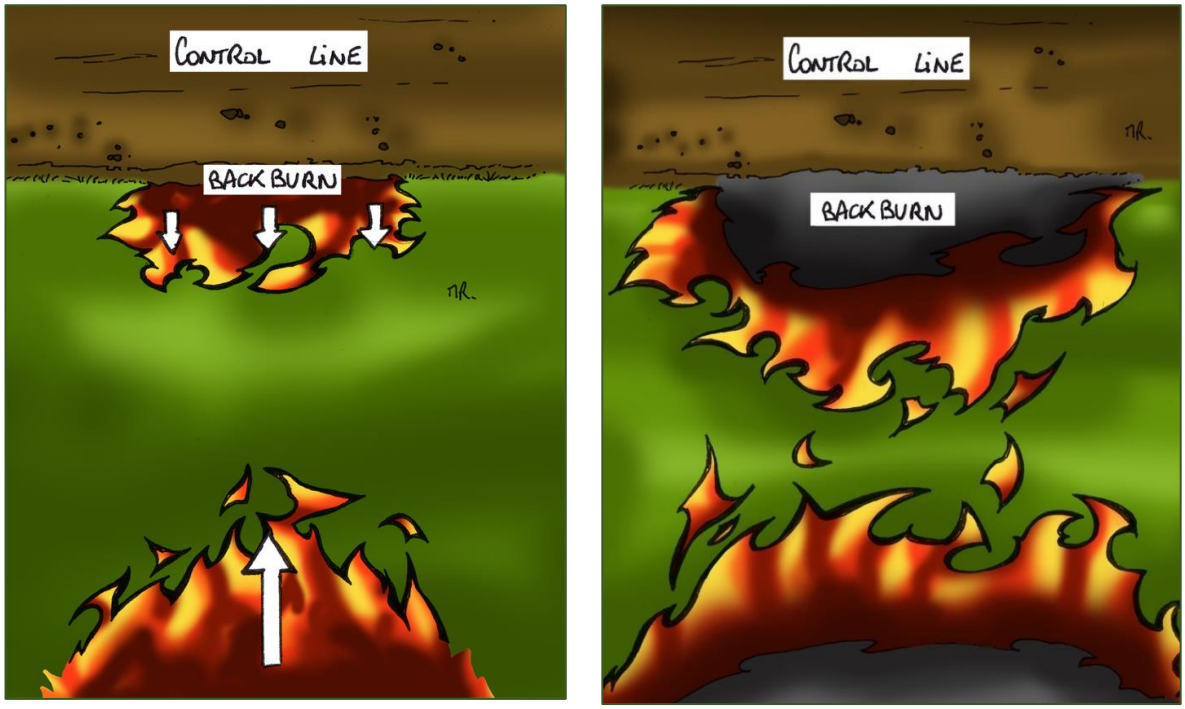
It may be widened or reinforced by placing a fire-retardant fence. Certain rules need to be followed, including :

- Use of trained staff (at least a backburn executive) ;
- Following safety regulations;
- Compulsory authorisation from the IC («backburn authorised») ;
- Transmitting information on the IC-authorised backburn to the Zone Commanders and the Air Operations Director to communicate with the water bomber aircrafts.

For good efficacy, the zone which is burnt by a backburn should be efficient enough that it can't be crossed by the initial fire front.

1. Backburns on the fire line

This is a secondary fire lit under control and facing a developing fire, in order to deprive the latter of its fuel on its pathway. Igniting is carried out from a previously determined support zone. When the two fires meet, they extinguish each other as they run out of fuel.



© Matthieu Robert – SDIS 85

This technique usually requires little extinguishing equipment, sometimes none at all. It is set up by the Backburn Executive, under the orders of the IC, and requires:

- A reconnaissance and analysis of various parameters: terrain, topography, vegetation, weather and a support zone to light the fire;
- Speedy reactivity and short-term anticipation to grasp the opportunities to ignite which may present themselves during the attacking phase;

The backburn is characterised by two essential, crossed parameters:

- The topography of the area it is developing on (flat terrain, upward slope, downward slope);

- Its location on the attack point (frontal, side-on, from behind).

1.1. Backburns Following the Type of Topography

1.1.1. Backburns on Flat land

This consists in igniting the vegetation on the same level as the fire. The topography does not interfere at all with the spread of the fire. The evolution of the fire is essentially linked to:

- Weather conditions (wind, temperature, hygrometry, sun exposure, etc.);
- Vegetation (nature, density, continuity, water content, etc.).

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	• Possibility of attacking a significant frontal fire. • Topography doesn't influence the wind and the spread.
	• Difficulty locating the fire to determine the igniting zone. • Work in smoke when there are strong winds. • Risks of spot fires or crossing depending on the fire and width of the support zone.

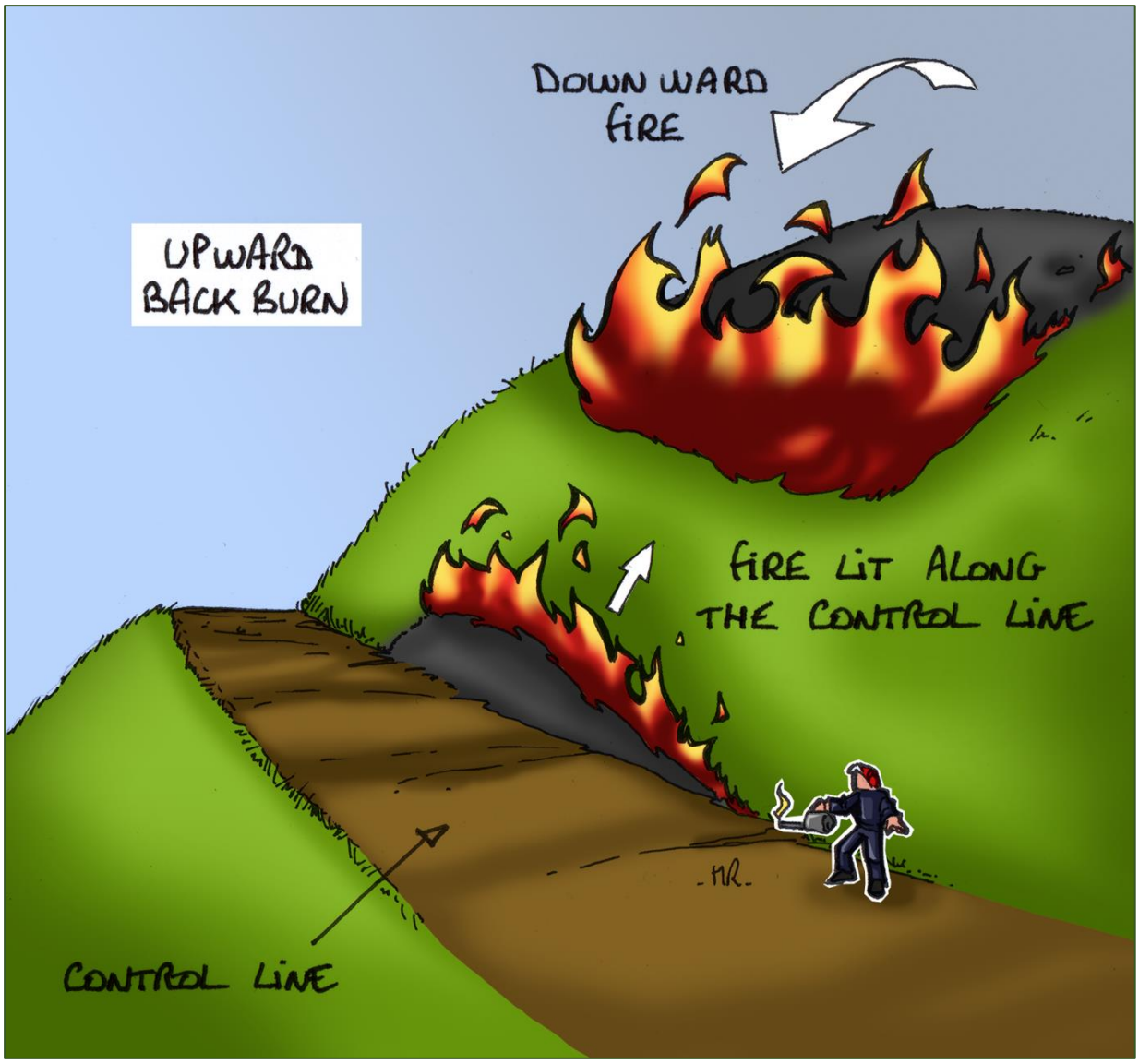
The backburn on flat land may or may not require extinguishing means to keep it under control.

1.1.2. Upward Backburns

The backburn will be used when there is a fire in a hilly or rough terrain, to counter a frontal fire progressing into its downward phase.

In that case, it will be lit higher than the determined support zone, in order for it to spread on the upward slope, towards the fire.

In this case, the backburn generally evolves faster than the fire, as it benefits from the favourable slope, generating a sufficiently wide burnt area in little time.



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	• Rapid progress of the backburn in the direction of the fire. • Limited risk of spot fires or crossing. • Comfortable working conditions for the staff. • Considerable savings in terms of means.
	• Potentially necessary to wait for the fire to be close before igniting.

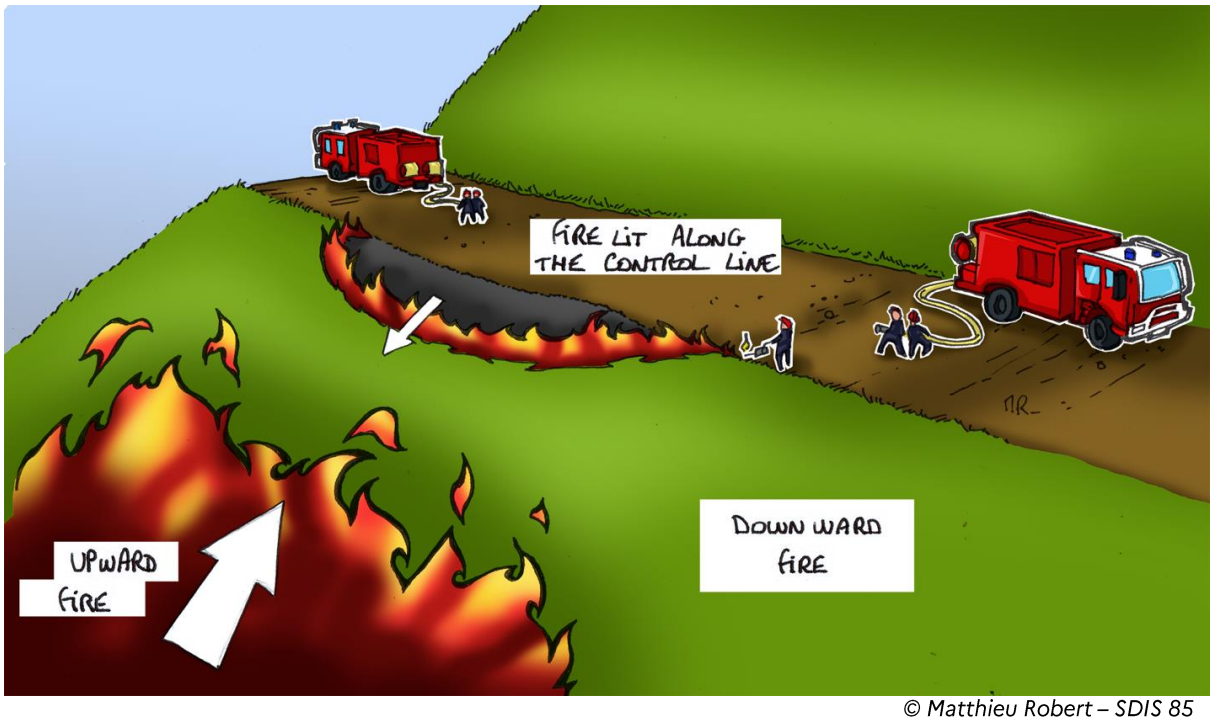
According to the intensity of the fire, the upward backburn may be set up with little to no means of extinguishing to keep it under control.

1.1.3. Downward Backburns

This one will be used for fires on hilly or rough terrain, to face a frontal fire evolving in its upward phase. Due to the downward slope, the backburn will evolve counter-slope, quite slowly and in a more unfavourable context.

The backburn will be lit below the determined support zone, so that it spreads in a downward phase, in the direction of the fire.

In this case, good anticipation is required in order to obtain a sufficiently wide burning zone.



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	• Technique adapted to fires with slow kinetics. • Efficient during fires in undergrowth.
	• Slow progress of the backburn. • Set up needs to be made a considerable amount of time before the fire arrives. • Considerable risks of spot fires from the fire on an upward slope. • Staff exposed to smoke.

1.2. Backburns According to On Site Location

1.2.1. Frontal Backburns

These will be used to stop the spread of the fire, at the front of the fire, on a principal or secondary axis.

Its action consists of igniting the vegetation along the pre-determined support zone, to attack and stop the fire front.

In this case, early anticipation and set up are required to take into account the speed of the fire's progress.

This method can provide very good results to limit the extensiveness of the damage and thus reduce the size of the burnt area.

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	• Possibility of attacking a high intensity fire front. • Clear and clean extinguishing of the head of the fire. • Rapid and efficient extinguishing. • Saving means
	• Good anticipation of the manoeuvre required. • Existence of a sufficiently wide support zone for igniting. • Work in the smoke. • Considerable risk of crossing. • Technique not adapted to high intensity upward fires.

1.2.2. Lateral Backburns

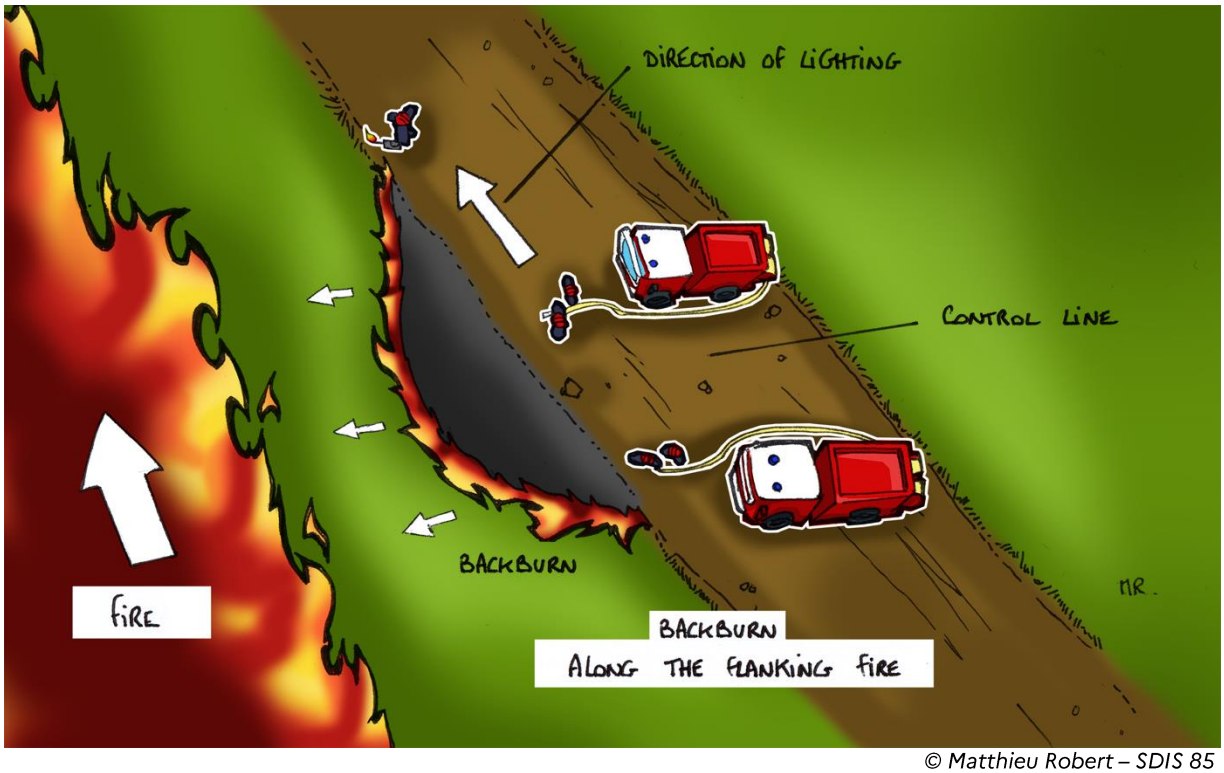
These shall be used to reduce or limit the widening of a fire by direct flanking attacks.

The action consists of igniting the vegetation along the pre-determined support area, to channel the side of the fire, entirely or partly, without it crossing the support area.[30]

Its progress will be made even faster by the fact that it will be ignited under an 'entering' wind, in the direction of the fire, or where it may benefit from a suction effect produced close to the ground by the fire.

However, its action will also be efficient with a different wind.

[30] It may be useful to proceed to ignite several parallel backburns at the front of the fire (See. The Fire of Montserrat, Bosc de les Creus, Marc Castellnou) in order to break the kinetics and allow for a head-on direct attack



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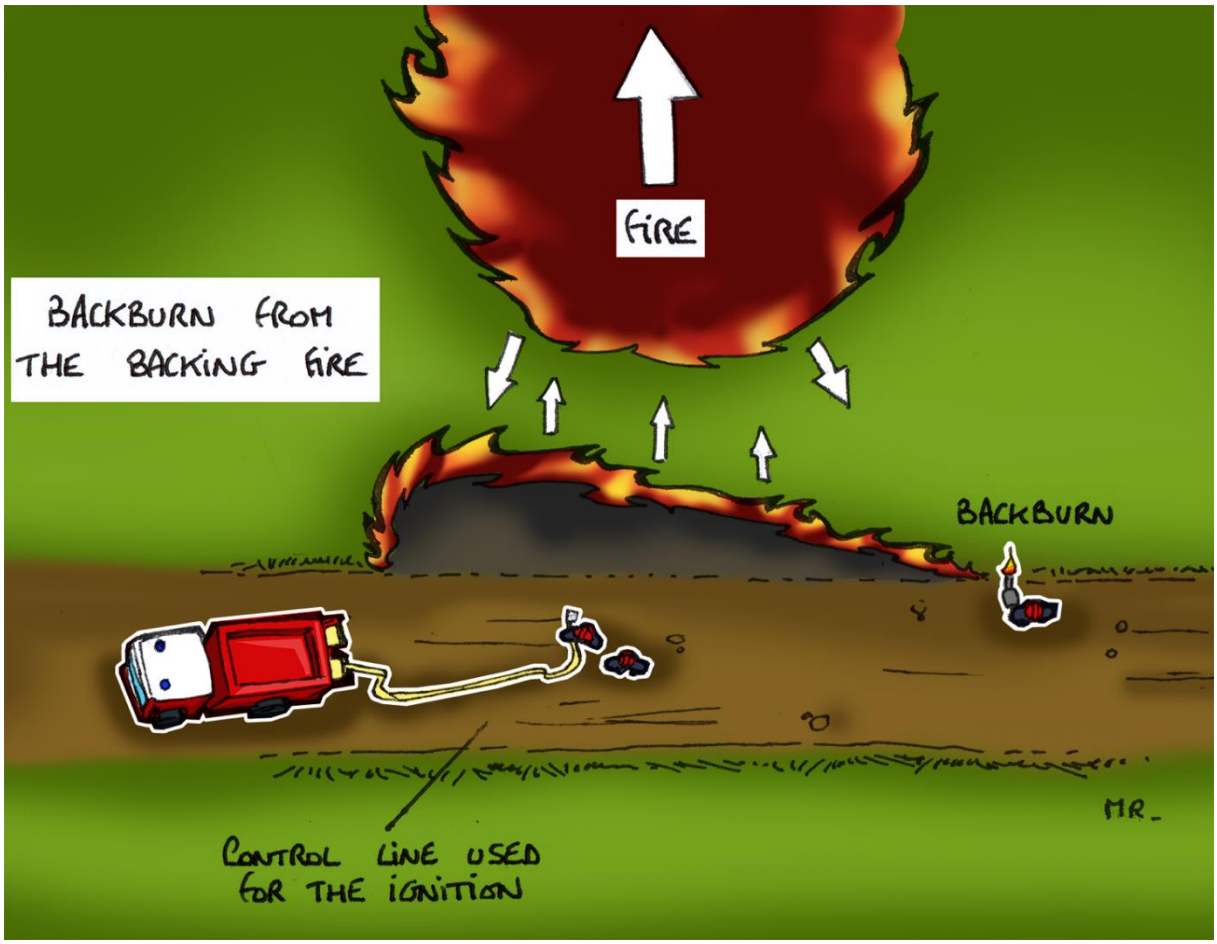
	• Limits the lateral progress of the fire. • Clearly and neatly extinguishes the fire on the treated zone. • Limits the risks of crossing (depending on the topography).
	• Igniting may be dynamic in order to follow the fire's progress. • Monitoring spot fires.

1.2.3. Rear Backburns

This will be used to stop the spread of the fire in the rear sector. Its action consists of lighting the vegetation along the pre-determined support zone, to stop the fires progress behind the action zone.



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In this scenario, the backburn's progress may be faster than the front fire's in this sector and may offer a positive result in a relatively short amount of time.

	• Rapid progress of the backburn. • Limited exposure of staff to smoke. • Low risk of spot fires. • Work in the wind.
	• Risk of expanding the fire if the length of the backburn is over-estimated.

2. Backburns for fire breaks improvement

Backburns for fire breaks improvement is a forest fires-fighting technique, which consists of igniting a fire which may be planned ahead in terms of time and location.

This technique helps channel the fire to limit its spread. It also helps extinguish partly active boundaries which may present risks of reigniting. It may help create or improve a fire-fighting support zone, or even create a refuge zone for staff safety.
The aims of backburn for fire break improvement are to:

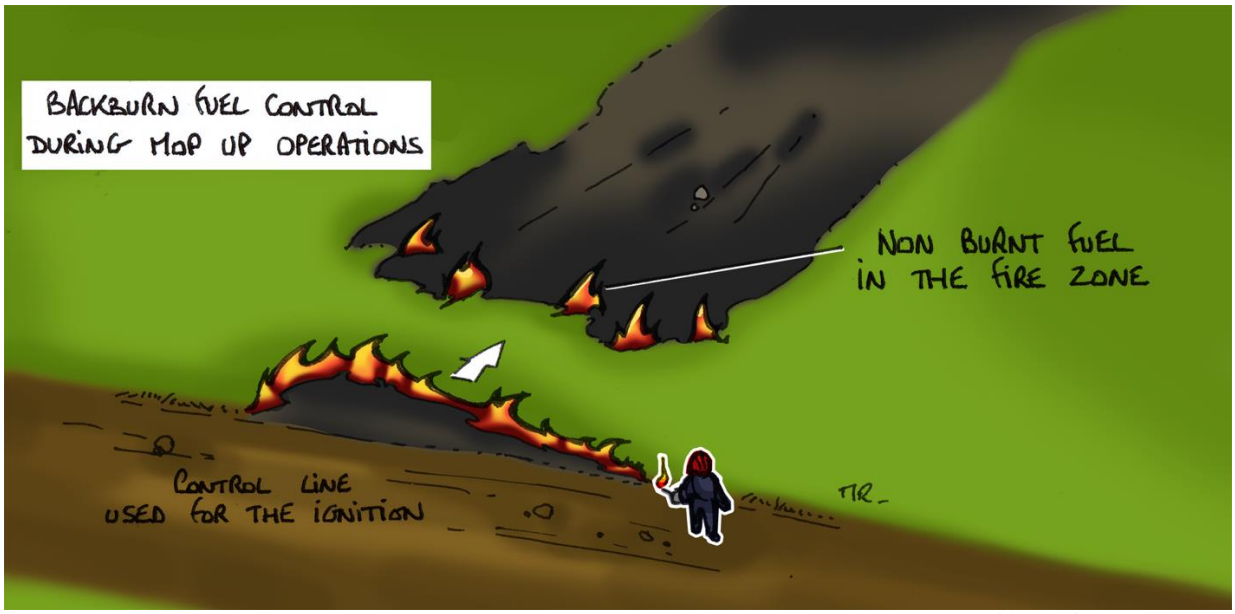
- Channel the side of the fire to avoid and lateral spread;
- Help extinguish the boundaries entirely;
- Protect the perimetre of a sensitive spot;
- Create or improve a fire-fighting support zone;
- Create a refuge zone (safety zone) for staff and/or equipment.

2.1. Aligning the edges

The edges are characterized by a partly burnt vegetation. This technique aims to perfect the extinguishing of the edges while it is still active or if it presents a risk of reigniting, in particular in the presence of humus.Tactical burning action consists of aligning the edges along a pre-determined support zone. The result is clear and neat extinguishing.

To carry out this technique, the following parameters are required:

- Determining the igniting zone;
- Evaluating the weather conditions;
- Measuring the extinguishing means.



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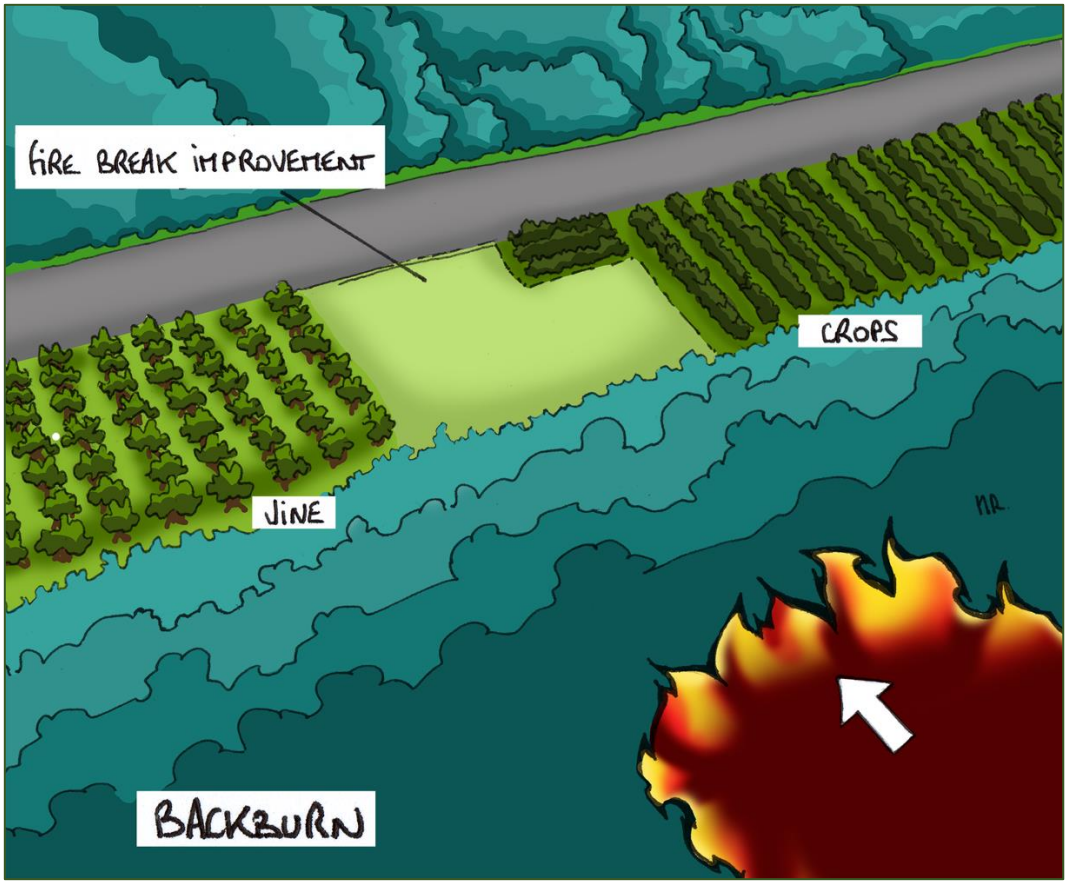
Regarding weather conditions, a favourable acting window will be required, for example, lower wind, falling temperatures and increased air hygrometry.

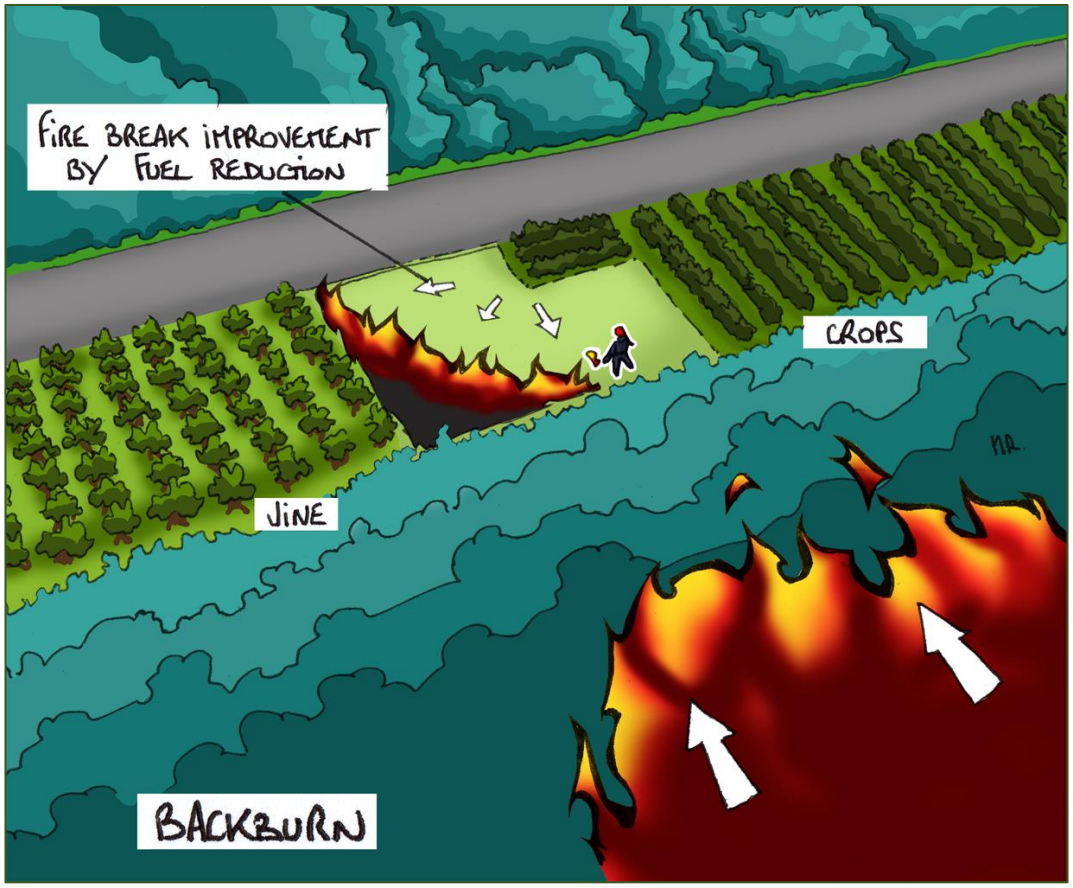
During summer, these conditions usually occur at night or at sunrise.

2.2. Creation or Enhancement of a Fire-Fighting Support Zone

This technique is used when trying to create a zone from which the IC may launch fighting means, for a defense manoeuvre for example, or for a subsequent backburn action.

The point is thus to remove and residual fuel by burning the area.





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3. Operational Setup

Once the plan has been approved by the IC, the operational setup of a backburn will be the responsibility of the backburn executive.

3.1. Safety Measures

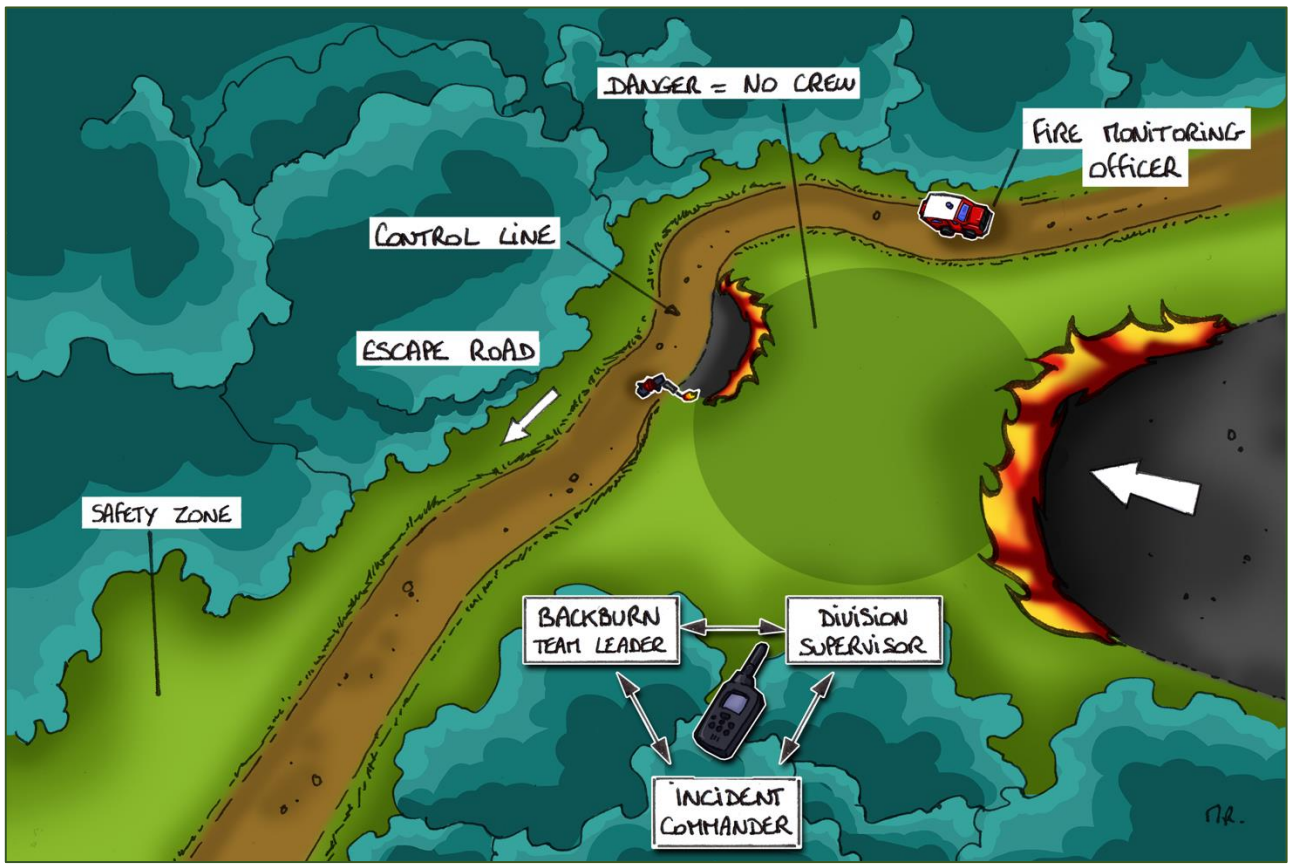
Igniting any backburn requires the presence of qualified staff, including:

- At least one backburn executive;
- One or more trained igniting staff;
- Teams handling one or more extinguishing means if necessary;
- One alarm bell if necessary, to observe the fire and the backburn.

Staff are only employed on the zone of action with adequate personal protection equipment.

Before igniting the backburn, it is necessary to:

- Make sure no one is present in zone between the igniting zone and the fire;
- Determine the refuge zone and specify the itinerary to move there in case of danger;
- Only ignite the backburn after the IC grants authorisation to do so;
- Maintain permanent radio contact with the IC or the Division Supervisor;
- Report the progress of the backburn to the IC or Division Supervisor;
- Make sure third parties and staff are safe;
- Monitor weather conditions for any changes.



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3.2. Carrying out Backburning

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Once the IC has handed him responsibility for the mission, the backburn executive will carry out a reconnaissance for the Zone of Action in order to:

- Observe and analyse the fire;
- Look for one or more igniting opportunity(ies) from a potential support zone;
- Estimate the protection means if necessary;
- Submit the manoeuvre idea to the IC.

Once the IC has approved it, the backburn executive contacts the Division Supervisor to submit his manoeuvre idea. On the backburn igniting zone, the backburn executive positions the available means, according to his needs:

- **An igniting team** made up of at least one staff member equipped with a drip torch. They place themselves at the igniting point determined by the backburn executive ;
- **One monitoring team** made up of the staff from the fire-fighting protection vehicles, or by staff on foot, equipped with portable extinguishing material. The role of this team is to contain the ignited backburn, reduce its progress if necessary, and act immediately in the event of spot fires outside the support zone;
- **An observation bell** made up of a staff member equipped with a portable radio receiver. It is placed, if necessary, in a favourable position to guarantee surveillance from a distance of the igniting zone and the fire.

Once human and material means have been positioned, he reminds the teams of the safety measures and makes sure they are applied.

Once the IC has given his approval, the order to ignite is given by the backburn executive alone.

Once he has launched the igniting, he reports to the IC and Division Supervisor. The backburn executive monitors the progress of the backburn, regulates the igniting speed and orders its end at the appropriate time, while keeping the Safety Operations Commander and the Division Supervisor informed of the progress of the backburn.

It is important to report the information to Air Operation Director (AIROPS) and the aircrafts in order for the pilots to know it is not a spot fire and thus a nascent fire.

3.3. Igniting and Monitoring Techniques

According to the configuration of the area, the fire can be ignited using a torch in one of the following four methods:

- Continued igniting with a torch;
- Igniting several points with a torch;
- Igniting parallel lines with two torches;
- Igniting a central point, towards the outside, with two torches.

For each of these methods, the speed of progress of the igniting staff will be defined by the backburn executive, in order to carry out the igniting in the best conditions.

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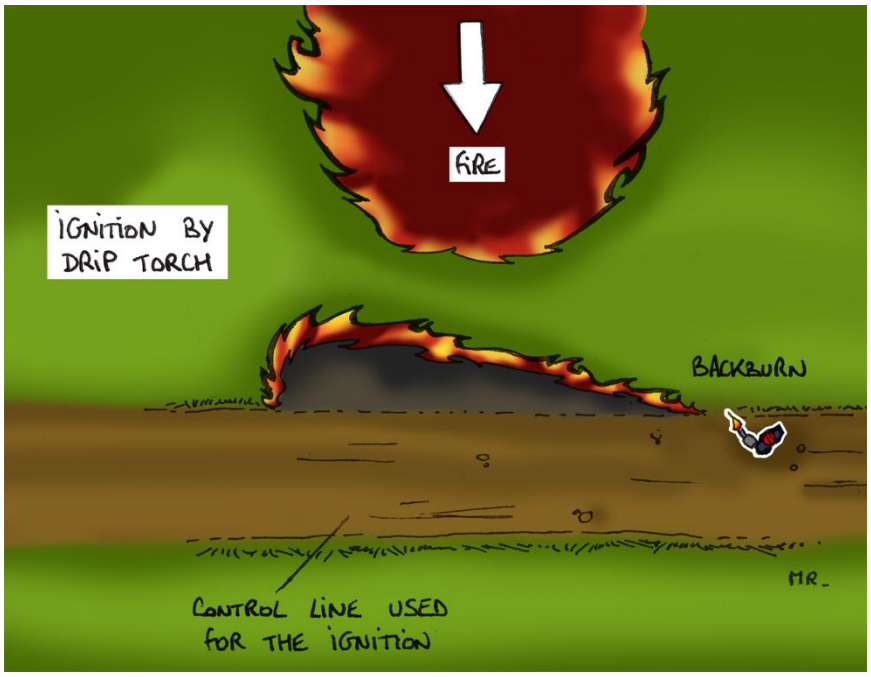
3.3.1. Continued Igniting with a Torch



This is the most commonly used method, consisting of igniting along a support zone, in a continued line, from a starting point, to the end point indicated by the backburn executive.

This igniting must be a little wider than the fire front it is established against, in order to contain it. This helps carry out a rapid and efficient backburn.

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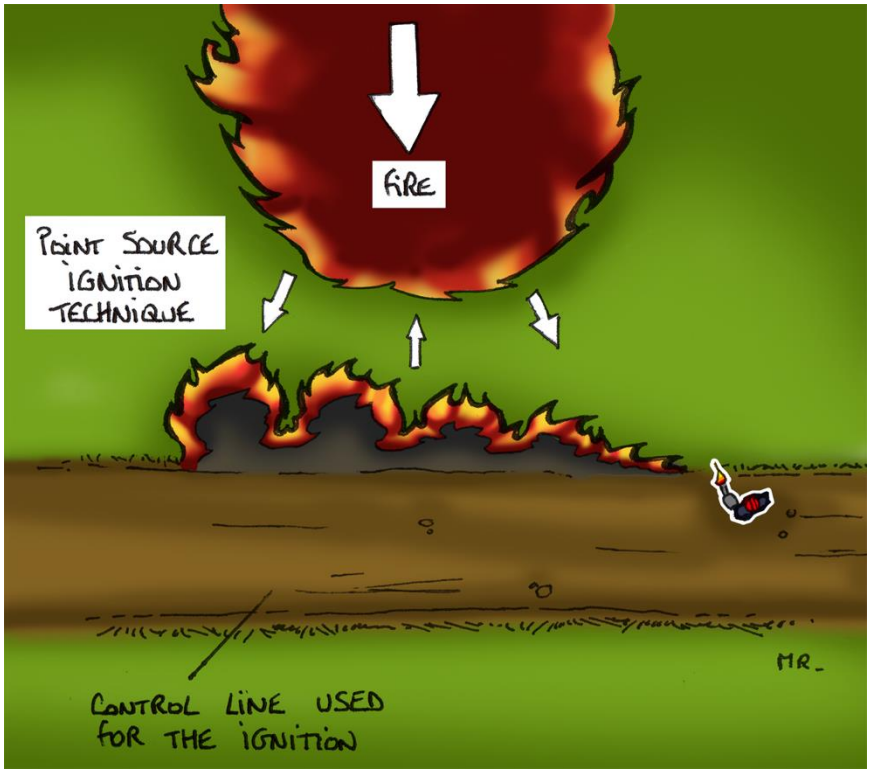
3.3.2. Igniting Several Points with a Torch

This method consists of igniting several points with an interval of few metres, in order for them to meet and form a continuous line.



It helps carry out a linear backburn rapidly and remains adapted when the vegetation near the support zone is continuous.

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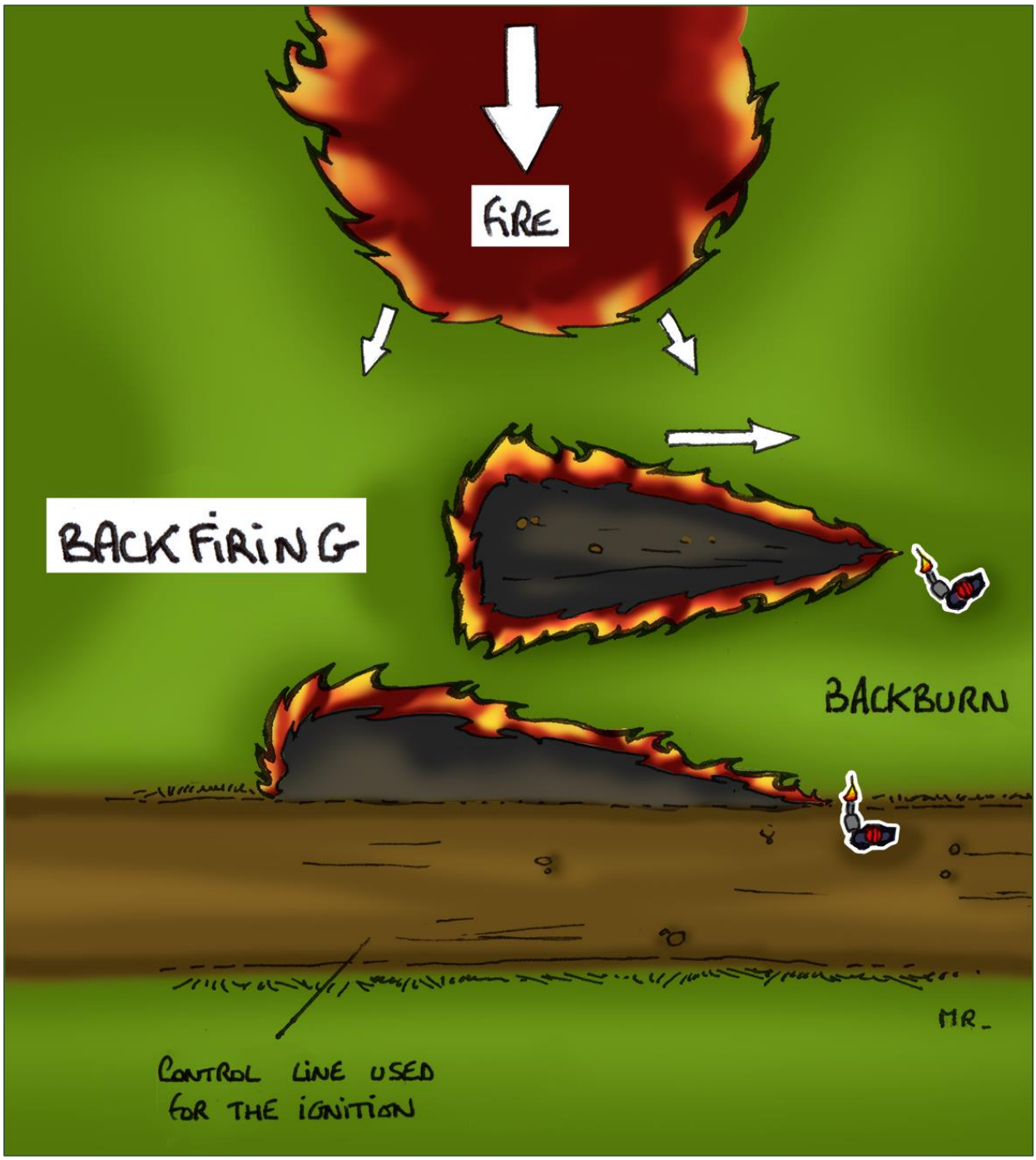
3.3.3. Igniting Parallel Lines with Two Torches

This igniting method consists in carrying out a first igniting line a few metres inside the vegetation, and make it progress in a parallel line to the support zone.

A second igniting line is subsequently carried out along the support zone, several metres away from the first line.

This accelerates the progress of the backburn moving towards the fire and widens quicker the burnt zone more.



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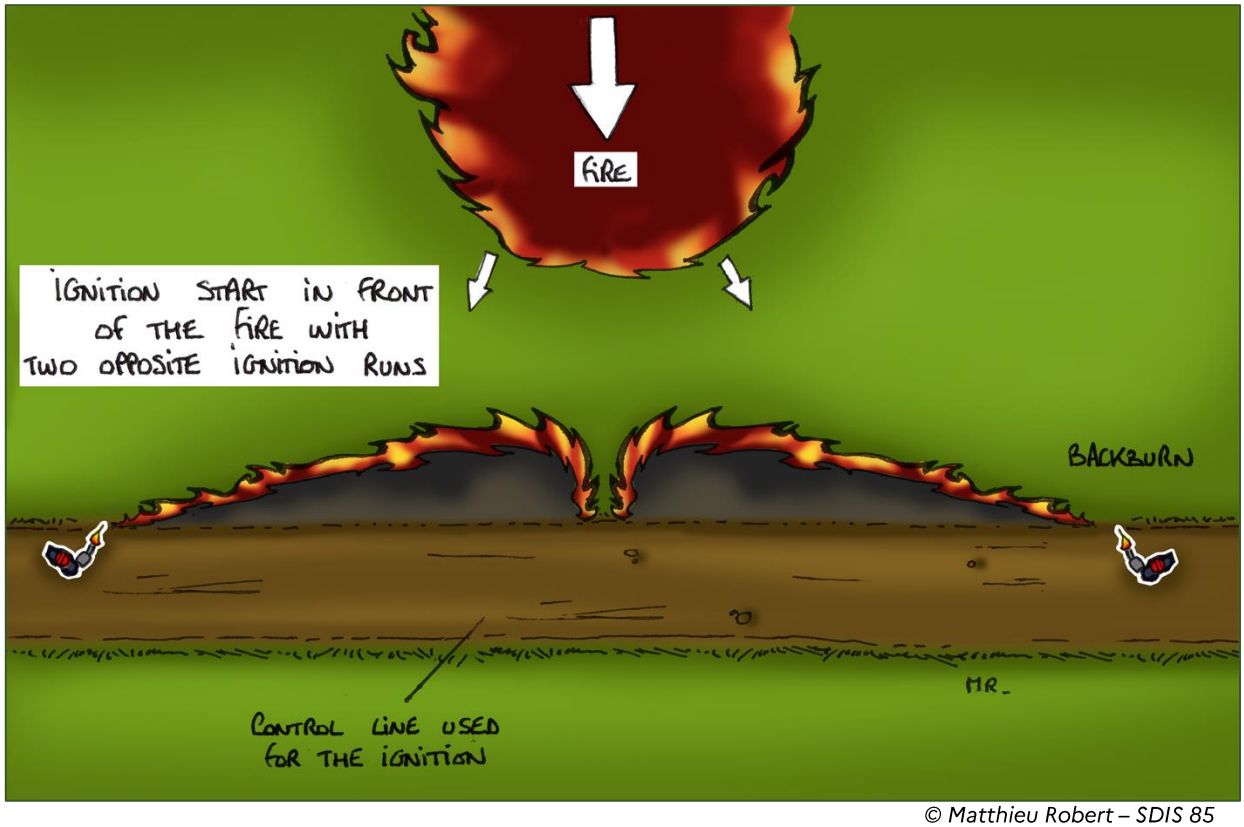
3.3.4. Igniting a Central Point, Towards the Outside, with Two Torches

This less frequent method consists of creating two igniting lines from a point determined by the backburn executive, and leading them in opposite directions, along the support zone.

It helps establish a backburn rapidly, however it requires efficient coordination of the manoeuvre, with a good overall vision.

It is also necessary to anticipate a refuge zone for each igniting team. This method is used more for thatch and crop fires.



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APPENDIX A –Abbreviations Used in This Guide

AFB: Aviation Firefighting Base.
AIROPS: Air Operations Director
AT: Air Tanker.
CC: Crew Commander
CF: Crew Firefighter
CFO: Controlled Fires Officer
Chemical retardant: Long-Term Chemical Retardant
CPGD: Civil Protection General Directorate
CPMU: Civil Protection Military Units
DIVS: Division Supervisor
ECASC: Forest fires national academy (French acronym)
FB: Fire Break
FCV: Fire Command Vehicle
FD: Fire Department
FE: Fire Engine (Pumper Tanker)
FEM: Fire Escape Mask
FF1: Forest fires standardized qualification level #1, Crew Firefighter
FF2: Forest fires standardized qualification level #2, Truck Commander - first officer
FF3: Forest fires standardized qualification level #3, Strike Team Leader - small forest fire commander
FF4: Forest fires standardized qualification level #4, Column Commander - medium forest fire commander
FF5: Forest fires standardized qualification level #5, Large forest fire commander
FFT: Medium Forest Fires Truck
FFU: Forest Fires Unit
FLSST: Fire Line Support Strike Team.
Foam: Short Term Chemical Retardant
FPC: Fire Protection Capability
FPSS: Fire Protection Safety Specifications
FRMU: Fire Retardant Manufacturing Unit
FRST: Fire Retardant Strike Team
FSOD: Fire Suppression Operational Doctrine
HCC: Helicopter Crew Chief
HELIST: HELITACK Support Truck
HELITACK: Helitack Team
HFFT: Heavy Forest Fires Truck
HFFU: **:** Heavy Forest Fires Unit
HFRB: Helicopter Fire and Rescue National Base.
HNS: Hose Nominal Size (Ø)
HRT: Hose Reel Truck
HST 1/2: (wildland fires) Heavy Strike Team Half (2 trucks)
HST: (forest fires) Heavy Strike Team
HV: High Voltage
HWB: Helicopter Water Bomber
IC: Incident Commander
ICP: Incident Command Post
LFFT: Light Forest Fires Truck
MLM: Maximum Loaded Mass
MST /2: (wildland fires) Medium Strike Team Half (2 trucks)
MST: (forest fires) Medium Strike Team
PAT: Patrol Air Tanker (with retardant)
RCS: Radio Communication System
RPTT: Rural Pumper Tanker Truck

RV: Rescue Vehicle
SDIS: Fire Department (French acronym)
SOPFF: Standard Operating Procedures Forest Fires
SPC: Safety Protection Capacity
SRST: Specialised Resources Strike Team
STWWT: Strike Team Wildland Water Tender.
TC: (Fire) Truck Commander
TD: (Fire) Truck Driver – pump operator
TSD: Track safety zone (20m cleared area on both sides of the tracks)
WFNA: Wildland FIres National Academy
WST: Water supply strike team forest fires
WUISP: Wildland Urban Interfaces and Structures Protection
WUIST: Wildland Urban Interfaces Strike Team
ZA: Zone of Action

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MAJOR AMENDMENDS IN THE GUIDE

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19/01/2022	1	Translation in english

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ET DE LA GESTION DES CRISES

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