

The French Conne

France's wildland fire service finds success through high-

By Daved van Stralen & Gary Provansal

A fire approaches as you and your crew prepare to make a stand to protect property. It is early morning, 60 degrees F. You know where the fire is coming from and believe you have defensible space based on the water from a swimming pool, your location and past fire behavior. You mentally check off your list for structure protection; you are ready.

Suddenly, fire and heat build to raise a smoke plume 18,000 feet high. Winds increase and the roar drowns out your orders. The heat builds; the humidity drops. Spot fires surround you. Escape is no longer possible.

would make, we begin to feel the time pressures and confusion of life-or-death situations. Researchers have long understood the thought process needed to succeed in such environments; they call it high-reliability organizing (HRO), and wildland firefighters have long been using HRO concepts.

Recently, we traveled to France to examine wildland firefighting outside the United States, and to further our understanding of how wildland firefighters across the globe are using HRO practices every day to improve their safety and effectiveness in our never-ending battle against wildfire.

What Is HRO?

Researchers have approached HRO from various directions. Researcher and author Karlene Roberts studied U.S. Naval Aviation to codify five characteristics of high-reliability organizations:

- **Process auditing:** An established system for ongoing checks designed to spot expected as well as unexpected safety problems.
- **Reward system:** The payoff that an individual or an organization gets for risky behavior.
- **Degradation of quality and/or inferior quality:** The essential quality of the system involved as compared to a referent system that is generally regarded as the standard for quality.
- **Perception of risk:** Whether or not there was any knowledge that risk existed at all and the extent to which it was acknowledged appropriately or minimized.
- **Command and control:** Hierarchy without negative bureaucracy (e.g., the person with the most expertise makes the decision, backup systems exist, senior managers don't micromanage).

Researchers Karl Weick and Kathleen Sutcliffe, on the other hand, focused on the process of HRO, rather than the organizational aspects. They concluded that HRO requires



PHOTO COURTESY SDIS 13

Older construction, medium-duty steel unit in southern France. Note the personal protective gear, including escape mask.

Should you have taken other action? Many people with knowledge of the circumstances and outcome would say these events were predictable. They would also say the mistakes lie in the behavior or judgment of the firefighters. Such an attitude protects us, allowing us to believe that a similar situation could never happen to us.

But when we acknowledge the crew made the right decision, a decision that we

ction

reliability concepts

the user to maintain a state of mindfulness. They identified five aspects of mindfulness:

- **Preoccupation with failure:** Believes any lapse is a signal that something is wrong.
- **Reluctance to simplify interpretations:** Takes deliberate steps to create more complete and nuanced pictures, believing the world is complex, unstable, unknowable and unpredictable.
- **Sensitivity to operations:** Shows ongoing concern with the unexpected; is attentive to the front line where the real work is done. Continuously adjusts to prevent errors from accumulating or enlarging.
- **Commitment to resilience:** Bounces back from mistakes, believing that errors are a part of the indeterminate world.
- **Deference to expertise:** Develops diversity in thinking, believing rigid hierarchies are vulnerable to error. Gives authority to the person with the most expertise.

Wildland firefighters will recognize some of these concepts from their time on the fire-line. When you assume that your decisions and actions may not succeed, you are “preoccupied with failure.” When you develop a plan that recognizes the conflict between structure protection and fighting head fire in excess of 8 feet, you are “reluctant to simplify interpretations.” Focusing on small irritations because they could herald a large failure demonstrates “sensitivity to operations.” Working the problem as the problem grows and actions fail shows “commitment to resilience.” Listening to the rookie operating from an area you cannot evaluate shows “deference to expertise.”

HRO Abroad

So, what does all this have to do with wildland firefighting in France? After thoroughly studying and documenting the presence of HRO in U.S. wildland firefighting, we wanted to examine its presence in another country.

Typical wildland fire direct attack in southern France.

PHOTO COURTESY SDIS 13





Newer construction, medium-duty steel unit. Note auto-protection wheel nozzles activating, white strip around door handle, white piping for external protection to the cab and tubing for spray nozzles to windows.

French wildland firefighting has 4 major objectives:

- 1 – prevent fires from starting;**
- 2 – take quick action;**
- 3 – limit development of catastrophic fire; &**
- 4 – organize the forest for prevention after the fire.**

During the last week of November, we visited Col. Luc Jorda, fire chief, and selected officers from *Service Départemental d'Incendie et de Secours* (SDIS) 13 in Marseille, France.

SDIS 13 (<http://web.sdis13.fr/>) covers the Bouches-du-Rhône (Area 13) department, similar to a county, in southern France at the mouth of the Rhone River. It's one of the busiest wildland fire services in France. When the 90-mph Mistral winds blow on a nascent fire, you can predict that within an hour, something major will be threatened: the luxury resorts of the Riviera, priceless historical buildings, small villages or large cities, France's second-largest oil and gas industrial area or nuclear facilities.

French wildland firefighting has two major axes, prevention and suppression, and four major objectives: 1) prevent fires from starting; 2) take quick action; 3) limit devel-

opment of catastrophic fire; and 4) organize the forest for prevention after the fire (e.g., change the type of trees growing in the forest). When a fire occurs, personnel begin identification of the cause; gather information about people who live in or travel through the forest; develop an idea of the risk and scale of the fire; and respond with some form of dissuasive surveillance (police, gendarmes, forest service, firefighters and government officers).

Risk estimation is developed from area maps. These maps draw on at least 30 years of past fire history and are available to the incident commanders during wildland fires. Risks are defined by weather, vegetation and terrain with a daily scale of risk developed and given to the public. In some departments, forest access can be forbidden or

limited to certain hours. This differs from the United States, where we readily restrict some activities, such as campfires, but hesitate to impose travel restrictions.

A closer look at the command structure and firefighting strategies of French wildland firefighters reveals a reliance on HRO concepts, especially Roberts' "process auditing" and "perception of risk," and Weick and Sutcliffe's "sensitivity to operations" and "reluctance to simplify concepts."

Incident Command System

The incident command system (ICS) in France is called the *gestion opérationnelle de commandement* (GOC). It has the same functions as the U.S. ICS except it doesn't include a finance sector. And because the French strategy focuses on fire suppression within the first 30 minutes, the GOC has a slightly different configuration than the ICS. Functions are progressively transferred from the Department Operations Center (CODIS), which oversees all operations, to the incident management team (IMT).

The basic unit of firefighting in France is the Forest Fire Intervention Group (GIFF), which consists of four Type III engines led by a lieutenant who drives a light all-terrain vehicle. The lieutenant, equivalent to a battalion chief, is trained for forest fires to Level 3. ►

Foreign Apparatus

A look at French brush trucks

French firefighting apparatus include:

- Light-duty brush engines used mainly for patrol. These 4 x 4 engines carry small amounts of foam and are made of aluminum. They are staffed with four firefighters.
- Medium-duty engines that carry more water and have a pre-plumbed monitor mounted on top of the vehicle. These 4 x 4 vehicles have Class A foam capability. Staffing is four firefighters.
- Super-duty engines which hold the most water and are also equipped with monitors mounted on top of the vehicle. These 6 x 6 vehicles carry large amounts of foam and retardant as well; they are constructed of steel and are staffed with four firefighters.
- Large 4 x 2 water tenders confined to operation on roads only. The water tenders are not equipped to fight fire and are considered support vehicles; they are staffed by two firefighters.

All of the wildland engines have the ability to shift into very low gear ratios and have aggressive angles of attack and departure, along with good ground clearance. They have enclosed cabs and are equipped with special air filters to prevent embers from entering the air cleaners.

The French fire service has decided that the best protection for its firefighters during burnover is in the cab of the fire engine. Because 99 percent of all wildland firefighting in France involves direct attack with engines, firefighters remain relatively close to their equipment. Personnel are not issued personal fire shelters. Each firefighter in the SDIS 13 region carries an emergency smoke mask for retreating back to the vehicle.

In addition, each engine is equipped with special life-saving equipment, including:

- Windows treated with a special film for heat radiation.
- GPS equipment installed inside the cab. An emergency button sends the coordinates and distress call to airtankers, command and CODIS. The nearest airtanker will drop its payload on the coordinates to help protect the crew.
- White reflective paint surrounding the door handle to make it easier to locate during heavy smoke conditions.
- An air bottle and regulator with attached masks for each position in the cab and an air bottle to pressurize the cabin.
- Roll bars inside the engine cab to protect the occupants during a rollover or from falling objects such as trees.
- A piping system surrounding the cab to provide protection during high heat and actual flame impingement.
- A water-protection system that features water nozzles that protect windows and the windshield; each tire, the fuel tank and the battery locations; and the rear pump panel, pump and hoses. The system is activated during the maximum point of threat and is fed by either the engine's pump or, in case of its failure, a separate electrical pump. The system is fully activated from inside the cab without any special preparation or action from outside the cab. The water source comes from the engine's main tank, which has a protective system that keeps at least 130 gallons of water available only to the auto-protection system; newer engines have a separate tank. The system provides for at least 4 minutes of water protection to the engine and its firefighters.

Medium-duty brush engine with auto-protection in full operation.



Auto-protection system covering the wheels.



Medium-duty brush engine with monitor in full operation.



PHOTOS DAVED VAN STRALEN

The lieutenant of the first GIFF dispatched by the CODIS to arrive on scene becomes the first IC. The IC makes situation reports to the CODIS, assesses need for resources and assigns the first goals and missions. If the fire remains small, the first GIFF lieutenant remains the IC throughout the fire, dividing it into three or four sectors: left, right, front and sometimes back. Each sector is commanded by a division chief; each sector has three GIFFs.

At larger fires, usually after the first 30 minutes, the Level 4 IMT assumes command, bringing with it a command post and a dedicated

safety frequency on the radio. ICS functions are transferred from the CODIS to the IMT: an operations/situation officer who updates the situation and supervises division chiefs, an aerial officer who coordinates air resources and may have a helicopter for his own use, two logistics officers and an aero officer who has both Level 4 and aviation-specific training.

For large fires with multiple sectors, the IC must work at Level 5 and each sector receives its own sector command post in a truck or van. A Level 5 IMT, with a dedicated command post, assumes command after the first hour. The command post has two parts:

the "noise" room and the "silence" room. The noise room is dedicated to operations with the situation officer, operations officer, logistics officer, media officer and the operator in contact with the CODIS. The silence room is staffed by two officers, the anticipation chief and the logistics chief, who create scenarios for the next 1–2 hours. The anticipation and logistics chiefs also propose strategies and subsequent actions to the IC.

A dedicated officer in direct contact with the IC coordinates the command post. Because of the mindset that safety is everybody's concern, France has traditionally not

Simulated Fire

French firefighters train on a state-of-the-art simulator



PHOTOS DAVED VAN STRALEN

Top: Headquarters for the national fire command school, *ECole d'Application de Securite Civile*, housed in a 15th century chateau. Bottom: Control room for wildland fire command simulation exercise. Controller is manipulating parameters for the burn.

The *ECole d'Application de Securite Civile* (ECASC, www.valabre.com) is France's national research, dissemination and training agency for Type 1 and 2 incident management teams. The ECASC created a wildland fire simulator in 2000. The simulator covers the development of a fire in the first 6 hours, about

25 square kilometers (approximately 10 square miles). The region is developed from GIS data, making it possible to use actual maps and real locations.

ECASC's training is renowned throughout Europe, and Type 1 teams from across the Mediterranean region train there. ECASC also leads the European Union's efforts to build a "network of excellence" for wildland fire sciences and technologies.

Simulations for large fires occur by computer simulation with use of separate simulators for each position, all tied together in a master simulation. Each position, from single engine to the IC, can view their actions and portion of the fire activity, including airtankers and helicopters that can, through actual flight simulators, view the entire fire and make actual drops.

Real pilots operate the controls for the air bomber and helicopter simulators, which function in separate helicopter and aviation rooms. The chief can choose the type of plane and payload (foam, water or retardant). The chief also decides how to unload the payload.

The director manages the fire simulation from a control room with three screens, setting the fire and the smoke development based upon wind, terrain and fuel type models. The director can change any elements of the unfolding scenario, such as wind direction, GIFF accidents and people in distress in the forest. He operates three simulators at the same time.

Simulation exercises typically last several hours. Students are watched by two psychologists who debrief participants on how they work in stressful situations. Special attention is also paid to the relationships with the media and local authorities, played by the simulator staff.

employed a safety officer, but the position is planned this year.

France has two jurisdictional levels in relation to the safety of citizens: the mayor and the prefect. As a fire approaches a town, the mayor becomes the director of operations and all involved resources comply with the mayor's goals. When the fire threatens several towns, the prefect sets the objectives. Law enforcement, fire service, private and public-sector organizations all come under the command of the prefect.

Surveillance

Surveillance is two-pronged and involves ground and aerial observation. SDIS 13 doubles its engine companies for the maximum burn hours during the main wildland fire season. Half of the ground resources are in regions under threat and half of the increase is placed on patrol in high fire-danger areas. Ground surveillance includes lookout tours, roving patrols, motorcycles with hose and a camera that sits above CODIS. The camera is programmed to automatically recognize a new mass of smoke, provide geo-location and sound an alarm.

Because of the mindset that safety is everybody's concern, France has traditionally not employed a safety officer, but the position is planned this year.

Aerial observation occurs by the airtankers flying patrol fully loaded. They are constantly in the air during the maximum burn periods with a response area of approximately 10 minutes each. Jurisdictional boundaries or restrictions do not interfere with the response. The National Fleet is in charge of airtankers and can be called by any GIFF. The priority is preventing a new fire.

Initial Attack

The alert comes by airtanker, lookout tower, CODIS camera, ground patrols or by phone and goes to the formal group that is closest to the fire. The GIFF lieutenant receives the mission and is the first IC. The aerial unit may get to the fire first, explain the situation and ask

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for authorization to make a first drop of water. Permission comes from CODIS unless the GIFF is on the fire. CODIS tells the airplane who is on the fire and gives the frequency. The GIFF then directs the aerial unit. If there is no GIFF, CODIS can authorize the air drop.

Action on new small fires is the most important point; if you want to be quick on a fire you must have planes in the air and boots on the ground. Attack must occur within 10 minutes of discovering the fire. CODIS has planes flying in different zones and stations four helitankers in the region. Each GIFF is pre-positioned in an area, not at stations.

Within 20 minutes, three GIFFs (12 vehicles) and air units (airplanes and helicopters) will begin fighting the fire. Before the first report from the IC, additional GIFFs from 1–2 hours away will begin their response. This method of attack without regard for jurisdictional boundaries or agency responsibility keeps the fire small and enables the use of direct attack with water 99 percent of the time in addition to the air support.

HRO in France

We found much evidence of the use of HRO concepts in French wildland firefighting, including:

- *Perception of risk* is very strong in the French culture because of the large forest-urban interface. Air and ground patrols increase during the fire season.
- To *reduce degradation of quality*, firefighters travel on-site to study bad incident outcomes.
- Senior managers maintain *command and control* by observing the site and maintaining close communication with GIFFs and sectors as the fire grows.

- *Showing a reluctance to simplify*, they have created a command school for wildland firefighting using simulators and mandatory training.
- They increase their *sensitivity to operations* by allowing GIFFs freedom to attack their fire.
- *Deference to expertise* exists; for example, air bombers can drop water on fires unattended by a GIFF.

As a result of our findings, SDIS 13 and the San Bernardino County (Calif.) Fire Department have started a joint program with the County Sheriff for initial air attack; we will also be evaluating the benefits of altering our brush engines related to engine protection.

Conclusion

Wildland firefighters in France are searching for new methods and structures to improve firefighter and citizen safety. HRO continues to provide solutions for the difficult challenges that affect both France and the United States. ▲

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