AFAN

Advanced Fire Analysis Network

Guidelines of fire analyst competencies and skills

December 2021

Funded by
European Union
Civil Protection

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Cite this report: Castellnou, M.; Miralles, M.; Nebot, E., Estivill, L.; Guidelines of fire analyst competencies and skills. AFAN Project (2021).

https://fireanalysisnetwork.eu/

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We would like to thank all fire specialists of GRAF (Grup de Recolzament d'Actuacions Forestals) from Catalan Fire and Rescue Service (Bombers de la Generalitat de Catalunya) and the FAST team (Forest fire assessment and advisory team of Spain) who have participated directly or indirectly in the preparation of this guide.

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List of Acronyms

AFAN	Advanced Fire Analysis Network
BAT	Best Available Technologies
BEH	Fire behaviour
CPS	Campbell Prediction System
FAA	Fire analysis and assessment: 'art & discipline'
FA	Fire Analyst: position
FAT	Fire Analysis Team
PAT	Fire spread patterns
POS	Fire position
GIS	Geographic Information System
GOC	*Gestion Opérationnelle et Commandement*
IAP	Incident Action Plan
ICS	Incident Command System
IC	Incident Command
LVF	Large Vegetation Fire
MET	Impact of meteorology on fire behaviour
SCA	Strategy and Scenario awareness
TO	Tactical Objectives
TP	Tactical Planning

Executive Summary

This guide corresponds to the Deliverable 2.2. Guidelines on fire analysis competencies and skills for the fire analyst profile across Europe from Task 2.1. Harmonisation of fire analysis knowledge (WP2) of the Advanced Fire Analysis Network project (https://fireanalysisnetwork.eu/). Through its content it can help to identify fire analyst, capacities, knowledge and different other aspects of vegetation fire[1] analysis to facilitate the creation of a common framework at European level.

The guide's ambition is to **contribute to build towards a shared European framework of fire analysis (or assessment) to identify current knowledge, existing gaps and opportunities.** This action aims at building up fire analysis capacities, harmonizing existing fire assessment knowledge across Europe through a joint network of wildfire emergency responders and training centres willing to build capacities in that area. So, we identify the whole range of fire analysis competencies that firefighting organisations can develop in order to face key fire problems, focusing on paths to improve decision-making during the response phase.

Thus, we explore operational profiles, their skills and capabilities to be able to deploy operational strategies during wildfires and share wildfire knowledge amongst different members of the networks. This document includes a set of guidelines that can help to define the range of fire analysis skills and competencies when facing current and future wildfires in different European countries. Nevertheless, this Deliverable 2.2 is considered an initial work, a first step, offering a first contrasted vision based on real existing cases.

The aim of the guide is to contribute to create a **common framework in which different organisations can be included and allow the existing network of forest fire analysts to be identified and visible**. This framework should also make it possible to identify organisations expertise in certain thematic areas, to facilitate the exchange of knowledge,experience and needs, and to detect potential areas for growth.

This integration does not neglect the **need to differentiate between forest fire analysis and analysis corresponding to other fields** (e.g., GIS specialists, incident meteorologists, hazard/risk manager, etc.). The line between both is defined by the capacity to address all key elements (currently known) involved in the forest fire scenario, the monitoring and continuous re-assessment. They are both at the level of the processes that can occur in the fire as a phenomenon and considering the actions that can modify or modulate the phenomenon during the management of the emergency. Analysis from other fields can be of great use, expertise and quality but would address only one aspect of the whole forest fire analysis.

1 In this guide we will use the concept 'vegetation fire' instead of wildfire or 'forest fire' with the aim to be inclusive considering fires that can affect not only forests in wildland areas but also brush, croplands, etc. (See the Glossary).

For fire analysis to be useful, it needs to recognize and frame decisions on key fire problems (1.3 Insights), such as changing scenarios as fire regime shifts, unintended consequences such as the fire paradox, or building resiliency to avoid the collapse in safety or service capacity of firefighting organisations. In order to frame decisions, we need to understand the whole range of existent options, shifting from reacting to planning in front of anticipated risk to deciding in front uncertainties, but always focusing first on the changing fire at different scales.

Within the framework set out in AFAN project, the guide helps to detect general capabilities (3.2, 4.1, 4.2) and examples of tasks (4.3) of fire analysis scope. The guide includes the link detected between forest fire analysis and decision-making, as well as the responsibilities that may arise (3.2).

This framework aims to facilitate the identification, exchange and characterisation of current forest fire analysis. The next step would be to go down to the level of the specific needs of each organisation and territory. It should be borne in mind that this is not a closed process, as future needs and challenges may require the contents of this guide to be expanded, so this is an initial starting point.

The process of elaboration of the guide has included various feedbacks to produce suitable contents that contribute to the harmonised framework across different countries and doctrines. Therefore, this guide is the result of various contributions. The consultation process has been carried out both with partners of the project and its network. With the aim to have a vision of different European territories, contributions from different representative countries (UK, FR, NOR, PT, SP) have been obtained to include different singularities in terms of landscapes (Atlantic, Mediterranean, Nordic), organisational structures (Incident Command System, *Gestion Opérationnelle et Commandement*, adapted systems) and current needs and fires they are facing. Taking into account the short duration of the project, the pandemic situation COVID-19 and the need to have the guide available at M12 (December 2021), a first draft of the guide was prepared on the basis of on-line meetings and discussions (08/2021). Subsequently, the first version of the guide was presented online to the partners and several experts from different countries (meeting dates: 03/08/2021, 12/08/2021, and 13/09/2021) to initiate the validation and feedback process (August-December 2021). The same was done for the second version (meeting dates: 23/11/2021, 25/11/2021, and 15/12/2021). Additional to the dedicated meetings with experts, several gatherings have been used to collect and exchange useful information for the guidelines: the project's webinar on Fire Analyst Competencies and Skills webinar[2] (17/09/2021); [3] and second project workshops (21/04/2021 and 27/09/2021); and the meeting of Vegetation Fire Analysis and Planning Units from Spain (29/11/2021-02/12/2021) where AFAN was invited.

2 https://fireanalysisnetwork.eu/2021/10/05/conclusions-fire-analyst-competences-and-skills-webinar/

3 https://fireanalysisnetwork.eu/case-categories/methodology-and-information-gathering-on-fire-analysis-capacities-across-europe/

This guide is targeted at an audience already initiated in the analysis of forest fires. For this reason, although some concepts and processes are explained, they are not explained in depth. This guide has been built from the perspective of analysts and for analysts (or future analysts). It describes a way of acting that is already operational in some agencies.

With the purpose of harmonising, this guide does not intend to define a unique and specific methodology to be followed to develop competencies in forest fire analysis, but rather to include different ways to achieve the same fire analysis action. This is why the reader should not expect D.2.2 to explain how to carry out a forest fire analysis or some basic concepts for fire analysis such as spread, regimes, fire generations or other information as operational structures mentioned in the document that is not explained either.

1

1. Introduction

Fire Analysis and Assessment (FAA) discipline collects vegetation fire information and transforms it to knowledge. This knowledge is used during emergencies to provide guidance and direction for decision-making on strategical, tactical and operational fire management levels.

The FAA is a relatively new discipline used by some organisations within Europe and globally. While there is not a standard way to define the FAA discipline, there are common tasks, competencies, and skills developed by the FAA discipline that can be harmonised.

Fire Analysis and Assessment (FAA) capacities are scattered across different levels (scales of application):

- Fire analysis competencies and skills for basic firefighters, intermediate commanders, fire planners, incident commanders, etc. all profiles in fire management. These sets of skills and competencies provide a better situation awareness and an improved way to make decisions.

- Specialist profiles, known generically as 'Fire Analyst', such as 'Long-term Fire Analyst', 'Tactical Analyst', 'Fire Analyst- planning' 'Fire Analysis Branch Director', among others.

Fire Analysis (FAA) can be performed on the ground, in an incident command post, in a coordination centre or as external assistance.

Fire Analysts (FA), being specialist profiles, can be embedded in the forest fires response in different ways. For example, on an ICS type structure FA can be found (Figure 1):

- Within the Command Staff, to support the Incident Commander and its General Staff in decision-making and communication.

- In the Planning Section, to assist the Planning Chief in managing information and/or in building a shared understanding of the scenario, framing strategical and tactical decisions and supervising its evolution, for the current and next operative period.

- In the Operations Section, as a Functional Branch or Division, for a high degree of linkage and coordination between fire analysis and operational tactics, especially in high-paced and high-impact scenarios.

- A separate General Staff Section, when highly specialized, coordinated

analysis performed from different positions is critical to reduce the separation between decision-making and a changing reality, especially in front of uncertain and complex scenarios.

– Outside the incident area, in a coordination or dispatching centre, managing information and assessment on new alarms, prioritizing and balancing considering the whole scenario, and providing remote assessment to specific managed incidents.

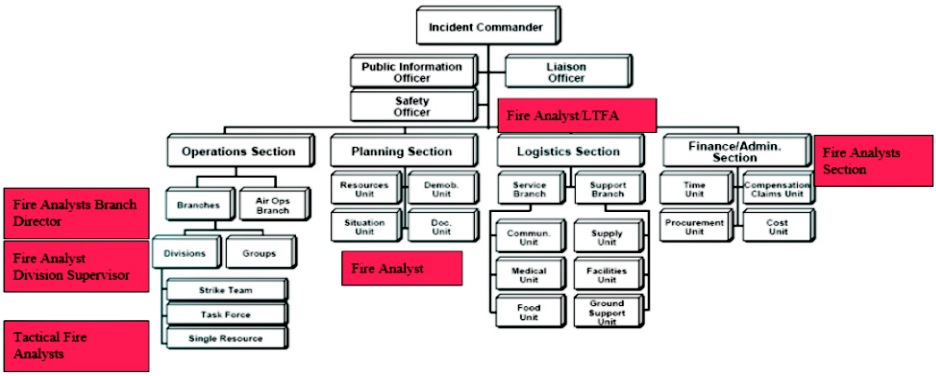


Figure 1. Diagram of the ICS showing that the fire analyst can be in different places in the organisational chart depending. Source: CFRS adapted from FEMA [1].

All these different skills and profiles interact in different ways within teams or groups, both inside an agency or in a multiagency framework.

Nowadays, different '**fire vegetation response**' agencies have decided to invest in incorporating different competencies and profiles of fire analysis[4].

The capacity of any agency to integrate FAA changes depends on the frequency of the fire generations [2] faced, which implies the frequency of challenging scenarios faced during the last years. Nevertheless, it also depends on the legal and socio-cultural context and on the structure of the teams in the organisation, etc. So, each agency trains and practices different competencies and skills to the different profiles (firefighters; fire bosses, leaders, supervisors, chiefs, commanders; dispatching specialists; pilots; fire prevention and management planners, etc.). Agencies promote specialist profiles in their ranks and how they interact with others in different fire management scenarios.

Extensive national and organisational differences do not allow to standardize competencies on FAA across European Firefighting Agencies. The great diversity and

4 Conclusion from the meetings and activities carried out for the development of this guide.

heterogeneity of models and standards that are available are adapted to the past problems, challenges, context and needs. However, in front of shifting fire problems, uncertainties, fast-paced changes, and complex fire behaviour there is the challenge to enhance the transference of best practices and to boost the cooperation across EU countries and globally.

Building a common framework can facilitate the harmonization of different models, facilitating benchmarking and interoperability. In face of a changing global environment, the understanding of the available 'building blocks' of FAA and its linkage with the existent challenges (for which these 'building blocks' have been designed) facilitates the fast adaptation to the 'new' challenges in wildfire management.

Precisely for this reason, in this guideline we will build a common framework to understand the different FAA profiles, tasks, activities, processes, tools and products, allowing each organisation to self-classify the fire analysis capacities and benchmark tasks, activities, processes, tools or products from others.

1.1 Aim of the guide

This Guide describes the Fire Analyst capacities during incident management, relating them to the scope and complexity of decision-making**,** describing the set of activities and tasks developed, and giving examples of processes, tools and products developed.

This guide is not intended to impose a specific methodology or to generate an exhaustive list of tools and resources, but rather facilitates the creation of a framework for harmonization of analysis at the European level. The guide aims to build a common framework and presents different FAA profiles, tasks, activities, processes, tools and products, allowing each organisation to self-classify its fire analysis capacities and benchmark tasks, activities, processes, tools or products from others.

The content of this guide can also help to identify the difference between vegetation fire analysis and other analysis from other disciplines that are equally necessary and useful, and contribute to some parts of the fire analysis. However, the guide does not include the possible existent contributions of forest fire analysis. It can also serve to identify areas of potential growth within fire analysis for organisations, individuals and teams..

1.2 How to approach the guide

The guide can be approached from different perspectives. It can be used by an organisation or individual to identify what contributions to make in the field of vegetation analysis. It can also serve to identify other organisations or profiles with expertise in making such contributions. Both can be used at the European level to identify expertise and facilitate exchange, to know who can provide what in emergency situations requiring external assistance or to identify areas requiring training in a particular location or organisation.

The guide should also help to draw the line between what is forest fire analysis and what are other types of analysis which, although they can be of great help, specialisation and expertise, fall outside the common framework envisaged here.

The first part of the guide attempts to lay the groundwork. Section ***1.4 Insights*** describes the conceptual basis for the guide while section ***1.5 Glossary*** aims to include simple definitions to facilitate the reading. ***Section 2. Fire Analysis and Assessment (FAA)*** deals with the description of what the Fire Analysis and Assessment is, both from an individual and a collective (organisational) point of view and in the different phases of emergency management that can occur for a vegetation fire.

The second part of the guide (section 3) describes contributions from fire analysis to facilitate decision-making that can be made from the fire analysis, showing also the impact of these decisions. This section also includes a discussion on the link between fire analysis itself and the liabilities it may entail. From this part, competencies and skills can be extracted but a specific list of these has not been included as they are directly related to the decisions that each organisation must make. However, it serves as a framework and guide to identify them and it can help organisations to do so.

The third part of the guide runs under de name of Fire ***analysis skills and capabilities*** (section 4). Precisely for the reasons aforementioned, when addressing specific competencies and skills, it is necessary to consider them inside the context of each organisation. While the explicit definition of all existing skills and capacities has not been exhaustively described, the combination of the content of sections 3 and 4 facilitates the identification on key skills and capacities on fire analysis. Section 4 includes examples of tasks performed by vegetation analysts and proposes a grouping by thematic areas. A proposal for the identification of expertise and domains for potential growth areas through graphs is also included.

Finally, the guide includes different types of examples. On the one hand, specific and brief examples using figures, on the other hand, more developed and comprehensive examples included in the annexes.

The figures included in the sections of the guide show brief examples of what is described in each section and have been compiled from contributions by project part-

ners and specific consultees (see contributors on the cover page). Some examples have been kept in the original language as the aim of including them is not to show specifically the exact content but rather the typology of information and products, in a generic way, to give an idea of the existing possibilities. In all cases, the author is mentioned to facilitate consultation and networking between analysts using the AFAN network that has been strengthened through this project.

1.3 Insights

With the aim to establish a conceptual basis for the guide, important aspects that constitute the framework into which the forest fire analysis is integrated are presented below.

As previously mentioned in the executive summary, for fire analysis to be useful, it needs to recognize and frame decisions on key fire problems such as changing scenarios as fire regime shifts, unintended consequences such as the fire paradox, or building resiliency to avoid the collapse in safety or service capacity of the fire-fighting organisations. In order to frame decisions, we need to understand the whole range of options, from shifting from reacting to planning in front of anticipated risk to deciding in front uncertainties, but always focusing first on the changing fire at different scales.

1.3.1. The Fire Paradox

Over the last few years, the occurrence of large wildfire episodes with extreme fire behaviour has affected different regions of Europe. During years, the response of most European societies to this problem has generally been to strengthen fire suppression policies with the overall aim to increase their fire suppression capacity. However, these large wildfire episodes have clearly shown the limitations of the fire suppression systems which have been overwhelmed by fire fronts of very high intensity and fire spread. Prevention and fire suppression systems with large budgets began to recognise that they had become victims of their own success: the heavy investment reduced fires of medium and low intensity, while the more intense wildfires continued to spread unhindered through the landscape, remaining beyond the fire suppression capacity. Additionally, the reduction of low-and medium-intensity disturbances paradoxically ensured the persistence of high-intensity wildfires, which resembles the application of a negative selection to our wildfires [2].

The strategy to improve and increase fire suppression resources has resulted in a scenario with a rather constant pressure over the years and with the characteristic that in only few years there are several thousands of hectares affected by large wildfires. Thus, the problem is concentrated in years with droughts and/or adverse weather conditions that may produce combustion processes with extreme fire behaviour [2].

Despite the high investment in fire suppression efforts, wildfires are becoming larger and more intense, with faster spread rates, which offers only few opportunities for the fire suppression systems [2].

This is known as the Fire Paradox or the Firefighting trap.

1.3.2. From tactics to strategy

According to the 'Forest Fires in Europe, Middle East and North Africa' report for the year 2020, over 3400 km^2 of land were burnt. The 2021 fire season has already been the second worst in the EU territory after 2017, with another 0.5 million ha land and vegetation in flames and, sadly, a high number of killed firefighters and civilians. [...] Europe is not spared from the global trend that fires no longer affect the 'traditional' southern states only but that they are an already existing and still growing threat also for central and northern Europe [3].

The forest fire season in 2020 was characterized by a large number of wildfires during the first half of the year, in winter over the Danube delta and in the Pyrenees, and in spring mainly over the Balkan region. During summer and autumn, the most affected areas were the Mediterranean countries, which recorded the largest fire events of 2020 in the EU, specifically in Spain and Portugal. The largest fire events were of particular interest and concern, as they took place near the Chernobyl nuclear reactor [3].

Organisations face an increase in complexity of vegetation fire emergencies due to global change, which involve an increase in highly populated vegetation-urban interphase areas, increasing amounts of available accumulated fuel in landscapes and climate change conditions leading to an increase in large wildfire events, increasingly complex, highly dynamic and uncertain. With the aim to select the scenario that will allow us to solve the situation without collapsing, it is necessary to set a path from reacting to what the fire is doing, towards operational and tactical planning based on expected fire behaviour, with its opportunities and impacts, and towards the inclusion of uncertain collapse sources and landscape values into strategic scenarios.

The ***tactical*** level decides the allocation of efforts (manoeuvres) in time and space while the ***strategic*** level has a broader vision and chooses the result of a fire event, encapsulating uncertainty by fixing gains and losses for each opportunity and creating a scenario of resolution where tactics and operations can succeed [4].

For example, tactics can focus on selecting where to deploy resources to be able to close a fire or develop a specific manoeuvre in a specific location (site A); while strategic can focus on checking if the objectives being pursued are consistent with existing needs and their linkages assuring that action 1 (site A) is

solved before action 2 (site B) to ensure security.

For improving vegetation fires management in front of complex uncertain scenarios it is necessary a growth from tactical to strategical vision. When organisations do that, FAs become an essential part of this process of change. In organisations focused on tactics, FA acts as an advisor delivering information to the IC and command staff while in organisations focused on strategic, FA also proposes the strategy to the IC who decides to consider or discard it. In case the strategy is considered, the IC and its command staff decides on how to organize it, balancing efforts and managing information, receiving tactical advice from other FAs on the ground.

Situational awareness collapses when we have too much information to control. In this situation decision-makingtends to lag behind because there is a tendency to focus on information and risks that are too certain and lose sight of the uncertain ones. However, when we become certain that there may be a change and what it may imply, it is often too late to change it (decision-lag); causing perilous situations for the operative or being not efficient enough in resolving the scenario. Therefore, strategy seeks to reduce the two factors that cause this collapse in situational awareness: a) blindness to the changes that cause us to collapse, and b) lack of focus on what can cause us to collapse.

This **shift from tactics to strategic does not imply that we will identify two different analyst profiles** (tactical analyst and strategic analyst). The definition of FA is unique while the number, position and focus of FAs in every organisation is variable, as seen in figure 1. So, it should be understood as an evolution along the possible growth path for the analysis in firefighting organisations.

Eventually, the strategic part cannot be separated from the tactical part along the road of growth. The strategic analysis without understanding the capacity and position of the organisation involves focusing on only one part of the process. So, the usual evolution is from tactical to strategic, to include in decision-making a wider focus on how the uncertain collapse of the organisation is fabricated and prevented and how values on the landscape can be impacted.

Strategic means sharing the same vision inside the organisation about 'what is happening' and 'what will happen soon', it does not depend on the view of who is in charge that day. So, this makes easier to plan and facilitates solving the situation, but requires an analysis planning staff', settling alternative plans so that the ***fire suppression chief*** can focus on choosing between them, and implementing it (see sections below for examples on this point). Nowadays, there are different organisations transitioning to this way of proceeding.

In this context, the role of FA goes beyond providing information for the firefighting chiefs to decide. It focuses on elaborating the different plans considering the linkages of these plans with tactical objectives and the deployment of capa-

bilities and positions so that the incident command can choose between alternative strategic scenarios and can direct the firefighting. Thus, **FA transforms information and data to well-prepared knowledge, to specific ways of proceeding and 'know-how' inside organisations, facilitating that the command staff focuses better on his/her task avoiding noise**. Therefore, often there is a distribution of tasks in which everyone assumes different responsibilities inside a team and necessarily involves creating a system of trust between the different figures. The FA is mentioned here as an individual, but stable teams can be formed with different vegetation fire analysts performing different tasks working together with the same vision (some in the command and control room, some in forward command centres, some in the field, etc.). This teams can be useful in critical situations and events.

It is not the purpose of this guide to explain how organisations can carry out this process. Nevertheless, it is worth noting that in some cases the analysis team has been integrated directly both in the Command Staff or Planning Section to propose strategical scenarios, and into the Operations Section, or as a General Section to facilitate the link between strategical and tactical decision-making, while in other cases it has opted for an integrated interaction but outside the operations unit.

1.3.3. Decision-making process (reasoning, methodologies and scopes)

Organisations use reasoning to deal with situations. The reasoning process in vegetation fires (section 1.3.2.1) helps defining the ***scenario*** and the actions to be performed on it. Based on this, different methodologies can be used to make decisions (section 1.3.2.2). These decisions taken in the management of forest fires through the different methodologies can be grouped according to whether they make reference to the different scopes in the decision-making process (section 1.3.2.3): **mission, vision, position or capacity**. This grouping helps to structure the logical achievement of the emergency management and to assess the needs that an organisation must manage in the scenario.

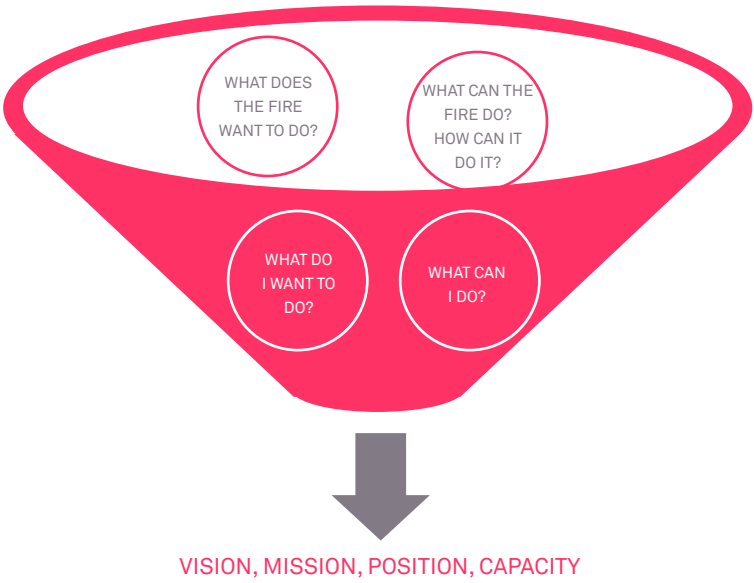


Figure 2. Strategical reasoning process (what the fire wants and can do, and what we want and can do) that translates into strategical decision (vision, mission, position and capacity).

1.3.3.1 Reasoning process in wildfires

Organisations that aim to have the capacity to proactively anticipate the scenario based on the capacities of the analysis seek that the reasoning process used is the appropriate to match the real situation of the scenario with the problems that will need to be solved.

One way of adjusting the scenario and the real risk is to ask four basic questions which refer to the fire behaviour (what it can and wants to do) and the position of the organisation (what it can and want to do). So, the questions for the fire are: ***What does the fire want to do? What can the fire do? How can it do it?*** And the questions for the organisation are: ***What do it want? How can it get it?*** This is based on game theory, the science of strategy, in which for optimal decision-making, one should consider the expectation on what the other (fire) can do, and the consideration of the outcomes of alternative scenarios of decision-making. And High Reliability Organisations' (HRO) theory states that in uncertain, complex, unpredictable scenarios, decisions should be focused on how the unexpected collapse is fabricated, identifying the potential sources of this uncertain collapse (both in the fire scenario and in our own operatives), and on building robustness in front of it.

These questions will allow understanding:

- ***What does the fire want to do?*** It defines and identifies the potential of values at risk to be addressed at different scales (from landscape to fire line). This question helps to analyse the behaviour of the fire, the ability to advance due to its typology, etc. *Outcomes*: Potential values at risk.

- ***What can the fire do? How can it do it?*** It defines 'how', this is the steps it has to do to achieve all of its potential. This step helps firefighters identify the key sources of threat, and the opportunities to avoid them, and their linkages. Identifying these steps can tip the balance towards resolution of the incident or towards its continuation or even worsening. These are the key factors that become a tipping point. These are points/places/moments/etc. where, if not acted upon, they can generate a major problem. Unlike the rest of the factors that may exist in the fire, these specifically generate an important change, normally aggravating the situation in a non-linear way. Therefore, these factors are those where efforts should be focused to avoid losing the opportunity to extinguish the fire. These facilitate analysing the constraints and advantages of fire to reach its full potential. *Outcomes*: Trigger points, opportunities, window of opportunity, key factors and indicators, potential diagrams.

- ***What do I want to do?*** Given the fire and firefighting scenario, select the alternative scenarios of resolution, and its values. This resolution scenario is approached from the perspective of emergency management, this is the scenario that will allow the emergency to be resolved successfully and safely. *Outcomes*: (Alternative) resolution scenarios

- ***What can I do?*** It identifies the feasible steps to achieve those scenarios. We order and prioritize the tactical objectives in operative tempos and span of control, considering positions and capacities. It identifies priorities, as what should be achieved for sure, and what should come next. It settles the order (sort out) as what to do first, what to do next to achieve the priorities, and even the connections between one action and another. *Outcomes*: Prioritize objectives linked to resolution scenarios, types of resources linked to windows of opportunities, etc.

This way of using questions makes it possible to identify and organise logically and consecutively the way in which analysis contributes to decision-making.

1.3.3.2 Decision-making Process Methodologies

Vegetation fires management involves many people thinking at once trying to converge to the same objective. The way to make decisions depends on the different methods of reasoning used. There are different methodologies coming from the decision-making analysis field that are also applied in the vegetation fires management: **immediate**, **analytical/tactical**, and **strategical/evaluative**. Each meth-

odology has a distinct focus, it is applied to different context and scenarios, and it is used in different levels of deployment. For example, each methodology has different ways of:

- Being applied in familiar and usual scenarios or in new scenarios.
- Using the available information: confirmed or predicted, certain or unknown.
- Can be integrated at different levels of deployment: first responders, commanders in extended deployments, command support structures, etc.
- Is used to integrate safety in a transversal way: at the level of incident teams, at the level of specific safety protocols and with the aim to avoid collapse at the level of safety.
- Responding to risks: considering known, probable and unknown risks.

The following paragraphs explain how each of the three decision-making methods explained is applied in the case of forest fire management.

IMMEDIATENESS METHODOLOGY OF OPERATION

This methodology is based on information considered 'certain', on what can be seen on-field, and on pre-planned strategies and tactics according to the type of behaviour and the pattern of propagation. Based on these, the method focuses on positioning capabilities and choosing the most appropriate manoeuvres in scenarios that are certain and usual.

Example: Methodology OODA (Observe-Orient-Decide-Act Loop) by John Boyd [5].

This is equivalent to the Methodology ***SOYEC (Situation. Objectif. Idée de manœuvre. Exécution. Commandement)*** of Operational French Doctrine [6].

ANALYTICAL/TACTICAL METHODOLOGY

This methodology is based on information considered 'probable' that comes from map/GIS, from information observable directly on-field and in photos coming from the field, and from experience and knowledge of the territory. It functions based on pre-planned strategies according to the fire of reference for that area. It is focused on prioritising achievable missions, on understanding the cost of opportunity involved, and on organising efforts in time and space, both on the incident location and the way to it. It aims to reduce probable risks, both for actions that are taken and those that are not taken, because not carrying out an action may also entail risks.

Example: Cyclical IADO (Information-Assessment-Decision-Order) Methodology.

This is equivalent to the Methodology SAOIELC (Situation-Anticipation-Objectives-Maneouvres-Execution-Logistic-Command) [6] of Operational French Doctrine (level 4 and 5).

STRATEGICAL/EVALUATIVE METHODOLOGY

This methodology is based on reducing the sources of uncertainty that lead to collapse. It seeks to choose the VISION of the incident that reduces the sources of uncertainty, integrating them in the decision-making process that avoids the collapse. The worst possible scenarios are identified. Of these, only those scenarios that meet certain criteria are chosen. In other words, they choose scenarios that prevent firefighters' safety protocols from failing, that prevent the emergency system from collapsing, or that seek the 'lesser evil' (from common good perspective) among the different scenarios.

Example: Models of game theory and decision-making in uncertain scenarios [4].

This is used for the GRAF Units from Catalan Fire and Rescue Service and the French Wildfire Analysts from ***Pompiers des Bouches-du-Rhône*** of France.

1.3.3.3 Scopes in the decision-making process: Capacity, Position, Mission and Vision

Several **scopes in the decision-making process** can be defined:

- **CAPACITY**: capacity defines what is needed to carry out operations to take advantage of opportunities: resources, fire suppression capacity, and higher speed to deploy safe operations compared to the speed of fire spread. Certainty is sought in achieving the capacity to work in the current conditions. The capacity refers to what is needed to carry out operations to use opportunities.

- **POSITION**: position defines when and where an opportunity to win will be. This is the identification of opportunities to carry out operations safely and efficiently using fire potentials evaluation.

- **MISSION**: this refers to situations where we must choose and order among known consequences and we prioritize objectives. It focusses efforts on tactical objectives.

- **VISION**: is the idea of final resolution of the incident (defined by the strategy). Includes identifying the strategic scenario and its awareness, avoiding blindness to changes and info-toxicity understanding the sources of uncertainty and reducing them, choosing a scenario of resolution and accepting the consequences.

If the whole organisation is aware of the Vision, Mission, Position and Capacity, this means that the different members or sections have the capacity to adapt the orders in tasks that go in the same direction as the rest of the organisation. Therefore, they work towards a common goal and at the same time they may be able to identify those orders that arrive late (due to various factors such as decision-lack) or that have a different direction to the path of resolving the situation.

1.3.4. Safety

Until a few years ago, the experience from firefighting organisations have shown that safety in the management of vegetation fires was only considered at the level of people and work teams (manoeuvre level); and was focused on describing protection equipment, protocols or procedures of work, and command procedures. Accidents and lessons learned coming from different areas of risk management have shown that in complex scenarios with rapid changes and a high degree of uncertainty, the set of measures, manoeuvres and self-protection protocols mentioned before are not sufficient to guarantee the safety of personnel.

The evolution that risk managers have made in these complex scenarios (such as forest fires) has been focused on incorporating new doctrines that assume that errors and accidents are not avoidable. Nonetheless, there are ways to reduce them through systemic changes by improving the ability to identify efforts and focus these efforts on how to deal with the unexpected and to build organisational resilience.

This step forward implies incorporating safety as part of the backbone of operational reasoning at all levels. Therefore, safety is a 'pre-conditioning' factor, so, it cannot be included ***after*** the fire analysis has been done. Thus, the different possible scenarios of resolution must be approached including safety from the beginning.

Therefore, it is necessary to focus on the information, understanding and processing it. And it is also required to identify the one on which it is necessary to focus attention because it is the one that will allow to detect the change that can lead to safety failure and collapse.

Safety is the responsibility of all the organisation, so, it needs co-responsibility (surpasses the individuals). Each decision has a consequence. Consequences and reasons behind each action must be considered, not only for the group of people performing it, but for the rest of the team involved in the fire. Organisations need to build tactical security in decision-making and strategic security in the planning of operational scenarios to make them safe, without sudden changes leading to collapse and lack of safety.

This objective is reached when the elements of the scenario that can change are introduced into the tactics and strategy. That is, when decision-making and security are linked in the same rationale. On the contrary, if situational awareness is some-

thing added on top of the operational scenario (objectives, tactics, strategy) then it is difficult to follow the linked implications in times of change.

However, if strategy includes the situational awareness and deploys it in the tactical objectives (TO) and accompanies them with the appropriate monitoring and the aim to detect issues on time; each tactical sector can maintain proactive traceability of changes, and the whole organisation is building certainty and traceability and robustness of security. The aim is to face uncertainty by eliminating it at the strategic level and not trying to eliminate it at only by acting at the manoeuvre level.

1.4 Glossary

This section does not intend to provide formal, academic or contrasted definitions, but only to define the necessary concepts from the point of view of this guide and in a simple way to avoid confusion in the interpretation of the guide. It is not recommended to use these definitions as a reference for purposes other than the one mentioned above.

- **Competence**: competence is the combination of skills, knowledge, and attitudes that allow to act accordingly in different situations depending on the different circumstances involved. It is a demonstrated ability to apply knowledge, skills, and attitudes to achieving observable results[5]. This is the knowledge and behaviour that lead the person to be successful performing a task or role e.g., strategic planning, decision-making, expertise, etc. Competencies are developed through practice and real-world experience, and mastering them usually takes longer than learning a skill.

- **Complex of fires**: a complex of fires is a combination of two or more fires that are close enough to interact among them and behave jointly to create a different outcome than they would on their own. The interaction may result in a phenomenon of greater magnitude, impact, scale and sharing than the fires alone.

- **Incident Action Plan (IAP)**: The incident Action Plan is a plan for managing the response to an incident using the Incident Command System (ICS). The team that is managing an incident develops an IAP for each operational period, the time schedules for executing a given set of actions as specified in the IAP, using the standard ICS incident action planning process. The IAP itself communicates the incident objectives and the tactics that will be used to manage the incident during the operational period that the plan covers. The incident action planning process provides a tool to synchronize operations at the incident level and ensure that incident operations are conducted in support of incident objectives. A disciplined system of planning phases and meetings fosters collaboration and partnerships, and focuses incident operations [7]. The different IAPs can be

5 https://www.ecompetences.eu/faqs/what-is-the-difference-between-competences-and-skills-arent-they-the-same/

numbered for better identification (IAP 0, IAP 1, IAP 2), where the number indicates the operational period.

- **Information**: it refers to data that has been given some meaning by using connections and linkages among them.

- **Knowledge**: it is the appropriate collection of information in a way that is useful for a certain situation or to solve a certain problem.

- **Large Vegetation Fire (LVF)**: (See also vegetation fire) in this guide we will use the word Large Vegetation Fire to indicate those fires that may be outside the Capacity of Control. These fires can be characterised by an extreme fire behaviour (categories 5 to 7 [8]), by complex, changing, unexpected behaviour and/ by other complexities in its control (orography, simultaneity, etc.).

- **Objectives of action**: Intervention in forest fires can determine four different objectives of action depending on the characteristics of the fire scenario. Emergency management organisations may use all or some of them. The most common cases are shown below [9]:

  - *Attack: This is the intervention aimed at minimising the surface area affected by the fire, making use of fire-fighting resources to extinguish the fire front where it is growing. Direct, parallel and indirect attack manoeuvres can be deployed.*

  - *Defence: This is the intervention aimed at protecting people and property that may be affected by the spread of the vegetation fire. It makes use of fire-fighting resources to deploy manoeuvres to protect the population, dwellings, campsites, farms, industries and other vulnerable elements, by using safe locations as a manoeuvre point.*

  - *Confinement: This is the intervention aimed at delimiting the maximum surface area that vegetation fire burns in a specific and known area. Parallel and indirect attack manoeuvres are deployed.*

  - *Fire management: This is the intervention aimed at monitoring the evolution of the fire with the aim of minimising negative consequences. Manoeuvres of stabilisation and accompaniment of the fire until it reaches definitive anchorages, carrying them out until the final fire suppression.*

- **Operational Period (OP)**: It is the period of time in which the objectives set are expected to be met which depends on the nature and complexity of the incident. The specific time is often determined by fire behaviour and environmental conditions (weather, terrain, availability of resources, time needed to execute the actions marked, etc.).

- **Fire potential polygons**: A proposed methodology based on fire behaviour experience and pragmatic knowledge that helps decision-makers to apply fire service culture, identifying the best opportunities to meet the strategic objectives. These methods are currently being applied both in fire suppression and fire prevention and preparation [4].

- **Process**: set of steps that guide analysis to achieve the specific product.

- **Product**: result of an analysis that is performed by an individual or a team. It is the final outcome.

- **Responsibility**: actions binding by law and information and knowledge that is key in the framework of the situation and that influences the decision making.

- **Role**: it is the position or purpose that someone has in a specific situation or in the organisation and the activities or tasks that FA may perform to complete the process.

- **Scenario of resolution**: the scenario of resolution is the definition of a final result of the incident. It is used at a strategic level to choose the final result of a fire event, encapsulating uncertainty by fixing gains and losses for each opportunity and creating a final scenario where tactics and operations can succeed. Defining strategic objectives based on universal organisational values can be of help in identifying the scenario of resolution [4].

- **Skill**: They refer to the specific learned abilities that a person needs to perform a task or role (e.g., analytical ability, problem-solving, etc). They are typically learned through formal education or additional learning. Usually, learning skills will be faster than mastering a competency.

- **Strategy**: The chosen final scenario in which firefighters plan to solve the emergency using the fire management agency knowledge. Strategy reduces uncertainty and provides credibility to tactical and operational decisions [4].

- **Tactical**: Distribution of efforts in time and space during a wildfire event that helps to achieve the objectives and priorities defined by strategy [4].

- **Toolbox**: it refers to the set of manoeuvres, resources and actions that fire-fighters have mastered and are able to apply on-field. Their use will depend on several factors, among others the window of opportunity.

- **Uncertainty** (in fire management decision making): situation in which wildfire knowledge is too limited or unfocused to make good decisions for efficient and safe operations [4].

- **Uncertainty matrix**: An uncertainty matrix is a matrix based in game theory that

gives different response options to the scenario and the events happening. The matrix has two main components, (1) what is known and unknown from the emergency response system perspective, and (2) what is known and unknown from the scenario. The matrix helps in addressing uncertainty in the strategy and tactics of a decision-making process that, in the meantime, can help to build resilience and credibility [4].

- **Vegetation fire**: in this guide we will use the concept 'vegetation fire' instead of wildfire or 'forest fire' with the aim to be inclusive considering fires that can affect not only forests in wildland areas but also brush, croplands, etc.

- **The window of opportunity**: The window of opportunity is a space (time and place) that offers the right conditions to carry out a specific action, in the case of vegetation fires it marks the right moment to be able to carry out specific manoeuvres to attack the fire and it can have a variable and limited duration.

2

2. Fire Analysis and Assessment (FAA)

2.1 FAA: knowledge, definition, profiles

Knowledge on FAA comes mostly from the expertise in vegetation fires response phase of the emergency management cycle, where it has been growing for years, but can be used and nurtured by other phases of the emergency management cycle.

2.1.1 The organisation's FAA knowledge and capabilities

From an organisational perspective, FAA can be considered a capability fostered by having analysis competence at all levels, from firefighters to the highest command levels. Then each organisation may have figures, teams, etc. accumulating experience, knowledge and skills, who spread lessons learned and training at all levels, fostering a joint vision, efficiency, capability, etc.

Having FAA at different levels leads to the sum of capabilities at the organisational level, and generates trust, agility, synergies and greater efficiency than the sum of the parts. And it allows the whole organisation to contribute to the analysis of the situation, to be aware of the risk and to be able to respond with a joint and integrated vision according to the situation to face.

Beyond the ability to analyse vegetation fires occurring within their territorial boundaries, organisations can provide remote assistance to other organisations involved in a vegetation fire incident. Assistance can also be given on-field.

To define an organisation's capacity in FAA during an aid or exchange it is necessary to determine:

- What type of FAA resources the organisation has available according to the next points?
  - Tasks they can carry out (matrix position)
  - Availability of activation
  - Autonomy
- What availability of accommodation the organisation has as a host?
  - Liaison teams - liaison officer

– Accommodation and maintenance infrastructures

2.1.2 The Fire Analyst (FA)

This knowledge is gathered in key personnel using some of the FAA profiles. Some of the **profiles** that use the competencies are:

- **Fire Analyst**, understood as the professional who accumulates a large experience analysing vegetation fires, participates in the response phase of the emergency management.He/she is involved in decision-making process, assumes responsibilities, and continuously monitore the fire season. A Fire Analyst can also give advice and participate in prevention, preparedness and post-fire phases. The fire analyst can be one or a team of vegetation fire analysts.

- **Other profiles in the response phase** using some of the skills of FAA. That includes both profiles in the Planning and Operations Sections (from firefighters to Divisions Supervisor, from GIS specialists to incident meteorologist or situation specialists), or even from the Command or General Staff.

- Without forgetting that in other emergency cycle phases there are key activities in which the fire analysis knowledge is used by **experts and managers** to make decisions: hazard/risk manager, fuel manager, wildfire prevention officer, post-fire severity and damage advisor, fire causality analyst, etc.

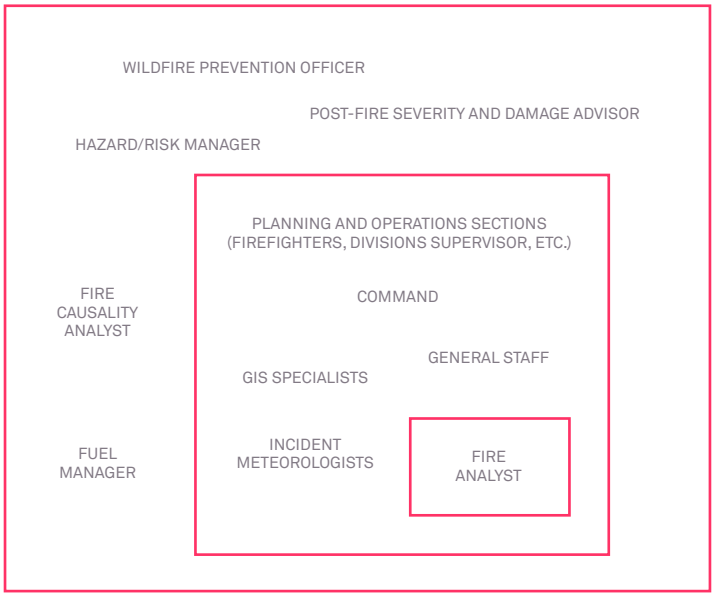


Figure 3. Examples of profiles that use competencies of FAA. Source: CFRS

The FAA knowledge is usually shared among pilots, firefighters, fire chiefs, vegetation managers, fire cause investigators and ultimately among different actors. But this guide focuses on the tasks of the fire analyst during the response, that means the person or team that participates during the response to an emergency, who is integrated in the decision-making process and therefore has direct responsibilities for the claims or information produced. This person or team have a continuous vision of how the scenario is evolving, not only for days or hours, but also for months. Therefore, it is not a one-off analysis made on demand for a specific situation but a long-term continuous work.

FAA knowledge is also unfolded in different phases of the emergency management. Some examples of key activities and topics developed with FAA knowledge in different emergency management phases are listed in section 2.2.

2.2 FAA and the risk management cycle

In the risk management cycle (prevention, preparedness, response, restoration/adaptation) there are many actions, but not all of them are part of the FAA.

There is circular work during the emergency and the aim is to reduce uncertainty in all phases of the emergency. The analysis of historical fires and post-analysis of small fires that occur during the fire season serves to prepare (preparedness at risk, IAP 0) the response. From a response perspective, the risk management cycle can be adapted as suggested in Figure 4.

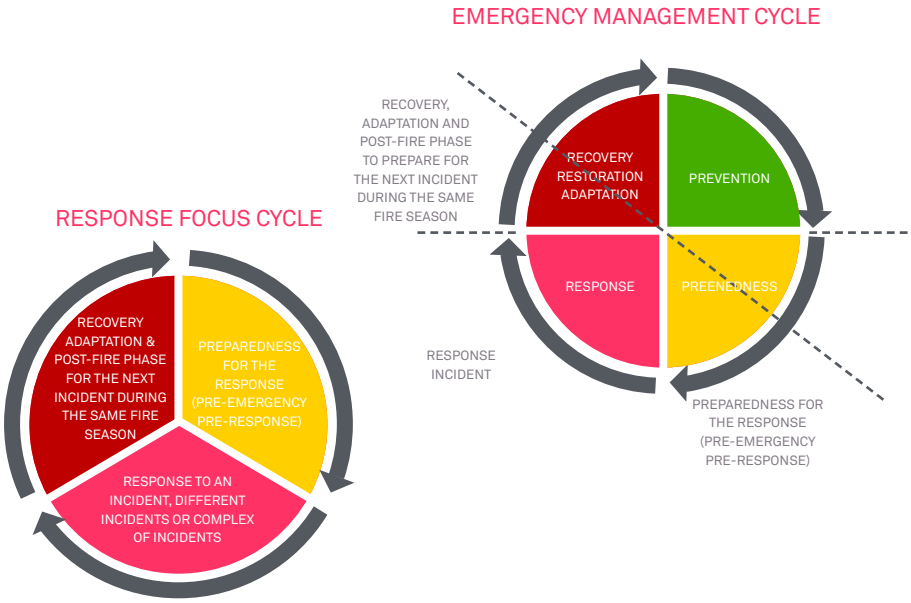


Figure 4. Emergency management cycle (right) vs response focus cycle (left). Source: CFRS.

Examples of these activities are detailed below, some are linked to fire analysis during response and some are not. This guide focuses on the response phase, to create a common framework to harmonize the different ways to understand FAA in European organisations and facilitate a similar understanding on the capacities of each one. So, from this section forward, the focus will be on the response.

PREVENTION PHASE

Examples of activities that use FAA knowledge during the prevention phase are:

- Fire vegetation hazard and risk assessment
- Mobility restrictions and blocked routes proposal
- Design and planning: in fire vegetation prevention plans, fuel treatments design, roads network, water resources, safety areas, etc.
- Adjustments and usability of fire spread and fire behaviour simulators
- Participation in landscape vulnerability assessment discussions

PREPAREDNESS vs PREPAREDNESS FOR THE RESPONSE

There are a number of actions that can be taken prior to the onset of the incident that are part of incident preparedness (pre-emergency, pre-response). This preparation has different phases. The first, pre-emergency, is even before the actual risk appears (daily, seasonal), and the second, pre-response, refers to preparedness within the risk situation but before the incident occurs.

Examples of preparedness before the risk:

- Compile, extract and analyse lessons learnt from past fires.
- ***Fire design*** and ***fire polygons network*** description for prevention measures in each massif/region and future fire potential scenarios.
- Produce operational reports to describe vulnerable or risky elements to advice about how to manage during an incident.

Examples of preparedness linked to the response phase performed before the incident:

- Monitor the risk throughout the season: periodically risk analysis in high danger season (e.g., daily, weekly).
- Synoptic vegetation fire hazard analysis and detection of extreme situations.
- Operational forecasts at a strategic or decision-making level related with the danger of the season that can be used e.g., to determine the resources that will be needed and whether or not to suspend activities, to follow the evolution of the state of the vegetation, the number of expected fires according to historical data, including the expected rate of spread, the state of drought and how the accumulated temperature will evolve (See Figure 5, Figure 6, Figure 7).

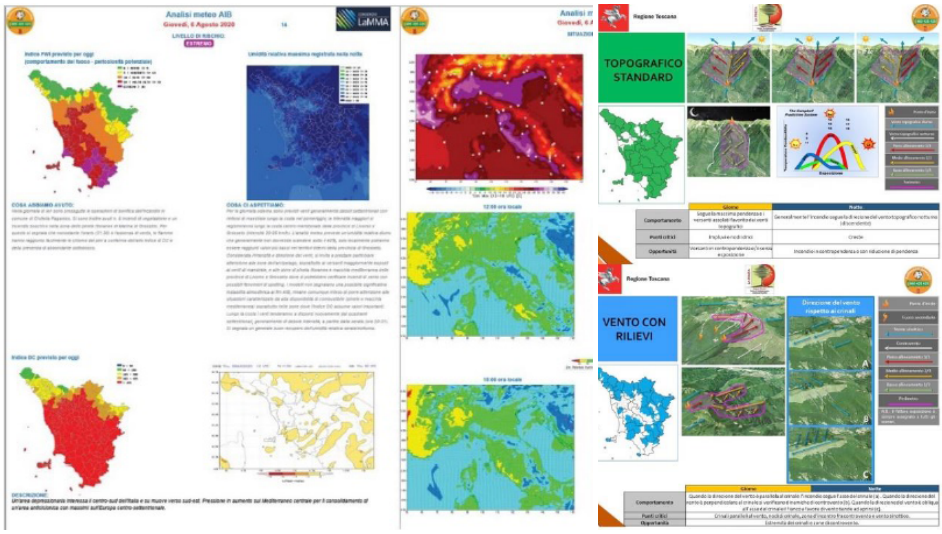


Figure 5. Fire-Weather Analysis Bulletin. Source: D.R.E.AM. ITALIA.

The main weather indices and parameters for vegetation fire-fighting purposes are summarised, contains two sections: "WHAT WE HAVE HAD" and "WHAT WE EXPECT". The "WHAT WE HAVE HAD" section provides information on the number, territorial distribution and characteristics of forest fires that occurred in Tuscany during the previous day, while the "WHAT WE EXPECT" section provides a detailed analysis of the weather conditions expected for the day, divided into time bands. Particular emphasis is placed on the characteristics of the wind, relative air humidity and atmospheric conditions in terms of stability/instability, as well as the type and intensity of expected fires, in addition to operational indications considered particularly useful in relation to the present and forecast weather conditions. In addition, the Fire-Weather Analysis bulletin is supplemented by the "fire types" concept (according to the propagation factor) expected in the Region. Each analysis carried out includes consultation of dedicated meteorological sites to get the most important information necessary for a specific analysis: lifted index, Haines, Radiosonding, air humidity previous night, air humidity and wind forecast (for 12-15-18-21 hours), FFMC, FWI, DC and BUI.

Analysing what we can expect helps during the preparedness phase for the response. On the one hand, what has happened in the previous days can provide information on the number, territorial distribution and characteristics of forest fires. On the other hand, if we foresee what might happen, the focus can be put on weather conditions expected for the day, characteristics of the wind, relative air humidity, atmospheric conditions in terms of stability/instability, the type and intensity of expected fires, in addition to operational indications considered particularly useful in relation to the present and forecast weather conditions. All this managed information can help to better cope with the day, the situations that arise and the response.

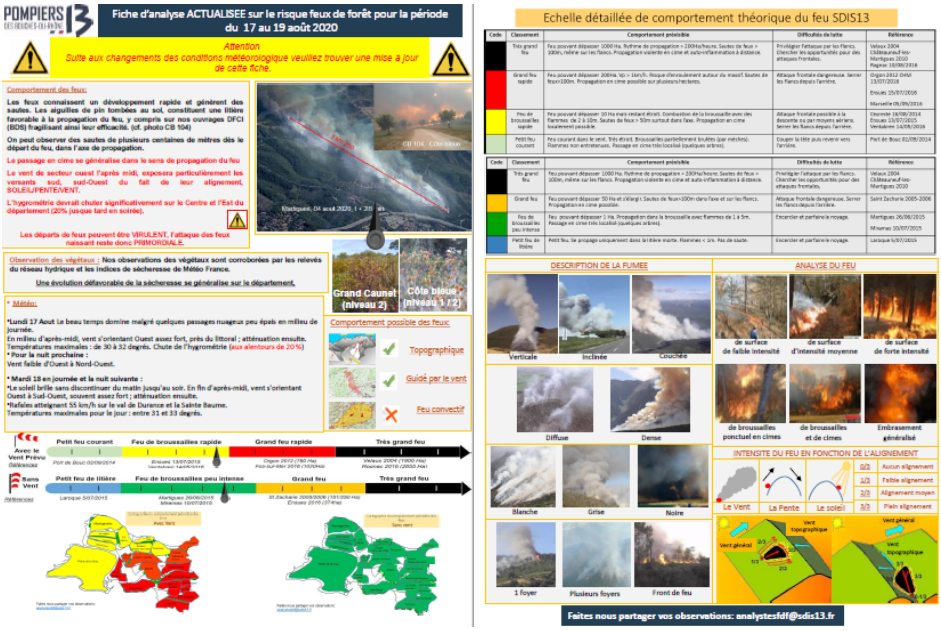


Figure 6. Forecast dedicated to the on-field resources. Source: Pompiers des Bouches-du-Rhône.

The forecast includes:

1. *Expected fire behaviour and size based on meteorology, topography and fuel observations; as well as areas where expected [Image on the left].*

2. Detailed scale of the theoretical behaviour of fire at the region analysed (SDIS13) including expected behaviour, possible fire suppression difficulties and reference fires in the past; images of column typologies and flame fronts to observe behaviour, intensities according to alignment (Campbell diagram method) [image on the right].

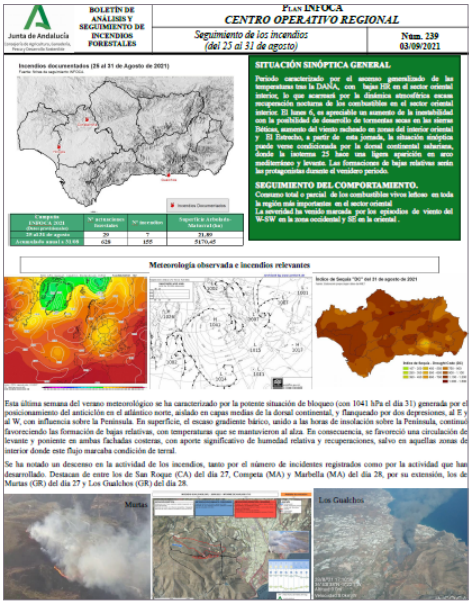
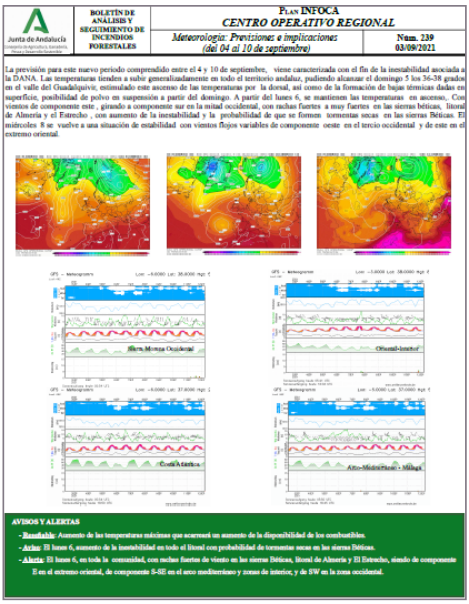


image 1



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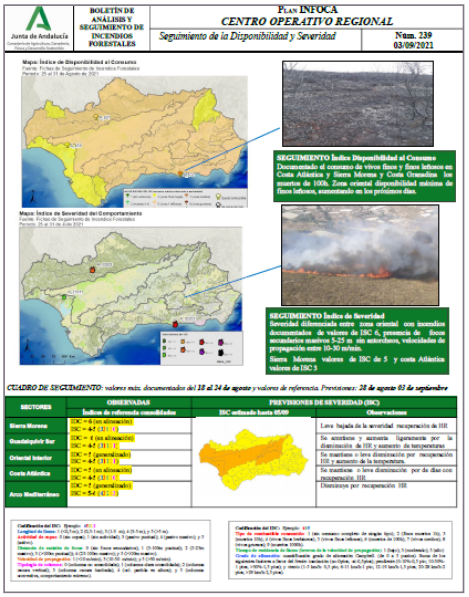


image 3

Figure 7. Vegetation fire analysis and monitoring bulletin for a specific period of time (from the 25th to 31st of August 2021). Source: INFOCA Plan. Regional Operational Centre. Andalusian Regional Government (Spain).

The bulletin includes:

- *The fires documented during the period analysed, the general synoptic situation, the monitoring of the behaviour, the meteorology observed in relevant fires and the state of drought* (Image 1).
- *The forecast for the new period (4 to 10 September 2021), warnings, alerts and relevant issues* (Image 2).
- *The status, availability and monitoring of fuel, severity and own reference indices to characterise different sectors of the region* (Image 3).

RESPONSE PHASE: As this guide is based precisely on this phase, no further examples are given here but can be found in the rest of the document.

RECOVERY/ADAPTATION/RESTORATION PHASE – POST-FIRE PHASE (OUT OF SEASON VS SEASONAL PERSPECTIVE)

Similarly to the preparedness phase (See PREPAREDNESS vs PREPAREDNESS FOR THE RESPONSE), there is a time in close proximity to the incident that may require analysis actions linked to the response to the incident. During and after the incident, actions can be taken to facilitate the adaptation and post-fire phase to prepare the organisation for the next incident during the same fire season. This provides continuity of analysis throughout the season. This way the analysis does not work as a single contribution to a specific incident, but as an action throughout all the fire season, with continuity and involvement in the different events that occur along the season.

Examples of post-fire phase during the fire season:

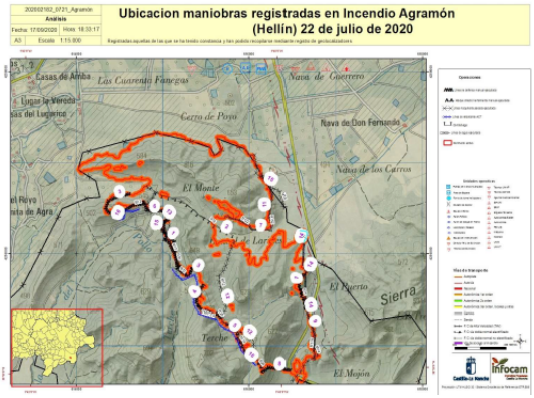


image 1

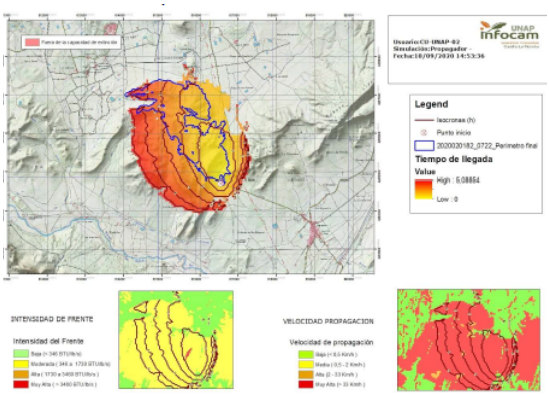


image 2

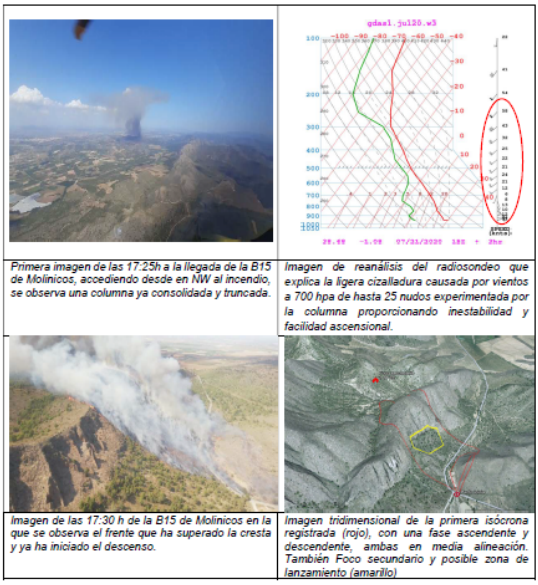


image 3

Figure 8. Operational Analysis of the Forest Fire 2020 Agramón - Hellín Forest Fire in Albacete (Spain). Source: UNAP Plan. Castilla-La-Mancha Regional Government (Spain). Regional Operational Centre for Forest Fire Fighting. Analysis and Planning Unit.

This specific example is 29 pages long and cannot be included in this guide entirety, so only some of the images (1, 2, and 3) contained in the document are shown.

The complete analysis includes the type of fire, synoptic situation, potential and final surface, time data (detection, stabilisation, extinction control, and action times), spread, active units until stabilisation (ground, air, personnel).

1. *Key factors of the fire: climatic, meteorological, fuels, behaviour.*
2. *Climate and meteorological analysis: synoptic situation, analysis of specific meteorological factors in relation to the fire (temperature, relative humidity, wind, etc.).*
3. Analysis and typology of affected fuels, state analysis, availability, drought evolution (e.g., percentiles of temperature, drought, etc.), severity and consumption after the fire.
4. *Spreading development: initiation, development, growth rate. (Image 3: propagation analysis).*
5. Simulation analysis carried out after the fire, once all the data are known to be able to study it (image top right).
6. *Recording of manoeuvres and operations to analyse execution times and manoeuvres* (image 1).

Examples of recovery/adaptation phase not directly linked to the response phase or the fire season: there are activities that are performed during the recovery and post fire phase of a vegetation fire:

- Causality, vegetation fire investigation
- Reports and lessons learnt from past incidents
- Evaluation of damages produced by the fire on landscape
- Restoration and recovery proposals

This section does not provide a detailed list of what can be done in the different phases of the cycle. Only a brief commentary of each phase and some specific examples are given in order to understand the following sections.

3

3. Impact on decision-making

3.1 Responsibilities

All products generated by the FA can have an impact on decision-making. Fire analysis conditions the tactical and strategic decision making, in which other data (e.g., weather) can be part of the information but not the FAA itself. FAA not only focuses on managing information, understanding, processing and drawing conclusions, but it also goes forward and involves expert judgement, know-how and specific knowledge coming from different areas (see section 4.2). Once FA has done his proposal, FAA becomes part of what has been considered or discarded during decision-making, hence it conditions the operational response. Therefore, this strategical analysis (see Strategy and Scenario Awareness, SCA in section 4.3.1) becomes totally integrated in the organisation and situation.

In strategical framework (see Strategy and Scenario Awareness, SCA in section 4.3.1), the FA not only proposes and gives an opinion, it also takes responsibility for proposing and drawing up the plan. When the IC assumes this plan, he/she and all his/her command staff are assuming the strategy in order that this strategy is executed. So, the analysis is an active part of the incident decision-making, and it has a direct impact on the field.

There are other roles/agencies that do not participate in the response decision-making process actively, but do it in a passive way, also modifying the outcomes of the emergency. For example, if in a country the law requires protective measures to be put in place around communication routes, but they are not done, this jeopardises the emergency actions during the response, but they do not share responsibility on the response.

In this guide, ***responsibility*** refers not only to actions binding by law but also to information and knowledge that is key in the framework of the situation and influences the decision making.

Summarizing, there are two key issues about the profile of a FA and role:

- RESPONSIBILITY ON his/her DECISIONS OR PRODUCTS
  - The FA is responsible of what he/she produces during their task (outputs) while the operations command is responsible for whether it assumes it or not.
  - The responsibility is held by both the FA with analytical functions within

the competencies of the emergency plans, as well as FA that participates in the operational decision-making from the command structure during the incident.

- DECISION-MAKING PROCESS PARTICIPATION

The FA generates products that can include operational capabilities and operational deployments with the aim to generate useful information for the incident IC.

In the economic and military world, there is a tendency in which the intelligence area focuses on proposing strategy while the operational area assumes it, applies it and deploys it tactically. But in vegetation fires and from the perspective of IC, increasingly the strategy is planned to anticipate what type of operations will be able to be developed in each scenario. The FA can propose and assume the strategy as it is the basis that marks the plan developed by the IC. Therefore, the FA and the IC become part of the same team, with their own co-responsibility, each one with a clearly differentiated participation in the event but both integrated in the same response operation.

The degree of responsibility and the impact on decision-making should also be determined when forest fire analysts provide assistance to other organisations.

3.2 Decision-making needs, FA contributions and impacts

Organisations make decisions in the face of vegetation fires. Some general needs (Figure 9) are shared among them but entail more specific needs (Table 1). All of them involve making decisions that affect coordination and planning, and ultimately the management and resolution of the emergency.

The FAA can help to provide certainty to facilitate this decision making. The analyst can contribute in different ways depending on the needs of the organisation at each moment linked to the decisions. These decisions that are made have an impact and therefore, the contributions from the FA are also linked to this impact, thus there is a responsibility behind them. Table 1 is intended to show links between the needs and decision-making of organisations faced with a vegetation fire, examples of the impact they generate and possible contributions that can be made by the FA.

Fire analysis contributions are linked with the fire analysts' specific knowledge and capacity, but also behaviour and attitude (e.g., behave in a trustworthy manner, ability to take responsibility) and experience in real situations (e.g., analysis in similar situations, participation in real cases). [See Figure 10]

Table 1 includes **4 sections** that describe **general needs** of the organisations (highlighted in green) that group the different specific needs and decisions explained below. These 4 general needs (in Figure 9 can occur simultaneously or consecutively, and

in the case of the 'planning of measures according to anticipated risk' occur before and after the incident, i.e., pre-emergency and post-emergency (See section 2.2).

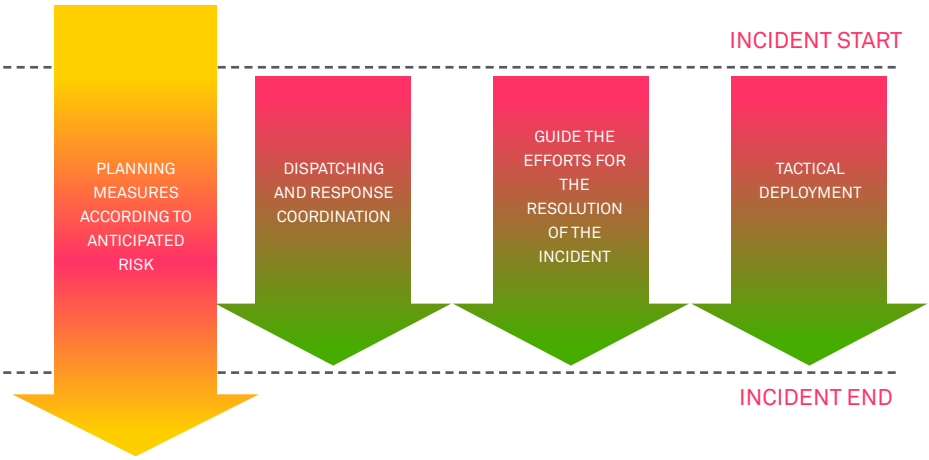


Figure 9. General needs that organisations have when facing vegetation fire incidents. Source: CFRS.

The table describes **different specific needs of** organisations and decisions involved:

- Organisation needs (column 1) describes the general need (CAPITAL BOLD LETTERS) and specifies specific needs for different situations.

- Fire Analysis Contribution (column 2) describes the contribution of the analysis. This column includes in the different 'decision-making methodologies' considered (see section 1.3.3) in CAPITAL LETTERS (See from 'Dispatching and Response Coordination' section forward), the 'reasoning processes in ***bold italics*** (see also section 1.3.3) and the different fire analysis contributions in pointed list. It also includes the Incident Action Plan aim that the fire analysis should consider (See Figure 10).

- Decision-making impacts (column 3) shows on which elements the analyst's contributions impact.

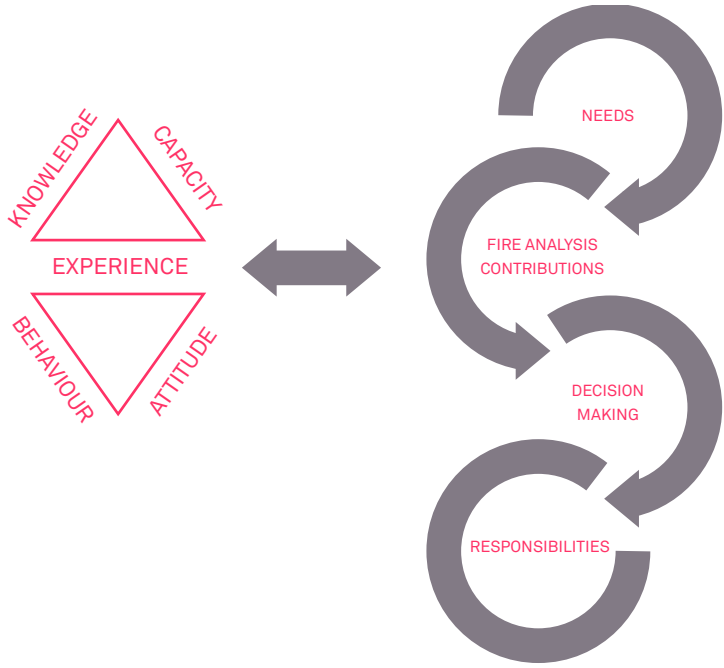


Figure 10. Fire analysis contributions are linked with the fire analyst's specific knowledge and capacity, but also behaviour and attitude and experience in real situations. Source: CFRS.

Each section of the table works in a cumulative way, i.e., actions that are carried out in the first steps can also be carried out further down the table. In other words, this table is not a list of options that once some contributions have been selected excludes the others, but aims to identify those actions that are most representative of the moment or scenario described in each row.

To facilitate the search in the table, click on the following headings to access the corresponding section:

PLANNING MEASURES ACCORDING TO ANTICIPATED RISKS

DISPATCHING AND RESPONSE COORDINATION

GUIDE THE EFFORTS FOR THE RESOLUTION OF THE INCIDENT

TACTICAL DEPLOYMENT

The contributions of fire analysis in Table 1 are a first approach to competencies. Subsequently, this first approach can be linked to profiles, knowledge, skills, and attitudes; according to the needs and characteristics of each organisation (See Figure 10).

Table 1. Table of decision-making needs, FA contributions and impacts (column 1: 'needs of the organisation'); also, the impacts of these decisions (column 3: 'decision-making impacts'). The central column (column 2: 'contribution of the fire analysis) includes different contributions from fire analysis. The table aims to reflect the impact that fire analysis has on the decision-making and on the results of this decision-making (column 3).

PLANNING MEASURES ACCORDING TO ANTICIPATED RISKS
The organisation managing the emergency should assess the risk scenario that has to face, based on an anticipated risk, and assess the measures needed to deal with it. When: Phase prior to the risk scenario. Scales: Periodic (daily, weekly, campaign) or punctual (episodic warnings). Local, regional, national or international.

ORGANISATION NEEDS	FIRE ANALYSIS CONTRIBUTION	DECISION-MAKING IMPACTS
MOBILIZATION ACCORDING TO RISK Decisions. Reinforcement of on-site and 'on call', both ground and air resources. Redistribution of resources and coordination of daily routes. Cover resources for fire detection.	Describe risk analysis: • Meteorology and specific climatology, status of fuels, statistics on activity/ignitions, and fire behaviour of recent events, fire types and critical scenarios of reference. Predicting damage, fire behaviour and collapse scenarios. • Mapping and evolution of hazard levels. • Mapping and evolution of the expected fire behaviour, in particular behaviour outside the extinction capacity.	Impacts on the availability of resources close to the fire at the limit and outside the fire suppression capacity. ✓ Time and volume of arrival of the first attack and extended attack, both on ground and air resources and command in potential fires and in simultaneous scenarios. ✓ Capacity to support in the coordination of command & control rooms and command positions.
PREVENTION AND PROTECTION MEASURES. Decisions. Give authorisations for fires and activities of risk, blocking access to forest massifs, preventive evacuations. Planning campaigns and the communication with the population.		Reduction of simultaneous ignitions and reduction of vulnerability against fires with extreme behaviour.
PRE-PLANNING OF COORDINATION AND INTERVENTION. Decisions. Definition of strategies and predefined tactics according to critical scenarios of a LVF and criteria for the first attack, for the extended attack and for detection.	Guide strategies and tactics in large vegetation fires (LVF): for the first attack, for the extended attack and for coordination. • Types of predefined strategies and tactics according to type of behaviour and type of spread pattern. • Expected critical scenarios of reference for the period and area, behaviour and sources of uncertainty. • Indicators to recognise the critical challenges of the scenario.	Proactivity in the activations of the extended attack and in the decision making of the first attack. ✓ Efficiency at first attack. ✓ Situation awareness in decision making, expressed in providing vision and mission in assignments, in self-protection planning and in strategic, tactical and operational decisions. ✓ Time of arrival of the extended attack and of the additional equipment (aerial means, technical fire, heavy machinery, tactical and strategical analysis, commands, support, logistics).
Decisions. Pre-planning of strategies in the coordination scope in the face of potentially complex scenarios of several simultaneous LVFs.	Guiding strategies and tactics in the scenario of several large-scale wildfires occurring simultaneously or with this potential to be a 'complex'. • Expected critical scenarios, behaviour and sources of uncertainty in the interaction of different LVFs. Indicators to identify them. • Non-collapse value of the emergency system. • Criteria to guide the resolution of the incident with different LVFs. • Pre-planning of strategies and integrated coordination, communication and prevention and protection measures.	Proactivity in the management of scenarios with the potential to be LVF complexes. ✓ Effectiveness in the prioritisation of the first attack of the fires with most potential in the face of simultaneity. ✓ Effectiveness in the management of external support (regions/countries, organisations, etc.). ✓ Effectiveness of communication strategies and protection measures.

(This table continues in the next page)

DISPATCHING AND RESPONSE COORDINATION

The organisation needs to coordinate the different responses according to active services, with a dispatching of resources sufficient and adjusted to the priorities of the scenario that requires to be faced, and to maintain the capacity to plan and anticipate scenarios to avoid collapse at the emergency coordination level.

When: both in the phase of receiving a warning and coordinating simultaneous active incidents.

Scale: Regional, National and European Dispatch – Command & Control Rooms

ORGANISATION NEEDS	FIRE ANALYSIS CONTRIBUTION	DECISION-MAKING IMPACTS
PREVENTION AND PROTECTION MEASURES. Decisions. New restrictions on anthropic activities. New warnings and communication to the population.	Analysis of the scenarios of fire with the available information: Search for key information on fire behaviour for each incident call/warning: • Mapping of the potential of the area where the fire started. • Relevant photographs of the column and fire behaviour. • Current and forecast weather. • Doing all this beginning from the worst possible potential and discarding from the worst to the better as new information arrives (surface area, impacts). • Anticipate challenges and critical scenarios. • Reassessment of the risk to the rest of the territory and reassessment of the response capacity of other services. Monitor the temporal and territorial evolution of the risk. Analysing meteorological indicators and assessing the deviation between models and reality, adjusting the type of fire according to the behaviour of the fire, adjusting the different manoeuvres available and ready to be used ('toolbox') to the behaviour and fire challenges. Monitor the active incidents • Seek information on the evolution of active incidents on the organisation's scale of work. • Perimeter mapping and potential analysis by parts of the fire. • Deviation between expected behaviour and reality. • Understanding the idea of the final incident resolution scenario. • Monitoring the percentage of objectives achieved. • Anticipate whether more resources will be needed in the coming hours and what type of resources will be needed.	Reduction of the simultaneity of ignitions and reduction of vulnerability to fires with extreme behaviour.
RESOURCE DISPATCHING. Decisions. In front of a new incident call, activation of ground, air, command, analysis, logistics and support resources in front of a forest fire warning. Decisions.Ground and air routes for fire detection (before the warning and during other active fires).		Proactivity in the activation of the resources and different manoeuvres and resources ready to be used ('toolbox'). ✓ Time of arrival of the first full attack, of the extended attack in fires at the limit and outside the extinguishing capacity. ✓ Time of arrival of the 'toolbox' (different manoeuvres and resources ready to be used) adapted to the challenges that the fire will present (aerial means, technical fire, trucks, heavy machinery, tactical and strategic analysis, command, support, and logistics).
REDISTRIBUTION OF RESOURCES ACCORDING TO THE PRIORITISATION BETWEEN ACTIVE SERVICES AND THE EVOLUTION OF THE RISK. Decisions. Activation of ground, air, command, analysis, logistics and support resources in the event of a forest fire incident call or during the response to active services. Activation of external assistance commonly used (from the same territory as the organisation).		
INTEGRATION, DISTRIBUTION AND ASSIGNMENT OF EXTERNAL RESOURCES (NOT COMMONLY USED) IN LVFS COMPLEX SCENARIOS. Decisions. To prioritize in scenarios with LVFs complex potential. Activation and management of extraordinary external support (from areas and territories other than the organisation itself).	Identify scenarios that can lead to collapse and criteria for their resolution. • Anticipate collapse scenarios due to safety, simultaneity... • Identify the sources of uncertainty that lead to collapse, and their indicators. Establish criteria to guide the idea of resolution. • Recognise those scenarios that should be considered as a complex of fires. Incorporate external support in on-site or remote analysis. • Integrate information from external remote analysis into the information of the analysis being carried out. • Expand alternatives and review indicators that provide awareness of the situation of the dynamics and interaction of the LVF complex of fires.	Proactivity in the management of scenarios with the potential of being LVFs complexes. ✓ Effectiveness in the prioritisation of the first attack at those fires with the highest potential in the face of simultaneity. ✓ Effectiveness in the management of external aid to ensure the capacity to receive and integrate aid into the dynamics of the own emergency management. ✓ Effectiveness of the communication strategies.
PRE-PLANNING (BOTH THE INCIDENT DURING THE WARNING AND ON THE WAY BY THOSE RESOURCES GOING TO THE FIRE).	Shared visualisation of the incident: both in the incident call phase and in the fire with on-going response. Sources of uncertainty leading to collapse. Anticipate general potentials and common scenarios that imply a limit to the system's fire suppression capacity to guide the search of opportunities in each LVF of the complex taking into account their interaction.	Proactivity in the decisions of the first attack. ✓ Effectiveness of the first attack. ✓ Effectiveness of the extended attack.

(This table continues in the next page)

GUIDE THE EFFORTS FOR THE RESOLUTION OF THE INCIDENT

The organisation that manages the emergency has to respond to a specific incident or complex of incidents, so it is necessary to organise, decide and act with the resources that have arrived and the information that is available at each moment. This is the on-field response but at the same time monitored from the respective Dispatch-Command & Control room. All command and coordination positions in the organisation must be aware of the incident scenario of resolution and the uncertainty factors that could change it. There are usually 3 scenarios: small fires that can have runs outside of the fire suppression capacity (scenario A), small or medium fires that can become large vegetation fires (scenario B), and the complex of several large vegetation fires (scenario C).

ORGANISATION NEEDS	FIRE ANALYSIS CONTRIBUTION	DECISION-MAKING IMPACTS
IN A FIRE, THE ORGANISATION NEEDS TO **GUIDE EFFORTS TOWARDS A SHARED IDEA OF THE INCIDENT RESOLUTION. ESTABLISH STRATEGY AND PRIORITISED TACTICAL OBJECTIVES** (1) There are 3 scopes to identify needs and the decisions to make involved: Scenario A: ***Description***: Vegetation fire with the potential for firefighting outside the fire suppression capacity, where the CAPACITY* must be positioned. ***Decision***: To choose the scenario for the resolution of the incident of the first attack, in the first operational period (1h for example) of the incident. Scenario B: ***Description***: Fires with the potential to become large vegetation fire (LVF). ***Decision***: To select the incident scenario of resolution in the corresponding operational period (e.g., first hours) to organise the mission. Scenario C: ***Description:*** Simultaneous LVF (exceeding the fire suppression capacity). ***Decision***: To choose the scenario of resolution (scenario C) in simultaneous LVF (exceeding the extinguishing capacity) where it is necessary to provide vision. NOTE (1): The organisation that manages the emergency has to respond to a specific incident or complex of incidents, so it is necessary to organise, decide and act with the resources that have arrived and the information that is available at each moment. This is the on-field response but at the same time monitored from the respective Dispatch-Command & Control room. All command and coordination positions in the organisation must be aware of the incident scenario of resolution and the uncertainty factors that could change it. There are usually 3 scenarios: small fires that can have runs outside of the fire suppression capacity (scenario A), small or medium fires that can become large vegetation fires (scenario B), and the complex of several large vegetation fires (scenario C).	IMMEDIATE AWARENESS / OPERATIONAL METHODOLOGY ***What does the fire want to do? What can the fire do? How can it do it?*** • Assess the actual behaviour and pattern of the fire compared to that predicted. • CPS of the flanks, head and tail. Identify the trigger points and potential immediate damage of each the several parts of the fire. • Assess the risks to firefighters (safety of the teams), people, property and forest mass and the values involved. Understand the potential risks. ***What do I want to do? What can I do?*** • Choose a 'scenario of resolution' that minimises potential damage, positioning resources in the opportunities that the trigger points offer with the aim to achieve the priority objectives. • Assess the suitability of pre-defined strategies. • Know the capacities of the resources in place and requesting new ones if necessary. **Incident Action Plan**: ▯ Guide the first incident commanders, the working teams and those who must make decisions (from dispatching to on the way teams) to build a shared vision of the resolution of the incident. Assess on tactical objectives (mission), and on the positions and capacities to achieve them, and about the incident's self-protection plan.	✓ Efficiency in the management of fires that have the potential to run out of fire suppression capacity and to become LVF (and this also involves the final surface area, vigilance after the fire...). ✓ In the ***fire suppression paradox*** of the system because it affects the size of the final fires, reducing the number of medium-sized fires and increasing the proportion of those that remain as outbreak (an attempt that does not develop in a LVF) of fire (Surface affected by the fire <1 ha, reference MITECO1).
	ANALYTICAL/TACTICAL METHODOLOGY ***What does the fire want to do? What can the fire do?*** • Identify the driving force of the fire from the CPS and the patterns of spread (propagation). • Identify the key variability and change factors of the fire. • Identify the 'windows of opportunity' and the estimated potential impact of the fire. ***What do I want to do?*** • To choose a scenario of resolution that minimises potential damage in front of foreseeable changes, prioritising achievable missions in the current operational period (tactical objectives) to ensure the resilience of the firefighters and minimise damage. ***What can I do?*** • Choose the missions (attack, containment, defence and management) that are achievable by ordering (deciding what goes first and after) the efforts in time and space, including the capacity of the resources on site and of those on the way. • Understand the speed of the manoeuvres and the deployment capabilities with respect to the scope of action ('window' of action) and the time of arrival of the resources to be used to take advantage of the available opportunities. • Choosing the specific manoeuvres (toolbox) for each opportunity and determining the containment strategies to be used. • Establish key indicators to measure the tactical objectives. **Incident Action Plan** • Guide the tactical, logistical and support efforts and the decision-makers of the incident, on the tactical objectives and security of the device of responders. • Provide vision and mission in the assignments to build safety in an integral/transversal way and avoid the collapse of the device of responders.	✓ Effectiveness in the management of fires that have the potential to become LVF, which means reducing the number of simultaneous fires. ✓ Effectiveness in the prevention measures implemented in the territory, because it allows testing their real use during the fire suppression. ✓ In the ***fire suppression paradox*** of the system because it impacts final size of the fires, reducing the number of LVFs and increasing the proportion of those that remain within the fire suppression capacity. ✓ To promote strategies of fire containment by means of the controlled burning of areas where to deploy tactics ('***let it burn'*** and firing operations/technical fire) in parts of the perimeter, to increase the resilience of the landscape (post-fire adaptation/restoration).
	STRATEGICAL/EVALUATIVE METHODOLOGY ***What does the fire want to do?*** • Establish the diagram of fire potentials. • Establish the values of the polygons of each potential (multi-focus perspective). ***What can the fire do? How can it do it?*** • Assess the 'windows' of the opportunities that are identified. • Translate to 'fire probability of flux' through each polygon (this is the probability that the fire goes from one polygon to the next one), establishing the flow of fire between polygons. ***What do I want to do?*** • Choose a scenario of resolution that minimises uncertainty and makes the strategy resilient in the face of foreseeable and uncertain changes. ***What can I do?*** • Define the different scenarios: desired, accepted and discarded. • Identify achievable missions for the next operational period (tactical objective). • Identify key indicators to measure the effectiveness of the strategy (***uncertainty matrix***). **Incident Action Plan** • Build the alternative scenarios of resolution, with its consequences and constraints that allows to choose the strategy. • Provide the vision and mission in the assignments with the aim to build the integral safety of the scenario including the sources of uncertainty and eliminating noise to have a common and certain image of the scenario.	✓ Effectiveness of efforts in the management of large vegetation fires (LVF). ✓ In the confidence of the emergency system in strategic and tactical decisions in complex scenarios. This leads into confidence in the steps towards fire management in the ecosystem. ✓ In the creation of more or less vulnerable future landscapes. ✓ In the measures to prevent strategies for resilient landscapes (prevention). ✓ In the adaptation of landscapes and their economy to the new scenarios of the future (adaptation/restoration). ✓ In the CAPACITY* of the emergence system towards future scenarios by generating mosaic and opportunities.
RESOLUTION SCENARIO WHERE THE ORGANISATION HAS **TO HAVE A VISION AND A MISSION TO CHOOSE BETWEEN THE ACHIEVABLE OBJECTIVES AND THOSE IT WILL NOT BE ABLE TO ACHIEVE**. Decisions: To see whether the visualised scenario corresponds to reality in order to take the decision to implement changes. Indicators can help on this.	• **Monitoring the objectives achieved**: Determine the information to be monitored in order to be aware of the level of achievement of the objectives, as well as to identify indicators that allow us to detect when the rate of achievement does not match the rate foreseen in the planning and indicates that there is a mismatch between what was foreseen and the reality. • **Monitoring the indicators of the strategy**: Identify the indicators and their change targets to ensure that the planning, response and understanding of the situation of the emergency scenario is consistent and in line with reality, reducing the gap between reality and response (cite reference text). Incorporate internal self-assessment method or delegate supervision to someone external to the emergency environment and conditions. • **Managing and processing information through documents and meetings**: Collect information on the objectives, with the order and priority assigned, on the application of the tactic, on the work stations and on the development of the key manoeuvres to avoid the free spread of the fire. **Incident Action Plan** • Create products with the necessary operational information to be included in the **Incident Action Plan**, to be explained and distributed at incident coordination meetings, and to develop situational awareness and protection measures for the population.	✓ Self-assessment. ✓ In the vision of the shared scenario. ✓ In the capacity to face changes. ✓ In the trust of the organisations to make-decisions, the awareness of its limits and constraints, and the trust to communicate them in a transparent way in front of uncertain scenarios.

TACTICAL DEPLOYMENT

The organisation is at the incident location and has a forward command post deployed there. In this situation, the emergency management team has stablished its incident action plan and must implement it during an operational period. It´s time to order actions, move resources and monitor key indicators to achieve the strategy and tactical objectives defined. In this context it is important to adjust the necessary resources, information and actions. It must be established where, when and how the division supervisors and the units/team leaders of each area will have the specific resources, information, and links with others that will allow them to develop the actions that are commended to each sector. It is necessary to create tactical architecture to see which manoeuvres come before others, what windows of action exist, what priorities are set and what can withstand a breakdown situation or fail. For all this, it is necessary to constantly monitor the achievement of objectives, to observe the gap between analysis and reality, and to constantly reassess the scenario.

ORGANISATION NEEDS	FIRE ANALYSIS CONTRIBUTION	DECISION-MAKING IMPACTS
ADJUST EFFORTS IN TIME AND SPACE TO ACHIEVE THE VISION AND MISSION OF THE ACTION PLAN. Decisions: Order and link manoeuvres in an opportune moment.	IMMEDIATE AWARENESS / OPERATIONAL METHODOLOGY. Assessment of critical opportunities, constantly adjusting the manoeuvres and self-protection plan with the new information available, monitoring indicators. ***What does the fire want to do? What can the fire do? How can it do it?*** • Identify current and expected behaviour, trigger points and vulnerable elements, safety aspects and the proper 'window' for action. ***What do I want to do? What can I do?*** • Build the tactical architecture as an opportunity to achieve the assigned objectives with the available resources. • Confirm the 'window' available to work. • Identify the location or anchorage of the manoeuvres, as well as the manoeuvres with the available resources, considering the possible evolution over time, and the need for extraordinary resources. **Tactical Decisions**: • Identify self-protection planning (LACES, EPI...). • Monitoring of key indicators (monitor whether the manoeuvres and tactics are achieving the objectives, monitor whether the objectives are being achieved). • Provide safety information related to fire behaviour and weather forecast, at least on a large scale and in case of sudden changes or particularly dangerous situations (for example, when a storm is close and may affect a forest fire). Units should be aware by observation, forecasting, etc. but an additional `safety net' to make sure this is taken into account might be advisable.	✓ Improvement of the situational awareness in decisions in **manoeuvres** that are considered critical to achieving **tactical objectives**. ✓ It reduces the delay in decisions and the deviation between perception and reality.
Decisions: Order and link opportunities in a sector. Decisions: Ordering and linking opportunities in a sector in a big fire.	ANALYTICAL/TACTICAL METHODOLOGY Tracking and monitoring of a critical sector, constantly adjusting the distribution of efforts with the new information available. ***What does the fire want to do? What can the fire do? How can it do it?*** • Identify opportunities and risks in the containment areas. • Monitor the deviation between observed and expected behaviour of the fire. • Monitor the key factors that can generate changes. ***What do I want to do?*** • Build the tactical architecture of the sector/fire to achieve the vision and mission with the available capacities. ***What can I do?*** • Understand the capacity of the types of efforts available, and the scope of action and potential of each opportunity. • Prioritise the opportunities and discard them if necessary, understanding the cost of opportunity of the decision at sector/business level. **Tactical Decisions**: • Constantly balance the new information available with the use of resources (toolbox) distributing them between the available opportunities of the sector/fire, and organising the efforts in time and space. • Prepare a Plan B. • Establish indicators to monitor key changes and the achievement of objectives. • Provide vision and mission in allocations to build safety in an integral manner. • Assess complex manoeuvres performed synchronously between geographic and functional divisions (such as aerial means or technical fire, etc.), where and when can be most effective, and the conditionings factors and constraints to synchronize them so that the behaviour can be affected.	✓ Improvement of the situational awareness in **tactical** decisions that are considered critical to accomplishing the **strategy**. ✓ Reduction on the delay in decisions, and the deviation between perception and reality.

4

4. Fire analysis skills and capabilities

4.1 Fire Analysis and Assessment (FAA) competencies and skills

The FA should have core competencies which enable the analyst or the FA team to provide support at a wildfire incident. As a general rule, the competencies and skills required to carry out the FAA are very similar among organisations, but each organisation defines them differently and with the meaning of its own language.

This guide outlines the competencies needed in a generic and harmonised way by describing shared organisational needs and commonalities. This aims to allow to harmonise and follow the objective set out in this guide.

With the aim to address general competencies, section 3.2 shows the contributions that the analyst can make to decision-making and the impact they can have (Table 1. Table of decision-making needs, FA contributions and impacts).

The contributions of fire analysis in Table 1 are a first approach to competencies. Subsequently, this first work may in the future be linked to profiles, knowledge, skills, and attitudes; according to the needs and characteristics of each organisation. These contributions show which competencies would be good to develop in the organisation to be able to make the related decisions. In addition, the reasoning methods (1.3.3.1 Reasoning process in wildfires), examples of tasks (4.3. Examples of tasks) and thematic areas (4.2.Description of fire analysis and assessment areas) show the set of necessary competencies detected under the development of this guide necessary to perform fire analysis.

From this guide, the next step would be to define what specific skills each analyst profile (tactical analyst, strategic analyst, etc.) should have. However, this definition depends on the profiles integrated in each organisation. The aim of this guide is to facilitate harmonisation and, therefore, it remains at this level of competency definition. the annex to this document includes an example on how to describe competencies that can help illustrate a next step. The annex gives more detail on the example of 'UK wildfire tactical advisor competencies' which develops criteria that can be used to validate such competencies ('performance criteria') and also the detail on how each individual can provide evidence of competence through demonstrating their knowledge and understanding or by taking relevant action ('subject competence') [See '"7. Annexes"].

Figure 11. An essential capability of the Field Analyst is the ability to communicate with the Incident Commander and the other Assisted Coordination staff. At regular intervals, the I.C. meets with the Field Analyst at the Coordination Post to discuss the evolution of the fire and adopt the main containment measures. Source: D.R.E.AM. ITALIA.

Figure 12. Fire analyst training examples. Source: D.R.E.Am. Italia.

4.2 Description of fire analysis and assessment areas

- **Impact of meteorology on fire behaviour (MET)**: This refers to the FA's knowledge of weather understood as weather that has an impact on the speed of fire. This includes current and forecasted changes on fire behaviour and not only on-site meteorological variables.

- **Fire position (POS)**: This refers to the knowledge that the FA owns when he/she has the capacity to track, draw or forecast perimeter movements to define the fire position and opportunities.

- **Fire behaviour (BEH)**: This includes knowledge about fire intensity, rate of spread, spotting, crowning, etc.

- **Fire spread patterns (PAT)**: This refers to the knowledge that the FA has about the movement of the fire. Moving a step forward from BEH, PAT involves tasks from defining types of fire (topographic, wind-driven, convection dominated) to identifying patterns. In this block, fire behaviour is considered not only from the perspective of point variables (temperature, humidity, etc.) but also including frontal analysis (study of the transition zone between air masses of different densities), convective cells or patterns.

For example, this knowledge can start from knowing the state of fuels (vegetation), linking this to specific behaviours to identify areas where fires have not yet occurred, but the state of the fuel is known and finally recognising the type of movement that fire can have.

This process can be done at different scales (fire scale or landscape scale), so here the knowledge about patterns not only considers fire flames during a specific day, but also fire regimes to finally propose scenarios that have impact on the landscape.

- **Tactical Planning (TP)**

The FA perfectly knows the way the organisation in which he/she is embedded works, including its limits and constrains, to be able to first identify opportunities and secondly to know in which order and priority the objectives are set by the IC. This whole block implies that the fire analyst has a minimum knowledge of manoeuvres and tactical deployment.

For example, FA is able to set indicators to detect when the situation deviates from the envisioned scenario and quickly communicate this to IC to share the awareness of the situation.

Other examples: safety protocols knowledge, situational awareness, direct observation from on-field (both on the surface and aerial), etc.

- **Strategy and Scenario awareness (SCA)**

In this block FAA focuses on the strategical view. FAA deals with scenarios using knowledge of what the fire aims to do and identifying how the response could be to solve it, while also integrating safety in both certain and/or uncertain scenarios.

For example, at this stage the FA could proceed as follows: In a control room, the FA locates the fire and is aware of the state of the fuels (vegetation), the weather and the position of the fire verified by the first crew deployed on-field. Hence, the FA starts to define the polygons of the fire potential, analyses the spread of the fire, and makes proposals on how to limit the perimeter or modify/reduce the fire movement. The FA analyses the difficulty and complexity of the scenario and assess whether it is possible to position crews in the area at the actual rate of spread of the fire. With all this information, the FA depicts the scenario that will be communicated to the ***fire suppression chief*** to facilitate decision-making.

The SCA work of the FA at this stage involves logic and mental processes that cannot be carried out simply by applying algorithms, simulations, or models without further processing even with the current Best Available Technologies (BAT). FA activities embedded in the organisation entails actions that go from the elaboration of specific products to the design of the strategy. But the whole process has to take into account how ***operations manager*** assumes the proposal and integrates it into the deployment.

4.3 Examples of tasks

This section includes examples of tasks that have been identified as common among fire analysts in active service. The list of tasks is not exhaustive. In the future, the list may be expanded or reduced. It may even be that future challenges cause changes in methodologies, tasks or needs. But the aim of this section is to give a general idea that can help identify thematic areas to develop certain capabilities and skills.

Tasks are examples of the contributions of fire analysis and complement the first approach to competencies initiated with table 1. Subsequently, this first approach can be also linked to profiles, knowledge, skills, and attitudes; according to the needs and characteristics of each organisation.

4.3.1 Fire Analyst tasks classification

In this section, it is proposed to classify FA tasks using two perspectives representing two pillars of decision-making in fire management with the aim to organize the knowledge used and tasks developed in fire analysis during the response phase. The two pillars are:

- The scope on emergency management and complexity in decision-making process
- Thematic areas of knowledge

The ***scope on emergency management decision-making*** aims to identify the impact of the tasks on the emergency management decision-making scopes CAPACITY, POSITION, MISSION and VISION (See section 1.3.3.3. Scopes in the decision-making process: Capacity, Position, Mission and Vision) and complexity in the decision-making process. This point is not developed further in this guide but is included in the analysis graph proposal and the idea can be developed much further in the future.

The ***thematic areas of knowledge*** aim to link the tasks usually carried out by fire analysts today to areas of knowledge. The proposed classification is next:

- Impact of meteorology on fire behaviour (MET): refers to the current and forecasted changes on fire behaviour, not only on-site meteorological variables.
- Fire positioning (POS): fire perimeter including fire position and opportunities.
- Fire behaviour (BEH): includes considering fire intensity, rate of spread, spotting, crowning, etc.
- Fire spread patterns (PAT): refers to the movement of fire.
- Tactical planning (TP)
- Strategy and Scenario awareness (SCA)

4.3.2 Description of fire analysis and assessment tasks

Next there are key tasks and topics grouped by thematic. The elements are listed increasing in complexity, this is grouping the themes from the simplest to the most complex and is intended to set a possible road for the growth of a FA during the response phase. In the 'Description of Fire Analysis and Assessment' section, these topics will be the base for identifying specific FA tasks.

IMPACT OF METEOROLOGY ON FIRE BEHAVIOUR

1. Collect basic information of weather variables:

   Example: The 30-30-30 rule occurs when in the same day we have temperatures equal or higher than 30ºC, a relative humidity of less than 30% and a wind speed higher than 30 km/h. It is a basic indicator of the impact of the meteorology over the vegetation and on the fire behaviour**.**

2. To integrate weather forecast information to other weather inputs with the aim to anticipate when fire behaviour will change.

   Example: The analysis of wind direction changes involves assessing changes in the spread of fires, especially wind-driven fires (*Figure 13*).

3. To identify atmospheric conditions that facilitates convective processes, instability, etc. (*Figure 15*, *Figure 16*).

4. To identify boundaries and heights of atmospheric layers to predict the rise of air mass in the troposphere (*Figure 16*).

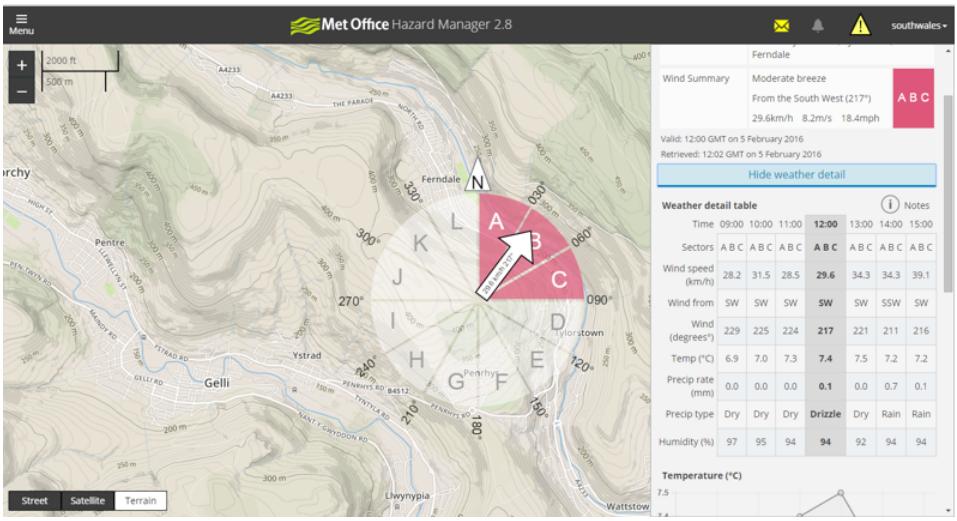


Figure 13. Example of on-site information used available at fires to give weather details FireMet used by SWFRS. Source: SWFRS.

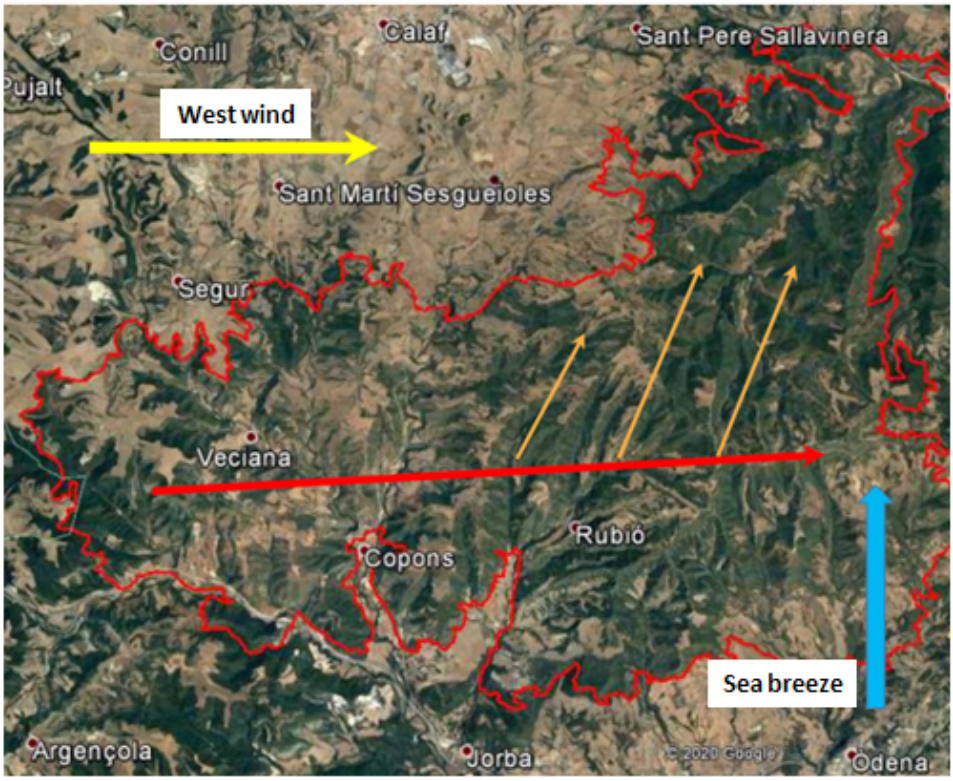


Figure 14. The 1986 Rubió fire (Catalonia, Spain). In the example of this image, the fire started pushed by a west wind and spread towards the east (red arrows). Forecast indicated that the west wind would decrease intensity and the sea-breeze would dominate so the left flank would tend to widen (orange arrows). At the moment of the entrance of the sea breeze, there was a flank of several kilometres and with flank behaviour. But with the change of direction, the flank was transformed in the head of the fire thus it had higher intensity and there was an increase of the fire potential. This is a typical pattern in fires in Central Catalonia: long propagations during a few hours by the west wind and once it decreases or ceases, the left flank opens with the sea breeze. This situation is a challenge because forecasting the change of dynamics is difficult. This change on wind direction during that fire occurred later than forecasts had predicted. Source: CFRS.

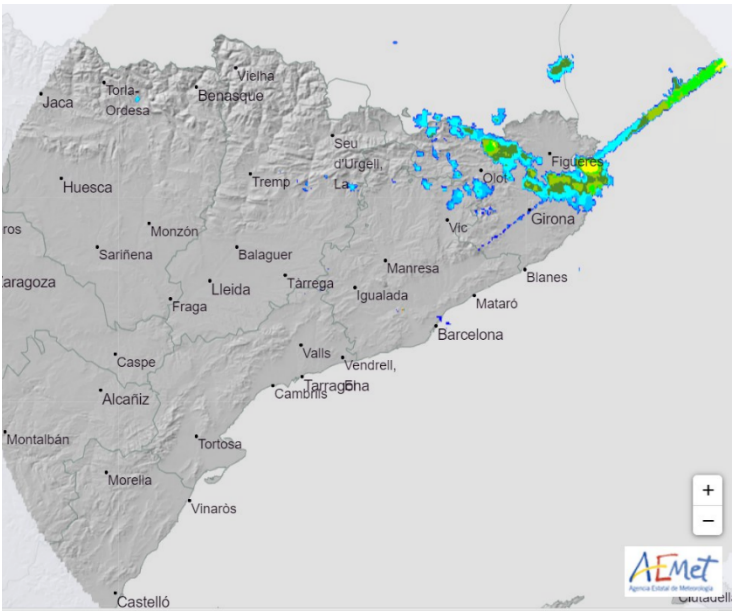


Figure 15. Detection of storms close to a fire near Barcelona (2021, Castellví de Rosanes Fire, Catalonia, Spain, 13/07/2021) but not on-site, that can cause erratic movements of the fire. Source: AEMET.

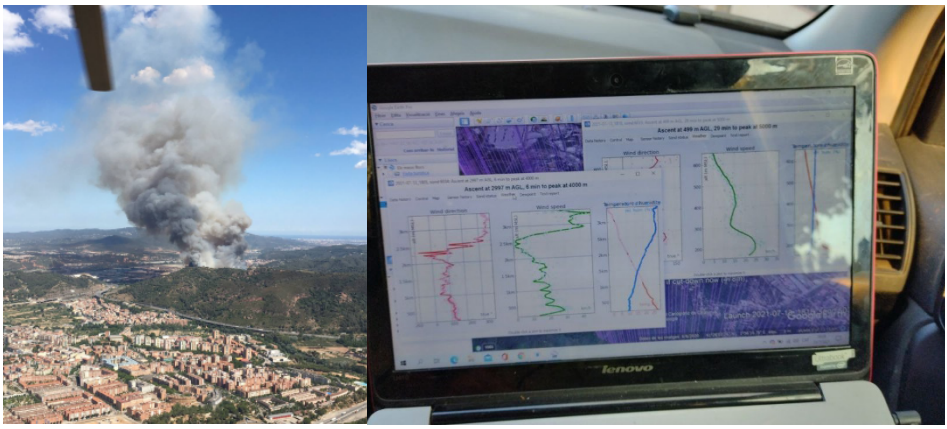


Figure 16. Analysis on-field of the vertical profile of the atmosphere in Castellví de Rosanes (Catalonia, Spain) vegetation fire (13/07/2021). Image on the left is the vertical column of the Castellví de Rosanes Fire at 16:48h 13/07/2021. Image on the right are different parameters from soundings consulted on-line from inside an operational vehicle in the field near the same fire. Source: CFRS.

FIRE POSITIONING

1. To draw and update fire perimeters with current data. Example: using images (*Figure 18*), crew positioning, satellite (*Figure 19*), on-field information (*Figure 17*), etc.

2. To draw short and medium-term polygons of fire potential and their trigger points.
   Example: Campbell Prediction System (CPS) can be used as a tool to detect changes and anticipate movements (*Figure 20*), not only to quantify what can be seen at the moment, but to detect those changes that can lead the situation for better or for worse.

3. To draw long term polygons of fire potential depending on fire suppression opportunities that includes the capacity of crews to implement the tactical objectives on-field [***probabilistic fire simulators, Potential Operational Delineations*** (*Figure 21*)].

4. To perform algorithms and artificial intelligence to assess on polygons of fire potential. Example: Although it is not yet possible at an operational level even with the BAT, the way forward may lead to being able to introduce different specific parameters as the effectiveness of the fire suppression operations patterns of each organisations, the type of fuel in each situation, the emergency specific scenario on-going into simulators, and learnings during the emergency to integrate and forecast the next periods, so that they can be taken into account when determining fire potentials. This is a possible tool to be developed in the future.

Figure 17. Drawing and defining the perimeter on-field and preparing the information to be distributed to each crew arriving to the fire (2021 Castellví de Rosanes Fire 13/07/2021). Source: CFRS

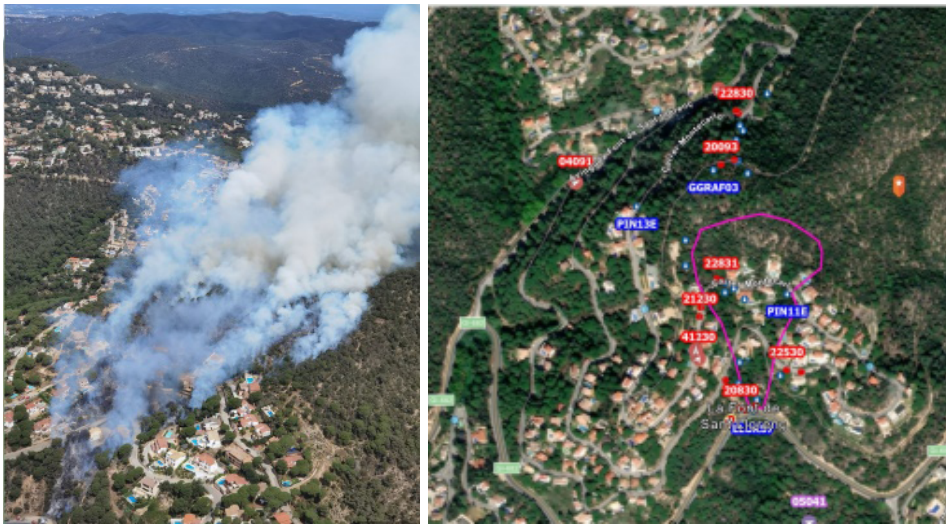


Figure 18. Fire perimeter: aerial photo left (12:03h) and perimeter drawn (12:54h) in 2021 Lloret de Mar's Fire (Catalonia, Spain, 13/07/2021). Note: to draw the perimeter, more images in addition to the one included on the left were used. Source: CFRS

Figure 19. Sentinel satellite image from 13/07/2021 with the perimeter of the 2021 Castellví de Rosanes Fire (Catalonia, Spain). Source: CFRS from Sentinel.

Figure 20. CPS logics in the Castellví de Rosanes fire and Lloret de Mar fire (Catalonia, Spain, 13/07/2021). Note: grey arrows indicate the wind direction and red dotted arrow indicates inclination. Source: CFRS.

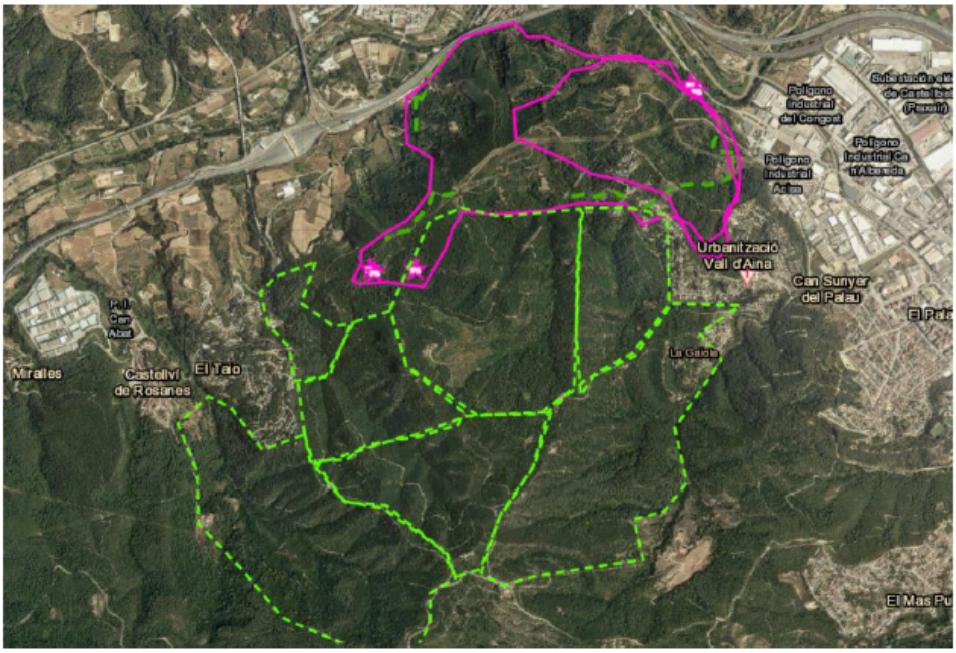


Figure 21. Fire perimeter (purple) and polygons of fire potential (green) of the 2021 Castellví de Rosanes Fire (Catalonia, Spain) drawn during for the 3rd operational period from the beginning of the fire (14/07/2021 early morning). Source: CFRS

FIRE BEHAVIOUR

FLAME & RUNS:

1. To assess the vegetation fuel quantity and availability (live and death) (*Figure 22*), to predict the expected fire behaviour of the day. Examples: images coming from on-field crews, classification of fuels according to the time needed to start burning, Rothermel fuel models (1973), etc.

2. To describe current fire behaviour (rate of spread, spotting, flame length and heat (KW·m). Examples: Using information coming from on-field crews or videos or thermic cameras.

3. To stablish similarities between the actual fire behaviour and the expected ones in different areas inside the potential impact. (Campbell ***Prediction System, RAF...).*** Example: maps.

PLUME & ATMOSPHERE: This is how the vertical axis will affect the column.

4. To anticipate fire behaviour due to the smoke plume interaction with the atmosphere. This is to anticipate integrating vertical column analysis to anticipate critical situations to add the vertical component of the atmosphere to the analysis.

5. To anticipate complex incidents behaviour in which different fires are interacting: dominance, suction, etc. (*Figure 23*)

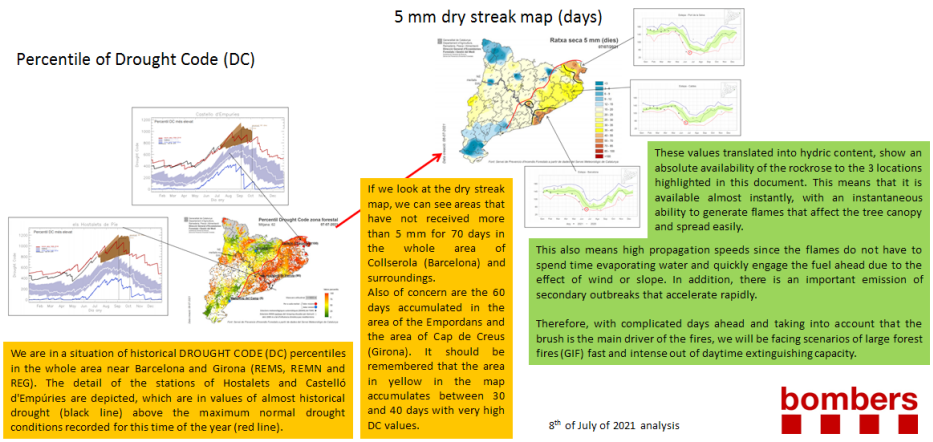
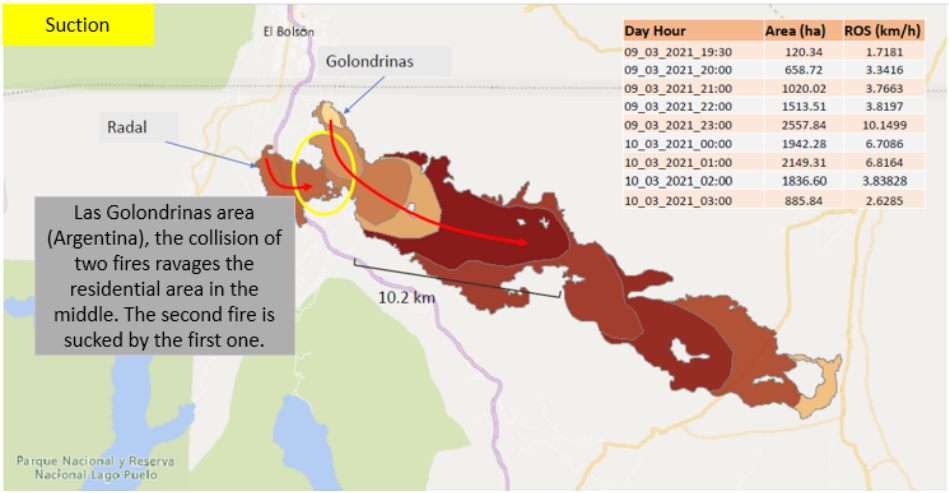


Figure 22. Vegetation fuel assessment obtained during preparedness that is added to the on-field information about the vegetation during the response. The match between each information allows to forecast the behaviour of the day. The 8th of July of 2021 in Catalonia, Spain. Source: CFRS.



Day Hour	Area (ha)	ROS (km/h)
09_03_2021_19:30	120.34	1.7181
09_03_2021_20:00	658.72	3.3416
09_03_2021_21:00	1020.02	3.7663
09_03_2021_22:00	1513.51	3.8197
09_03_2021_23:00	2557.84	10.1499
10_03_2021_00:00	1942.28	6.7086
10_03_2021_01:00	2149.31	6.8164
10_03_2021_02:00	1836.60	3.83828
10_03_2021_03:00	885.84	2.6285

Figure 23. Analysis of suction during the collision of two fires in Las Golondrinas (Argentina). Source: Marc Castellnou (GRAF Unit FA, CFRS).

FIRE SPREAD PATTERNS

1. To identify basic fire spread patterns: topographical, wind-driven, plume-dominated (*Figure 24*). Examples: use of aerial images (command and control room), identifying the main motor of the fire (on-field), etc.

2. To identify Fire Types patterns (common and own specificities).

3. To map the fire polygons in a specific landscape, depending on on-field implementation of the selected Fire Type of the specific on-going fire (*Figure 25*).

4. To assess the main path of the fire through polygons and its associated probability (*Figure 26*).

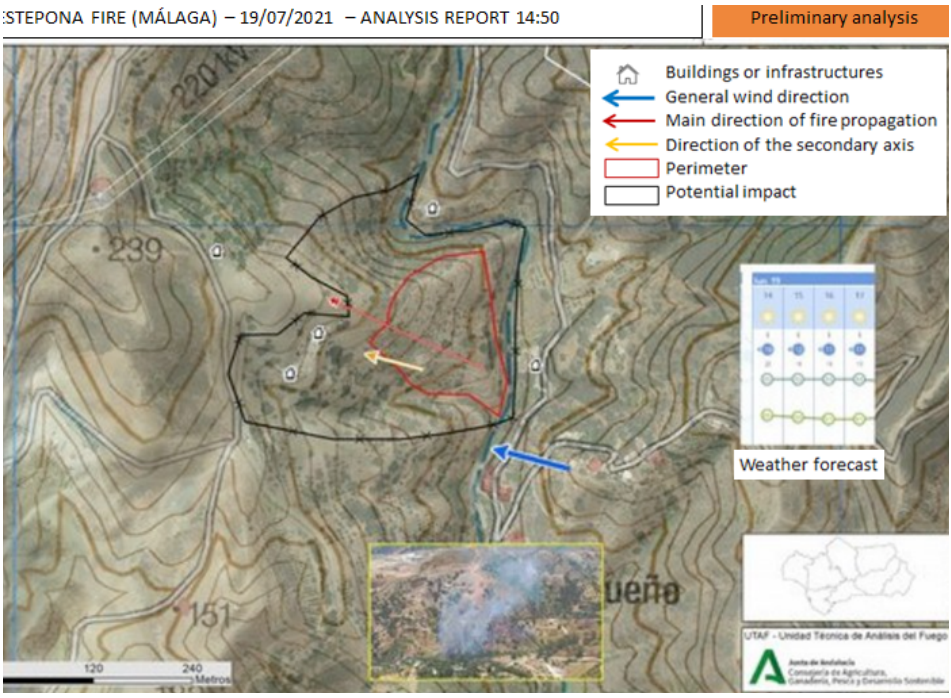
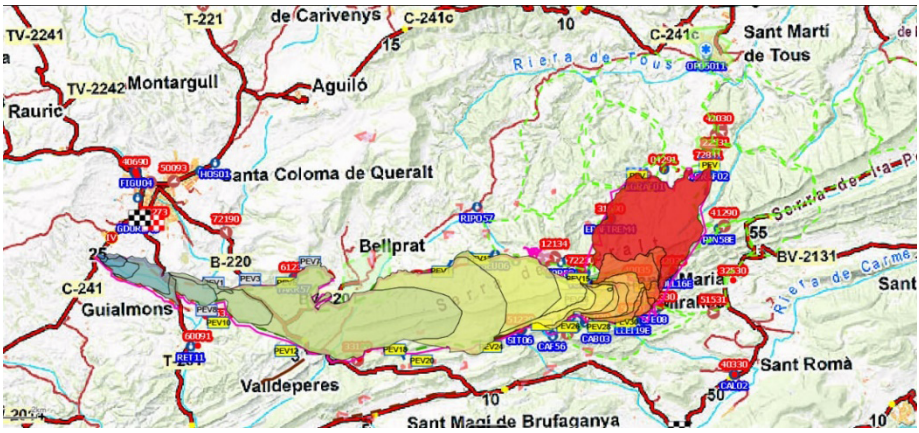
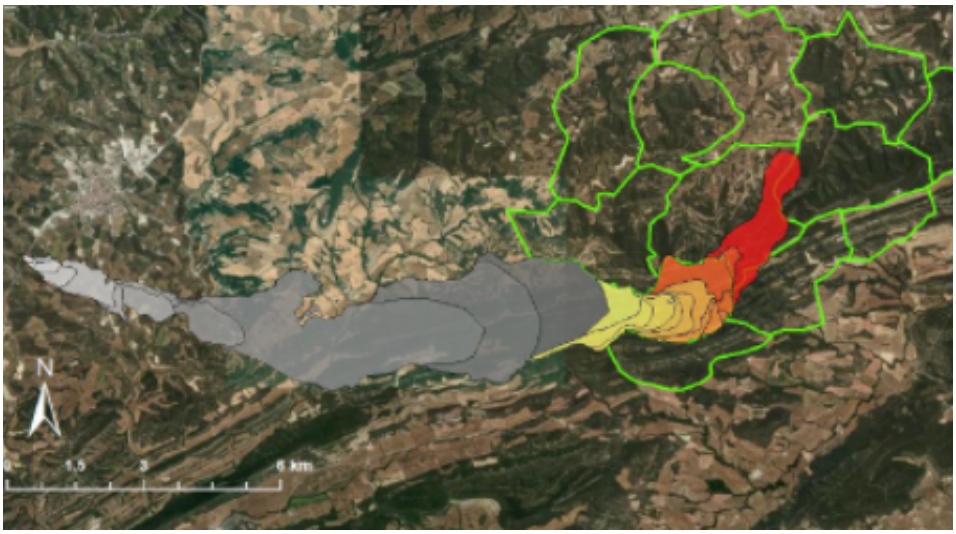


Figure 24. Preliminary fire report of the 2021 Estepona Fire (Málaga, Spain) the19th of July of 2021. Source: Fire Analysis Technical Unit INFOCA.



(a) Crew positioning and isochrones.



(b) Isochrones and polygons of fire potential.

Figure 25. Image of the isochrones (grey and coloured), perimeter, and potential impact (green polygons) of the vegetation fire of the 2021 Santa Coloma de Queralt Fire (Catalonia, Spain) during 24-27th of July, 2021 (b) obtained using on-field and aerial photographs and videos, direct observations and crew positioning and reporting (a). The analysis of the increase of the fire during the 24th (second day) indicated 370ha had grown since 2:00h (part of the perimeter indicated in colour). It also showed that from 20:00h to 21:30h 180 ha had burned during the formation and fall of the pyrocumulus, with a run of 3.3 km/h. The graph was also useful to observe that the average speed of the 23rd day (first day) had been 1500 m/h approx., that of the 24th day (second day) was 600 m/h approx. and that the fire reached a total surface area of 1426 ha. Source: CFRS

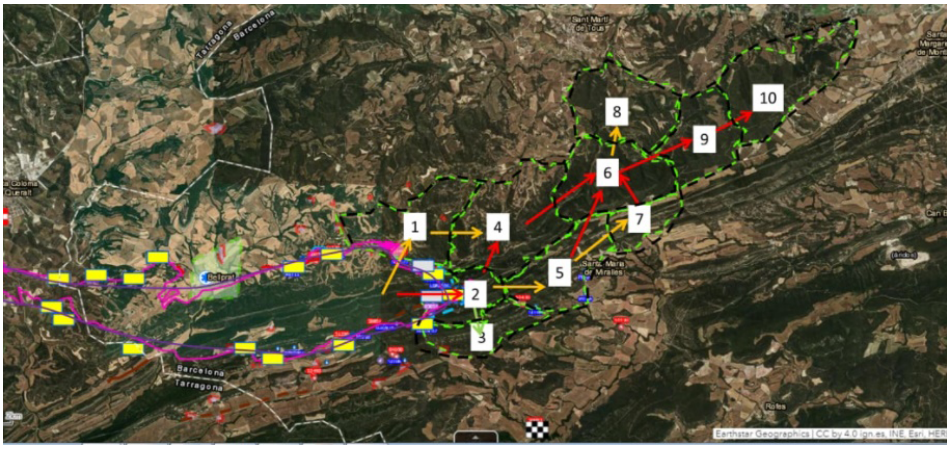


Figure 26. Image of the 2021 Santa Coloma de Queralt Fire (Catalonia, Spain) from the 23-27th of July 2021 in which perimeter (purple) is delimited using crews positioning (yellow, red and blue rectangles). Green dotted line shows potential fire polygons and arrows (red: high probability, orange: medium probability) indicate the linkages between polygons and the numbers in white squares indicate the order in which they fire could spread. Source: CFRS

TACTICAL PLANNING

MANOEUVRE LEVEL:

1. To Identify best suited ways to access fire perimeter to deploy resources on time (both on land and aerial) considering viability and safety.

2. To Identify and map opportunities for action/work/response according to BEH and POS including the definition of 'when' and 'where' proceed (position).

3. To propose type of manoeuvres according to the BEH and opportunities for action/work/response.

4. To Plan a set of manoeuvres according to BEH (fire suppression capacity limit) and to the deployment of the organisation (capacity).

5. To monitor key manoeuvres with direct impact on safety or on the achievement of tactical objectives.

TACTICAL LEVEL:

1. To Identify opportunity windows (operational windows) according to BEH and fire suppression capacity in each sector of the fire.

2. To propose tactical objectives (TO) that fit the strategy.

3. To propose priorities (according to polygons of potentiality, values, safety)

4. To sort objectives (according to window of opportunity)

5. To propose tactical architecture (according to deployment of the organisation, safety, and indicators) (*Figure 27*).

6. Monitoring the achievement of tactical objectives (TO).

   6.1 On-field/direct observation.

   6.2 Set of indicators.

7. To propose the balance of effort for each tactical objective.

8. To Anticipate and plan new tactical objectives (TO) if existing ones expire, do not work as expected or the situation changes.

STRATEGY AND SCENARIO AWARENESS

1. Setting the scenario. This implies situational awareness (*Figure 28*).

2. To adjust potential polygons of fire to the actual working capacities during the fire and response constrains. This is to map forecasted fire impact, linking potential fire polygons with their values and response constraints (*Figure 30*, *Figure 29*).

3. To propose the strategy (*Figure 28*, *Figure 31*):

   3.1 To describe a range of strategical scenarios using fire polygons and tactical objectives potential achievement, integrating known risks.

   3.2 To identify the set of possible final strategic scenarios, including short-, medium- and long-term risks and uncertainties, and its consequences (desired, avoided...) for decision-making.

   3.3 To propose a final strategical scenario using fire polygons diagram, integrating known risks and uncertainties and transfer probabilities between polygons (common goods and avoiding collapse).

4. To Monitor the selected scenario and if it changes then adjust the strategy.

   4.1 On-field/direct observation.

   4.2 Indicators (e.g. numerical).

      Example 1: numerical

      Example 2: signs, people behaviour, human factor, that indicate that things are moving different from expected.

5. To Detect key sources of uncertainty (*Figure 32*).

6. To anticipate likely new scenarios.

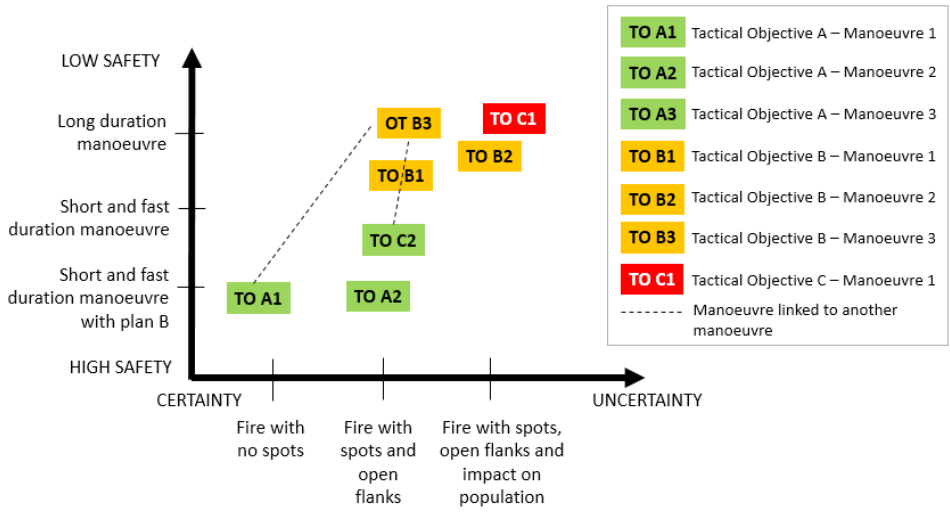


Figure 27. Wildfire manoeuvres corresponding to specific tactical objectives (TO) considering their safety and certainty and the linkages between some of them. Source: CFRS

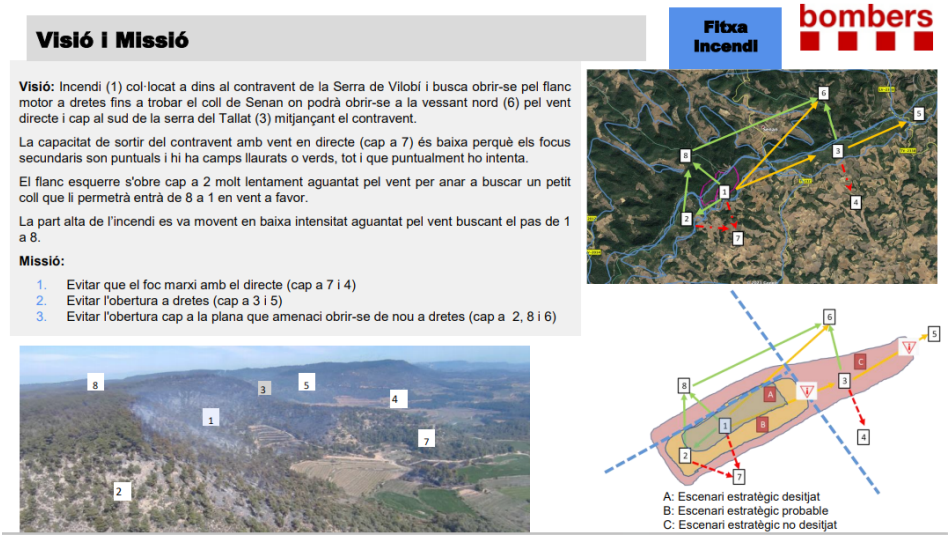


Figure 28. Example of product that includes a range of scenarios corresponding to different polygons (image of the bottom left), a set of scenarios (selection in the upper right image) and the selected scenario A (image of the bottom right; A: strategical desired scenario, B: strategical probable scenario, C: strategical undesired scenario). Source: CFRS

Figure 29. On-field or anticipation analysis and fire spread flowcharts. Analyse of the Rognac Fire, France, 10/08/2016. Source: Pompiers des Bouches-du-Rhône of France.

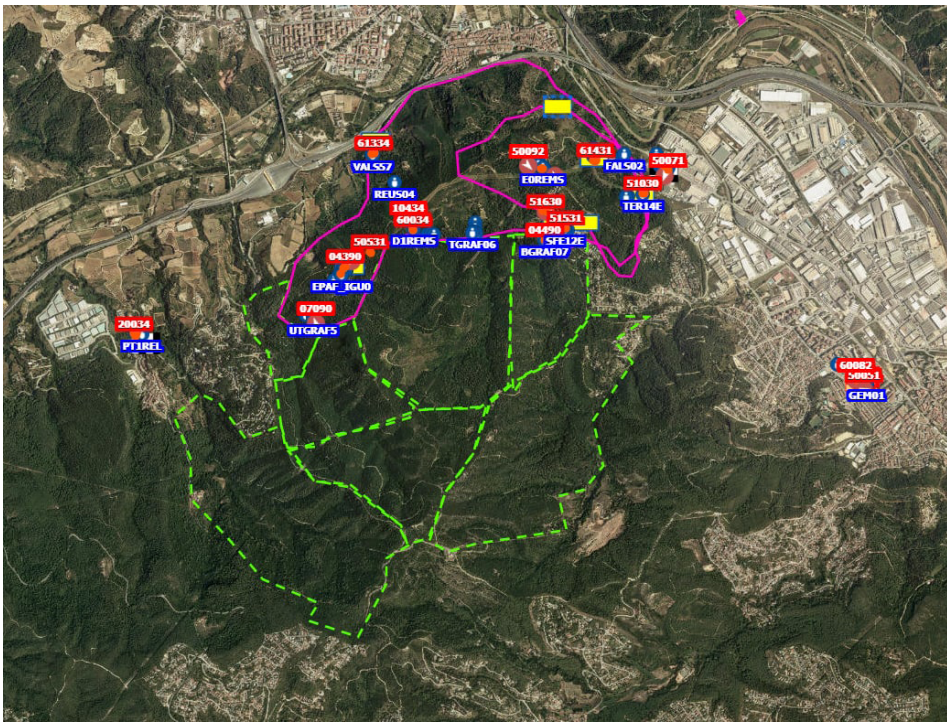


Figure 30. Polygons of fire potentiality (green dotted line) of the 2021 Castellví de Rosanes Fire (14/07/2021 02:09h Catalonia, Spain). Fire perimeter (purple line) is near urban areas, industrial areas and WUI. Source: CFRS

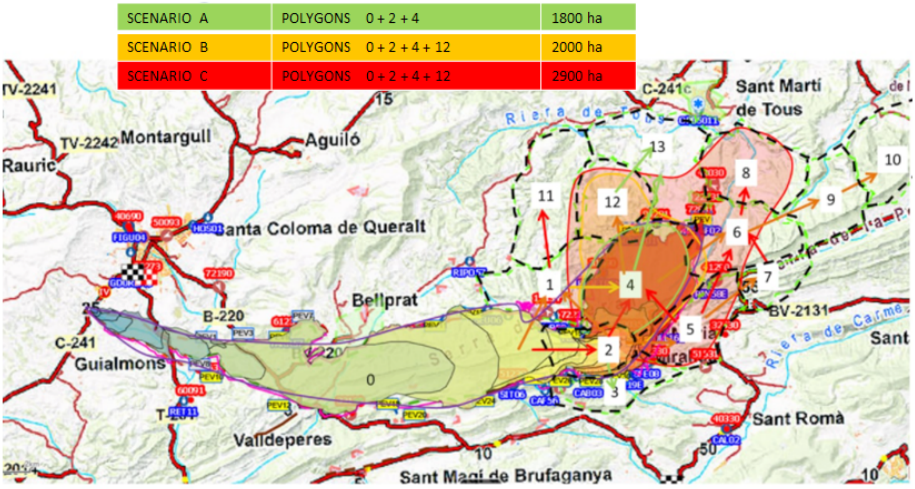


Figure 31. 2021 Santa Coloma de Queralt Fire (Catalonia, Spain) from the 23-27th of July 2021. Identification of a set of possible final strategic scenarios (A, B, C) with probabilities (arrows and numbers in white squares). Source: CFRS

	STABLE SCENARIO	VARIABLE SCENARIO	SCENARIO WITH CHANGES	UNCERTAIN SCENARIO
POSITION	A	B		
CAPACITY			C	
MISSION				D
VISION				

Figure 32. Analysis made during a hypothetical fire that begins as a stable scenario (A), after some time becomes variable due to a rotation of the wind (B), later the wind decreases and a sea breeze enters the area causing a change of behaviour of the fire (C) and instability increases enough to create PyroCb prone conditions. Before moving from C to D, indicators are planned that will allow for a safe area. Source: CFRS

4.4 Proposal for assessment

4.4.1 Organisation

As it could be seen in the previous section, depending on the FA tasks and impact on decision-making, FA analyst can have a focus on tactics or go a step further and incorporate a focus on strategy depending on where they are on the growth path.

A FA expertise chart can be defined based on the tasks the FA is able to develop and contribute on decision-making process. For this purpose, a spider chart can be used. The spider chart (also called web chart, polar chart, etc.) is named by its similar appearance to a spider's web . It is a chart that uses a two-dimensional graph to display a multi-dimensional data structure. Each item is depicted in one axis and covers a fixed area. Each area can be assessed by a number of metrics, so the chart itself is the general comparison of all metrics and areas.

Each FA or organisation can create a self-description using a spider chart (Figure 33). Each axis describes a thematic (MET, POS, BEH, PAT, TP, SCA) and it is graded considering the total number of points (those explained before in section 4.3.1). Points from section 4.3.1 are defined increasing in complexity from 1 to X, so this fits with the gradation of the chart. The spider graph can be used to easily show the capabilities that each organisation has, as well as where their expertise is focused. The empty spaces in the graph identify those areas of potential growth for the FA.

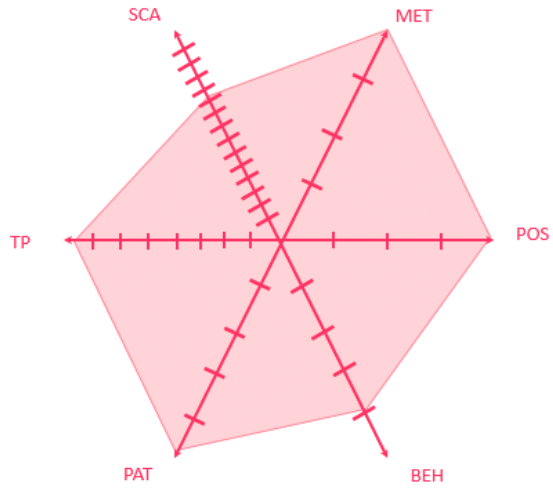


Figure 33. Spider chart to define each's organisation sign.

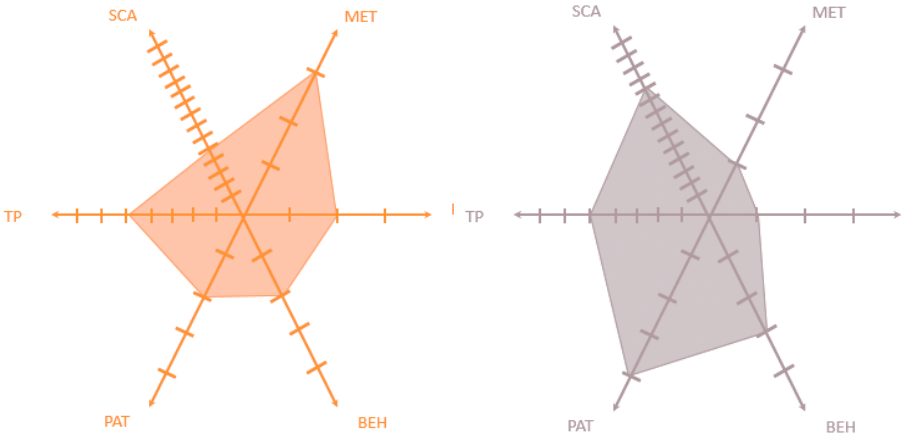


Figure 34. Spider charts of different organisations to be compared.

By comparing the graphs of different organisations for the same geographical area, gaps and complementarities can also be visualized (*Figure 34*). The annex of this guide includes a table with the list of themes corresponding to the gradation of each axis of the chart.

This sort of analysis can help in exchanges by identifying which organisations are experts in certain areas and performing certain tasks. This can meet objectives as diverse as learning from them when having experience in other areas, or sharing lessons learned and good practices when both organisations have experience in the same areas. In emergency situations, they can also be useful to identify resources needed when the organisation does not have them, or resources similar to those

you do have to be able to detect elements that escape the attention of the organisation responding to the fire due to demanding situations (See section ***Conclusions***, 'remote assessment' paragraph). They can also contribute to map capabilities at European level.

This sort of analysis could, for example, help in EU Host Nation Support Guidelines or similar actions.

4.4.2 Individuals and teams

The classification proposed in the previous sections (4.3.1 Fire Analyst tasks classification) can be used to generate a chart to show areas of growth. But another chart can be added to the previous one. With the aim to organize the different knowledge used and tasks developed in fire analysis during the response phase, and assessing the **areas of growth** of individuals and teams, a two-axis matrix is proposed (***Figure 35***).

The horizontal axis describes the impact of a knowledge, task, activity or product depending on its impact on emergency management decision-making: CAPACITY (C), POSITION (P), VISION (V), MISSION (M) [See section 1.3.3.3. Scopes in the decision-making process: Capacity, Position, Mission and Vision]. This axis could identify also **levels of complexity** in decision-making process at emergency management scenario.

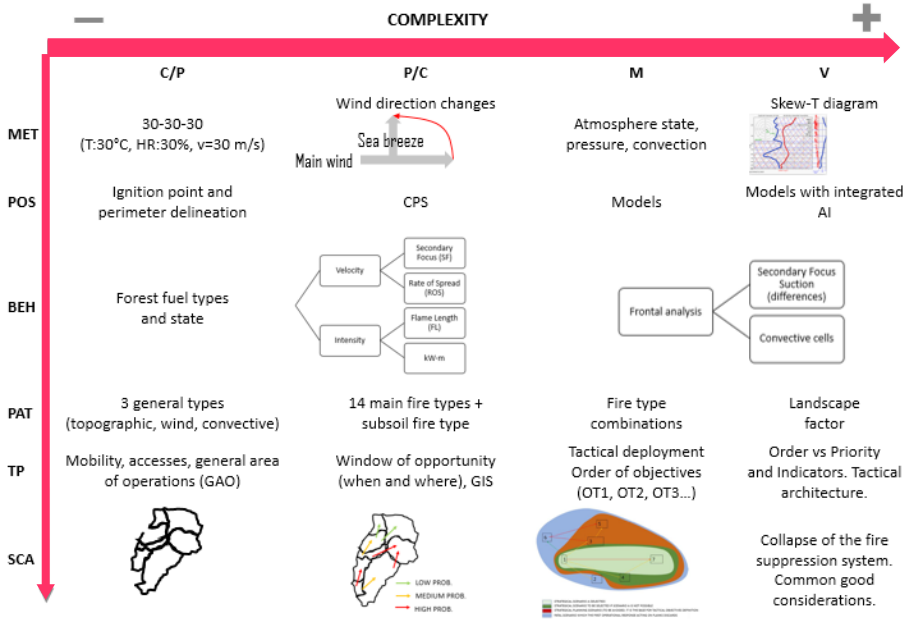


Figure 35. Two axis matrix to identify areas of growth. The horizontal axis identifies levels of complexity in decision-making (C/P/M/V) and the vertical axis shows knowledge classified by thematic areas (MET, POS, BEH, PAT, TP, SCA).

Therefore, the graph of decision-making process and complexity levels can be the framework to allocate FAA tasks and its impact on decision-making scopes. This framework and the number of those tasks the FA is able to do could be related to a list of competencies and skills to describe which of them are needed to achieve the related capacities.

The matrix of ***Figure 35. Two axis matrix to identify areas of growth. The horizontal axis identifies levels of complexity in decision-making (C/P/M/V) and the vertical axis shows knowledge classified by thematic areas (MET, POS, BEH, PAT, TP, SCA).*** does not include all the capability items and has only been developed as an example in this guide. The development of this matrix for use should include more elements within it but it has been considered sufficient for the purposes of this section.

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5. Conclusions

FAA is a discipline that uses information collection and retains it as knowledge to provide guidance and direction to assist decision-makers on strategical, tactical and operational fire management. This discipline is exercised in organisations, by increasing skills of its members or by specific profiles in the structure, depending on the specific challenges faced.

In front of large vegetation fires out of capacity of extinction, fire analysts in planning and coordination are key to focus efforts on anticipated opportunities. In front of fast changing scenarios, fire analysts in the ground are needed to bridge the gap between changes and decisions, monitor indicators of change, and quickly adapt decisions to new realities. As the fire scenarios become more unpredictable and uncertain, fire analysts are key to provide robustness in the decision-making. All that implies being part of the decision-making and assuming responsibilities in it.

In order to achieve it, Fire Analyst must be a person (or a team of Fire Analysts) who accumulates a large experience analysing vegetation fires, participates in the response phase of the emergency management, who is involved in decision-making process all-year around and assumes responsibilities, and who is continuously monitoring the fire season. A Fire Analyst can also advice and participate in prevention, preparedness and post-fire phases. The definition of vegetation fire analysts included in this guide is based on the observation of currently existing cases. **There is a network of analysts at European level and only a few specific cases that have been involved in remote support for forest fire analysis**. It is therefore important to enhance the value of this network and build on the accumulated expertise to create a common framework at European level.

Fire analysis involves responsibility. The contributions of Fire Analysts influence and condition the decision making. Fire Analysis and Assessment not only focuses on managing information, understanding, processing and drawing conclusions but it also involves expert judgement, know-how and specific knowledge coming from different areas. Once a Fire Analyst has done a proposal, the Fire Analysis and Assessment will become part of what has been considered or discarded during decision-making, hence it will condition the operational response. Therefore, Fire Analysis and Assessment has an impact on decision-making and its consequences.

Vegetation fire analysis is linked to the decision-making. The Fire Analyst plans a scenario of resolution, but the implementation of this plan must interact and adjust to reality. Monitoring this changes from the field is key for decision making. **Therefore, the analysis is fed by the results obtained, it detects and adjust changes and anticipates them thanks to direct monitoring. It requires a direct link with the situation in situ to have all the key elements that intervene and modify the scenario**.

The competencies required for vegetation fire analysis should focus on covering a set of knowledge, skills and experience in real fires, as well as certain **attitudes and behaviours** that contribute to improve the response to vegetation fire emergencies (e.g., trust). Fire Analysis and Assessment, understood as an organisational capability, can be carried out with different configurations and figures that each organisation will have to integrate and adapt according to its needs and singularities. Therefore, this document does not offer an exhaustive list of competencies, but rather establishes a **framework that makes it possible to identify competencies and skills, as well as examples of the contributions** that analysis makes to decision-making and specific tasks according to a proposal of thematic areas. More specific descriptions can be derived from this framework, such as those provided as examples in the annexes to this document, but this would form part of the work subsequent to the preparation of this guide based on the specific adaptation to each organisation.

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7. Annexes

TASK CLASSIFICATION TABLE TEMPLATE

IMPACT OF METEOROLOGY ON FIRE BEHAVIOUR (MET)	
	Collect basic information of weather variables
	To integrate weather forecast information to other weather inputs with the aim to anticipate when fire behaviour will change.
	To identify atmospheric conditions that facilitates convective processes, instability, etc.
	To identify boundaries and heights of atmospheric layers to predict the rise of air mass in the troposphere
FIRE POSITIONING (POS)	
	To draw and update fire perimeters with current data.
	To draw short- and medium-term polygons of fire potential and their trigger points.
	To draw long term polygons of fire potential depending on fire suppression opportunities that includes the capacity of crews to implement the tactical objectives on-field
	To perform algorithms and artificial intelligence to assess on polygons of fire potential.

FIRE BEHAVIOUR (BEH)	
Flame & runs:	To assess the vegetation fuel quantity and availability (live and death) to predict the expected fire behaviour of the day.
	To describe current fire behaviour (rate of spread, spotting, flame length and heat (KW·m).
	Stablish similarities between the actual fire behaviour and the expected ones in different areas inside the potential impact. (Campbell Prediction System, RAF...).
Plume & atmosphere:	To anticipate the fire behaviour due to the smoke plume interaction with the atmosphere.
	To anticipate complex incidents behaviour in which different fires are interacting: dominance, suction, etc.
FIRE SPREAD PATTERNS (PAT)	
	To identify basic fire spread patterns: topographical, wind-driven, plume-dominated.
	To identify Fire Types patterns.
	To map the fire polygons in a specific landscape, depending on on-field implementation of the selected Fire Type of the specific on-going fire.
	To assess the main path of the fire through polygons and its associated probability.

TACTICAL PLANNING (TP)	
Manoeuvre level:	Identify best suited ways to access fire perimeter to deploy resources on time (both on land and aerial) considering viability and safety.
	Identify and map opportunities for action/work/response according to BEH and POS including the definition of 'when' and 'where' proceed (position).
	To propose type of maneuvers according to the BEH and opportunities for action/work/response.
	Plan a set of maneuvers according to BEH (fire suppression capacity limit) and to the deployment of the organization (capacity).
	To monitor key maneuvers with direct impact on safety or on the achievement of tactical objectives.

Tactical level:	Identify opportunity windows (operational windows) according to BEH and fire suppression capacity in each sector of the fire.
	To propose tactical objectives (TO) that fit the strategy.
	To propose priorities (according to polygons of potentiality, values, safety)
	To sort objectives (according to window of opportunity)
	To propose tactical architecture (according to deployment of the organization, safety, and indicators).
	Monitoring the achievement of tactical objectives (TO).
	On-field/direct observation.
	Set of indicators.
	To propose the balance of effort for each tactical objective.
	Anticipate and plan new tactical objectives (TO) if existing ones expire, do not work as expected or the situation changes.

STRATEGY AND SCENARIO AWARENESS (SCA)	
	Setting the scenario. This implies situational awareness.
	To adjust potential polygons of fire to the actual working capacities during the fire and response constrains. This is to map forecasted fire impact, linking potential fire polygons with their values and response constraints.
	To propose the strategy
	To describe a range of strategical scenarios using fire polygons and tactical objectives potential achievement, integrating known risks.
	To identify the set of possible final strategic scenarios, including short-, medium- and long-term risks and uncertainties, and its consequences (desired, avoided...) for decision-making.
	To propose a final strategical scenario using fire polygons diagram, integrating known risks and uncertainties and transfer probabilities between polygons (common goods and avoiding collapse).
	Monitor the selected scenario and if it changes then adjust the strategy.
	On-field/direct observation.
	Indicators (e.g. numerical).
	Detect key sources of uncertainty.
	To anticipate likely new scenarios.

UK WILDFIRE TACTICAL ADVISOR COMPETENCIES

NFCC National Fire Chiefs Council

The professional voice of the UK Fire & Rescue Service

Wildfire Tactical Advisor – Concept of Operations

Release: **Version 1.2**

Version Release Date: **25th April 2019**

Doc Ref: **Wildfire Tactical Advisor – Concept of Operations**

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Initial Approval Date: 13th July 2017

WTA Tactical Adviser Information (Document revision history)			
Date	**Status**	**Version**	**Author**
11.04.17	**Draft**	**0.1**	**P. Hedley**
25.04.17	**Draft**	**0.2**	**P Hedley**
03.05.17	**Draft**	**0.3**	**P Hedley**
23.05.17	**Draft**	**0.4**	**P Hedley & B Massie**
17.07.17	**FINAL**	**1.0**	**P Hedley**
31.05.18	**FINAL (rev)**	**1.1**	**P Hedley**
18.03.19	**FINAL (rev)**	**1.2**	**P Hedley & S Walton**

Document Revisions		
Date	**Revisions**	**Made By**
25.04.17	1. Repeated 'CFOA' removed 2. Reference to HVP removed 3. Footer amended	P Hedley
03.05.17	Changes made following WTA Course at Linden Hall, Northumberland. 1. WSO / Wildfire Support Officer changed to Tactical Advisor or WTA. 2. CFOA amended to read NFCC 3. References to NFRS Fire Control replaced with NRFC **4.** References to a deployment of 2 WTAs amended to state **a minimum of 2** 5. Amendments to Appendix A	P Hedley

23.05.17	Conversion to 'Concept of Operations' format	P Hedley & B Massie
17.07.17	Formatting changes made following wildfire Tac Ad meeting held at Merseyside FRS HQ 13.07.17	P Hedley
17.11.17	Addition of Surrey FRS and DFRMO to list of WTA services	P Hedley
09.04.18	Changes to mobilisation procedure to include Northumberland FRS Fire Control Updated tabard illustration from NOG	S Walton
15.03.19	Minor amendments due to feedback from 2018 wildfire debriefs; • Inclusion of WTA Lead • Updated FRS WTA list • Updated WTA pre-planning actions • Updated section 3.4 • Revised WTA photo Mobilising and availability criteria update due to changes with NRFC Appendices amended to; • Appendix A – WTA Criteria • Appendix B - WTA SMEAC Briefing Form • Appendix C – WTA SMEAC Briefing Form Completed Example	P Hedley & S Walton

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1. INTRODUCTION

This Concept of Operations has been developed by the National Fire Chiefs Council (NFCC) Wildfire Group.

1.1 Scope

This document sets out the Concept of Operations for enhancing the capability and national co-ordination of Wildfire Tactical Advisors (WTA) use at significant, protracted and /or high volume wildfire events. In particular this document sets out:

- How affected FRS request WTAs support
- How WTAs are mobilised and deployed
- The roles and responsibilities of WTAs
- The management and engagement of WTAs

This document will be updated and reviewed on an annual basis, or when necessary, to ensure it reflects user requirements and emerging best practice. The scope of this document is for Fire & Rescue Services only.

1.2 Aim

The Concept of Operations has the following aim;

The provision, and maintenance, of a UK wide National Wildfire Tactical Advisor capability that will respond to wildfire incidents following a request for assistance, support and advice from an affected Fire & Rescue Service (FRS).

1.3 Objectives

The objectives of the Wildfire Tactical Advisor capability are as follows:

- To provide planning advice at Tactical and Operational levels for the appropriate wildfire response.
- To provide tactical advice to the Incident Commander, Operations Commander or Sector Commander as to the safest and most effective use of deployed wildfire resources.
- To provide information to the Incident Commander, Operations Commander or Sector Commander regarding the nature of the wildfire incident, its potential development and further wildfire resources that may be required for the resolution of the incident.
- Ensure the best use of available resources in order to provide a capability in the most efficient and effective manner.
- Provide a scalable approach which can incorporate existing and expanding resources.
- Serve as a source of reference and basis for long-term planning and improve understanding of wildfire risk within a FRS area.

1.4 Requirements

This document will provide the basis for a set of planning assumptions regarding:

- Training required for Wildfire Tactical Advisors
- Capability requirements for participating personnel
- Accreditation and permission requirements for participating personnel
- The type and quantities of equipment required for participating personnel

1.5 Benefits

Articulation of a Concept of Operations affords the following benefits:

- Greater awareness of the availability of a national wildfire tactical advisor
- Greater clarity and certainty in respect of roles and responsibilities of Wildfire Tactical Advisors
- Assurance for the public, regulatory bodies, requesting Authorities and Incident Commanders (IC) that the mobilisation and deployment of Wildfire Tactical Advisors enhances the ability of the requesting FRS to carry out the tasks required of them legally, safely and effectively
- Improvements in the co-ordination of the logistical planning of the resources required to effectively resolve the incident
- Enhanced fire ground safety
- Reduced costs by taking a national multi-agency approach to strategic wildfire resilience and making best use of existing assets
- Supports standardisation of wildfire suppression tactics, planning and incident management
- Improved relationships and enhanced partnership working between FRS, NFCC, Local Authorities, Land management agencies, Government agencies/departments, and other responders.

1.6 Dependencies

In order to achieve effective operations on the ground, the Concept of Operations will need to interface effectively with:

- Multi-agency co-ordination procedures implemented by Strategic Coordinating Groups
- Existing arrangements for the deployment of National Assets, for example, High Volume Pumps, MAC(A) requests
- The FRS Incident Command System and other similar systems in use with other key responder agencies for example JESIP.

2. CONCEPT OF OPERATIONS

The concept has been divided into 5 distinct phases. These are:

Phase 1 – Preparedness:

In this phase Wildfire Tactical Advisors conduct regular training and exercising, review and make changes to their procedures based on lessons learned, maintain equipment and plan responses.

Phase 2 – Mobilisation:

The mobilisation phase is the period immediately following the receipt of a request from the affected FRS to National Resilience Fire Control (NRFC) via telephone. Following a request for assistance, a Lead Wildfire Tactical Advisor will be selected to respond along with other Wildfire Tactical Advisors who will also be notified and begin their preparations to respond and travel to support the affected FRS.

Phase 3 – Operations:

This is the period during an incident when Wildfire Tactical Advisors are predominantly involved in reviewing the current tactical plans and providing ongoing support and advice for the safe and effective resolution of the incident. This support can include operations that extend into the recovery phase of an incident. Recovery operations can include work to support other responding agencies, inter-agency liaison and fire investigation work, and will cease on instruction from the host FRS Incident Commander.

Phase 4 – Demobilisation:

The demobilisation phase is the period when the Wildfire Tactical Advisors are stood down and commence withdrawal from an incident, repatriate their equipment and co-ordinate their departure through the affected FRS, NRFC and/or Strategic Holding Area (SHA).

Once the emergency phase of the incident has concluded, WTAs may be well placed to support the integration of the research community within the incident command team functions to enable important research to be conducted. This could extend into offering FRS support post event.

Phase 5 – Post-Event:

The post-event phase is the period immediately after Wildfire Tactical Advisors return to their home location. In this phase the Wildfire Tactical Advisor is required to complete and submit post-incident reports following an in-depth debrief or review process to identify any capability gaps, learning outcomes and good practice events. This phase may also include a requirement support to major incident investigations, inquests, and enquiries.

3. PREPAREDNESS

3.1 Selection

Selected personnel have all attended a Wildfire Tactical Advisors (WTA) course which was developed by the NFCC Wildfire Group. Attendees were selected due to their previous attendance on advanced wildfire training courses, or were deemed to hold equivalent practical experience, knowledge and competence.

Future WTA courses would reflect the Current national Operational Guidance NOG) Wildfire Training Specifications.

3.2 Register of Wildfire Tactical Advisors (WTA)

The National Register of WTAs is maintained and managed by the NFCC Wildfire Group. The WTAs details are available on the National Resilience Fire Control (NRFC) Electronic Support System (ESS). The WTA availability will be processed following the request from a FRS via either a call for advice/support.

A register of FRS Wildfire assets is being established which will be available for NRFC access on the ESS. In addition a National Wildfire Asset Register for FRS and Partner Agency assets will be maintained by NFCC Wildfire Group on Resilience Direct.

3.3 Joining the National Asset Register

Individual FRS wishing to register their wildfire assets for the National Capability will be required to complete a form detailing their resource capability and assuring the NFCC Wildfire Lead Officer that they meet the necessary criteria for safe, effective and legal deployment in support of national wildfire incidents. The National Wildfire Asset Register, which is managed by the NFCC Wildfire Group, is available and hosted on Resilience Direct.

3.4 Registering Wildfire Tactical Advisors (WTA) as a National resource

The NFCC Wildfire Lead will maintain an agreement with the relevant Chief Fire Officers and Chief Executive Officers from each of the WTA host FRS's, that the personnel nominated as WTAs can deploy to local, regional or national scale incidents subject to their availability and a formal request being received via NRFC.

This agreement is manifested when services nominate personnel to attend the national Wildfire Tac Ad training course and when the names of the successful Tac Ads are subsequently uploaded onto the NRFC ESS. Fire and Rescue Services are free to request removal of Tac Ads from the ESS and also to decline permission for their WTA resources to

be mobilised in response to a request for support being received by National Resilience based upon their own prevailing circumstances.

3.5 Wildfire Tactical Advisors (WTA) for pre-planning

FRS's are encouraged to always consider utilising the skills and knowledge of WTAs for incident 'pre-planning' whenever the development of site specific plans which may require the use of WTA equipment for the resolution of an emergency incident are being considered. Additionally, WTAs can support the FRS quality assurance process of completed tactical wildfire fire / response plans.

The use of WTAs for wildfire pre-planning will be co-ordinated via the NFCC Wildfire Lead or the NFCC Wildfire Group Chair.

3.6 Wildfire Tactical Advisors (WTA) Role definitions

- To provide planning advice at Tactical and Operational level for the appropriate wildfire response.
- To provide tactical advice to the Incident Commander, Operations Commander or Sector Commander as to the safest and most effective use of deployed wildfire resources.
- To provide information to the Incident Commander, Operations Commander or Sector Commander regarding the nature of the wildfire incident, its potential development and further wildfire resources that may be required for the resolution of the incident.

3.7 Governance

WTA governance broadly refers to the mechanisms, processes and relationships by which the capability is controlled and directed. This includes a clear distribution of responsibilities for key individuals and groups that represent the interests of the Fire and Rescue sector. The main WTAs governance stakeholders include:

National Fire Chiefs Council – Wildfire Lead

The NFCC Wildfire Lead Officer provides strategic direction, leadership and professional advice for the capability, and reports progress through NFCC Operations Directorate. The Lead Officer also provides support and advice to FRS strategic managers, strategic partners and HM Government officials on all matters relating to the capability.

NFCC Wildfire Group

The NFCC Wildfire Group provides a national forum which is open to attendance by stakeholders from all UK FRS and which can be attended by other key partners / agencies by invitation. In a WTA context, the group exists to ensure the effective management, maintenance and development of the national wildfire tactical advisor capability. This will include the delegation of work streams and tasks. The NFCC Wildfire Group is chaired by a senior officer from one of the participating FRS constituting the wildfire group.

National Wildfire Forums

The NFCC Wildfire Lead Officer and Wildfire Group Reps are standing members at both the England and Wales Wildfire Forum (EWWF) and the Scottish Wildfire Forum (SWF). These forums comprise representatives from agencies and organisations that are committed to reducing the harmful impact of wildfire occurrences across the UK. The purpose of the forums are to create a focus for joint working between stakeholders which allows NFCC Wildfire Lead / Group Chair to influence strategic initiatives for the improved management of wildfire risk, enhanced wildfire preparation, prevention, response, suppression and research. NFCC attendance at EWWF and SWF also enhances opportunities to raise wildfire awareness and improve communication to government, stakeholders and the wider community.

FRS WTAs

WTAs provide specialist technical knowledge and skills when attending wildfire incidents. Each WTA should meet the minimum role requirements as set out in Appendix B.

3.8 Welfare Arrangements

Incidents occurring outside of a FRS geographical area of responsibility, and requiring the continued deployment of personnel for protracted periods of time, necessitate appropriate welfare support mechanisms to be in place. Although welfare arrangements at large-scale incidents will be co-ordinated by the host FRS (or agencies such as Local Authorities or the voluntary sector), WTAs must have pre-planned levels of welfare arrangements, as agreed with their local FRS, which consider needs arising from gender, cultural or physical requirements, and are self-sustaining. **As a general rule, all WTAs should prepare for a deployment to be a minimum of 48 hours.**

Welfare requirements arising from the attendance of WTAs may include:

- Refreshments at any response scene, especially to provide warmth or prevent dehydration
- Facilities for having meals away from the scene of operations
- Washing and changing facilities

- Shifts of reasonable length and rotas that ensure proper rest periods are taken. As a general principle, personnel working in more arduous conditions must be rotated and/or be relieved more frequently
- Regular briefings to ensure personnel are aware of what is happening and their tasking's.
- Provision of a quiet space to prepare, and unwind when on stand-down period
- Consideration for support and information to be available for immediate family or partners.

It is likely that a requesting FRS will already be under significant operational pressure. In order to reduce the burden on the requesting FRS, teams should plan for self-sufficiency within the initial stages of a deployment (first 24 hours) regarding refreshment, hygiene and medical requirements by means of a welfare pack.

3.9 Training and Assurance

In order to ensure that the WTA capability is properly maintained and continues to be fit for purpose, an assurance process is being established by the NFCC Wildfire Group.

The process will gather information specific to the developed assurance objectives, and use this to measure the extent to which assurance criteria are being met. This enables the NFCC Wildfire group to provide assurance to FRS, National Resilience, Home Office and other agencies that the WTA capability is able to respond effectively to national-scale incidents with regard to the required amount of competent personnel and with equipment that is operationally fit, and safe, for purpose.

In support of ongoing WTA maintenance of competence and continuous professional development (CPD), and in order to align with the compliance requirements of the National Co-ordination and Advisory Framework (NCAF) the NFCC Wildfire Group will facilitate assurance of the national cadre of WTAs against the essential criteria provided in **Appendix A**.

Assurance will be undertaken using the following means:

- Via evaluation / assessment of regional or national mobilisations
- Via evaluation / assessment at regional or national exercises
- Via the WTA Assurance Framework
- Via evaluation / assessment at WTA CPD training events
- Via an annual WTA CPD Workshop.

WTA host FRS's should maintain appropriate local systems to ensure that their WTAs are afforded sufficient opportunities to maintain their competence in the role. WTAs will be required to complete at least 2 CPD events (*one of which should be attendance at the*

annual WTA CPD Workshop) every year to ensure that their knowledge and skills are maintained.

The NFCC Wildfire Group also maintains a CPD recording system on the Resilience Direct website that enables WTAs to monitor the CPD that they have undertaken.

All training / CPD events should be in accordance with the identified competence requirements for WTA as detailed within the WTA competency framework document.

3.10 Health & Safety Management

WTAs must also work within the affected FRS Health & Safety Management System which includes the use of local risk information and incident ground risk assessments.

4. MOBILISATION

4.1 Method of mobilisation

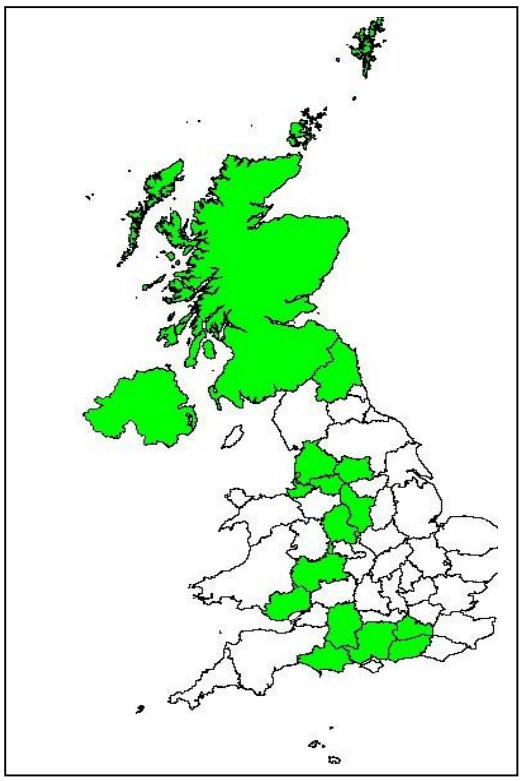
WTAs may be mobilised in one of the following ways:

1. **Home FRS** – Mobilised in their home FRS
2. **Cross-border** – Mobilised in to neighbouring FRS under existing mutual aid arrangements.
3. **Regionally / Nationally** – Mobilised following a request from a FRS to National Resilience Fire Control (NRFC) at Merseyside FRS.

In all 3 mobilisation types National Resilience Fire Control MUST be notified of WTA deployment

38 WTAs are currently located within the following FRS's in the UK

- Dorset and Wiltshire
- Scottish FRS
- South Wales
- Hampshire
- Merseyside
- Lancashire
- Northern Ireland
- Hereford and Worcestershire
- Northumberland
- Surrey
- Defence FRS
- West Yorkshire
- Staffordshire
- Manchester
- Derbyshire
- West Sussex



4.2 Wildfire Tactical Advisor (WTA) availability

Although the WTA capability is now supported by the NRFC – it remains a ***best endeavours*** facility. All NFCC WTAs will be listed on a nominal availability rota held on the NRFC ESS. The **default** position on the rota is that WTA's are **available** to respond.

Use of the System

The nominated mobile phone contact details for all current NFCC WTA's have been entered into the ESS data base. The default position is that WTA's are currently considered available unless they amend their status to unavailable.

WTA's can access the Text Messaging System to change their status by texting **01452 204040** from their registered mobile telephone number. The content of the message will be one of the following two statuses

A Makes their status available.
U Makes their status unavailable.

In order for the system to recognise an incoming text message it must be sent using the mobile phone (number) stored on the system (your current mobile number provided to NRAT). It will not recognise any other number therefore it is extremely important for any number alterations to be communicated to the NRAT team as soon as possible following any change.

Action Required

Whenever there are confirmed wildfire events occurring, a request for WTA assistance has been received **or** when the Met Office / Natural Hazard Partnership issue weather warning that indicate the anticipated wildfire risk / threat will be significant for a protracted period then a group text request will be sent to WTAs to confirm their availability on the ESS.

WTAs should ensure that they notify their Duty Principal Officers that a request to update availability has been received. Mobilisations of WTAs must not occur without service approval.

In the event of a WTA being required for a regional / national scale incident, the following procedure will be followed:

- The requesting FRS to contact National Resilience Fire Control (NRFC) requesting WTA Support and provide a single point of contact from the requesting FRS and location of RVP

- NRFC will inform NRAT Duty Officer, they will then contact the National Fire Chiefs Council (NFCC) Wildfire Lead Officer (CFO Paul Hedley Northumberland FRS) and/or NFCC Wildfire Dep Lead (SM David Swallow Hereford & Worcester FRS)) and provide them with the details of the request for advice/support and current WTA availability from ESS

- NFCC Wildfire Lead/Dep will determine if remote advice or attendance is required, select the most suitable WTAs to respond, nominate a Lead WTA and inform the NRAT Officer requesting their deployment by NRFC. **A minimum of 2 WTA's will be deployed**

- WTA's will gain approval from their FRS and confirm mobilisation with NRFC, this will be recorded on the NR incident log

- NRAT Officer will confirm mobilisation has taken place with NFCC Wildfire Lead/Dep and provide talk group/contact details for mobilised WTA's

  Lead WTA will establish an incident log with their home FRS this will be utilized as the message log for all WTA deployment for the duration of the incident, this will ensure a consistency of recording messages in one location. When WTA reliefs are required the message log is to be maintained with the same FRS for consistency, this will need to be agreed and arrangements made with the lead WTA and their Control Room prior to change over.

- The lead WTA will liaise with the requesting FRS SPOC to ascertain situational awareness and offer interim advice if appropriate

- The nominated lead WTA will be responsible for liaising with other WTA's as to pre-attendance arrangements and for updating NRFC/NFCC/Home FRSs on their arrival at the RVP, ideally as one unit.

- WTAs will establish communications via mobile phone or Airwave National Talk Group to NRFC. WTAs will inform NRFC when -
  - mobile to incident
  - in-attendance incident
  - mobile home FRS on leaving incident
  - any urgent situation relating to the WTA response that needs supporting

Informative messages will ideally be recorded for the WTAs at the Lead WTA home FRS Control Room not NRFC. The Lead WTAs will provide regular updates to their home FRS Control Room on actions, advice provided and decision rationale. This info will be recorded on the mobilising system and be available to NFCC Wildfire Lead/Dep. An individual WTA decision log should also be maintained.

- WTA reliefs, requests for FRS Wildfire assets recommended by the WTA must originate from the host FRS to NRFC. The Lead WTA should ensure these are also recorded on the WTA incident log at their home FRS.

- Should there be a change of Lead WTA updates and messages should still be forwarded and recorded by the original Lead WTA home FRS Fire Control to ensure continuity and a completeness of the WTA incident log.

In order to provide WTA resilience and peer support, the expectation is that whenever possible, a mobilisation will involve the closest appropriately skilled WTA responders. The NFCC Lead/Dep will, where possible, utilise mobilisations to provide opportunities for less experienced WTAs to be deployed along with more practiced colleagues to further enhance and develop their skills and competencies. Close liaison and communication between the nominated WTAs will be essential during pre-departure and mobilisation.

Prior to mobilising, the WTAs should:

- Ensure they have copies of the WTA SMEAC Form **(Appendix B)** to ensure that they are equipped to gather as much relevant detail regarding the incident.
- Lead WTA will hold at least one telephone conference with the Incident Commander (or nominated officer) to determine whether the provision of remote advice and support is appropriate and sufficient.
- Ascertain precisely where they are mobilising to (e.g. Incident Scene, RVP, Strategic Holding Area, Tactical Command Group location etc).
- Discuss the arrangements to be made to ensure that all WTAs being mobilised can maintain contact prior to their attendance at the incident.
- If applicable, identify an appropriate 'Airwave' radio national talk group / radio channel to facilitate communications with NRFC and / or local FRS control
- Ensure they have their own personal equipment where applicable (i.e. Wildfire PPE (if provided), WTA Tabard, Handheld weather station, Airwave/VHF Radios, Sat Nav, ID tally, aide memoires, appropriate OS maps, IT Equipment etc.)
- Attempt to identify how long the incident will last and thereby anticipate personal welfare needs and the requirement for WTA reliefs. Personnel should work on the principle that they will be deployed for at least 48 hours.
- Obtain details of the affected FRS Welfare Liaison Officer.

Request contact details of the NFCC Wildfire Lead/Dep and NRAT Duty Officer via NRFC and establish contact accordingly.

N.B: It is important to note that the WTA role is an advisory role and there is no obligation upon an Incident Commander to request or utilise this resource.

5. OPERATIONS

5.1 WTA Role in Pre-Planning

FRS's are encouraged to always consider utilising the skills and knowledge of WTAs for incident 'pre-planning' whenever the development of site/risk specific plans requiring the use of WTA equipment or resources for the resolution of an emergency incident are being considered.

There are a number of ways that WTAs can support the national enhancement of wildfire pre-planning, response and evaluation. These include;

- Ensuring that their home FRS are aware that all wildfires falling within the national NOG criteria are required to be uploaded onto the National Reporting Tool to ensure that a comprehensive evidence base of significant incidents can be developed.
- Ensuring that their FRS has provided the necessary information to populate the NFCC wildfire asset register.
- Ensuring that their FRS is engaged with any local or regional wildfire groups to improve cross sector planning, preparedness and response.

Additionally, WTAs can be utilised to support the FRS quality assurance process of completed tactical wildfire fire / response plans.

5.2 WTA Role at an Incident

WTAs will not monitor performance or take any operational command responsibilities at an incident other than the provision of advice as stated above.

The following section provides information on the type of advice and support that a WTA can provide at an incident.

The provision of:

- Technical wildfire capability advice to the Operational / Tactical Incident Commander (IC).
- Review of the current tactical fire plan and assessment of the current working / deployment arrangements of operational personnel and advise on any immediate safety concerns.
- Review the location and tasking brief of any deployed Safety Officer / Lookouts.
- Advice to the IC team to develop suppression / defensive tactics to contain / suppress the incident.
- Provide initial advice based upon expected weather/fire behaviour in the next 4-6 hours.

- Review the weather forecast for the next 12 / 24 / 36 / 48 hours and analyse probable fire development/behaviour.
- Information regarding other national assets that may assist wildfire suppression operations.
- Advice regarding task priorities in accordance with IC plans and information available.
- Anticipation of arriving assets and pre-planning of tasks to be allocated.
- Liaison with partner agencies e.g. Forestry Commission, land owners/agents, Environment Agency, Police, Local Authority.
- Advice regarding potential future wildfire logistical requirements e.g. personnel and appliance resources, specialist vehicles and assets, external partner and expert advice.
- Advice on suitable, safety zones, escape routes access / egress routes for assisting wildfire assets.
- Advice on timelines for wildfire specific operational elements.
- Providing information to the NFCC Wildfire Lead/Dep as required.
- Liaison, briefing and cooperation with other wildfire WTAs in advance of WTA reliefs being mobilised.
- Advise whether any external agencies should be requested to attend as advisors to the IC team.

N.B: The above is not an exhaustive list

5.3 WTA identification

In accordance with other Tac Ad cadres from National Resilience capabilities, WTAs are to utilise a red and white tabard and personal identification tally to assist with their identification and accountability on the incident ground.

Pictures - Example Tabard of Wildfire Tac Ad

Communications

Via NRFC, at the point of mobilisation, the WTA will be provided with any Airwave National Talk Groups in operation at the incident. Once in attendance at an incident, local communications will be determined by the affected FRS. WTAs will be expected to ensure that NRFC and the Lead WTA Home FRS Control Room are updated as per previous points in mobilising. WTAs should also ensure their own records of advice given and rational for is kept using decision logs.

6. DEMOBILISATION

6.1 Demobilisation process

Demobilisation is the orderly, safe and efficient return of a WTA back to their home FRS location and operational status. Demobilisation usually occurs at the resolution of the incident and during the recovery phase, however should a wildfire incident be protracted there may be situations where a number of WTAs are mobilised, deployed and stood down whist the emergency phase of the incident is progressing.

Demobilisation of WTAs may be required for the following reasons:

- WTAs being rotated for welfare reasons and sent back to their home FRS location.
- The incident enters the recovery phase, with no defined requirement for ongoing WTA attendance.
- The IC of the wildfire incident no longer requires the support of WTAs.
- A decision is taken by the affected FRS to cease operations.
- The WTA is requested to relocate to another incident.

6.2 Debriefing

The IC should conduct a hot debrief with the WTAs and relevant affected FRS staff prior to leaving, any immediate learning outcomes should be recorded and actioned as appropriate.

6.3 Leaving the Incident

Prior to leaving the incident the WTAs should log out from the relevant incident command point and/or Strategic Holding Area. If necessary provide briefing and handover to oncoming WTA reliefs and inform NRFC On return to own FRS advises local Fire Control.

7. POST INCIDENT ISSUES

On completion of the deployment of a WTA to any wildfire incident and prior to their return to their home FRS. FRS management teams, in liaison with the NFCC Lead Officer and Wildfire Group Chair if applicable should consider and plan for the following areas:

- Rest periods prior to the team member's return to normal duties
- Incident stress debriefing
- Post-incident reporting
- Post mortem enquiries and coroner's court
- Criminal investigations, public or judicial enquiries
- Media co-ordination on return to service
- Collation of contemporaneous notes and other incident documentation
- Return to normality.

Appendix A WTA Criteria

Wildfire Tactical Advisors

Definition

Wildfire Tactical Advisors (WTAs) are Fire and Rescue Service (FRS) personnel who have been identified as having specific skills and knowledge, which enable them to offer support and advice on the tactical elements of National Resilience capabilities.

They may be provided by local arrangement within the FRS, but will also offer expertise and support as part of an informal regional / national response through the NFCC Wildfire Group.

NRFC will be responsible for managing requests for regional / national assistance from nominated WTAs.

Nominations

Personnel can be nominated by their host FRS to undertake the role of WTA on the basis of the fulfilment of the personal specifications and skills and knowledge requirements listed in this Appendix.

The selection of nominated personnel for attendance on the WTA Development Workshop will be made by NFCC Wildfire Lead and NFCC Wildfire Group Chair based

Functions at Incident – Advisory Capacity Only

They have responsibility to provide detailed tactical, logistical, safety and fire behavioural advice to the Incident Commander at both tactical and/or operational levels. This may include attendance at the Home Office / Operations Centre, NRFC and any dedicated Strategic Holding Area (SHA).

N.B: WTAs **will not** be mobilised to assume command at Tactical or Operational level, or to monitor performance.

Mobilisation	Essential	Desirable
Only upon request from FRS WTAs will be mobilised by NRFC fire control in liaison with the host FRS.	Arrangements will be made by the host FRS, e.g. own vehicle, service vehicle.	Vehicle with Firelink radio.
Call Sign	N/A	
Communications	Mobile Phone	

Reporting Mechanism	WTAs will report to the Incident Commander at Operational/Tactical level. WTAs will maintain regular contact with NRFC fire control to update the mobilisation log held by NFRS with key information related to the deployment, advice/support provided, decisions taken etc.

Capability Specific Requirements			
Capability	Wildfire	**KPI**	Target 24 (Minimum 12)

Personal Specification	
Essential	Desirable
Approval from Chief Fire Officer to undertake WTA role Availability to deploy nationwide to major incidents for protracted periods – 48 hrs as a minimum guide Excellent personal communications skills, both written and verbal Ability to engage with stakeholders at all level Physically fit and in good health Robust work ethic High level of personal integrity Willingness to learn and develop	

Equipment Requirements	
Essential	Desirable
• Communications – mobile phone • PPE dependent on role and capability • Wildfire National Operational Guidance • Wildfire Handbook** • WTA Tabard* • Identification Tally * • Welfare bag * • Access to transport (Car / van) • Sat Nav / road mapping system. * *Items provided by WTA Host FRS* ** *Provided by Northumberland FRS*	• Wildfire PPE • Handheld Weather Station (Kestrel) • Vehicle with “Fire-link” Radio • Pager • Laptop computer • “Fire-link” SAN J Radio.

Skills and Knowledge Requirements	
Essential	Desirable
1. Completion of Advanced Wildfire Course (or equivalent) 2. 3 Day WTA Development Workshop 3. Proven wildfire experience and knowledge within own FRS 4. Evidence of wildfire deployments and management within FRS 5. Evidence of evaluation and debriefing of wildfire incidents and/or exercises within own FRS.	1. IOSH health and safety management qualification 2. Accredited C&C course 3. Accredited Evaluation Course 4. Off Road Driving Course

Welfare Arrangements
Welfare provision to be provided by host FRS, however WTAs should be prepared for protracted deployments and assume a minimum deployment period of 48 hours

WTA Assurance
Responsibility of NFCC Wildfire Lead Officer and host FRS. WTAs will be assured on an annual basis through a wildfire CPD workshop. Assurance will also be evidenced through programmed NFCC Wildfire Group capability assurance audits and pre-arranged training events / simulations within FRS.

Appendix B – WTA SMEAC Briefing Form

NFCC National Fire Chiefs Council

The professional voice of the UK Fire & Rescue Service

NFCC NATIONAL WILDFIRE TAC AD BRIEFING FORM

Location of Incident/FRS		Incident Number	
		Date	
		Time of Call	
BRIEFING DELIVERED FROM – **To-**			
Fire	Location		
	Size		
	Direction of spread		
Topography	Slope		
	Position on slope		
	Aspect		
	Topographical Hazards		
Fuel	Type		
	Condition		
	Arrangement		
	Change		

Weather Update verbally at briefing – Commanders to insert current information after briefing	Time/Date		
	Temperature		
	Relative Humidity		
	Wind speed		
	Wind direction		
Fire behaviour	Flame Length and Fire Intensity (0 to 0.5m = low intensity; 0.5 to 1.5m = moderate; 1.5-3.5m = high; More than 3.5m = extreme)		
	Rate of spread		
	Alignment factor (F0, F1, F2 or F3)		
Additional information			
MISSION			
Objective			
EXECUTION			
Specific Information			
Contingency Plans			

Hazards and Controls	Hazards	Control measures

LACES	**Lookouts**	**CONFIRM AN EVACUATION SIGNAL IS IN USE AND KNOWN TO ALL PERSONNEL ON THE FIREGROUND** Team lookout(s) deployed: Tactical lookout(s) deployed: • Maintain communications with Command Team • Individuals should be competent to carry out the role. • Located in a suitable position to oversee operations. • Able to instigate tactical or emergency withdrawal by enacting LACES protocol
	Awareness	• SMEAC briefing to be carried out with staff working within the sector • Anchor point declared
	Communications	• Communication to be established (consider cross border working) • Personnel fully briefed • Regular situational updates
	Escape Routes	• More than one considered • assessed and deemed suitable • Known by all and monitored • Reviewed periodically • All access to be maintained and kept clear of vehicles
	Safety Zone	• Suitable location and size • Known and understood • Monitored and assessed

ADMINISTRATION		
Logistics		
Reliefs		
Welfare		

COMMAND AND CONTROL		
IC Structure	Incident Commander	
	Command Support Officer	
	Operations Commander *(if applicable)*	
	Sector Commander 1 *(if applicable)*	
	Sector Commander 2 *(if applicable)*	
	Sector Commander 3 *(if applicable)*	
	Sector Commander 4 *(if applicable)*	
	Sector Commander 5 *(if applicable)*	
	Sector Commander 6 *(if applicable)*	
	Functional Officers *(complete if applicable)*	
	Wildfire Tactical Advisor	
	Wildfire Support Officer	
	Wildfire Support Officer	
	Wildfire Support Officer	
	Burn Team Sector Commander	
	Sector Safety Officer 1 (Tactical Lookout)	
	Sector Safety Officer 2 (Tactical Lookout)	
	Sector Safety Officer 3 (Tactical Lookout)	
	Safety Officer 1 (Team Lookout)	
	Safety Officer 2 (Team Lookout)	
	Safety Officer 3 (Team Lookout)	
	Safety Officer 4 (Team Lookout)	
	Safety Officer 5 (Team Lookout)	
	Safety Officer 6 (Team Lookout)	
	Water Officer	
	Welfare Officer	
	Logistics Officer	
	Marshalling Officer	
	JESIP and other partners (name and org.)	
	JESIP and other partners (name and org.)	
	JESIP and other partners (name and org.)	
	JESIP and other partners (name and org.)	
	JESIP and other partners (name and org.)	
	JESIP and other partners (name and org.)	

Lines of Communication	

NFCC Wildfire Tac Ad Completing SMEAC Briefing		**Commander Receiving SMEAC Briefing** **I confirm that I have understood the above briefing.**	
Name		Name	
Sign		Sign	
Role		Position	
Date		Date	
Time		Time	

Appendix C – WTA SMEAC Briefing Form Example

NFCC National Fire Chiefs Council

The professional voice of the UK Fire & Rescue Service

NFCC NATIONAL WILDFIRE TAC AD BRIEFING FORM

Location of Incident	Incident Number	12345678
Smith Moor Smith Road Sandford	Date	10/07/18
	Time of Call	NA

BRIEFING DELIVERED

FROM – Shaun Walton (NFCC WTA)

To- Area Manager Smith (Incident Commander)

Fire	Location	6 Sectors on Smiths Moors
	Size	18sq KM perimeter covering two FRS areas (fire size approx. 10kmsq
	Direction of spread	Easterly
Topography	Slope	Various across incident ground sectors
	Position on slope	Various across incident ground sectors
	Aspect	In aspect for duration of day
	Topographical Hazards	Shafts, uneven ground, culverts, open water, undulating ground and drops, burnt vegetation and ground fuels, forestry changes in fuel
Fuel	Type	Molinia grass, heather, forestation, peat
	Condition	Very Dry
	Arrangement	Open moorland with coppices
	Change	As above
Weather Update verbally at briefing – Commanders to insert current information after briefing	Time/Date	1845 hrs 10/07/18
	Temperature	23C
	Relative Humidity	40 RH
	Wind speed	9km/hr
	Wind direction	Easterly

<table>
<tr><td rowspan="3">Fire behaviour</td><td>Flame Length and Fire Intensity (0 to 0.5m = low intensity; 0.5 to 1.5m = moderate; 1.5-3.5m = high; More than 3.5m = extreme)</td><td colspan="2">Sector 1 low intensity with pockets of flare up potential
Sector 2 low intensity with pockets of flare up potential
Sector 3 low intensity if spread to adjacent forestation it will provide extreme
Sector 4 Low/Moderate if spread to adjacent forestation it will provide extreme
Sector 5 low/moderate intensity extreme if reaches forestation
Sector 6 Low/Moderate if spread to adjacent forestation it will provide extreme conditions</td></tr>
<tr><td>Rate of spread</td><td>80m per/hr Back burn</td><td>80m per/hr back burn</td></tr>
<tr><td>Alignment factor (F0, F1, F2 or F3)</td><td>Sector 1 F1/F2
Sector 2 F2
Sector 3 F2
Sector 4 F2/3
Sector 5 F1/2</td><td>Sector 1 F1/F2
Sector 2 F2/3
Sector 3 F2
Sector 4 F2/3
Sector 5 F1/2</td></tr>
<tr><td>Additional information</td><td colspan="3">The wind direction is expected remain Easterly and North Easterly for the next 24 hours. Fire behaviour remain fairly constant with a drop in fire flame overnight due to rise in humidity and drop in temperature.
Mountain rescue teams have now left the incident sector commanders should have sufficient resources to position tactical lookouts and also capability to assist personnel that may be injured off road way. If MRT is requested in an emergency the team leaders can be contacted and mobilised on 01234 567890
Air support is unavailable for the next 48hrs provision should be made to facilitate attendance of appropriate firefighting resources to trigger points and areas of unburnt fuel. Recommend one fire fogging unit remains available for immediate redeployment on the fire ground.
A realistic informed assessment should be made prior to requesting fire fogging unit to ensure it is utilised effectively in areas of greatest risk/need.

FRS Tactical Lookouts are recommended to be deployed day and night to observe fire behaviour at the agreed locations and be subject to a strict LACES protocol and ARA. No lone working to be carried out as tactical lookouts and communications with Sectors and Command Point to be maintained.
All sectors to review fire conditions in proximity of dwellings and infrastructure as this change occurs and update the command team of any changes so that the tactical plan can be reviewed.
Trenches used as control lines should be backed up with hose lines charged and in use where ever possible including during night time operations.
Keep a watch on the unburnt fuel areas adjacent to control lines and extinguish where possible.</td></tr>
</table>

	Quick interventions may be required to control hotspots to keep them manageable on the control lines. Helicopter availability is consider essential, If no helicopter support is available then tactical lookouts could be increased and fire fogging capability/additional resources should be made available to respond to areas of concern. Don't get drawn into the inner area unless significant fires are occurring in unburnt fuel areas. Large amounts of smoke may become visible from hotspots in burnt areas that may not influence fire behaviour along control lines but may affect personnel working in those areas. As control lines are strengthened then crews and fire foggers can work into open land to manage hotspots. Monitor and extinguish where practicable slow back burning fires, don't become complacent. Make good use of aerial suppression and fire fogging units as soon as available. Pre laid jets at trigger points of unburnt fuel should be utilised throughout the night. Each trigger point should be protected by jets and where jets are not able to be laid and tracks can be safely accessed by foot or vehicles close supervision and monitoring should take place at 30 minute interval throughout the night. LACES protocols should be in place and updated at each Sector by the current sector commander. The sector commander will have total responsibility to ensure LACES protocols are in place and delivered to all personnel within their sector. Establishing and maintain a **25m control line** on the full fire perimeter is essential. The control line will consist of a 25m clear area on **burned** vegetation on the edge of the fire line perimeter. Attention to be given to the control line to ensure all hot sports are completely extinguished by pressurised jets or removed prior to moving on. It is accepted that the ground fuel peat is burning in excess of 60cms at points due to steaming off when lanced, however saturation to extinguish hotspots should be the operational objective. **The fire front should be continually monitored for opportunities to extinguish it, these should be adopted at every opportunity day and night.** **Compliancy in low activity areas such as back burning fuels at perimeters of sectors must be avoided, these could if unsupervised develop into a significant head fire if fuel is available and alignment occurs leading to unburnt areas becoming involved.** Opportunities to saturate ground fuels should be taken in particular on HVP routes/tracks from road way when safe systems of work can be adopted during day and night. Consider USAR lighting. It is likely that if hot spots within the 25m control line are not monitored and managed effectively a development in fire behaviour leading to fire spread outside of control line may occur into unburnt fuel may occur. We are currently dealing with a low intensity fire with a risk of significant underground fire travel that may only be detected by Infrared or when it presents itself. Smoke plumes can be managed where appropriate with additional crews damping down hotspots to ease working conditions in other sectors. During hours of darkness the smoke plume will drop lower to ground.

	Helicopter water drops and beating will need to be backed up with water, ideally pressurised by fire fogging units as per above management of hotspots, air drops will only supress the fire it won't extinguish it. Potential for fire to back burn over previously unburnt areas that will accelerate fire development with the likelihood of increased fire development and spread to woodland areas and fuel. Changes in wind direction have the potential to spread fire into unburnt areas of moorland/forestation. These areas of unburnt fuel could be large and prescribed burn could be considered to remove fuel. Maintain a sustained and appropriate weight of attack to make progress, stoppage of firefighting actions could impact on containment. Teams consisting of 1/3 suppressing, 1/3 extinguishing and 1/3 resting on a round robin is a concept to be considered Use favourable weather conditions in evening/night where safe to do so e.g. illuminated tracks in vehicles or on foot when low temperature and high humidity are occurring to attack fire to ease physical exertion of crews. Strength existing natural control lines such as paths with machinery/hand tools at critical points e.g. change in fuel, overhanging fuel and fuel of different heights where it may spread easily uphill over small natural control lines. Utilise OS map, san J Radios, appliance MDTs (on road way) to provide accurate grid references.
MISSION	
Objective	Maintain awareness and implement tactical plan Create and maintain a 25m control line along the perimeter of the burnt vegetation to protect unburnt fuel from fire spread due to fire development caused by change in wind conditions or underground travel through peat. Hotspots to be fully extinguished by digging out and high pressure jets prior to progressing forward along the control line to prevent re-ignition. Control lines to be managed by trenches cut utilising machinery in the sectors, supervision needs to be maintained by tactical look outs and team lookouts in particular during hours of darkness when crews have been withdrawn and a fire could occur. Machined control lines will need to be backed up by charged hose lines where possible. Situational awareness to be maintained by strict hand over of priorities at each sector and communications between sectors Continual application of water even during hours of water should be applied • Maintain control line to prevent spread of fire • Management of air borne embers to be monitored and extinguished on unburnt areas where practicable • Manage exposure of personnel to particles utilising P3 mask and work outside of smoke plume

EXECUTION	
Specific Information	Incident Commander to brief Ops/Sector Commander utilising this briefing Sector commanders to ensure clear tactical brief is given to all persons operating in their sector and brief is adhered to, updated information in relation to fire behaviour to be communicated to incident/ops commander to enable review of tactical plan. Use of tactical lookouts at predetermined points to be implemented Utilise LACES as part of this briefing to be implemented. Low activity control lines remain effectively managed to prevent any.re-ignition Strong briefs given to crews and ground truths confirmed Sector Advice to be read in conjunction with OS Map Consider use of Tactical Lookouts for all sectors to support Team Lookouts and Command Team these could be FRS personnel supported by MRTs. Locations recommended are – • Burnt Edge over looking sector 4 and Smith Rd grid ref 123456 • Reservoir east of Smith Cottage overlooking sector 4 grid ref 234567 • Quarry overlooking sector 5 grid ref 345678 • Grange Brow overlooking sector 5 grid ref 456789 • Top Tower with team lookouts and a strict safety brief due to fuels around the tower that could be affected • These will be supported with land manager tactical lookouts during daylight hours **Sector Specific** Sector 1 – Both sides adjacent to Smith Rd • Fire perimeter control line leading down right flank between cairns to sector 2 ensure clear communications between Sectors to prevent spread. • The Smith road splits sector 1, Sector commanders need to maintain awareness of both side of mast rd to adjoining sectors • Area of fuel around two lads needs to be monitored to prevent spread from adjacent area • Control lines need to be strengthened between mast rd and pike cottage by pressure fed supply. • Team lookouts posted between Smith Rd track to Smith Cottage with firefighting capability Sector 2 – • Maintain contact with sector 1 to ensure joined working at sector merge points on control line. • Maintain wakeful watch utilising tactical lookouts of control line from sector 1 due to being incomplete • Extra vigilance between fuel changes in the area adjacent to control lines on Belmont Rd in particular the heather bankings adjacent to plantations. This banking should be strengthened. • Ensure all dams and IBCs are filled to capacity in the evenings

	Sector 3 Tower Rd Area– • Maintain control line management working from sector 2 and extend to Tower Cottage • Maintain strengthened fire edge to prevent spread to forestation along route towards dove tower and tower cottage • Utilise IBCs to replenish water used and ensure they are at full capacity during the evening • Maintain wakeful watch by tactical lookouts of control line, Princes Lane access route Sector 4A – Land Owner Offices Stevens Rd (A&B) • This is a consistent smoke generator for incident affecting working conditions in other sectors • Maintain control lines throughout sector • Trigger point for fuel change and ignition at point where machinery dug trenches from Princes Rd and behind the main plantation meet. • Consider strengthening control line with jets at Stevens Hill and Wild Wood near unburnt fuel. • A strict watch should be maintained in this area. The most appropriate entry point at night would be via Smith Rd via recently made track and track behind Smiths Farm. This area to be managed by sector commanders and recommend a fire fighting presence maintained day and night and tactical lookout utilised. • Potential for fire development within this area due to unburnt fuels is possible. • Access can be gained from Smiths Farm to strengthen control line • Jets to be laid and water delivered during day and night where safe to do so 4B • 2 hose lines from reservoir, adjacent to Shooting Hut on Smiths Moor. Effective management of control line to be maintained Sector 5 Darwen Rd Forestation Plantations • Vehicle with suppression capabilities to patrol edge of track in area C every 30 minutes day and night. Provision of pressurised supply to be available. • Jet to be laid along track on area C to cover burn towards plantation from hill adjacent to scout road. • Cover properties with charged lengths • Jet to be charged and water delivered day and night to top corner and fire perimeter line of area B adjacent to area C. • Jet to be charged in area B between area A & B, Jets to be delivered to protect plantation day and night and suppress burnt and cover unburnt area • Control line to be strengthened around a plantation to reduce opportunity of surface & ground fuel fires spreading undetected from moorland into forestation. 3 jets to be charged and delivering water constantly on edge of forestation to deal with hot spots on Williams Moor. • Jets to supress fire front and saturate trenches, unburnt vegetation • Jets to be laid to cover and observed fire spread in plantation, do not enter at night or in fire conditions charge hose lines remotely and utilise ground monitors

<table>
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Use of tactical and team look outs to be deployed
Fire development has a greater potential within this sector due to unburnt fuel and forestation and developing underground peat fire, extra vigilance and no complacency should be applied.
Particular consideration should be made to the introduction of Ground Monitors or Fan spray projectors to create an area of wet ground to protect the forested areas.
Consider water tower

Sector 6

Stoops Farm, fuel in farm grounds including trees and LPG Bullets and adjacent forestation not shown on OS Map at Stoops Moor.
Tactical look outs required all night

top of brow towards Stoops Farm,
Plantation monitoring and suppressing fire perimeter, use lighting.
End of track toward sector 4 to manage fir perimeter

Continuous uninterrupted water supplies required in this sector due to fire loading. Utilise hydrants, reservoir, IBC and bowser. Consider use of HVP.

</td></tr>
<tr><td>Contingency Plans</td><td colspan="2">Reserve assets available to reinforce the area and knock down any flare ups.

Good understanding of situational awareness in each sector to prioritise asset requirements

Support from Ops Commander re available on and off site asset requests

If conditions change and any significant developments occur consider recall of NFCC Wildfire Tac Advisor.</td></tr>
<tr><td rowspan="10">Hazards and Controls</td><td>Hazards</td><td>Control measures</td></tr>
<tr><td>Machinery</td><td>Sector Command Control – strict safety brief to operators working under FRS Sector Commander Control. Brief crews</td></tr>
<tr><td>Air operations</td><td>Sector Command Control – maintain contact with aircraft</td></tr>
<tr><td>Uncontrolled fire</td><td>Sector Command Control- LACES protocols adopted</td></tr>
<tr><td>Non adoption of LACES</td><td>Sector Command Control- Support from Ops Commander</td></tr>
<tr><td>Underground electricity cables</td><td>Liaise with Electricity Company prior to any excavations</td></tr>
<tr><td>Smoke</td><td>Work in clean air</td></tr>
<tr><td>Vegetation particles</td><td>P3 Masks worn</td></tr>
<tr><td>Peat involved in fire, dead space leading to burns, unpredicted presentation across incident ground</td><td>Assess ground prior to walking over it, LACES principles applied</td></tr>
</table>

	Disorientation in plantations	Don't deploy in fire conditions and adopt LACES	
	Allergy from using different insect repellents	Use one type of spray and seek medical advice.	
	Driving and operating fire fogging vehicles without training	Ensure only trained personnel operate vehicles and machinery within their competencies	
	Inappropriate PPE	Sector Commander to ensure Sector Commanders are utilising appropriate PPE at all times.	
	Sector Command Continuity	Sector Commanders need to ensure Sector Command is handed over to appropriate commander whilst attending briefings	
	Use of mulcher machine	Maintain 50m exclusion zone	
	ARA completed and communicated to personnel? *(please indicate)*	YES	NO

LACES **To be completed in each sector by sector commander**	**Lookouts**	Team lookout(s)/safety officers deployed: Tactical lookout(s)/sector safety officer(s) deployed: • Individuals should be competent to carry out the role. • Located in a suitable position to oversee operations. • Able to instigate tactical or emergency withdrawal.
	Awareness	• SMEAC briefing to be carried out with staff working within the sector
	Communications	• Communication to be established • Personnel fully briefed • Regular situational updates
	Escape Routes	• More than one • Scouted and deemed suitable • Known and updated • All access to be maintained and kept clear from traffic.
	Safety Zone	• Suitable location and size • Known and understood • Monitored and assessed
ADMINISTRATION		
Logistics		
Reliefs		NFCC Tac Ads released from incident when FRS decides advice is no longer required should hand over Tac Advice gained to FRS Wildfire trained staff. Telephone support and a request for re-attendance can be made via NRFC.
Welfare		

COMMAND AND CONTROL		
IC Structure	Incident Commander	
	Command Support Officer	
	Operations Commander *(if applicable)*	
	Sector Commander 1 *(if applicable)*	
	Sector Commander 2 *(if applicable)*	
	Sector Commander 3 *(if applicable)*	
	Sector Commander 4 *(if applicable)*	
	Sector Commander 5 *(if applicable)*	
	Sector Commander 6 *(if applicable)*	
	Functional Officers *(complete if applicable)*	
	Wildfire Tactical Advisor	
	Burn Team Sector Commander	
	Wildfire Support Officer	
	Wildfire Support Officer	
	Wildfire Support Officer	
	Sector Safety Officer 1 (Tactical Lookout)	
	Sector Safety Officer 2 (Tactical Lookout)	
	Sector Safety Officer 3 (Tactical Lookout)	
	Safety Officer 1 (Team Lookout)	
	Safety Officer 2 (Team Lookout)	
	Safety Officer 3 (Team Lookout)	
	Safety Officer 4 (Team Lookout)	
	Safety Officer 5 (Team Lookout)	
	Safety Officer 6 (Team Lookout)	
	Water Officer	
	Welfare Officer	
	Logistics Officer	
	Marshalling Officer	
	JESIP and other partners (name and org.)	
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Lines of Communication	

Incident Commander (or person delegated to provide SMEAC Briefing)		**Officer In Charge of Crew/Team receiving SMEAC Briefing** **I confirm that I have understood the above briefing.**	
Name		Name	
Sign		Sign	
Role		Position	
Date		Date	
Time		Time	

AFAN