



PORTUGAL 2018

TECHNICAL SPECIALIST EMBED

AFTER ACTION REVIEW

AND

CLOSE OUT REPORT

DIRECT AWARD N.º 59/AD-SGPCM/2018

Provision of services of technical advice and training on incident command and divisional supervision related with rural fires aiming the Portuguese Rural Fires Management Systems professionals, Portugal 2018

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1. INTRODUCTION

During the summer of 2017 Portugal had some catastrophic wildfires, namely the fires at Pedrógã and Góis. These events highlighted the structural and operational flaws in the current model for preventing and suppressing wildfires.

In the technical reports that followed these events it was highlighted that there was a need for the consistent introduction of expertise in the various components of the system. To this end the Agency for Rural Fire Management (AGIF) was created in February 2018, with the objective to mitigate some, if not all, of the previously mentioned structural and operational flaws.

Considering that forest fire management expertise was one of the flaws identified, AGIF has initiated a programme of knowledge exchange with countries who have this expertise.

The contractual requirements were as follows:

Working on Fire International was contracted by the Portuguese Government, through the Integrated Rural Fire Management Agency, I.P (AGIF, I.P.) in an International Exchange Program to assist with the *'provision of services of technical advice and training, on incident command and divisional supervision, related with rural fires aiming at the Portuguese Rural Fires Management Systems professionals'*.

As a result a senior Incident Commander and a Divisional Supervisor were embedded in Portugal for the period 15 August to 15 September 2018.

The following deliverables were requested:

- a) Make available two operational personnel with high level of expertise in respectively incident command management and divisional supervision for 30 days on site in Portugal;
- b) Produce an After Action Review (AAR) operational report, from each participant, relevant to his deployment;
- c) Deliver continual operational assessment and value added input to command structure as and when needed;
- d) Engage and build operational understanding and foster relationships with the Portuguese operations personnel.

Summary of deployment organisational exposure:

1. SGIF

A special unit established by the President to investigate ways of mitigating the wildfires in Portugal.

People met:

Conceição Cordovil

Tiago de Oliveira

João Tome

Ana Diago

Opportunities to work together on ICS and Aviation organisation and control.

2. South African Embassy

People met:

Mmamokwena Gaoretelelwe – Ambassador

Hugo Lambrechts – Counsellor (Political)

Reed Mkhohliso – First Secretary (Political)

3. Prime Ministers Cabinet

People met:

Tomás Azevedo – Political Adjudant to the Prime Minister.

4. GIFF

People met:

Carlos Loureiro – Engineer Florestal

Exchanged ideas on fire breaks and prescribed burning.

5. The Navigator Company

People met:

João Melo Bandeira

Exchanged ideas on fire breaks and prescribed burning.

6. GIPS

People met:

Major Marques

Captain Chuna

Captain Fernandes

Looked at their equipment and training methods. Shared information on prescribed burning and extended attack. Possibility of training in hand tools, extended attack and ICS.

7. FEB

People met:

João Rodrigues - Chefe de Grupo da Guarda

Looked at their equipment. Shared information on prescribed burning and tactics.

8. Escola Nacional de Bombeiros

People met:

Joseph – Head of the School

Verónica Catarino

Looked at their training and fire simulator. The simulator is state of the art equipment and it would be useful to have such equipment in South Africa, for example at Saasveld or Working on Fire.

Possibility to share training material.

9. INCF

People met:

Marcos Liberal

Jorge Dias

Looked at control burns in Gerés National Park and the use of cattle and horses to control fuel load.
Possibility of working together on mosaic block burns.

Reporting structure:

The start of any wildfire interventions must be based on the principles of Integrated Fire Management (IFM). Over the past decade, land use changes in many regions of the world, combined with changing weather patterns (global warming) has led to an increase in fire frequency and the intensity of wildland fires. In some countries rural farmers are increasingly making use of fire as a land use management tool.

The range of social, economic and environmental impacts that wildland fires have, whether good or bad has been well researched and documented. The practice of IFM arose from a need to manage fires to do greater good than damage.

IFM incorporates the different fire management activities in a strategic framework to mitigate the impact of unwanted wildland fires and to promote the beneficial application of fire.

A clear and shared view of Integrated Fire Management, and its three main components of social, environmental and ecological elements, is key to the success of engaging all stakeholders involved in managing rural fires. It is for this reason that we have expanded our scope of reporting to include more than what was originally planned.

In every wildfire landscape we gauge the integration principles and strategies, directly against their operational realities.

The embed team had very little exposure to operations in both the strategic and tactical spheres, due to the quiet wildfire timing of their operational period, so we are comfortable to admit that there may be some instances of subjective reporting. This was through no fault of any of the logistics team and we are willing to amend sections of the report if there are specific needs and requests.

The report will be structured under the typical IFM sections for ease of cross reference.

2. INTEGRATED FIRE MANAGEMENT

Integrated Fire Management (IFM) incorporates different fire management activities in a strategic framework to reduce the overall impact of unwanted wildfire damage and promote the beneficial use of fire.

A clear and shared understanding of Integrated Fire Management is key to the success of engaging all stakeholders involved in fire management. Globally and locally there are several definitions and frameworks for understanding Integrated Fire Management. Most of these revolve around a similar group of functions organised in slightly different ways.

LESSONS

A number of key lessons can be drawn from the review of global practices around Integrated Fire Management investigated in New Zealand, Australia, France and California in the United States including the following:

- *the need for high levels of public awareness;*
- *the need for a holistic and integrated approach to managing wildland fire risks;*
- *the importance of well-functioning public-private partnerships around shared wildland fire management;*
- *the significance of state resources to support Integrated Fire Management; and*
- *the importance of taking a regional approach that enables resources to be better matched to threats and for resources to be pooled.*

The Working on Fire IFM wheel in **Figure 1** demonstrates the logical simplicity of the fairly complex collaboration needed to affect the integrated outcomes (Oosthuizen, Wilson, & Conradie, 2015 - 2018).

The core of the IFM wheel is made up of the internationally accepted five “R’s” of disaster risk management:

- Reduction / also called prevention
- Readiness / also called protection
- Response / also called suppression
- Recovery / or rehabilitation and
- Research (combined in the IFM wheel)

IFM involves integrating all actors and sectors involved into the same process; and integrating all actors involved in fire suppression, through the use of the Incident Command System (ICS), in the case off wildfires (FAO, Fire management: voluntary guidelines. Principles and strategic actions, 2006).



Figure 1: The IFM wheel demonstrates the interdependence off all the components. The wheel only works if all elements are present and appropriate to the risk profile of the subject area.

The key to the IFM wheel is that there should be 80% effort on the proactive sections (Reduction and Readiness). This leaves 20% for the reactive fire suppression (or Response). In Portugal’s fire history the reason for the perceived historical failures has been because the focus was on reactive Response, possibly due to a gradual decline in rural and agricultural activities coupled to depopulation of the countryside. This meant that fuel load management and fire awareness declined over time. Given this realisation, the paradigm is already shifting towards a proactive approach. However, if the shift to proactive planning is not done in a structured collaborative way, it will quickly revert to being reactive again. Maintaining an 80% proactive focus takes planning, collaboration and dedication. Reduction has to start at community level.

Each individual land user may have some of the IFM elements in play but they cannot be as strong on their own as when in collaboration with their neighbours and with all stakeholders. Land users working on their own can also not achieve the same cost effectiveness as can be achieved through collaboration. Fires don't respect cadastral boundaries and IFM shouldn't either. Wildfire management is a science and IFM should be focused on as a science too.

Broadly defined, IFM includes the integration of science and fire management approaches with socio-economic elements at multiple levels. As such, it implies a holistic approach to addressing fire issues that considers biological, environmental, cultural, social, economic and political interactions (Myers, 2006). The term Community-Based Fire Management (CBFiM) is often confused with the comprehensive approach to fire management known as Integrated Fire Management (FAO, Fire management: voluntary guidelines. Principles and strategic actions, 2006). They are, however, not the same thing. At best CBFiM is a subset or subsets of the more comprehensive IFM and often forms the basis upon which IFM is built.

3. LEGISLATION

The IFM wheel starts and ends on legislation due to the fact that laws are predominantly written to correct an unwanted state of affairs. Legislation must take into account customary practices, and their core reasoning, and capture lessons learnt for future generations. The entire reasoning behind legislation is to try and stop unwanted series of events from happening again in the future.

The following points were captured by the team:

Legislation is provided at National level by Decree-Law No. 124/2006, updated early 2018, and municipal bylaws to supplement the law. The law addresses the cleaning of land (fuel management) with fire, the definitions of rural areas, rural fires, as well as the fire season.

It was verbally communicated that the law addresses how to protect your house against forest fires, what to do if the neighboring land has not been cleaned, how measures will be enforced and priority areas for inspections.

It also addresses the cleaning of land near/under power lines, telephone wires, roads, protected trees, shrubs and protected areas as well as Clusters of houses (Small villages), what the councils should do, cleaning land by burning, difference between burning debris and pasture renewal burning and obtaining permission/permit before lighting fires.

The concept of Forest Intervention Areas (ZIF) warrants mention because it contains very sound principles of land users collaborating, with the common objective of building joint small scale forest holdings strategies their impact on fire management. The team did not get very much exposure on this point but the principles relevant to fire protection are very similar to Fire Protection Associations as found in South Africa and elsewhere in the world .

The 'letter of the law' notwithstanding, the operational reality observed was as follows:

There seemed to be very little, if any, legislation regarding the planting of trees for commercial forestry. It is suggested that this be reviewed as some form of control is needed. The reality we saw (in the north and south) was a landscape of seemingly abandoned or poorly managed woodlots looking like "jungles." They are characterised by high stems per hectare (extremely dense). Normal commercial planting is either 1111 or 1667 stems per hectare. Some areas observed were between 15 000 - 20 000 stems per hectare. At the same time the high fuel loads are contiguous, i.e. no breaks in the fuels.

The result is vast stretches of continuous fuel, with the very high fuel load momentum and intensity, making the scenario very dangerous. Any fire in these type of fuels, under bad fire conditions, will be almost impossible for ground forces to suppress. Apart from the physical impossibility it would be exceedingly dangerous to put any firefighters into the area.



Photo 1: Examples of continuous fuel.

In most countries forestry industries are highly regulated, in South Africa for example, planting of more than 1 hectare of commercial forests, is rigidly controlled by legislation and enforced by the Department of Agriculture, Forestry and Fisheries (DAAF). In its simplest form it requires a landowner to apply to government for a water use licence as well as planting permits, which are long and tedious processes. The process is designed to protect sensitive waterways as well as fauna and flora. It also addresses the management of the trees and this must be done according to normally accepted silvicultural practices. Without this planning a landowner may not plant exotic trees for the purpose of commercial farming.

Specific legislation pertaining to wildland fires seems to be unknown in Portugal because during our visit no such legislation was observed or discussed. The legislation that was mentioned pertains to backfiring, also called back burning (meaning the use of fire to burn out fuels as a tactical fire suppression method). No person in Portugal may put in a backfire unless they have been trained to do so. This is a process of 5 exams and practical work. Apparently there are only 24 individuals in Portugal who have this qualification. Some of them are in GIPS and some are with INCF, where the others are is unknown.

This is vastly different from South Africa where virtually any fire fighter can put in a backfire. Customarily the Incident Commander and the most senior person at a fire must give the instruction to initiate and ignite a backfire. Backfiring, if used responsibly is a helpful tool in suppressing wildland fires.

There is also legislation that requires landowners to clear 50 metres around their houses, something that was not commonly observed during the site visits. This legislation is allegedly policed by GIPS members out of fire season. This seems to be having little effect as landowners are fined but the enforcement does not seem to be effective in changing the mind-set of the community as a whole.

With the current situation of absent landowners, no legislation regarding afforestation and no clearing of burnt trees post fire, it may be necessary for the government to intervene. The complexities and dynamics of the political background are accepted, however if government fails to take action, the catastrophic fires will continue to occur. Government should consider appropriating these properties and clearing them. To this end GIPS or BV personnel could be utilised in the winter season.

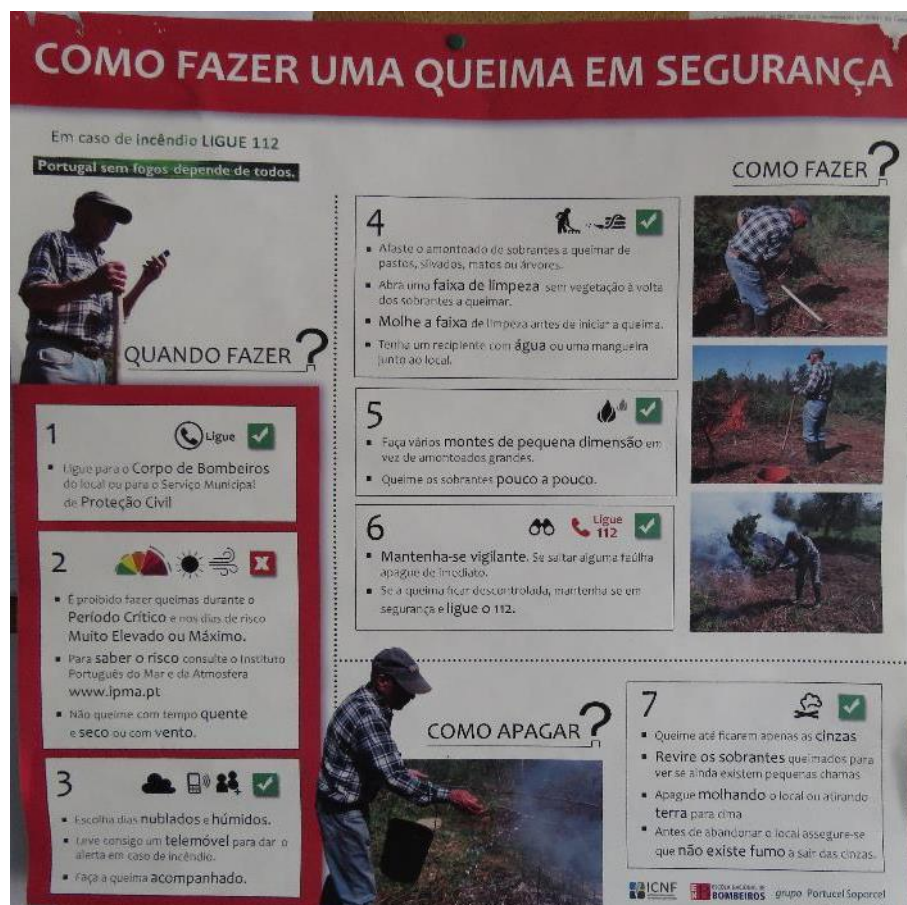
The situation in Portugal has deteriorated to the stage that enforcement must be seriously considered. For example, the big fire of 2017 at Pedrogão Grande, and the fire this year at Monchique were both allegedly started by trees touching power lines, yet little effort seems to have been made to clear beneath and on the flanks of powerlines; something that should be enforced by law.

4. COMMUNITY AWARENESS AND EDUCATION

Awareness and education is everything that involves communities, and best summarised by the phrase 'communities are the problem vs. communities are the solution'.

Very little exposure was gained in this field but what was noted was as follows:

Pamphlets and posters relating to fuel load management, and the dangers of wild fires were observed. No formal training of the general public was observed.



Poster 1: How to burn waste

TV coverage of disastrous events definitely seem to have an effect on public, making them aware of the dangers of unwanted ignitions. During the media coverage, the opportunity for awareness is emphasised.

The above **Poster 1** on how to burn waste, is an example of various educational posters and pamphlets from ICNF and other agencies involved in formal education of the public.

It is unknown if municipalities or other national agencies assist communities to organize themselves to engage and address issues relating to fuel load reduction.

A fire-wise project implemented at school level will assist in creating awareness around the danger of wildland fires. Although this is a long term project (4 - 10 years) it has been very successful in South Africa.

We are aware that our sister company, Landworks were engaged specifically to look at the community awareness elements. The subject is considered a very important foundation for any IFM system. In large IFM systems implanted on country scale there are significant benefits by fully integrating awareness into the full time activities of agency personnel to ensure optimal use and cost efficiency. Care should be taken not to fragment IFM activities into different agencies and this applies specifically to awareness as well.

5. FIREBREAKS

Firebreaks are based on very simple scientific principles. They should be long enough and wide enough to reasonably prevent a fire from crossing it. They should also be reasonably clear of combustible material and not cause erosion. Defensible space, around structures, are also classed as a fire break. Firebreaks are a place to fight a fire from and they aren't designed to stop a head fire (a common misunderstanding). A firebreak is any contiguous area that can be used as a point of defence or anchor. They can be small scale around structures or large scale covering entire mountain ridges. Firebreaks can be prepared through manual, chemical and mechanical operations. Burning can also be effective in the right place and at the right time.

Historically the thinking was that breaks were constructed at 90 degrees to the prevailing winds. Reality has proven this thinking to be somewhat wrong as breaks will not stop fires but merely offer a platform to stage suppression operations from.

Contemporary thinking now suggest that it is better to construct breaks in line or parallel to the prevailing winds. The theory behind this thinking is that the flanks are easier to control and that you will get a long, narrow fire, as opposed to the normal egg shaped fire. The head can thus run until conditions allow for it to be attacked.

More importantly it is suggested to have a mosaic of internal breaks. The idea is to break up the land into strategic parcels (500 hectares) and use the existing roads, clearing the vegetation back under the trees for a predetermined distance, possibly 20 metres on either side of a road or existing break.

Open ended fire breaks, a system where the "head" of a fire is allowed to burn until it extinguishes itself, is also a very effective tool. This is a scientific approach where fires are ignited under the ideal conditions and then monitored until they either self-extinguish or come up against a predetermined break or anchor. This could be possible on some of the mountain ridges in Portugal. For example, Gerés National Park on the border with Spain.

Here follows what was observed by the team:

Firebreaks, as part of a wildfire spread mitigating system in Portugal, are almost non-existent. A large part of the challenge behind this is the size of properties. There are so many small properties that, if the general rule of 1:2 is to be implemented on the boundary of each property (fires science states that firebreaks should be at least double the width of the height of the closest fuel on either side of the break), some landowners will have very limited land available for agricultural or forestry use, and therefore firebreaks in this sense are impractical.

Having said this, there is good work being done by the INCF as well as private timber corporates. Unfortunately it is the proverbial drop in the ocean! What is important to note is that where these interventions have taken place, fires have been controlled.

These interventions are happening in isolation, whereas they should ideally be part of a national fire break system. Fires do not care about lines on a map and have the best chance of being fought from a firebreak system that operates the same way. There is excellent data available on the historical

pattern of the wild fires and this information can be used at national level as a risk assessment exercise where the high risk areas are determined. This information can be used to plan strategic breaks and it is important that these breaks form part of a connected and continuous mosaic. The strategic breaks need to look at the history, fuels and terrain, and not be governed by cadastral boundaries.



Photo 2: Another example of continuous fuel as far as the eye can see.

Some bulldozer breaks are constructed as preventative measures as well as part of suppression tactics. The concern is that the breaks are constructed up and downhill, with little consideration for the environment and possible damage from erosion.



Photo 3: Bulldozer breaks at Monchique.



Photo 4: Bulldozer break being cleared – up and down the slope!! This is really not environmentally sound as it will cause erosion.

The INCF are busy constructing breaks in some areas. They consist of a 30 metre bulldozer cleared break, flanked on either side by an under canopy, hand cleared break of 45 metres. This a good initiative but once started must be done annually.



Photo 5: Internal breaks on communal land cleared by brush cutter.

These breaks are mapped by INCF staff but not shared with ANPC, so firefighters are not aware of their existence and cannot make use of them during suppression operations. This indicates a lack of coordination.

Importantly defensible areas may also be incorporated as fire breaks and it is important to make use of existing natural features, i.e. streams or rivers, wetlands and rocky areas. As importantly they must be mapped and the management principles documented.



Photo 6: Primary fire break

Funding for Forest Sappers seems to be limited and more a financial decision on municipality and state level. How fire management budgets are prioritized to other functions are unclear.

The situation is also aggravated by the current high fuel loads where the risk is just too high to perform prescribed burning.

Non- consensus between all agencies, combined with the huge potential risk for wildland fires lead to no agency accepting responsibility and accountability for little or no actions taken.

On private land, as fractured as it is, it is almost impossible to create a firebreak as the 1:2 ratio would mean a significant loss of agricultural/ productive land for sustainability. The “law” requires 50 meters removal of all fuel (trees, shrubs) around houses, and additional 50 meters under trees. It is not physically possible, and therefore impractical, for this law to be implemented on small properties.

6. FUEL LOAD MANAGEMENT

Fuel loads are the one leg of the fire triangle that humans can influence before the ignition. It is much more advisable to reduce the fuel loads under the conditions of choice than to have nature do it for you under the very worst conditions possible. There are numerous methods that can be employed but the bottom line is that fire fuels have to be consciously managed, because it unfortunately doesn't happen by itself. This is especially relevant with widespread landscape change that is prevalent all over the world. It's one of those cases of 'if you don't manage the fuels nature will do it for you...'

A large focus was given to this subject in the deployment, because it was very obviously a major problem.

As mentioned under Firebreaks, there are areas in Portugal where there is continuous fuel for hundreds of kilometres. In fire terminology we refer to three types of fuel namely, light, medium and heavy or; 1 hour, 10 hour and 100 hour fuels. The science of this is that light fuels burn quickly with little residual effect, whereas heavy fuels burn for a long time and have residual effect. In many forestry lands, fuel was allowed to build up to where there are now critical levels of light and medium fuels which ignite easily and can ignite heavy fuels. It is critical that these fuels not only be managed and removed but also broken into smaller land parcels. Furthermore, observations indicate that of the area's "managed" as forestry land, very few areas appear to have formal management practices applied to them. Not only does one then have a scenario of continuous fuel but also one of extremely heavy fuel loads.



Photo 7: Heavy fuel loads at Loriga fire.



Photo 8: Extremely heavy fuel load.

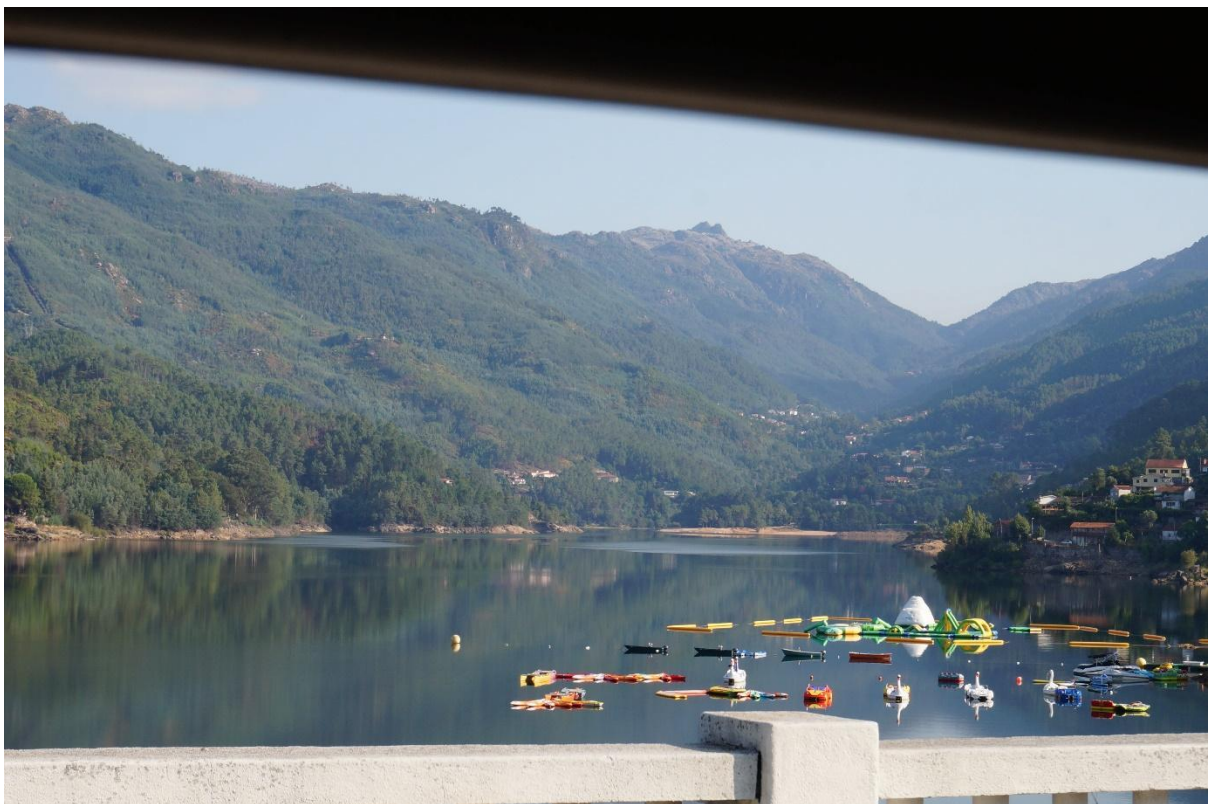


Photo 9: No defensible break between the urban wildland interface.

In most instances there are no breaks in the fuel between the urban and wildland interface. This obviously exposes the buildings to a high risk should a fire occur. Again, it is strongly advised that breaks be put in place and the fuels actively managed.

Fuel load management is the most important management intervention that a landowner can do to mitigate the risk of wildfire. It is something that can be done immediately, either manually, mechanically or with prescribed burning or under canopy burning. It is imperative that fuel load reduction interventions are applied before the 2019 fire season.

Portugal does not appear to have many mega herbivores to control the natural forests. Some good work, on a small scale is done at Gerés and Viana do Castelo with cattle and horses to control the fuel load.



Photo 10: Horses used at Viana do Castelo to reduce fuel load.



Photo 11: Cattle used at Gerés National Park to control fuel load.

In some areas it seems like fuel loads were not managed for prolonged periods (likely even 40-50 years), and it seems to be linked in some way with the closure of the “forestry department” in Portugal.

Information provided indicated that the forest service was split up under different “agencies”, although the current structure in Portugal was not clear to the observers. The collaboration between different agencies in fire management seems complex because responsibilities are shared between private landowners, municipalities and the state agencies. There appears to be many overlaps with no single agency responsible and accountable, or with a clear, overarching legislative mandate.

Reduction of fuels falls within two categories: burning of waste material and prescribed burning as pasture management for livestock. Burning of waste, out of season, seems to be less problematic without the need of permission from local authorities. Some cattle and wild horse pasture management projects were observed, but the total scale is unknown on National level and not incorporated in the National Fire Management plan. Furthermore, legislation stipulates that landowners need permission from the municipal authorities, and the presence of qualified/ certified firefighters during burning operations. The process is time consuming and seems to deter farmers from applying to perform prescribed burning. The path of least resistance is therefore to just burn, and hope for the best, or not to burn and thereby leaving the land to become a jungle.

Prescribed burning activities are further complicated by the small window of opportunity to execute the burns. The burns require very precise weather conditions to ensure that the objectives are safely met. The prime time to execute prescribed burning is in the month before the fire season commences, with an estimated six to seven days effectively available on a normal year. Fires

seasons do not know what the date or normal is, so this planning is often very fluid and can change within hours. To get permission to burn during the fire season is seems almost impossible under the current history of wildfires.

The fuel load management for pasture management is done with traditional knowledge. The term traditional knowledge is used as there is no vegetation analysis to determine the state of vegetation required to be burned and also no way of quantifying the fuel loads.

These agencies do not appear to have the human resource capacity to do the relevant pre-planning, prescribed burning and other functions related to parks management.

It is not clear if a national objective of vegetation management is determined and implemented in a structured way. In South Africa there are clear forest and grassland types. Portugal has complex mixtures of invader and indigenous forest species. The various species are very different in their tolerance of fire and natural regeneration cycles. Indigenous species often recover much slower than the introduced species, giving the invasive pioneers the time they need to take hold. Under canopy growth shows succession of other native species regenerating. More clarity is needed on this topic.

As fires are excluded over time, the mosaic is determined by disasters, and not by science of having a balanced forest. "Balanced", meaning a variety of all species and age classes. The unnaturally uniform age class distribution, over large areas, is likely the result of the country's fire history. Indecisiveness in forest management leads to no action being taken. The upshot is more fuel loads building up on an annual basis, with the consequences of the loss and non-rehabilitation of natural vegetation types.

The current focus in Portugal seems to be suppression of wildfires, which means the symptom is being treated, rather than addressing the root cause which appears to be the lack of tangible forest management practices.



Photo 12: *Acacia melanoxylon* before mechanical treatment

Alien species appear to be invading all natural areas, and it is definitely spreading into areas that were previously less encroached. The continuing encroachment seems to be acknowledged by all the land management agencies interacted with, but with little effort to perform weed control programs. Often lack of funds are cited as being the reason for this apparent lack of action.

There was even some talk that the alien species have been around for so long that they are now naturalised, and should be part of the landscape. Whatever strategic statement is to be supported the fact of the matter is that the alien species are strongly fire adapted, will often outperform endemic species, and will increase the fire fuel loading at a phenomenal rate. Calling them naturalised will not change the fact that there is a massive fuel loading problem on a National scale. Nature has a wonderful fall-back position where it really doesn't care what words are used, it just does what it does regardless, unless acted upon.

Weed eradication programs on the long term are not guaranteed. Funding and resources seem to be a stumbling block, as well as the process to apply for funds from the European community. The major invasive species observed are *Acacia dealbata*, *Acacia longifolia*, *Eucalyptus spp.* and *Hakea spp.*

The combination of the use of fire and utilization of trees would give the required mosaic for a balanced forest and will aid in maintaining the diversity.

Forest Management for whatever objective, should include strategies to use fire as a management tool. Not only for suppression, prevention and protection, but also to maintain the biodiversity of specific forest types.

From the limited areas observed, besides the big commercial companies like Navigator, other informal plantations are in a poor state of management, contributing to the size of wildfires and the spreading of the species into other areas as weeds.

7. RISK PROFILING

The embed team did not have much exposure in this field but here follows an expansion on the risk profiling section of IFM.

“You don’t know what you need to do to fix something if you don’t know what is wrong”. Risk profiling, and risk management, takes into account assessing every section of the IFM pie and comparing it against a set of acceptable norms. These norms differ markedly across the world, based on needs of the land user, but should cover the following basic criterion:

- a. Fire history of where, when, how many, causes, effect
- b. Resilience for full recovery
- c. Mitigation measures
- d. Cost vs. risk
- e. Lessons learnt before

Any risk identification process starts with hazard identification, risk analysis and control measures (HIRAC). This can be done at national, regional, district and municipal level. If required it can be applied to individual landowners. A HIRAC process is coupled to SPEQS and the protocols that support each of these. SPEQS being the acronym for, Safety, Production, Environment, Quality and Social aspects. The approach is therefore to identify the hazard, analyse the risk in terms of severity and probability and apply control measures in terms of SPEQS.

With this information meaningful fire management plans (FMP’s) can be compiled. The advantage of this approach is that the control measures are specific to the hazard and risk exposure identified.

A FMP is possibly the most important document that can be compiled for a district. Municipalities are required to submit annual FMP’s, if these are done is questionable as we were not able to locate one. It is also not clear at what level the municipal FMP’s are analysed and coordinated. The FMP will also assist in the correct allocation and placement of resources.

Fire management plans should be the first document that any area showcases because there is no other method of proving that the area has been assessed and that there is some sort of plan going forward. These documents should not be laborious and should be living documents with dog-eared pages and notes all over them. They are also not difficult to do as the foundations can be templated on a National level.

8. TRAINING

Fire is a science, and so is firefighting, so the training is also a science. Training should also be fluid and dynamic enough to encompass lessons learnt and changes in technology. Training should not only include formal training, but should include practical reinforcement in the field, E-Learning and periodic refresher programs.

Based on limited exposure the following was noted:

Formal training at all levels appears to be of high quality. Benchmarking training with other countries seems to be the norm and Portugal seems to be the leader in the European community. After seeing the resources in the Bombeiro Training facilities in Sintra, it can only be commended. We did not see any of the course content but, as the science of fire is exactly the same all over the world, we believe it would be similar to what we have in SA.

It appears that after training, auditing is not instigated by the formal trainers themselves. Compliance is measured by the Municipal Bombeiro Commander. The danger with this system is that the Commander is the judge and the jury with reference to competency. In our opinion this purview is more objective if oversight is outside of the Commander's immediate circle of influence. More importantly there doesn't seem to be any system of feedback being given to the training institutions.

An example would be that the crews are trained in the use of hand tools and containment lines as anchors. In reality the fuels are so heavy that it's less effort, and safer, to stay at the roads and use these as anchors. The fires are then predominately fought with indirect attack. The fuel momentum however is highly likely to facilitate spotting and slopping over the anchor. If the training institutions are not made aware that what they are training on does not exist, in the majority of the fire scenarios, then there is a major disconnect between theory and practice. Without any link to rectify and amend training requirements there is a very good possibility that the excellent training systems evident will degrade fast.

In South Africa we have a system whereby fire fighters are subjected to annual refresher training before the fire season, called Yellow Carding. It aims for a more comprehensive testing of fitness levels as well as safe suppression techniques. A major piece of the carding is safety and survival training, which is repeated every year. The training also includes lessons learnt from the previous season and includes any lessons that have become relevant on a global scale. It would be tragic to have known that a simple safety talk, based on someone else's mistakes, could have saved someone's life if they only just knew about it. If candidates do not pass this training they are not allowed on the fire line. This could be considered for Portugal.

A challenge is to conform to one standard when Incident Command (IC) promotion in the various agencies is considered. It seems some Commanders are promoted into positions with non-fire management qualifications or years of service, instead of IC courses passed and the number of actual fires as an IC. This is an incredibly dangerous scenario because a degree does not automatically guarantee competence or experience. This is obviously a practice embedded in lots of history but it needs to be critically assessed with safety in mind.

Currently fires in Portugal are escalated in relation to resources deployed, whereas this should be changed to escalation related to complexity of any specific fire event. Students should be trained to use indicators that will trigger when a fire escalates to extended attack. For example Fire danger Index (FDI) is one such trigger, if the FDI is in the Orange then a fire on such a day can be assumed to go into extended attack very soon after ignition. Rather have a high state of readiness planning than wallowing in reactive mode. Other trigger indicators are fuel (the heavier the fuel the more difficult it is to extinguish), wind (stronger the wind the faster it will spread) and terrain (steeper the terrain the faster it will spread). These are all really logical factors but have to be planned ahead to limit the surprises on the day that all hell breaks loose.

9. DETECTION

After unwanted fire prevention, fire detection is the next most important piece of the IFM wheel. Every fire starts small, and more than 90% of the time there is a human involved. The question is, how soon do you want to detect the fire and start suppression efforts? The exponential time that a fire uses to grow is almost entirely in the detection and dispatch systems hands. Reduction in reaction time at the onset of the fire can save you literally days of suppression time.

Detection in Portugal is through a system of approximately 200 manned lookouts placed in strategic high places. The system is adequate if you factor in the 95 percent effective success rate of GIPS deployed for initial attack.

Live stream camera systems are being investigated to reduce the time lapse between discovery and report at the control centre of ANCP. The footage collected is also an excellent source to compliment the AAR's if required.

The system is complex though in the sense that the lookouts are managed by the GNR. When a fire is detected this is reported to a GNR official, who in turns reports it to the district ANPC office, who advises national ANPC, who then activates the closest Heli attack team. This could be simplified by eliminating the number of agencies involved and having a regional system of dispatch and coordination.

The public also use the national emergency line to call in smoke and fire sightings. The system is working well and fires seem to be, on the whole, reported within minutes of ignition.

Due to the high saturation of lookouts it does not seem to be common practice to use airborne fire detection patrols. This could be an additional tool in the toolbox on one of those really bad days when you have 300 fires in one operational period. With very little training and effort all of your current FAC aircraft could be used very effectively.

10. SYSTEMS

Systems are the binder to the complex wildfire management environment. *'A system is a regularly interacting or interdependent group of units forming an integrated whole'* or, *'A system is a collection of elements or components that are organized for a common purpose'*.

There are numerous segments where systems are incorporated in the IFM wheel and the following was observed:

No Standard Operating Procedures (SOP's) were noted, although this does not imply that there aren't any. These are important documents that guide behaviour under certain conditions, and are often derived from lessons learnt. For example SOP's can be written up for the Heli attack teams, dealing with issues such as embarking, disembarking, safety, standard tools, emergency procedures, etc. BOP's for example would include the ten standard fire orders, giving guidelines of how to operate at a fire.

Communication seems to be good with various radios used by crew leaders, through to the IC. An improvement could be the use of dedicated fire channels for ground to air communication, not with operational aircraft but with the FAC. It was observed at the Loriga fire that aircraft were used for mopping up with no apparent ground coordination. The result was that some loads were not on target. More importantly it is questionable if the aircraft were needed at all because the fire was in a phase where ground crews could safely and effectively work in the black.

GIPS had a good system of tracking their vehicles, once deployed they are plotted on a system that enables the user to see where vehicles are. This was only observed for GIPS vehicles. This again is important at the ICS level where it is of utmost importance that resources are tracked and located on a system in regards to the fire.

The recording of fires is excellent, to add to this it would be good to have IAP's (Incident Action Plans) and AAR's (After Action Reviews).

Strategic and tactical fire management should form the backbone of suppression activities. The National Authority for Civil Protection (ANPC) coordinates all actions of firefighting: detection, dispatch, suppression, mop up and post-fire surveillance. In the event of an incident the highest ranked officer on scene assumes the position of Incident Commander (COS), followed by the hierarchy of lower ranks.

The COS commands the support of the Safety, Liaison and Public Relations officers. Directly under them is Planning, Operations and Logistics sections followed by the Air Operations Officer and Air Operations Coordinator, with Sectors following.

At this level there seems to be very little coordination between the agencies. This was one of the biggest surprises of the deployment. We can say with certainty that the ICS was not being used on the incidents observed, because one of the products of using the system is the Incident Action Plan

(IAP). This document is prepared by the Plans / Intelligence Section and is the single record of all the operational periods. No IAP's were ever provided despite being requested.

We also tried in vain to sit in on an IMT briefing but we were not allowed to attend. This seemed unusual because, where we come from, observers are welcome to attend the IMT briefings and peruse the IAP's. Comment is also welcome because many heads are better than one. In the absence of any demonstrated IAP's we unfortunately have to say that ICS, or any variation that we know of, is not being used.

Weather

Weather conditions are well monitored and also available on the website. Real time information available is: Current temperature, Minimum temperature, Maximum temperature, Wind Speed, Wind Direction, Humidity, Atmospheric pressure and rain.

Countrywide information given is temperature, air pressure and winds as well as the current risk (FDI) and for two days ahead. Other fire information is shown from detection to closure with the number of resources deployed.



Photo 13 – Fire danger index awareness at plantation level

Advanced Fire Information Systems

Similar to AFIS, Portugal uses fogos.pt. It is far more comprehensive than AFIS except for the size in hectares of area burned. A very useful tool.

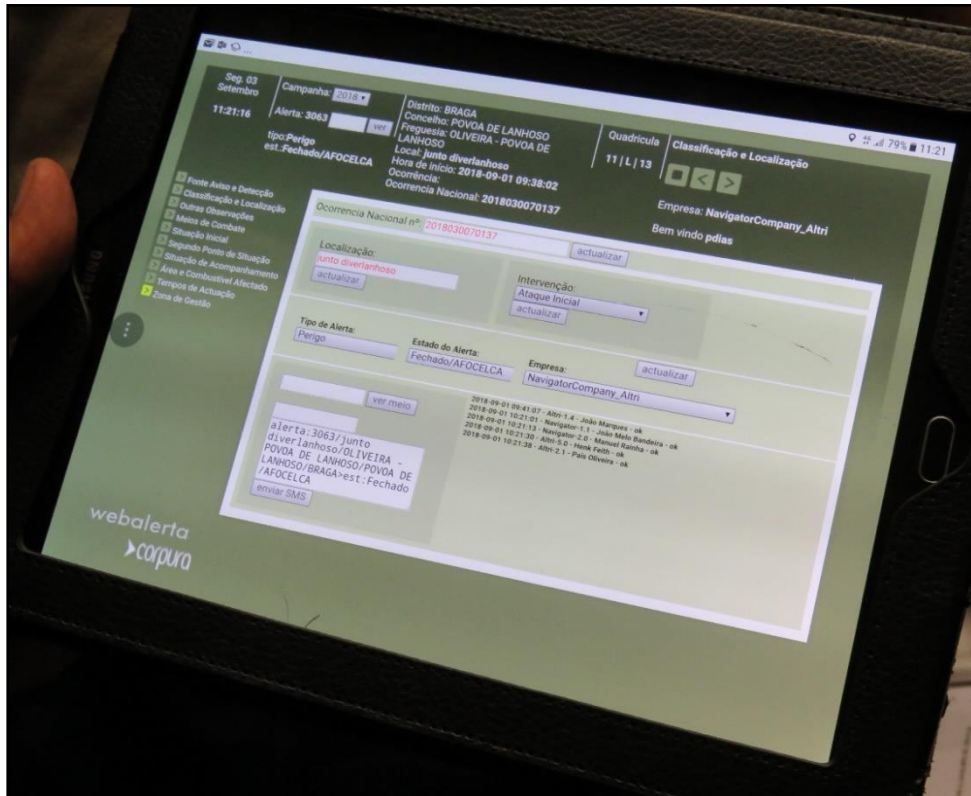


Photo 14: Webalerta used by The Navigator C

The Navigator Company, a commercial forestry company uses Webalerta, developed from Collector, an open source adaptor program. With this app, the crew leader of the Heli Attack team takes a photo from the air and sends it via cell phone to the base to assist in size-up of the fire.



Photos 15 & 16 – Examples of demonstrated back to basics systems use, real world tactical planning that doesn't need batteries. Technology doesn't always make things better.

11. CAPACITY

The last section of our IFM wheel, before it gets to the reactionary response stage, is capacity. This section includes all the following:

1. People – from firefighters to management
2. Equipment – LDVs, trucks, all different aircraft, hand tools and pumps, systems, PPE, PPC etc.
3. Logistics – fuel, food, water, resupply, medical
4. Infrastructure – roads and access, spike camps, offices, ICPs etc.

The following was noted by the embed team:

The Civil Protection Authority (ANPC) is the primary national disaster management agency with four directorates from which one is the Directorate of Fire-Fighters, managing the Bombeiros. Their capacity as Incident Commanders is unknown, assuming response to fire incidents is delegated to municipal level, and then delegated to the Bombeiros to take command.

GIPS are structured around Initial Attack Heli attack crews. Four to eight member crews at 50 stations in 11 districts, and from 2018 with extended attack capacity of 50 personnel (Captain in Charge with one or two Sergeants, and corporals as crew leaders), in eleven districts. The force totals 1 500 personnel including higher levels of ranks within the bigger GNR structure.

The active Bombeiros Volunteers total 30 000 during the fire season on three month contracts. There is a vast majority of the volunteer force that are also remunerated for their time during the season. They have their own rank structure similar to the military. Commanding officers ranks varies to the size of the bases occupied. They seem to be a very powerful political force and have strong influence in local politics.

Their numbers mostly depend on historic fire occurrence in the municipal districts for structural firefighting and other emergencies besides wildfires. The out of season number of personnel available is unknown.

The Special Forces Bombeiros (FEB) used to be Heli attack crews but for unknown reasons are not fulfilling this function any more. These firefighters are permanently employed, and do out of season training, but we could not get any intel on exactly what training was done.

In terms of people and vehicles there are sufficient resources. People however are not applied correctly, for example we continuously heard that the GIPS and FEB ground forces were the last to be deployed. This was often hours or days after the initial ignition. These are highly trained, expensive resources and should be deployed immediately. The golden hour concept should be applied here so that a fire can be contained in the first hour. The only way to accomplish that is to use the best trained and equipped resources as initial attack, as early as possible, in the incident.

The BV's are a huge resource of people and, keeping the political and cultural issues in mind, consideration must be given to changing their role. Currently their main role is to protect buildings, as such they wait passively on roads for the fire to come to them, as opposed to attacking the fire directly. If household protection is their core function then the GIPS forces must be increased to

fight the fires directly on the ground. Currently, ground forces only suppress the fire using indirect methods and no control lines are constructed around the fire. Evidence was noted that this results in at least 12% of fires rekindling / flaring up. BV personnel should be utilised in this role as well as mopping up.

Equipment



Photo 17: FEB outfitted LDV

Both GIPS and the Bombeiros have more than adequate resources in terms of LDVs and trucks. The photo above illustrates a sturdy frame mounted on a LDV to carry hand tools.



Photo 18: Light helicopter used for initial attack

Aircraft used are various light helicopters and Kamov heavy helicopters. Fixed wing aircraft include Air Tractor 802s and Canadair 415s. It is unknown how many are contracted in from private companies or are in agency ownership. We were told that there are in excess of 50 aerial resources available during the peak fire season. This is an incredible amount for a relatively small area.

Tools

All agencies have more than adequate tools available for the number of staff.

Systems

The system of using reservoirs as watering points is good. All locations are marked on the GIS system and is available to pilots by the touch of a button on their cellular phones or tablets. Unfortunately nobody seems to be able to clarify who is responsible for the maintenance and refilling of these reservoirs. The ownership of some watering points could sometimes not be clarified as official reservoirs are not marked. If empty, or in poor state of maintenance, the ownership allegedly belonged to a private landowner.

Personal Protective Equipment



Photo 19: LACES printed on clothing

Personal protective equipment is of high quality and sufficient. Standard issue is helmet with neck material flap, loose goggles, balaclava, shirt and trousers, boots and socks. Each fire fighter is also issued with a fire shelter, first aid kit and mask to be carried at all times.

A very good idea, demonstrating thinking out of the box, was seen with Afocelca. They print LACES on the back of T-Shirts and jackets, as seen on Photo. This is really clever because anyone following the person ahead of them is continuously reminded of the LACES fundamentals.

12. DISPATCH AND COORDINATION

Dispatch and Coordination are the unsung heroes of IFM because they are always working in the background. They are the glue that holds the response systems together. In the South African landscape they have a large Safety responsibility and accountability. They are the ones that ensure that the dispatch is co-ordinated and structured and follow the full 'who, what, where, when and how'. They are also partly responsible for data capture and recording, and have tools that help with resource flight / route following. A fundamentally important function is instigating incident and accident action plans, all based on pre-determined and planned scenarios. Where possible they are a communications relay between the land user and suppression operations.

Based on very limited exposure the team had the following to report:

Dispatch is done well but lies with the central ANPC office in Lisbon. This has the real possibility of wasting valuable time. It would be more time efficient if the dispatch function was at a district or regional level.

The initial dispatch of the Heli attack teams is good. Of concern is that the professional units of GIPS and FEB are the last to be dispatched, often hours or days after the initial ignition.

Data capturing and recording is good. The concern is that the data does not seem to be used in post fire AAR's.

Circumstances did not allow for the observation inside an Incident Command Post (ICP), as such no comment can be made.

Sequence of dispatch

After lookout towers spot a fire, the location is triangulated and forwarded to the National office of ANCP in Lisbon.

The Head office dispatches the nearest Heli Attack/ GIPS team as initial attack.

Time from report to dispatch varies between eight and ten minutes. The crew leader and helicopter pilot circle the fire for size-up and locate a landing zone. After touch down they then offload all hand tools and connect the Bambi bucket before they make their way to the fire with knapsacks and fire beaters.

The helicopter then flies to the nearest filling point (from the location on Geo referenced maps on a tablet) while the crew start suppression operations.

Simultaneous to the helicopter dispatch, three mobile units are dispatched from the nearest three municipalities to the location of the fire. On their arrival, the most senior Bombeiro assumes command of the incident and the helicopter and Heli Attack team is withdrawn.

The helicopter has a 90 minute operational time frame. Thereafter it flies back to base for refuelling and a 30 minute break, before being dispatched again if needed.

The Bombeiros IC can request extended attack from ANCP if needed.

The size-up of the fire would determine the IC level required to take command of the incident. If more resources are needed, they are selected from the toolbox at district ANCP level and dispatched. The GIPS and FEB special forces seem to be on last call, with an hour available to mobilise at base, before being dispatched to the site.

Incident and accident plans

Training in ICS provides for keeping a detailed log of events, from Objectives to Strategies and Tactics, but no evidence of this documentation was observed. There was also no evidence of a written handover from the Heli Attack team to the local ground forces.

It is assumed that recording takes place only after an incident if things go wrong and a formal enquiry is requested from higher authorities.

No aviation accident plans were observed

Resource databases and Resource tracking systems

Resource tracking system is from a wall mounted toolbox, based on the T Card System. As resources are dispatched from local ANCP municipal offices, resources are tracked to the incident or incidents. It is not clear how feedback is given to the National ANCP offices, but is seemingly effective as the fogos.pt app/ website is acknowledged as being very accurate.

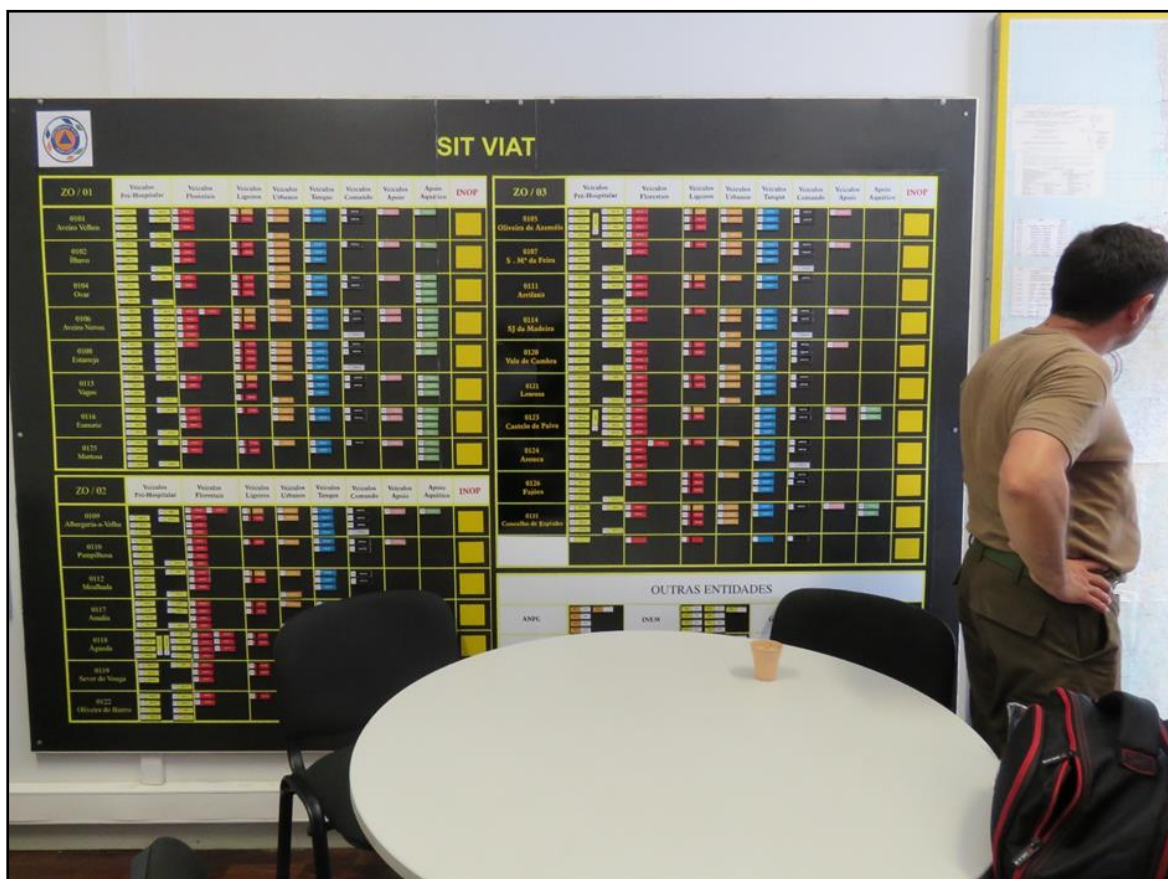


Photo 20 - Resource tracking board

13. SUPPRESSION

After all the planning and preparedness is done this is where the wet stuff is put on the red stuff. If the rest of the IFM wheel has been focused on this will be the easiest and least intensive part of the wheel. Suppression is where the science of lessons learnt, and basic principles that have been proved over many years and scenarios, are instigated. Objectives are set, strategies are assessed and tactical plans are drawn up. From initial to extended attack it should be a well-orchestrated event where it is not an emergency, it's just part of your job. Management of all the resources is the key here and is often where failures and mistakes occur.

Unfortunately the crew only had exposure to one wildfire event, at Loriga where they were deployed with the GIPS Intervention Unit from Aveiro, but have noted the following:

The initial attack system of using the Heli attack teams is very good, with reaction time limited to ten minutes. However after this the system seemed to have some challenges.

The Heli attack teams are only allowed on site for 90 minutes, this is based on fuel restrictions as well as the number of ignitions (≥ 300) per day. The challenge is that, on their departure, there didn't seem to be any system of ensuring that there were adequate ground resources in place, if there was a control line cleared around the suppressed area, if mop-up was commencing and by whom, not having a proper handover to the teams designated to complete the suppression and mop-up could have detrimental ramifications. Bottom line is that all activities should be fully planned and communicated and this appears to be completely absent.

Portugal is lucky to have ample water supply and the chosen method of suppression is thus using water. This seems fine on paper but water alone is not sufficient in suppression of wildland fires. Full fire suppression tactics should include a combination of containment (dry) lines and water.

Extended attack is not well coordinated, resources are called/dispatched without consideration of where or how they will be applied. This was observed at the Loriga fire, a fire of 300 ha's. Resources deployed at this fire were:

Firefighters:	307.
Vehicles:	96
Aircraft:	6

In this incident there were so many resources on scene that they were getting in each other's way and seemed to be pretty much just doing whatever they felt like. There was no sign of any coordinated dispatch or planned suppression activities. This perception of uncoordinated overkill could be a result of a dispatch issue but it definitely is an indicator of management related challenges.

Although the three BV ground forces are dispatched with the Heli attack team, they are of very limited use as they do not leave the road to attack the fire with direct attack. They wait passively for the fire to reach the road and they will only then engage with it. Alternately they are utilised for the

protection of homes. This again is passive, and they seem to only take action when flames are approaching.

Where extended attack is initiated, or more than one agency is involved, it is imperative that command rests with one individual. An effective use of ICS will address this. There were at least 6 agencies responding to a fire, but there was no evidence that these agencies were coordinated under a single command structure.

Commanders on the ground confirmed that little or no communication was done with the ICP after they had been tasked. It is also concerning that no staging area or pre-deployment briefing system is in place, so incoming forces are not briefed in terms of safety aspects, the objectives of the IC, the overall strategy and what tactics were being used. The ground crews interacted with agreed that there is a failure in this regard.

This perception of lack of on scene coordination is an issue that can be resolved fairly easily by the correct application of ICS. For example, memorandum of agreements between the agencies could be drawn up before fire season. These MOA's should clearly document what the responsibilities of each agency are. Once again, time spent in planning and preparedness is priceless when the incident occurs. The centralisation of all fire management related activities into a single entity would provide the best ultimate solution to aid in coordination.

Another major challenge is the lack of clear air to air and air to ground coordination. The crew specifically watched out for it and indicators were that the aircraft were operating to strategies and tactics of their own.

Some indicators of the lack of combined air and ground operations were aircraft loads that seemed to be jumping up and down the line (going back for flare-ups?), loads running parallel to each other instead of along the fire line (pinpoint positioning lacking), no sign of any crews on the lines being bombed (loads not supporting ground crews), aircraft being used for large scale mop-up operations (very ineffective use of costly resources), no consistency in load height or positioning on the flank (pilot training?). It seems like there may be a misguided impression that aircraft extinguish fires. Aircraft are best used in direct support of the ground crews because it's the resources on the ground that actually put fires out. All aircraft can do is slow down the spread and buy the ground crews time to get into the line. Bottom line is that unless there is some sort of coordination system between the aerial and ground resources there will continue to be major inefficiencies in the combined suppression operations.

We did a full presentation on the utilisation of Tactical Control Aircraft at the Joint Command bunker in Lisbon. The concept was very widely accepted and the Australians also showed how they use their airborne command and control systems. The main difference between the 2 southern hemisphere operations was that we train all our pilots to be strategic and tactical fire specialists where the Australians train up fire fighters for the role. Other than that the science, and rationale of making the best use of a limited but very expensive resource, is exactly the same. The current system in Portugal seems to be using ground controllers to co-ordinate the aircraft. We see a fundamental challenge with that method based on the fact that the ground cannot see the full picture that the aircraft can. With sufficient training and experience they could do a much more effective job

positioned in tactical command aircraft. The Airforce personnel present very much liked the idea that the command aircraft were used exactly the same as Forward Air Controllers (FAC) which is a commonly used resource in battle scenarios. FACs call in precision aerial strikes with bombs and missiles and aerial firefighting should be seen as being just as serious, because it is exactly the same!



Photo 21 – Joint Military Command presentation on the use of Tactical Command and Control Aircraft

14. RECOVERY, REHABILITATION AND RESEARCH

Recovery, rehabilitation and research are very often overlooked but they are a critical piece of the continuation of the IFM wheel. The most important factor is using events as a learning exercise. Every event should be followed by an After Action Review (AAR), and critically assessed to 'Affirm the good, Assess the bad and Address the ugly'. This is also the time to learn from other people's / countries mistakes because you don't have time to make all the previous mistakes on your own. Too often AAR's are washed over because something went wrong. We find this incredibly sad because all that does is set up the system to make exactly the same mistakes again in the future, maybe with even worse consequences than previously. Data collected in AAR's and fire investigations should lead straight back into the legislative system to reaffirm or modify laws / regulations / policies. Research on the fires sciences that were evident fall into this same category. An example is the excellent research being done by Prof Viegas at the Coimbra Fire Labs.

The embed crew had the following to note:

The start of recovery is the rehabilitation of the burnt areas. This means that burnt trees must be cleared from the land, which was unfortunately not observed in the burnt areas visited. Failure to do clear burnt areas results in a build-up of fuel for the next fire. In conjunction with clearing the burnt trees, the flush of germinating seed, especially Acacia, must be managed otherwise the burnt area becomes a jungle. Acacia are a highly fire adapted species whose seeds germinate after a fire. Any additional dead and down fuels are going to make weed control almost impossible, and provide a perfect breeding ground for the regen. What was observed were previously burnt areas that had a beautiful and lush green carpet of alien invader seedlings, so thick that you couldn't see the soil.

The Technical School of Pinhal was visited and the Technology and Information Department showed a video of footage taken from 3 static cameras to reconstruct the 2017 fire in Pedrogao Grande. The footage provided significant information on three fires developing simultaneously in the same area and showed the development as the weather conditions changed. Every single firefighter and manager should see that sequence because, in hindsight, the entire event could have been forecasted after the ignitions. There was no magic in the blow up, just the perfect conditions for the fire to do what it does.

A presentation by Miss A. Cunningham, of Eagle Fire Weather, on the use of a Tephigram, was of extreme value to potential fire behaviour. The practical exercises, analysis and case studies of past events were clearly carried across.

15. SUMMARY

By its nature the limited exposure of the team in Portugal cannot be considered as a comprehensive IFM review. For that a more structured investigation by a team of IFM experts will be required. Working on Fire has developed an IFM Roadmap which is a structured process used to conduct IFM evaluations be it on a local, landscape or country scale. The outcome feeds into addressing each of the IFM elements on which this report is based.

This short term embed has provided a snapshot overview of some of the main elements of IFM as enumerated in this report. What follows below can be viewed as a summary of strategic elements based on the limited exposure of the visit.

Spokes	Recommendations
<p>Legislation</p>	<p>The Portuguese legislation seems very comprehensive regarding the prevention and protection against wildfires but should be led by state and municipal land setting a good example of compliance. Communities and citizens should be involved and participate in following the “norm”. Following that, the law can be enforced with fines on landowners not complying.</p> <p>Serious consideration should be the promulgation of an Afforestation Law, where land owners need to apply for a permit before commercial tree species can be planted. If the land is too small to prepare fire breaks, no permits should be issued. This should not be the only criteria.</p> <p>Legislation to enforce ZIF (Forest Intervention Areas) associations should be mandatory by law. Benchmarking ZIF to similar associations such as the Fire Protection Associations (FPA’s) in South Africa should also be a serious consideration. The South African National Veld and Forest Fire Act’s Fire Protection Associations could be used as an example and some components be incorporated to have a more practical application, hence making it more attractive and advantageous for land owners to join. Given the seriousness of the fire problem, and the apparent challenges in ZIF implementation, consideration may be given to separate the fire management aspects from general land and forest management issues through the creation of FPA’s dedicated to fire (maybe modelled on existing ZIF areas or organisations or making them fulfil the role of FPA).</p> <p>Legalities regarding ownership of unregistered properties and absent landowners should first be clarified, before fire protection and prevention is addressed.</p>

Spokes	Recommendations
Education and Awareness	<p>Some pamphlets give a one sided view on 'bad fires'. This creates a culture of no fires. A more balanced approach should be followed that includes the safe use of fire and that there are 'good fires' too.</p> <p>Community fire resilience is the key, and continual awareness that the communities are a fundamental part of the solution. Ignore them and the challenges will escalate rather than reduce.</p> <p>Again, dedicated FPA's could become core to community fire resilience by taking the fire message down to local level.</p>
Fire Breaks	<p>Preparing ZIF fire breaks by bulldozers, especially on steep slopes, is not environmentally acceptable. With the disturbance of the top layers, over time, the rehabilitation cost of eroded surfaces could be a very costly exercise.</p> <p>Consideration should be given to the 120m wide primary bands to be rather divided into 3 or 4 smaller bands with tracks separating them as permanent tracers. These smaller firebreaks (blocks between tracks) can then be slashed and burnt in a cycle of three years. The same approach can be followed for the perpendicular secondary bands.</p> <p>Green belt breaks could also be considered by planting more indigenous fire resistant trees. An example is the green belt program being run by Navigator.</p> <p>Individual owners of small properties, with high fuel loads, seem to be the highest risk for wild fires. The ZIF associations could relax some of the criteria for membership and accommodate owners with smaller breaks on properties, or around a group of landowners. An example of how the South African FPA's deal with this challenge is that members of an FPA can plan and combine their fire breaks based on factors other than cadastral boundaries. So multiple land users could have no internal breaks but use a common peripheral break instead. This is a very effective mechanism of managing complex land user environments.</p> <p>The reduction of horizontal fuels along roadsides is effective to a point because, when crown fires occur, especially on steeper slopes, this practice is of little benefit due to the fire carrying straight over the ground anyway. Consideration should be given to remove some trees either side from the boundary roads, to create space between the crowns of trees as well. This can be done strategically, based on comprehensive fire management plans that look at the macro</p>

Spokes	Recommendations
	<p>picture. For example not every road needs to have the fuels cleared, but the ones that are cleared are mapped and used tactically. Suppression forces are then made aware of the strategic roads (they would be briefed at the staging area before being deployed), and no traffic would be deployed except on the cleared roads.</p>
Fuel Load Management	<p>If one factor can be isolated then fuel load management is the major challenge facing Portugal.</p> <p>Forest management practices should be reviewed in general but especially on the larger properties such as National parks to create a balanced forest, especially in the drier types of forests.</p> <p>In areas with high alien plant infestation, current fuel loads are too high for normal pre-scribed burning to be safely executed. The initial harvesting of saleable trees, felling and chipping or charcoal production could be considered.</p> <p>Once heavy fuel loads are removed, a standalone or combination of chemicals, burning, manual and mechanised options could be used.</p> <p>South Africa has made good use of experts on the management of the regeneration of natural forest species under alien tree canopies. This knowledge may assist in a national programme to reduce fuel loads.</p> <p>The problem of unnaturally high fuel loads will not go away by itself and will need a comprehensive annual plan of operations that looks at the macro landscape, ignoring cadastral boundaries. Fires don't care about lines on a map and planning shouldn't either.</p>
Risk Profile	<p>Risk quantification of horizontal and vertical fuel loads in all vegetation types should be developed as a user friendly method/application for landowners to determine the frequency and intensity for reducing fuel loads.</p> <p>Risk management profiles are not difficult to do and a simple national template could be produced. Keep it simple initially and let it grow in complexity once the basics are embedded.</p>

Spokes	Recommendations
Training	<p>Training as observed during the visit is of a very high standard. It is recommended that auditing training modules should be done during wild fires, by a third party, as participating party audits may be biased.</p> <p>Promotions as IC from Level 5 IC through to Level 1 IC should be rated on courses passed and a logbook with a set number of incidents exposed to. This is the only way to keep track of experience and link it to promotion. Retraining should also be considered if a person didn't have any exposure over a set number of years.</p>
Detection	<p>The use of mobile live streaming camera surveillance systems should be investigated to assist Incident Commanders during wildfires. South Africa is also using a system of live video streaming from the Command and Control aircraft, called FireFly. This is a very valuable tactical tool for the IC and operations staff because it requires no special tasking from the aerial operations. They just carry on with the operations and the ground forces have the same bird's eye view that the aircraft have.</p> <p>Early fire detection coupled with quick reaction is critical to prevent fire build up and disaster fires.</p> <p>The use of patrol aircraft, to be deployed on days when the lookouts are either overwhelmed by the number of fires or visually restricted by smoke should be investigated and planned for.</p> <p>Modern automated fire detection camera systems are very effective and more cost effective than manned towers. A relatively small country like Portugal should not be difficult to cover with such a system with blanket coverage in the fire prone areas. Care should be taken to stick to proven visual spectrum systems that are scalable and coupled to human verification to avoid wasted dispatches. Avoid the hype around Infrared and heat sensing technologies that are not effective at large scale.</p>
Systems	<p>If ICS is the chosen incident management system then it needs to be adopted across the board and from top to bottom. Whatever system is being used now relies heavily on rank and positional power and is not effective. Fires don't care what position you hold and are very good at separating training from experience.</p> <p>Be careful of throwing technology at simple problems. Refresh the basics of human dynamics and people management, coupled to the basic fire sciences and training. Let the systems reaffirm the good and correct the mistakes or shortcoming of the past.</p>

Spokes	Recommendations
Capacity	<p>Finance and administration need to be added to the ICS structure. It is a useful tool to compare the costs of incidents of wildfires per hectare and future budgeting. To compare the actual cost of prevention and protection versus suppression would also be of significant value for future fire management planning.</p> <p>Portugal have a massive amount of resources available. More resources are definitely not needed. Recourses just have to be used in a more coordinated and structured way. What is needed is a back to basics approach in all facets of the operations.</p>
Dispatch and Coordination	<p>The system is working well. A concern is that FEB and GIPS Special Forces are not gaining experience, and are limited to extended attack only, if required. It is recommended that ANPC develop a schedule where they are used more often operationally. Firefighting skills need to be kept current as competence comes from experience.</p> <p>Where, what, who, when and how is the same all over the world. Excessive dispatch of too many resources very quickly reaches a point of inefficiency and dangerous conditions where people are getting in each other's way without even knowing what the plan is.</p>
Suppression	<p>It is recommended that bulldozers only be used in extreme cases to prepare control lines, especially on steep slopes. Large scale mechanical breaks should follow contours to best limit the environmental impact of erosion and slope disturbance. Hand tools should rather be used by the multitude of firefighters and direct attack techniques should be used.</p> <p>The sheer number of Fire Tankers is overwhelming, and in that scale needs to be carefully managed. Crews need to not only focus on spraying water but get back to the basics of fire line construction, burn-outs or back-burns and mopping up operations. Out of the fire season these resources can be utilized by INCF for prevention and protection activities.</p> <p>The aerial operations need to be better managed and coordinated with ground resources. It is a fallacy that aircraft can manage themselves and totally extinguish fires by sheer volume of water dropped. Tactical aerial command and control training, and fixed wing forward command platforms, would go a long way to ensuring that this very expensive resource is more efficiently used.</p>

Spokes	Recommendations
	<p>Aircraft should be used in their appropriate roles and correctly applied. They should not be the relied on to operate alone and must always work in close direct support of ground crews. It's not called "air support" for nothing – they should support ground crews, not the other way around.</p>
<p>Research and Rehabilitation</p>	<p>It is recommended that any research done should not only be of academic value, but be of such a nature as to fulfil a real practical need. The excellent presentation of Miss Amanda Cunningham, Pyro-Meteorologist, is a prime example of applied science.</p> <p>As in all things, have a plan. A plan for post burn rehabilitation, and all that goes with fire adapted species regeneration. It should not be a big surprise when the whole area explodes with regen seedlings. As in all aspects of IFM, prior 'what if' and 'what are we going to do' planning is key to every one of them.</p>

If we can make one major suggestion it is this: Portugal has more than enough resources, don't throw too much technology at the challenges. Keep it simple by going back to basics.

16. IN CLOSING

We wish to express our gratitude to all the personnel of EMSGIF, AGIF, ANCP, CB, FEB, GNR, GIPS, ICNF, South African Embassy, Portuguese Diplomatic Office, The Navigator Company, Afocelca, DEMOP, Giff, UTAD and Eagle Fire Weather.

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We look forward to the continued good collaboration and remain available to assist and to clarify where needed.

- ENDS -