KNOX
GRAMMAR
SCHOOL

STATE

DA VINCI DECATHLON 2019

CELEBRATING THE ACADEMIC GIFTS OF STUDENTS IN YEARS 7 & 8

IDEATION

TEAM NUMBER _______________

1	2	3	4	Total	Rank
/15	/10	/25	/10	/60	

Complete the above table with question numbers and marks as required.

IDEATION

PLAYING WITH FIRE

BACKGROUND

Bushfires are common in Australia, and they bring with them **devastating** impacts upon the **natural landscape.** Flora and fauna are placed at extreme risk, as are humans, and the **ecosystems** of certain areas can be thrown wildly out of balance. The immense amounts of **smoke** produced can also have serious consequences which reach beyond the area where the fire itself raged.

Bushfires are most common in the **summer months**, between December and March, as well as during times of **drought,** where dry, burnable organic matter builds up. A number of possible **causes** exist, including lightning, power lines, arson, cigarettes, campfires, machinery sparks and controlled burn escapes.

The **prevalence** of bushfires in Australia long before European settlement means that many species of flora, notably eucalypts, have evolved to withstand their effects to a certain extent, while **Indigenous Australians** have used fire for centuries in order to clear land, create paths and hunt animals.

Nevertheless, the impacts remain severe, and there have been over 800 human casualties since 1851. Almost a quarter of these came during the infamous **Black Friday** bushfires of 2009 in Victoria, while close to 100 people also died in **Ash Wednesday** in 1983, across both Victoria and South Australia. Moreover, the affected landscapes (both **natural** and **man-made**) take several decades to heal, and the consequent harms to both **biodiversity** and the **economy** (e.g. farms, plantations) are substantial.

THE PROBLEM

While extremely damaging, the effects of bushfires are manageable if they occur only infrequently. The **problem** is that this appears unlikely to be the case in future, because **climate change** has caused bushfires to become **more and more common** in recent years.

This was acknowledged in 2011 by the **Australian Climate Commission**, which is a federal government body. It has also been highlighted by the **CSIRO** and **Bushfire Cooperative Research Centre.** The main explanation, of course, is that climate change has caused **rising temperatures** and thus conditions which are more **conducive** to the spread of a fire. As far back as 2007, the CSIRO predicted that this would cause **more days of very high and extreme fire danger,** as well as an **earlier onset** of and **later conclusion** to the bushfire season.

For some perspective, the federal government's Climate Council has determined that between 1978 and 2013, the fire season's length has **increased by 19%** due to climate change. 2014 and 2015, the main years subject to the Council's report, were the two **hottest years on record,** and seven of the months of 2014 also broke records in this regard.

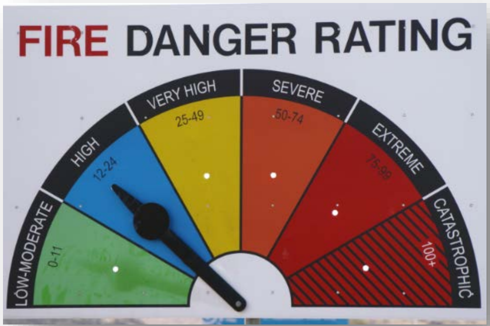
Furthermore, evidence of this trend has come as recently as December 2018, with an '**extraordinary'** and '**abnormal'** heatwave causing severe bushfires across much of Queensland. Such descriptions were provided by the Queensland Bureau of Meteorology, which also noted that the conditions were the first to be labelled '**catastrophic**' on the Fire Danger Rating System since 2010, while also being the most prolonged bushfire event in the state's history. Dr Philip Stewart, a fire ecologist at the University of Queensland, said that climate change was '**absolutely**' the cause.

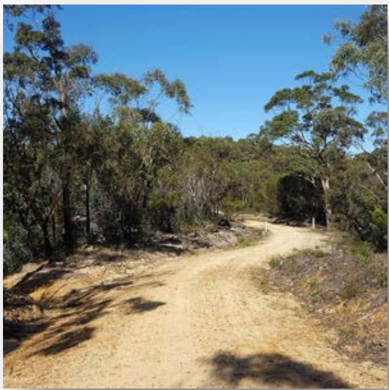
THE DESIGN CHALLENGE

Australia, of course, has several **mechanisms and systems** in place to prevent and manage bushfires. However, experts are now warning that they may be **insufficient** in the wake of a rise in both the **number** and **ferocity** of bushfires across the country. There is a strong need for new ideas to be implemented that will **protect** our natural landscapes against the threat of bushfires, and in turn also protect our infrastructure, farms, biodiversity, economy and population.

For reference, below is a list of just a few of the current ideas in place across Australia:

- **Fire Trails –** fire trails are barren strips of land that cut through areas of vegetation. They serve to contain bushfires by preventing them from jumping across to the other side of the strip, and they also provide important escape routes for humans and animals alike.





- **Fire Rating Systems –** these are the signs often seen on roadsides across the country. They warn humans of the risk of fire, and are usually accompanied by fire bans that prevent actions such as campfires, smoking and welding.
- **Backburning and Hazard Reduction Burns –** such activities are controlled forms of bushfires which aim to reduce the amount of organic fuel available should a real bushfire occur in the area, thus preventing one from getting out of control in future.
- **Helicopter buckets –** immense buckets filled with water that can be dropped upon bushfires from helicopters above. These are effective, but not preventative.

With these **existing ideas** in mind, your challenge is to **design a new solution** that will ensure that Australia is able to combat the growing threat of bushfires into the future. Your solution could be:

- An **invention**
- An **awareness** program or system (like the Fire Rating System)
- Some **change** to the **landscape** (like fire trails)
- Any other **preventative OR responsive** solution

As the above indicates, your solution does not need to be **preventative** or **pre-emptive.** It may simply be a new way to battle bushfires as they occur. However, if so, it should represent a **significant improvement** upon current techniques.

Those teams who present the most **innovative, original, plausible** and **effective** solutions will score highest. Further marking guidelines are provided on the following page, as well as in your answer booklets.

Stimulus material is also provided within this paper, following the marking criteria. You are encouraged to **refer** to this material in your answers as much as possible.

You are required to follow the **four-step process of ideation.** This is outlined immediately below and is set out in your answer booklet.

EMPATHISE (Ethical Decision-Making Framework) (15 marks)

This involves evaluating what 'ought to be done', through considering rights, obligations, fairness, the benefits and detriments for societies and other virtues. Reaching a final decision involves a degree of conviction and belief in what is 'the right thing to do'.

DEFINE (Design Brief) (10 marks)

Here, you must identify the problem, outline the ethical issues, evaluate the challenges and research findings, and identify possible solutions.

IDEATE (Reflection) (25 marks)

You must then reflect on their solutions and whether they will be viable. A preferable solution should be identified, and any unanswered questions should be addressed. Issues of implementation are also crucial to reflect upon.

CREATE (Prototype) (10 marks)

Finally, a design for how your ideas and solution will be disseminated must be produced. This could be a story-board, mind-map, diagram, model, narrative or any other appropriate medium. Critically, an audience must be able to understand the process of dissemination by examining this prototype.

MARKING GUIDELINES

1. Empathise (15 marks)

QUESTIONS	LIMITED	SOUND	OUTSTANDING	TOTAL
1: Factors contributing to the issue	0-1	2-3	4	
2: Consequences if not addressed	0-1	2-3	4	
3: Identify different perspectives	0-1	2	3	
4: Identifies barriers to addressing the issue and why they are barriers	0-1	2-3	4	
			TOTAL	/15

2. Define (10 marks)

ASPECT	LIMITED	SOUND	EFFECTIVE	OUTSTANDING	TOTAL
Vision Statement: What do you want to achieve?	0-1	2-3	4	5	
Importance of Vision Statement	0-1	2-3	4	5	
				TOTAL	/10

3. Ideate (25 marks)

ASPECT	LIMITED	SOUND	OUTSTANDING	TOTAL
Possible Solution #1	0-1	2-3	4	
Possible Solution #2	0-1	2-3	4	
Possible Solution #3	0-1	2-3	4	
Choice of solution	0	1	2	
Justification of solution	0-1	2-3	4	
Implementation: when, where, who?	0-1	2	3	
Dissemination: how to succeed with the solution	0-1	2-3	4	
			TOTAL	/25

4. Create (10 marks)

ASPECT	LIMITED	SOUND	EFFECTIVE	OUTSTANDING	TOTAL
Originality and creativity	0-1	2-3	4	5	
Clarity and communication of ideas	0-1	2-3	4	5	
				TOTAL	/10

TOTAL: /60

ADDITIONAL STIMULUS

***How climate change is increasing the risk of wildfires* (Manco, F., 2018, in *The Conversation*)**

The army has been called in to help firefighters deal with a huge wildfire on Saddleworth Moor, Greater Manchester, where residents have been forced to evacuate. Wildfires are also blazing across Northern California while the issue of bushfires in Australia calls for constant vigilance from the emergency services there. These fires are becoming more common and one of the reasons for this is climate change.

Warmer temperatures in the summer and associated drier conditions desiccate plant materials and create more vegetation litter, providing more fuel for these fires. Several studies have linked the increase of wildfires with climate change in various parts of the world, such as North America and Southern Europe.

For example, a study in California from 2004 found that the warmer and windier weather (brought about by an atmosphere with higher levels of CO2) produced fires that burned more intensely and spread faster in most locations. Despite enhanced firefighting efforts, the number of escaped fires (those exceeding initial containment limits) increased by 51% in the south San Francisco Bay area, 125% in the Sierra Nevada.

This image, captured by NASA’s Terra satellite, demonstrates the scale of the Saddleworth fire. University of Dundee

It has also been demonstrated that increases in rainfall during winter and spring – which are also known consequences of climate change – provide more favourable conditions for plant growth and therefore more potential fuel for the fires later in the summer.

Even though climate change increases the vulnerability of dry environments to wildfires, a source of ignition is still required. In the UK, it can be natural (such as bolts of lightning) or caused by man either deliberately or accidentally. Various studies have shown that the number of recreational visits to “risky” sites, such as the English Peak District, increase the occurrence of wildfire.

Human activities have shaped heathlands and moorlands in the UK over the centuries, keeping them open and slowing down the natural succession towards more closed forest habitats. Despite the human impact on their origin, moorlands represent important ecosystems for numerous endangered species including reptiles, insects and birds.

Moorland management

But historic poor management has caused a lot of damage in moorland habitats. The introduction of non-native species for the moor, such as Rhododendron or planted conifers, has affected biodiversity. Overgrazing and drainage has increased the risks of erosion and flooding by reducing vegetation cover and limiting the ability for the soil to absorb precipitations. This, in turn, as lead to an increase in aridity of the habitat – which is the perfect environment for wildfires.

Nowadays, most of the UK's moorlands are associated with red grouse shooting and are managed in relation to that activity. Procedures include rotational burning and control of predators. Some of these processes are controversial with some environmentalists claiming it can turn the moorland into a "monoculture" of low heather which can be highly susceptible to wildfires. But the evidence on this is not clear and a report by the RSPB found little proof of the negative effect of grouse moor management on biodiversity, flooding and wildfires.

The ecological role of fire

Landscapes and their plant and animal communities are not fixed in time. They are under the influence of dynamic processes that can be recurrent (such as marine tides and seasonal flooding) or catastrophic (volcanic eruptions or storms). Fire – whether natural or man-made – is an important factor that will drive the structure and wildlife composition of ecosystems.

Some areas, such as the Mediterranean region or the African savannah, have been shaped by fire for thousands of years. Plants and animals have evolved to cope with the periodic perturbations due to it. For example, some seeds can only germinate after they have been burnt.

There are even some plants and animals that are contributing in the propagation of wildfires. In Australia, some raptor birds have been observed picking up burning sticks and dropping them in unburned areas to force potential prey out of their burrows.

Despite its destructive power, fire is an important ecological process that can benefit several endangered species by maintaining their habitat. It is an important tool in the management and preservation of heathlands and moorlands in the UK when used appropriately and in a controlled way.

But climate change and human activities increase the vulnerability of those habitats to uncontrolled wildfires and higher population densities near these areas will potentially put more people and houses at risk. In addition to the global battle against climate change, appropriate management procedures are necessary to maintain those habitats and ensure the risks of uncontrolled fires are minimised and the potential spread of them reduced.

Excerpts from *Climate change impacts on fire-weather in south-east Australia* (CSIRO, 2015)

Fire risk is influenced by a number of factors – including fuels, terrain, land management, suppression and weather. This study assesses potential changes to one of these factors, fire-weather risk, associated with climate change. Fire-weather risk relates to how a combination of weather variables influences the risk of a fire starting or its rate of spread, intensity or difficulty of suppression.

The study is based in south-east Australia, an area projected to become hotter and drier under climate change. The study uses fire danger indices, such as the Forest Fire Danger Index (FFDI) and Grassland Fire Danger Index (GFDI), to provide an indication of fire risk based on various combinations of weather variables. These variables include daily temperature, precipitation, relative humidity and wind-speed.

Fire danger indices are calculated for historical weather records from 1974-2003 for sites in New South Wales, the Australian Capital Territory, Victoria and Tasmania. Two climate models are then used to generate climate change scenarios for 2020 and 2050, including changes in average climate and daily weather variability. Fire danger indices are then calculated for 2020 and 2050.

This study is a significant methodological improvement on earlier fire risk assessments in Australia. It avoids biases from:

• using raw daily climate model data that may not be representative of observed climate, or

• inadequate assessment of changes in extreme weather events through failure to take sufficient account of likely changes in daily weather variability.

A key finding of this study is that an increase in fire-weather risk is likely at most sites in 2020 and 2050, including the average number of days when the FFDI rating is very high or extreme. The combined frequencies of days with very high and extreme FFDI ratings are likely to increase 4-25% by 2020 and 15-70% by 2050. For example, the FFDI results indicate that Canberra is likely to have an annual average of 25.6-28.6 very high or extreme fire danger days by 2020 and 27.9-38.3 days by 2050, compared to a present average of 23.1 days. The increase in fire-weather risk is generally largest inland. Tasmania is likely to be relatively unaffected.

The study also indicates that the window available for prescribed burning may shift and narrow. It is likely that higher fire-weather risk in spring, summer and autumn will increasingly shift periods suitable for prescribed burning toward winter.

…

Since 1950, rainfall has decreased in south-east Australia, droughts have become more severe and the number of extremely hot days has risen. The effect of these changes on fire frequency and intensity is not evident, although it is clear that hotter and drier years have greater fire risk. Climate change projections indicate that the south-east is likely to become hotter and drier in future. The aim of this study is to assess potential changes in fire-weather risk associated with future climate change, due to the enhanced greenhouse effect. Fire weather is only one of the important factors determining fire risk and fire behaviour – fuels, terrain and suppression are also critical, but these have not been assessed in this report. This is just a first step toward better informing fire management agencies and researchers about climate change risks. Ongoing engagement between scientists and fire management agencies is needed to maximise the value of this assessment.

…

Following the widespread fires in December 2002 and January 2003, a number of inquiries were undertaken. For the ACT, the McLeod Inquiry Report (2003) recommended a range of fire mitigation activities to be undertaken prior to, and during, the 2003-04 bushfire season, with an additional $1.684 million being sought for that purpose, adding to the $0.5 million provided in the 2003- 04 budget.

The COAG (2004) Report of the National Inquiry on Bushfire Mitigation and Management stated "Climate change is likely to increase the frequency, intensity and size of bushfires in much of Australia in the future". It is possible that changes in the FFDI and other indices will require prescribed burning to take place a little earlier in spring and a little later in autumn, prolonging the effective fire season, increasing the personal and employer cost for volunteers, and increasing the cost of fire fighters. Climate change impacts would be seen in potentially prolonged fire danger periods, increased numbers of total fire ban days, increased community based educational and organizational programs such as Community Fire Guard (2005), and in increased reliance on the good will of employers or volunteers. The summary concluded that "more research is needed on building design and materials, climate and climate change, fire behaviour and ecological responses, individual and community psychology and social processes, and Indigenous Australians' knowledge and use of fire". It also concluded that "long-term strategic research, planning and investment are necessary if the Australian Government and state and territory governments are to prepare for the changes to bushfire regimes and events that will be caused by climate change".

The Report of the Inquiry into the 2002–2003 Victorian Bushfires (Esplin et al, 2003) noted that "The weather leading up to a fire season is not the only aspect of climate that influences the severity of a fire event. The weather at the time of a fire has a major impact on fire behaviour and on the ease of suppression. In relation to the 2002–03 fire season, the Bureau of Meteorology stated: The very dry conditions leading into the 2002/03 fire season do not in themselves fully explain the intensity and longevity of the fire episodes. A significant contributor to the long period for which the 2003 bushfires remained active was the absence of any significant rain for several weeks after". It also stated "A prolonged and severe drought, especially throughout much of the southern half of Australia, is the stand-out climatic feature of the 2002–03 fire season. Fire agencies need to be responsive to macro indicators of this kind, using them to assist with annual planning and preparation activities, as well as to match their response capacity to daily weather conditions. Operational responses during drought periods should reflect the 'worst case' scenario and include optimum available resourcing. Although the full extent of the fire threat may not be realised, operational planning must take account of this possibility".

The results of this study provide scenarios that reconfirm the findings of these inquiries. The impacts of climate change are likely to pose a number of challenges for natural and human systems. However, few impact assessments have been done. It is likely that an increase in the frequency and intensity of fire-weather would:

• alter the distribution and composition of ecosystems (Cary, 2002)

• lower the yield and quality of water from fire-affected catchments (Lavoral and Steffen, 2004)

• threaten the security of plantation forests

• increase smoke-related respiratory illness

• increase emissions of greenhouse gases to the atmosphere

• increase damage to property, livestock and crops

• increase the exposure of insurance companies to loss (Coleman et al,, 2004)

• increase the risk of injury, trauma and death to humans (BTE, 2001).

Excerpts from *The burning issue: Climate change and the Australian bushfire threat* (Climate Council of Australia, 2015)

It is clear that changes to the climate – and increasing atmospheric carbon dioxide levels driving these changes - will have an impact on fuel and therefore on bushfires in Australia. Because of the complex relationship, however, it is not possible to determine how — or in what direction — a changing climate will affect the amount and condition of the fuel in a particular region.

Weather has a very strong influence on bushfires and is directly affected by climate change. Once a fire is ignited, very hot days with low humidity and high winds are conducive to its spread. Any impact of climate change on heat, moisture or wind is therefore going to directly affect the spread and staying power of a bushfire. The frequency, duration and intensity of extreme weather events, such as extreme heat and heatwaves, are affected by climate change (IPCC 2014a). The annual number of record hot days across Australia has doubled since 1960 (CSIRO and BoM 2012). Over the period 1971-2008, the duration and frequency of heatwaves increased and the hottest days during a heatwave became even hotter (Perkins and Alexander 2013; Climate Council 2014).

A study into Australia's record hot year in 2013 found that the heat events in that year would be expected only once every 12,300 years in the absence of climate change (Lewis and Karoly 2014). A similar study found the events to have been virtually impossible without the influence of a changing climate (Knutson et al. 2014). At higher temperatures, fuel is 'pre-heated' and is more likely to ignite and to continue to burn (Geoscience Australia 2015). The impact of climate change on extreme weather, increasing the number of hot days and heatwaves, is driving up the likelihood of very high fire danger weather.

Recent decades have also seen a drying trend in the southeast and southwest of Australia, characterised by declining rainfall and soil moisture (CSIRO and BoM 2014). In very dry conditions, with relative humidity less than around 20%, fuel dries out and becomes more flammable (BoM 2009). Climate change is likely making drought conditions in these regions of Australia worse. Contributing to this drying is a southward shift of fronts that bring rain to southern Australia in the cooler months of the year (CSIRO and BoM 2015). This shift is consistent with the changes in atmospheric circulation expected in a warmer climate (Climate Commission 2013).

In the southeast and southwest of Australia, it is very likely that an increased incidence of drought - coupled with consecutive hot and dry days - will result in longer fire seasons and an even larger number of days of extreme fire danger (e.g. Clarke et al. 2011). A study into forested regions of Australia found that, in the majority of cases, years with drought conditions resulted in a greater area of burned land (Bradstock et al. 2014).

Local wind conditions are important for the spread and endurance of a bushfire. Wind speeds above 12-15 km per hour increase the rate of fire spread, with a doubling of the wind speed quadrupling the rate of spread (BoM 2009; Geoscience Australia 2015)

…

As climate change increases the likelihood of very high fire danger weather (IPCC 2014a) a substantial increase in the number of trained firefighters will be needed. To keep pace with asset growth and population, it has been estimated that the number of firefighters will need to increase from approximately 11,000 in 2010 to 14,000 by 2020 and 17,000 by 2030 (NIEIR 2013). When the increased incidence of extreme fire weather under a realistic warming scenario is also taken into account, a further 2000 firefighters will be needed by 2020, and 5000 by 2030 (NIEIR 2013).

The number of firefighters will likely need to double by 2030. Overall, this represents a doubling of firefighter numbers needed by 2030, compared to 2010. These estimates are likely to be conservative because they do not account for the potential lengthening of the fire season. Further, they do not account for the increased pressures on the trained firefighting services due to declining numbers of volunteer firefighters (NIEIR 2013). It is likely that a longer fire season will also reduce the window of opportunity for hazard reduction at the same time that the need for hazard reduction becomes greater.

…

Specialised helicopters and planes are integral to Australian firefighting efforts. Aerial firefighting resources (see, for example, Figures 12 and 13) are leased by state and territory services from domestic and international companies each bushfire season. In the 2015-16 season, Australia's leased fleet comprises more than 120 aircraft, including high volume helicopters, firebombing helicopters, air attack supervision helicopters, fixed wing firebombing aircraft, and fixed wing specialist intelligence-gathering aircraft.

During the 2013-14 Australian bushfire season, contracted aircraft were required on more than 3,000 occasions, making more than 36,000 firebombing drops and delivering over 86 million litres of fire retardant and suppressant across the country (NAFC 2014). Some of the largest aircraft in Australia's fleet, including six air-cranes and four large air tankers, are leased from international companies (Kestrel Aviation 2015).

During the northern hemisphere summer, these services are contracted to firefighting services in North America. As the climate changes and bushfire seasons continue to lengthen, the fire seasons of the two hemispheres – and the demand for these critical shared firefighting aircraft – will increasingly overlap, challenging such arrangements (Handmer et al. 2012).

…

Since 1970, areas of southeast and southwest Australia have experienced decreases in average rainfall accompanied by above average temperatures, with the past decade being the warmest on record in many areas (CSIRO and BoM 2014). The pattern of long-term below-average rainfall and above average temperatures means that conditions such as soil moisture and fuels are prone to rapid drying with the approach of summer, boosting an active bushfire season (BNHCRC 2015). It is expected that large areas of south eastern Australia and Western Australia, will be faced with above normal fire potential during the 2015-2016 summer (BNHCRC 2015; Figure 15).

This forecast takes into account a number of climate and social factors. Leading into this year, many areas have consistently received below average annual rainfall across successive years. This has produced a cumulative reduction in soil moisture levels and increasingly dry forests and grasslands. Other climate drivers, such as the currently Hotter, drier conditions mean that fuels are prone to rapid drying with the approach of summer, exacerbating bushfire conditions. strengthening El Niño event across the Pacific and the warmer waters associated with the Indian Ocean Dipole were taken into account. Non-climatic factors considered in the investigation include the distribution of firefighting resources, previous fire activity and the amount of prescribed burning undertaken prior to the start of the fire season.

Most of the southeast coast of Australia is expected to experience above normal bushfire potential due to a long-term rainfall deficit, relatively low soil moisture, and relatively warm conditions predicted for the summer (BNHCRC 2015). Similarly, in Western Australia, a lack of rainfall, a long-term deficit in the soil moisture, and high fuel loads have led to expectations of an above normal fire potential in the state's southwest.

Taking the heat out of bushfires with innovative technology* (Hunter, N., 2009, in *World Intellectual Property Organisation Magazine)

February 7, 2009, will long be remembered by Australians as "Black Saturday" – the day on which almost 200 people perished and thousands were left homeless as a result of bushfires that raged out of control on the outskirts of Melbourne. The Black Saturday tragedy is generally thought to have resulted from record high temperatures (around 46°C) on the day, significantly below-average rainfall over the five previous years and a "stay and defend" stance taken by many rural residents.

Hotter summers and a drier year-round climate suggest that conditions likely to increase the frequency and intensity of bushfires will persist in Australia for some time. And Australians are now looking to technology to help reduce bushfire impact in rural communities.

By their very nature, bushfires are difficult to predict and control – above and beyond the effects of other variables such as terrain and winds. Extinguishing them is a daunting task. So, in a world of video-playing iPods, mass-printable thin-film polymer solar cells and nanoparticles for targeted cancer treatment, what technologies are being developed for bushfire protection?

Elvis to the rescue

Generally, very few ideas conceived in the aftermath of bushfires have been converted into bushfire protection technologies. Even where patent applications are filed, they are often not followed through on. Some ideas, however, are translated into tangible solutions. One such tool – currently the subject of patent protection in Australia and other countries – is a water-bombing helicopter, colloquially known as “Elvis.” At the frontline of bushfire fighting, the helicopter, produced by the U.S. company Erickson Air-Crane Incorporated, is hired each summer by Australian state governments to assist in their protection efforts.

The Bushfire Co-operative Research Centre

In Australia, the Bushfire Co-operative Research Centre (Bushfire CRC) is at the heart of research aimed at generating bushfire protection solutions. The Bushfire CRC receives input from more than 30 fire and land management agencies in Australia and New Zealand, as well as the Australian government-funded Commonwealth Scientific and Industrial Research Organisation (CSIRO).

The Bushfire CRC’s research focuses on three main areas: (1) fire behaviour; (2) human behaviour and safety issues; and (3) building (infrastructure) and planning issues. It is anticipated that this research, particularly in the third area, will lead to bushfire protection technology that can be applied to building design and materials and, as a result, will give rise to a new generation of safer homes.

The Mist Bomb

Research and development work is not, however, limited to collaborative groups and government-funded bodies. Many individuals and companies are now seeking bushfire fighting solutions. Sydney-based inventors Marc Hartmann and Derrick Yap have taken up the challenge and developed a water-dispersing “bomb” that extinguishes fires by extracting heat from them.

The device is a football-sized, water-filled vessel that can be dropped from a helicopter or airplane. It is fitted with a detonator that triggers on, or slightly before, impact with the ground. This transforms the water into a fine mist that rapidly disperses in the vicinity of the “explosion.” The mist droplets have a considerably larger surface area than the water droplets associated with conventional water-bombing techniques. This enhances their ability to remove vast amounts of energy from the fire front, making the mist bomb an extremely effective fire extinguisher.

Bearing in mind that bushfires generally occur in remote forest areas, Hartmann and Yap designed the bomb from biodegradable materials so that bombing campaigns do not pollute the environment. The combination of mist-generation and eco-friendly materials makes this a unique tool for fighting bushfires.

With the assistance of Griffith Hack, the inventors filed a PCT international patent application (WO 2008/12884). They also established Wildfire Suppression P/L to commercialize their invention and export their technology. Technical development is still continuing on certain aspects of the mist bomb, but Hartmann and Yap expect to conduct extinguishment trials later this year. They hope that the trials will involve the Bushfire CRC and CSIRO because their approval of the technology would go a long way to bolstering commercialization efforts.

In the meantime, the inventors are pursuing discussions with a provider of aerial fire suppression services to adopt the mist bomb technology. They have a strong view that the technology is well suited to fighting fires in remote or mountainous areas, and therefore applicable to the terrain of Australia, North America and Europe.

It is to be hoped that successes such as that of Hartmann and Yap and the cutting-edge research being undertaken at the Bushfire CRC as well as the memory of the recent Black Saturday tragedy, will motivate individuals, companies and research organizations to follow through on their ideas for innovative bushfire protection technologies. Communities in bushfire-prone areas in Australia and elsewhere will live to thank them.