

FIRE AUSTRALIA

THE BUILT ENVIRONMENT'S FUTURE RISK

AFAC17 collaborating for success

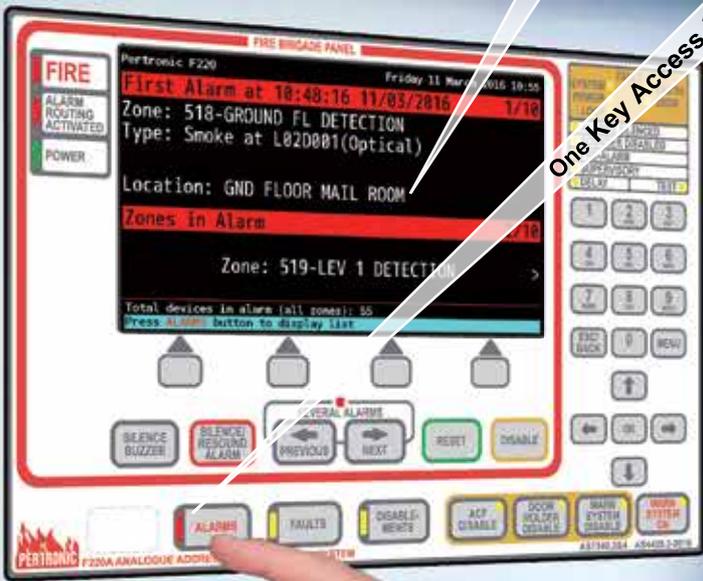
New natural hazards science for Australia

FPAS hits 2000 accredited milestone

PERTRONIC F220 Fire Alarm Panel

Identifies
Exact
Location of
Alarm

One Key Access to Alarm List View



Pertronic F220 Friday 11 March 2016 10:57

Alarm Events

Event	Zone	Location	Type
46	530	GYMNASIUM	Heat Alarm
47	505	LEV 1 APARTMENTS SPRINKLER	Smoke Alarm
48	524	LEV 6 DETECTION	Smoke Alarm
49	530	GYMNASIUM	Smoke Alarm
50	524	LEV 6 DETECTION	Smoke Alarm
51	525	LEV 7 DETECTION	Smoke Alarm
52	530	GYMNASIUM	Smoke Alarm
53	530	GYMNASIUM	Smoke Alarm
54	525	LEV 7 DETECTION	Smoke Alarm

Alarm Point: 50 of 50

Item: OPT at LEVEL 6 ELECT CUPB (LG2007L)

Time: 10:48:21, 11 March 2016

Total zones in alarm: 10

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Vital Information during Critical Incidents

The **Pertronic F220** makes it easy to track an incident's progress.

The large, 7-inch (180 mm) display allows the F220 to exceed the requirements of AS 7240.2. When the F220 detects an alarm condition, the display automatically shows the exact location of the alarm activation in big, 5mm text, in addition to the zone information required for AS7240.2 compliance.

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Brisbane

Unit 3, 43 Sandgate Road, Albion, QLD 4010
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sales.qld@pertronic.com.au

Perth

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sales.wa@pertronic.com.au

Sydney

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COLLABORATING FOR SUCCESS

BY
STUART ELLIS AM

Chief Executive Officer,
AFAC



The AFAC17 powered by INTERSCHUTZ conference and exhibition is a place for the emergency management community to come together to discuss the latest in research and practice, share insights and ideas, view what our industry partners have to offer at the exhibition, and network with colleagues.

Interest in the conference is growing each year. Thanks to our partnership with Hannover Fairs Australia, this year's event will be the largest and most comprehensive yet.

Our conference program will explore 'Collaborating for Success – Improving

performance in emergency management'. Leading local and international experts will share thought-provoking keynote presentations, with topics under the central theme including using data to drive performance and strengthening organisations. Our program of keynote speakers includes Dutch senior firefighter and big data expert Bart van Leeuwen; Victorian Equal Opportunity and Human Rights Commissioner Kristen Hilton; Public Service Commissioner Graeme Head and Telstra Non-executive Director Steve Vamos.

The conference will open with the Bushfire and Natural Hazards CRC Research Forum. This is an important platform for showcasing the latest science within our sector and a great opportunity for emergency and land managers to engage directly with researchers.

As well as speakers sharing the latest in practice and learnings, AFAC17 will offer our most comprehensive professional development program to date, with 10 sessions including field trips, forums, workshops and the AFAC Safety Symposium.

The INTERSCHUTZ Exhibition will also be our largest yet, with the latest in emergency services equipment and technology on display. For the second year, we are offering the Exhibition Visitor Pass so staff and volunteers can register to attend the exhibition free of charge.

There is absolutely something for everyone at AFAC17. I hope you'll join us in September at the new ICC in Sydney for Australasia's premier emergency management event.

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FIRE AUSTRALIA

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OUR COVER

Fire protection's future challenges include the risk from fighting fires involving solar panels (see page 18).

ILLUSTRATION: AIDAN GIFKINS

ABOUT FIRE AUSTRALIA

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JOINT EDITORS

Tom Bicknell (FPA Australia)
TEL +61 3 8892 3118 tom.bicknell@fpaa.com.au
Nathan Maddock (Bushfire and Natural Hazards CRC)
TEL +61 3 9412 9600 nathan.maddock@bnhrcr.com.au
Zoe Kenyon (AFAC)
TEL +61 3 9419 2388 zoe.kenyon@afac.com.au

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HISTORY PROVIDES A LESSON IN PREVENTING FLOOD DEATHS

Bushfire and Natural Hazards CRC research is now informing community flood warning campaigns, emergency services training and national policy initiatives, with a study investigating the circumstances of

all flood fatalities in Australia from 1900 to 2015.

Led by Dr Katharine Haynes at Risk Frontiers, Macquarie University, the study explored the socio-demographic and environmental factors surrounding the

1,859 flood fatalities, and found distinct trends in relation to gender, age, activity and circumstances of the death. These trends were analysed in the context of changes to emergency management policy and practice over time.

The NSW State Emergency Service has used the findings of the research for its 'Floodsafe' community campaign and training, while the Queensland Fire and Emergency Services has used it to inform the 'If it's flooded, forget it' campaign.

The results of this research are significantly contributing to investigations into preventing flood fatalities by the Prevention of Flood Related Fatalities Working Group of the Community Engagement Sub-committee of the Australia–New Zealand Emergency Management Committee. This working group, led by the NSW State Emergency Service, comprises policy makers, practitioners and researchers involved in flood risk management from Australia and New Zealand. ■

Flood fatality research is informing education campaigns for flood safety.



PHOTO: SOUTH AUSTRALIA STATE EMERGENCY SERVICE

INDUSTRY LEADERS TALK CONTROVERSY AND CRISIS MANAGEMENT

Senior leaders from across the emergency management sector came together for the two-day 2017 AFAC Executive Forum held in Melbourne during June.

The event focused on exploring controversy, crisis management and change. With growing pressure on government agencies to meet public expectations and deal with public scrutiny, these topics are of increasing importance within the public sector.

Day 1 of the forum featured presentations on recent crises and disaster events, including:

- ◆ NSW State Emergency Service Commissioner Mark Smethurst on the NSW 2016–17 storm event
- ◆ Queensland Fire and Emergency Services Commissioner Katarina Carroll on Cyclone Debbie
- ◆ SA State Emergency Service Chief Officer Chris Beattie on the South

Australia energy blackout and its implications

- ◆ Emergency Management Victoria Commissioner Craig Lapsley on the Victorian thunderstorm asthma incident
- ◆ NSW Rural Fire Service Commissioner Shane Fitzsimmons on recent NSW fires and preparing for catastrophic events.
- ◆ David Moore, Director of Next Level, also gave a presentation on executive learnings from operational events.

Day 2 of the forum featured presentations from:

- ◆ Matthew Koval from the Department of Agriculture and Water Resources on managing biosecurity events
- ◆ Chair of the New Zealand Fire Service Board Paul Swain on managing crisis and change in New Zealand
- ◆ Victoria Police Assistant Commissioner Luke Cornelius.

The forum included a networking lunch sponsored by Emergency Services Health and a dinner event sponsored by Tait Communications. AFAC would like to thank both Emergency Services Health and Tait Communications for their support. ■

FORUM HEADS WEST

More than 120 researchers, students and partner representatives participated in the Bushfire and Natural Hazards CRC's Research Advisory Forum (RAF) in Perth in April. The forum was held over three days at the new Indian Ocean Marine Research Centre at the University of Western Australia.

The first day was dedicated to development activities for PhD students, with a workshop on life beyond a PhD—either as a researcher or employed in the sector. Several current and former CRC researchers shared their experiences along the career path, including the pitfalls, opportunities and choices they faced.

The two-day RAF discussion focused on the Resilience and Policy themes of the research program. Projects were presented in the main auditorium and breakout workshops were held at other times. The program also included Three Minute Thesis presentations by CRC PhD students Andrew Clarke, Miles Crawford, Bill Calcutt and Charles Newland. ■

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The ways in which people volunteer to keep their community safe from natural hazards are changing.

As our work and life commitments change, many people do not have the time to dedicate to traditional ways of volunteering with an emergency service, undergo the required training, or develop the ability to respond to potentially dangerous situations. But they still want to help, and they still want to volunteer.

Research from the Out of Uniform

project has influenced key national initiatives, with the Australia and New Zealand Emergency Management Committee making extensive use of the study's findings to develop the National Spontaneous Volunteer Strategy.

The strategy provides advice to emergency service agencies on what they need to be aware of—and what they need to consider and plan for—when working with spontaneous volunteers. Important issues, such as legal obligations and social media,

are also covered, with the work of the project team integral to the strategy's completion.

CRC research shows that the nature of volunteering and citizen involvement in disaster management is fundamentally changing. Individual agencies and organisations are regularly seeking advice from the RMIT University team, led by Professor John Handmer, when developing guides and policies for volunteering and spontaneous volunteers.

In particular, the research is already having practical impact on policy and planning. For example, it has informed a Volunteering ACT guide to managing volunteers in emergencies, and contributed to Volunteering Victoria's Outcomes Framework for Spontaneous Volunteer Management.

Emergency services, including the Department of Fire and Emergency Services Western Australia and Emergency Management Victoria, are also using the findings. Be Ready Warrandyte, a community group in one of Melbourne's high-bushfire-risk suburbs, has drawn extensively on the research to help educate and support their local community, while the Australian Institute for Disaster Resilience is using the research to shape a handbook on spontaneous volunteering. ■

Spontaneous volunteering has been on the rise since the 2009 Black Saturday bushfires.



PHOTO: BLAZE AID

MANAGING BUSHFIRES ON THE URBAN-RURAL INTERFACE

AFAC has published a Guideline on the management of bushfires burning on the urban-rural interface.

The Guideline's principal focus is on the control and suppression of fire at the urban-rural interface, while managing public safety and protecting the built environment and other assets.

The Guideline sits within the response phase of the 'Prevention, Preparedness, Response and Recovery' emergency management spectrum.

During 2015 and 2016, AFAC's Rural and Land Management Group established an Interface Firefighting Project Team to develop and finalise the AFAC Guideline.

This Guideline helps to create a common understanding of the management of bushfires at the urban-rural interface and to improve interoperability between multiple agencies in terms of common terminology, firefighting strategy and tactics, approaches to public safety and decision-making at these fires. AFAC acknowledges the significant contributions from its Members who were involved in the development of this publication.

AFAC National Council endorsed the Guideline at their October meeting in 2016. The doctrine is available for all Members to download free from: www.afac.com.au. ■

FIRE AND EMERGENCY NEW ZEALAND

Urban and rural firefighting operations in New Zealand have become unified under a new service: Fire and Emergency New Zealand. The new organisation commenced on 1 July 2017. It joins the previous New Zealand Fire Service and the National Rural Fire Authority, together with 12 enlarged rural fire districts and 26 territorial rural fire authorities.

The Fire and Emergency New Zealand Bill was passed in New Zealand Parliament on 4 May 2017, coincidentally also the date of International Firefighters' Day. The organisation brings together New Zealand's rural, urban, paid and volunteer firefighters for the first time.

Several senior appointments for the organisation have been made, including Rhys Jones as Chief Executive Officer, Kevin O'Connor as National Manager of Rural Fire and Emergency Operations, and Paul McGill as National Commander of Urban Fire and Emergency Operations. For more details, see Movers and Shakers on page 50. ■

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NATIONAL MEMORIAL SERVICE HONOURS FIRE AND EMERGENCY PERSONNEL

On Friday 28 April 2017, AFAC held the third annual memorial service for fire and emergency services personnel.

More than 300 family, friends and supporters of fire and emergency services gathered at the service, which was held at the National Emergency Services Memorial on the banks of Lake Burley Griffin in Canberra.

The National Memorial Service has become an important day of commemoration for the sector to honour the courage and sacrifice of those who have died in the line of duty. This year's service included 13 commemorations from the ACT, NSW and Victoria.

Several families of those who died were presented with an AFAC memorial medallion during the service.

Recognised during the service were Steven Kadar, Katie Peters and Peter Cramer from the Department of Environment, Land, Water and Planning VIC; Mark Cupit, Claire Deane, George Fitzsimmons, Erik Furlan, Bryce Laut, Aaron Harber and John Garland from NSW National Parks and Wildlife Service; Raymond Watson from Fire & Rescue NSW; Simon Fensom from ACT Fire & Rescue; and Jittie Nieuwenhuis from NSW Rural Fire Service.

The service included a message from the Prime Minister of Australia, who

paid tribute to the memory of all fire and emergency services personnel who lost their lives in the line of duty.

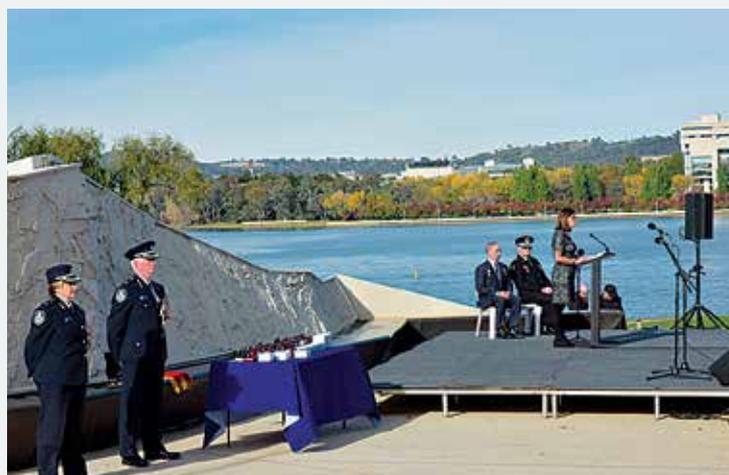
AFAC CEO Stuart Ellis reflected on what the National Memorial Service meant to the fire and emergency services community.

"It's a tremendously important occasion for our sector, and of course for the families and friends who have lost a loved one," said Mr Ellis.

"The presentation of an AFAC memorial medallion engraved with the names of those who have died, hopefully in some small way, provides a level of comfort to those who have lost so much." ■



The 2017 National Memorial Service was held on the shores of Lake Burley Griffin, Canberra.



The service honours the courage and sacrifice of those who have died in the line of duty.

FOREST FIRE MANAGEMENT VICTORIA

Victoria's public land management, parks, forests and water agencies have come together as Forest Fire Management Victoria (FFMVic) to manage and protect Victoria's parks, reserves and forests.

FFMVic are the lead agency for bushfire management on public land, dam safety, water and wastewater service disruption and whale stranding.

The agency's structure enables teams from a range of departments and agencies to easily work together. It brings together staff from the Department of Environment, Land, Water and Planning; Parks Victoria, VicForests and Melbourne Water, and works alongside Victoria's fire services and emergency services to protect communities, property and land.

As a government agency, FFMVic has responsibility for planned burning and preparedness activities, maintaining water points and fire towers in forests and parks and managing community and environmental recovery. ■

AFAC caught up with FFMVic Chief Fire Officer Stephanie Rotarangi about her role, experiences and priorities for the future of the agency, which you can read on page 44.

FIRE SPREAD MODELS GUIDE GOES DIGITAL

A Guide to Rate of Fire Spread Models for Australian Vegetation is now available in full-colour digital format as a free download.

Joint publishers of the guide, AFAC and CSIRO, first released the guide as a print edition in 2015. The new digital version can be downloaded free at: research.csiro.au/firemodelsguide.

The guide presents, reviews and discusses rate of fire spread models and their applicability for operational use in prescribed burning and wildfire suppression in grasslands, shrublands, dry and wet eucalypt forests, and pine plantation fuel types.

Background information is given throughout the guide, as well as a description of each model, including the data that constitute each model's application bounds. The mathematical equations that form each model are presented along with a discussion of model form and behaviour, the main input variables and their influence, and performance evaluation studies undertaken to date. ■

Copies of the print edition are still available for purchase from AFAC's online shop at: www.afac.com.au/auxiliary/shop.



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CAN WE PREDICT BUSHFIRES FROM SPACE?

Bushfire and Natural Hazards CRC research has received a boost, with CRC researcher Dr Marta Yebra receiving a prestigious award from the Australian Academy of Science.

Dr Yebra, based at the Australian National University, is one of the first two recipients of the Academy's Max Day Environmental Science Fellowship Award. The Max Day Award provides up to \$20,000 to support early-career researchers working on the

conservation of Australia's flora and fauna, ecologically sustainable use of resources, protection of the environment and ecosystem services.

Australia's forests are among the most fire-prone in the world. Satellite monitoring could greatly help to predict and mitigate bushfires before they occur. This space-based monitoring will be one step closer thanks to Dr Yebra's research in the Mapping bushfire hazard and impacts project.

Dr Yebra will use her Max Day Award funding to conduct experiments at the National Arboretum Canberra to determine the moisture content of Australia's native forests. Moisture content is particularly important to predicting bushfires on a large scale, because it affects the likelihood of ignition occurring and the fire's severity and spread. This real-world data will be incorporated into new models that can be used to predict bushfires. ■

Dr Marta Yebra conducts a grassland fire experiment.



PHOTO: CAROLINA LUZ

INSPECT & TEST MILESTONE

In 2013, Fire Protection Association Australia (FPA Australia) had a vision that all individuals in the fire protection industry would be fit for action—trained, competent and accredited by 2020. The Fire Protection Accreditation Scheme (FPAS) was launched so that individuals performing inspection and testing activities for fire protection systems and equipment had an independent framework in which they could be assessed and recognised.

In May 2017, FPA Australia achieved a milestone getting ever closer to achieving this vision with the scheme

“The Industry wants to see accreditation so FPAS is important for the industry. Other schemes have tried and failed but this one is going to work.”

– Ken Denning

now having more than 2,000 Inspect & Test accredited individuals. FPA Australia CEO Scott Williams described it is an outstanding achievement and one that shows the growing understanding in the industry of the need for accreditation and the delivery of professional services.

“There's still a long way to go but the Association continues to invest in staff, resources and systems to expand and accelerate our accreditation framework toward a fully professional and valued fire protection industry,” said Scott Williams CEO, FPA Australia.

“We still have many hundreds and hundreds of applications to process and there is no doubt FPAS is now the recognised benchmark and standard for the fire protection industry in regard to accreditation,” said Mr Williams.

“With other classes now available, such as Systems Design, Systems Certification with Emergency Planning and Training, and Annual Survey Certification due to be released shortly, the future of the industry and the realisation of our vision remains very positive.”

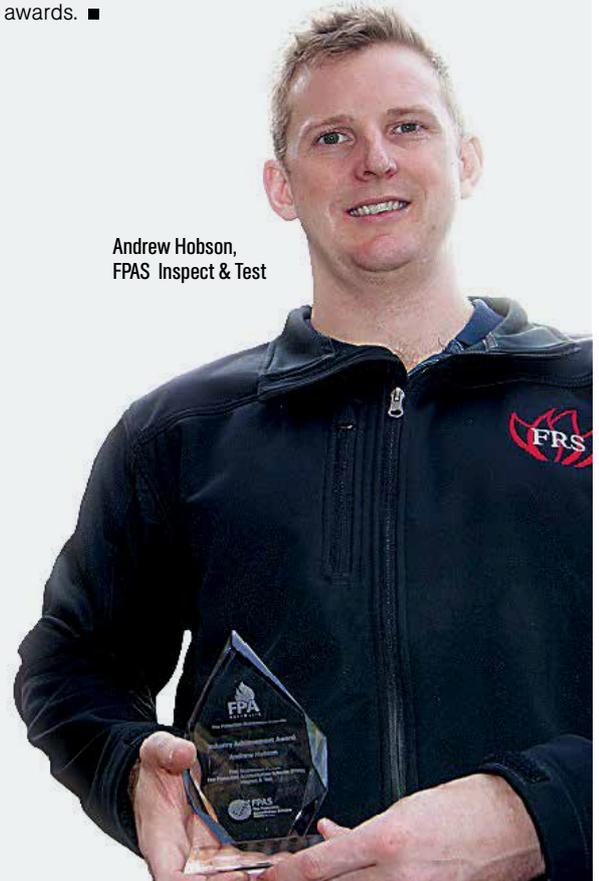
To mark the occasion special awards were given to the individuals who were the first to gain accreditation in their particular category. Ken Denning was the first fire protection industry practitioner to gain accreditation in FPAS Fire Systems Design.

“The industry wants to see accreditation so FPAS is important for

the industry. Other schemes have tried and failed but this one is going to work,” said Mr Denning.

George Andrews the first practitioner to gain FPAS Fire Systems Certification accreditation and Andrew Hobson the first to be accredited under FPAS Inspect & Test, were also presented with awards. ■

Andrew Hobson,
FPAS Inspect & Test



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Lessons on leadership shared nationally

Throughout May 2017, the Knowledge Event Series was held in six locations across Australia and in New Zealand. Lessons on leadership and collaboration were shared nationally through this professional development opportunity offered by AFAC and Motorola Solutions.

Participants gained an international perspective from our presenter John Beard, the Assistant Chief Fire Officer of the Gloucestershire Fire and Rescue Service in the UK. Mr Beard spoke about leading through change and leadership behaviours that drive an ethos of true public service at all levels within an organisation. He also outlined his responsibility for the two largest capital investment projects in the service, including reshaping the response model.

Mr Beard joined the service as a retained firefighter in 1991 and has served in a wide range of roles over his career, including many senior positions. He is also a representative of the Chief Fire Officers Association (UK), an organisation with which AFAC has an ongoing partnership.

The Knowledge Event Series kicked off in Darwin on 17 May and travelled to Adelaide, Sydney, Hobart and Melbourne, finishing in Wellington on 29 May. Around 350 people from across the emergency management sector attended the series, which was free of charge thanks to the support of Motorola Solutions. ■

Look for our full report on the Knowledge Event Series in the next issue of *Fire Australia*.



The Knowledge Event Series took place in six locations across Australia and in New Zealand.



John Beard shared lessons on leadership and leading through change.

ASSESSING FIRE FUEL WITH SMART PHONES

Research is improving the accuracy of vegetation monitoring for flammability—and saving critical hours—through the development of a beta smartphone application. Fuels3D, which is built on the Android platform, will allow land managers to rapidly collect imagery in the field. It uses computer vision and photogrammetric techniques to calculate fuel measurements and severity metrics.

There is great potential for the app to aid decision-making, believes Simeon Telfer from South Australia's Department of Environment, Water and Natural Resources.

"This project has engaged end users through the development of prototype products, workshops and circulating outcomes and published materials," Mr Telfer said.

"The Fuels3D mobile phone app has been of particular interest. This app has the potential to reduce fire fuel sampling times from hours per site to minutes. This helps to improve our knowledge of prescribed burn efficacy, inputs into fire behaviour modelling and information towards risk assessment and planning.

"These improvements will improve knowledge of risk and treatment options across landscapes." ■

PHOTO: KARIN REINKE



Bushfire and Natural Hazards CRC research is developing better ways to use satellites to map fires.

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AUSTRALIAN INVENTORS HONOURED AT INTERNATIONAL AWARDS

The Australian inventors of a revolutionary smoke-detection technology have been recognised with one of the fire protection industry's most prestigious international awards.

David Packham, John Petersen, Martin Cole and Len Gibson (who was recognised posthumously) developed the Very Early Smoke Detection Apparatus, or VESDA. The VESDA has improved the accuracy, reliability and applicability of detection systems in challenging environments for more than 20 years.

The group won the Philip J DiNenno Prize, also known as the Nobel prize for public safety, which is worth US\$50,000. The prize was presented at the National Fire Protection Association (NFPA) Conference held in Boston, US on 4 June.

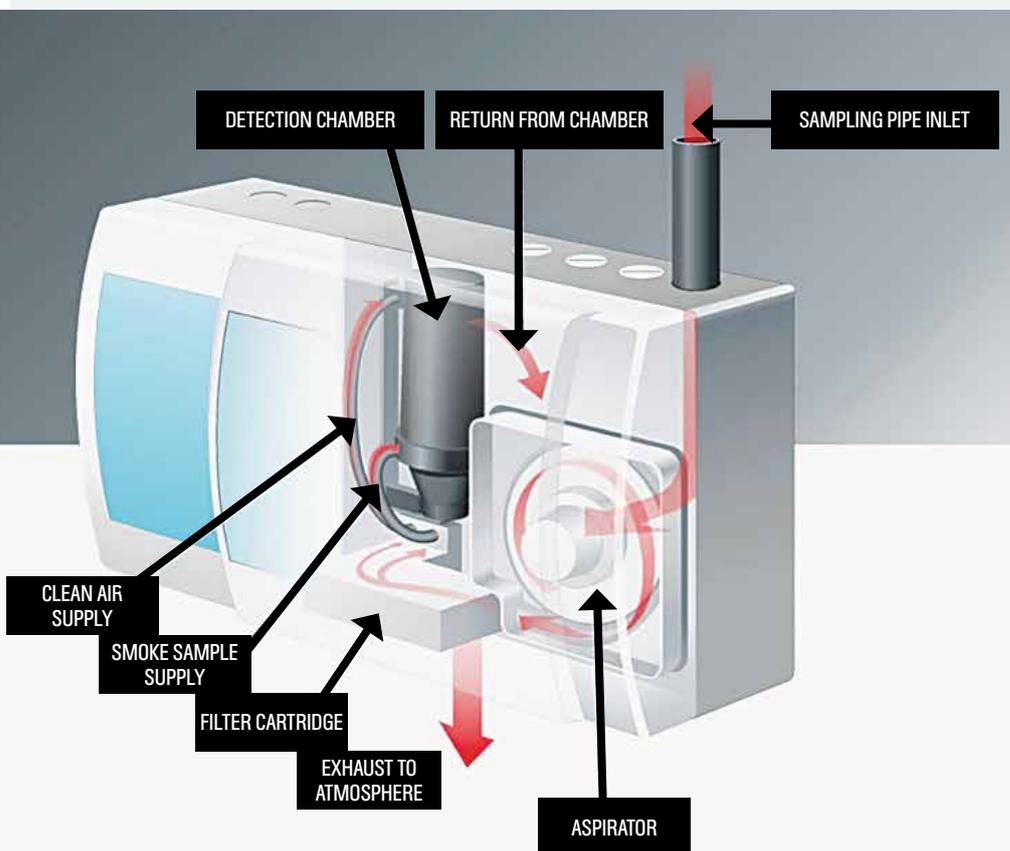
David Packham and Len Gibson are also the 2002 recipients of Fire Protection Association Australia's A.V. Viscogliosi Award for Outstanding Service to the Fire Protection Industry.

ACCORDING TO THE NFPA:

VESDA technology and its pre-eminent role in the global introduction of aspirated smoke detection or ASD has led to a major impact on public safety. The VESDA innovation transformed the fire detection and alarm industry and inspired a whole new aspirated smoke detection area of technology.

The installation of VESDA in telecommunication facilities, telephone exchanges, data centres, high technology manufacturing, industrial control rooms and other related facilities has had a significant impact on asset protection and business continuity. In addition, the very early smoke detection by VESDA provides life safety protection for employees working in these buildings.

VESDA technology allows for smoke detection over a very large, dynamic range, which means it can be used for both high and standard sensitivity alarm points typically seen in spot smoke detectors. VESDA has proven to be an adaptable technology that is ideal for effective detection in unique applications. For instance, VESDA has been successfully tested and used in road tunnels and zoo enclosures.



The DiNenno Prize [see over] was established in 2014 following Mr DiNenno's passing in 2013. More information can be found at: www.nfpa.org/dinenno.

"Fire Protection Association Australia congratulates John Petersen, Martin Cole, David Packham and the family of Len Gibson on their involvement and recognition of VESDA," said Association CEO Scott Williams, who was in Boston to attend the NFPA Conference.

"VESDA has contributed greatly to community safety and it is fitting that it be recognised with such an important and prestigious award on the world stage."

How do VESDA systems work?

VESDA Systems are aspirating smoke-detection units that incorporate laser technology. They 'breathe in' the air to detect smoke, and are used for early warning applications where response to a fire is critical.

VESDA works by continually drawing air into its pipe network via a high-efficiency aspirator. A sample of this air is then passed through a dual stage filter. The first stage removes dust and dirt from the air sample before it allows the sample to enter the laser detection

chamber for smoke detection.

The second (ultra-fine) stage provides an additional clean air supply to keep the detector's optical surfaces free from contamination, ensuring stable calibration and long detector life.

From the filter, the air sample is passed through to the calibrated detection chamber, where it is exposed to a laser light source. When smoke is present, light is scattered within the detection chamber and is instantly identified by the highly sensitive receiver system.

The signal is then processed and presented via a bar graph display, alarm threshold indicators and/or graphic display. The VESDA detectors are able to communicate this information to a fire alarm control panel, a software management system or a building management system via relays or a high-level interface. ■

SOURCE: Wormald

DINENNO PRIZE

The DiNenno Prize is a memorial to Philip J DiNenno (1953–2013) to assure that his contributions to fire safety will be remembered. The DiNenno Prize is given by the NFPA, beginning in 2015, to recognise an important innovation that has had a significant impact on public safety (building, fire and electrical). The DiNenno Prize consists of a diploma and medal presented to each winner, as well as a significant monetary award funded by an endowment. The Prize is presented at the NFPA Annual Meeting, where those being recognised for the innovation are invited to present a plenary lecture on the prize-winning innovation. Nominations for the DiNenno Prize are by invitation only by highly regarded institutions and experts selected by the Prize Selection Committee.

Mr DiNenno was best known as the founding editor of the Society of Fire Protection Engineers' *SFPE Handbook of Fire Protection Engineering* (1st edition, 1988), which he edited through four editions. He conceived the handbook when he was in his early thirties as a means for transforming fire protection engineering into a true science-based engineering discipline. The handbook has come to define the profession. He served SFPE in many roles, including president. He was awarded numerous awards by SFPE, including SFPE's highest honour, the Guise Medal. ■

US STUDY TOUR

Members of the Fire Protection Association Australia (FPA Australia) US Study Tour have been hosted by Fire Department New York (FDNY), where they heard first-hand about the devastation caused by the 9/11 tragedy.

The Manhattan Borough Commander of FDNY, Chief Roger W Sakowich gave a personal tour of the 9/11 memorial, and recalled what it was like to have lost so many friends and colleagues who were the first responders to the tragedy 16 years ago.

"It was incredibly moving to meet and talk to someone so closely involved in the response and recovery effort. I think I can speak for everyone on the tour when I say that it was a special moment on a trip that has already provided many special moments," said FPA Australia CEO Scott Williams.

"Chief Sakowich also took the group through the new One World Tower, which replaced the two World Trade Centre buildings that were destroyed in the terrorist attack. The group saw the extent of the fire safety systems and the level of construction of the building to address the many lessons learnt from 9/11. One World is a truly remarkable building and the level of technology related to the fire systems in this building is nothing short of an engineering marvel.

"The Director of Fire Safety for One World and a representative of Underwriters Laboratories assisted in the tour as well. The FPA Australia tour party were thrilled and very honoured to have been shown such a courtesy by our US colleagues."

The 14-day tour returned to Australia on 12 June. It commenced in New York before moving on to Boston for the National Fire Protection Association annual conference. ■



The FPA Australia US Study Tour Group with Chief Sakowich (centre).

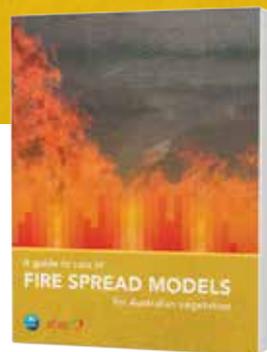


Chief Sakowich (left) with FPA Australia CEO Scott Williams.

A guide to rate of

FIRE SPREAD MODELS

for Australian vegetation



Download a FREE full colour digital version at:
<https://research.csiro.au/firemodelsguide/>

This essential reference guide to fire spread models is now also available in digital format. First published in 2015, the guide presents, discusses and reviews these models and their application and use in prescribed burning and wildfire suppression in grasslands, shrub lands, both dry and wet eucalypt forests, and in pine plantation fuel types. Download a free digital copy as above, or order a hard copy through the AFAC shop at <http://www.afac.com.au/auxiliary/shop/product?ID=1469>.

FIRE PROTECTION'S FUTURE CHALLENGES

Fire Australia 2017, held in Sydney in May, was Fire Protection Association Australia's (FPA Australia) most successful conference and tradeshow ever, with more attendees, more sponsors, more exhibitors and an impressive gathering of industry experts.

BY **COMMANDER
TIM LANDELLS**

Melbourne Metropolitan Fire Brigade Fire Investigation and Analysis

Fire Australia 2017 was officially opened by the NSW Minister for Innovation and Better Regulation, the Hon Matt Kean. The minister congratulated FPA Australia for their contribution to the legislative reforms that will bring widespread improvements to the fire protection industry in NSW.

"This Association has just helped the NSW Government deliver the biggest reform package around fire protection and safety the state of NSW has ever seen," said Mr Kean.

Local and international industry leaders and experts provided important insights into issues and topics that are shaping the future of the fire protection, fire safety and HAZMAT industries. How those challenges are faced will have the most significant impact for community safety as it becomes more organised and professional.

Some of the conference's highlights are described below.

Jim Pauley, President and CEO National Fire Protection Association (US)

As head of one of the leading fire protection peak bodies in the world, Jim Pauley spoke with great authority when he identified the three biggest challenges: an ageing population, increased frequency and severity of bushfires, and the management of the fire risk posed by a massively expanding renewable energy industry.

More than 25% of Australia's population will be aged over 65 by the year 2040. While we are a healthier group than ever before, increased age creates increased risk through age-related impairments to mobility, hearing and sight.

"This shift in population is going to

impact every area of building, fire and life safety," Mr Pauley told conference delegates.

Bushfires were another area predicted to grow in severity and frequency with an increasingly significant economic impact.

"The Climate Institute estimates the total economic cost of disasters in Australia, including bushfires, exceeded \$12 bn in 2012. They further expect those costs to double by 2030 and to rise to an average of \$23 bn per year by 2050," he said.

Renewable energy, predicted to play a major role in managing future energy needs, also presents issues for firefighters—particularly with the high use of solar panels in residential and commercial applications. Australia, said Mr Pauley, had one of the highest levels of installation of residential solar panels in the world. Internationally there are an estimated 2.5 bn solar panels in use, so the scale of the issue is huge.

"How do you safely shut off power to a system that is constantly generating electricity? How do you ventilate or navigate a rooftop that is completely covered with solar panels?" Mr Pauley asked.

His colleague, Chris Dubay, Vice President Engineering and Electrical at the National Fire Protection Association (NFPA), reiterated the need to closely monitor renewable energy in his paper, which looked at the fire risks involved with storage of lithium-ion batteries. These are the main method of storing renewable energy, so understanding the associated fire risks is an increasing focus of investigation.

Al Ramirez, Underwriters Laboratories (US)

Underwriters Laboratories (UL) is one of the world's biggest researchers of fires, their causes, behaviours and effects. Al Ramirez presented on the fire spread characteristics associated with newer

homes compared with older ones.

The research found that modern building materials and furnishings are often more flammable than older counterparts. Furniture is often created with materials that are petro-based. When they start to burn, they do so quickly and at high temperatures. This releases dangerous combustible gases that add to the dangers for residents and to the risk firefighters face when they have to tackle such blazes.

"We have synthetic materials being introduced to homes that weren't there (in older homes) and older homes had a lot more natural fibres, natural fabrics," Mr Ramirez said.

"The introduction of synthetics, petroleum-based materials, really influence the content that we see now."

As a graphic demonstration, Mr Ramirez showed a video with two rooms, side by side. One was a 'legacy room' with older furniture, while the second was a 'modern room' with new furniture in an identical fire situation. While the new furniture was ablaze in less than three minutes, spreading highly noxious fumes, the older furniture took more than 20 minutes to reach full flame and burned far cleaner than the modern counterpart.

Fire brigades aim to be on scene within seven minutes, but UL's research shows even that might not be enough to protect occupants from fires involving modern furnishings. You can watch the video at www.youtube.com/watch?v=aDNPhq5ggoE.

Graeme Leonard, Reliable Automatic Sprinklers (UK)

Graeme Leonard's presentation was timely, given that a lot of discussion had been generated about ways of handling the issues Mr Pauley had identified—especially in protecting an ageing population.

In 2009, a fire in Lakanal House, a multistorey apartment block in the

UK, killed six people. A coroner's report recommended investigating the potential for a sprinkler retrofitting program. Reliable Automatic Sprinklers supported the British Automatic Fire Sprinkler Association's Callow Mount Project, which developed a retrofit process.

According to Mr Leonard, the objectives of the Callow Mount Project were to:

- ◆ demonstrate that sprinklers can be effectively retrofitted in existing apartment high rises
- ◆ gauge the cost-effectiveness of the retrofit
- ◆ conduct the retrofit in occupied premises with minimal disruption to residents
- ◆ use the project as an exemplar for others to follow.

"We found that the average cost on the retrofit Callow Mount Project equated to about \$2,000 so hopefully that debunks a lot of the myths about sprinklers just being too expensive," Mr Leonard said.

The retrofitted systems have been tested in real life, when a retrofitted unit experienced a fire causing the sprinklers to activate.

"In the Sheffield low-rise retrofit,

there was a fire event. An elderly lady had a mobility scooter parked outside her unit, which had some faulty electrics that caused a fire on the outside facade which would have spread into the unit had the sprinklers not been operating. The sprinklers prevented the fire from coming in to the unit and maintained it as viable until the fire and rescue service arrived. In my opinion, that saved a certain fatality," Mr Leonard explained.

The fire protection industry in Australia is looking very closely at the results of Callow Mount and the NFPA's home fire sprinkler program in the US, to see what possibilities there are for Australian houses and apartment blocks currently without such protection.

Charity dinner

The Fiona Wood Foundation is justifiably world-renowned, which is why FPA Australia is proud to give its ongoing support. The Fire Australia Charity Dinner, sponsored by Chubb, was a great opportunity for individuals and businesses to get behind the Foundation.

FPA Australia raised nearly \$27,000 on the night, which is fantastic in its own right, but the most memorable part of the evening came from Bali bombing

survivor, the inspirational David Fyfe, whose horrific injuries were treated by Fiona Wood herself. Mr Fyfe recounted the explosion and the damage it did to his body, as well as the story of recovery and the work Professor Wood did to save and restore his life using techniques the Foundation pioneered.

The Association Board, Management and staff is proud that Fire Australia 2017 was such a record breaker, and thanks everyone involved, particularly our sponsors Tyco Fire Protection Products and Kidde—as well as our Platinum members—for making it such a huge success. ■

Fire Australia 2017's Charity Dinner raised a record \$27,000 in aid of the Fiona Wood Foundation and their work developing burns treatments.



FIRE PROTECTION INDUSTRY AWARDS GALA 2017

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Interested in supporting the Fire Protection Industry awards? Contact us today to discuss judging or partnership opportunities available – awards@fpaa.com.au

GALA AWARDS EVENING
9TH NOVEMBER, 2017
MELBOURNE



MFB FIGHTS SOLAR FIRES

In the past five years, the Metropolitan Fire and Emergency Services Board (MFB) has responded to more than 40 fires involving solar panels. The causes of these fires vary, but they are usually sparked by faults in the isolation switch or inverters, rather than the panels themselves.

Properties with solar panels installed pose a challenge for firefighters during an emergency incident, due to the panels' capability to generate electricity. When responding to a fire at these premises, MFB firefighters take several safety precautions, such as arranging for the panels to be disconnected, and wearing protective gear, including gloves.

MFB's Fire Investigation and Analysis team has conducted several investigations into fires involving solar panels. This work has led to the safety recall of some potentially dangerous products, which presents a great outcome, both for MFB and the community.

Some examples of fires that MFB has attended include:

- ◆ a solar panel on the roof of a house in Cheltenham caught fire
- ◆ a solar panel placed in a balcony garden bed to power Christmas lights in Doncaster East caught fire
- ◆ solar panels being transported by courier in Fawkner caught fire in the truck after being placed too close to the exhaust pipe.



Electrical faults can cause a fire in solar panel arrays, but these are usually sparked by faults in the isolation switch or inverters, rather than the panels themselves.

As technology moves forward with the introduction of battery-storage systems, MFB is working with all parties involved to have input relating to safety and fire risks. As with all electrical equipment, MFB recommends service and regular maintenance to reduce the likelihood of electrical faults causing a fire.



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The National Construction Code (NCC) does not provide guidance for testing external wall materials and systems that are combustible. However recently developed standard AS5113, provides a framework for the classification of external wall systems and refers to test methods BS8414 Part 1 and 2 2015, ISO 13785-2 and AS1530.4-2014 Appendix B7.

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LOCATION, LOCATION, LOCATION – REVIEWING AS 2444-2001

Many of us will have walked through an apartment, office high-rise or a public building—such as a hospital or sporting arena—and read the signs showing the location of a fire extinguisher. It's probably background information for most people, who wouldn't normally register it. But if there was a fire, that location, signage and the choice of extinguisher could be lifesaving.

As with all things in fire protection, a great deal of thought has already gone into optimising the choice and location of fire extinguishers and fire blankets.

The relevant Standard is AS 2444-2001 *Portable fire extinguishers and fire blankets – selection and location*. Fire Protection Association Australia (FPA Australia) believes it is now time to review that Standard.

In the 15 plus years since the last edition of AS 2444-2001 was published, many new technologies and materials have become commonplace, creating new hazards and new hazards practices. For example, modern building materials and furnishings behave differently in a fire; there are new fuels on the market, such as ethanol, and new thinking may be required about what kind of extinguisher provides the best performance.

There are also some points of confusion about identifying when to select and install different classes of extinguishers and how to apply the rules for their distribution.

The Standard also covers

extinguishers used in vehicles which is another area where technologies that are now almost commonplace—such as hybrids and fully electric vehicles—weren't even a consideration during the original drafting of the Standard.

Under these circumstances, it is not surprising that industry and consumers are sometimes confused. They frequently ask about the difference or advantages and disadvantages of an extinguisher of the same size but different rating and classification, or different size but same rating and classification.

FPA Australia has asked the fire protection industry for input on what industry members believe should change to improve the Standard. The industry feedback will be considered in a review of AS 2444-2001 by FPA Australia's Technical Advisory Committee for portable and mobile equipment (TAC/3/7), with the aim of submitting a project proposal to Standards Australia to revise this Standard.

To assist in identifying the sort of issues that could be raised, TAC/3/7 has provided the following examples that have already been identified:

- ◆ Extinguishers of different sizes but the same rating and classification. Extinguisher rating and classification (e.g. 2A:20B:E) is currently used to determine suitable extinguishers and their distribution, but you can sometimes have extinguishers of the same rating and classification

but different sizes (e.g. 4.5 kg or 9 kg). Does size also need to be a consideration in the selection of extinguishers? For example, should a minimum extinguisher size also be set, or should the issue of size simply be discussed as part of the informative appendices, so people understand the advantages and disadvantages of a smaller or larger size for the same rating and classification?

- ◆ Greater clarification needed of what light, ordinary and high hazards are, and what this means for selection, location and distribution of extinguishers.
- ◆ Need to review any contradictions between AS 2444-2001 and the Building Code of Australia.
- ◆ Clarification needed on the difference between similar vehicle types. Clarification also needed on when an extinguisher fitted with a hose is needed, and why and if higher ratings are needed for extinguishers in vehicles used outside urban areas.
- ◆ Ethanol blended fuels are now readily available and have been for some time, however, there is no clear guidance on extinguisher type for this hazard. This may also require changes to the testing standard (AS/NZS 1850) to include a test for such fuels. ■

If you have any questions, please contact the Technical Services Department at: technical@fpaa.com.au.



SOCIETY OF FIRE SAFETY AWARDS

The Society of Fire Safety (SFS) has announced its Hall of Fame and Research Grant award winners.

Paul England becomes a 'Hall of Famer', while the \$5,000 Research Grant Award was presented to Edmund Ang. Both awards were presented during the Fire Australia Conference and Tradeshow in Sydney in May.

Mr England is a founding member of the SFS and has worked in fire safety engineering for more than 25 years, making a remarkable contribution. He also established the country's first private fire-testing company, Warrington Fire Research (Australia), in the 1990s.

Mr Ang is the inaugural winner of the SFS Research Grant, which is

awarded to Australian students in fire science, engineering or a related field to encourage and support research projects that contribute towards excellence in fire safety engineering.

Mr Ang is investigating 'throttling effect', which is a phenomenon where fire in a tunnel or passageway increases flow resistances, thereby reducing flow velocity due to the injection of volatile fuel mass and increase in air temperature. His goal is to establish a model that describes the fire throttling effect in longitudinally ventilated long tunnels or passageways from first principles.

Fire Protection Association Australia congratulates Mr England and Mr Ang on their awards. ■

AMICUS COMBINES SCIENCE AND EXPERT KNOWLEDGE IN PREDICTIONS OF BUSHFIRE SPREAD

New prediction software developed by CSIRO is helping to combine the complex science of fire behaviour prediction with the expert knowledge needed to fill in the gaps.

BY **DR MATT PLUCINSKI**

CSIRO

Fast and accurate fire spread predictions are essential for planning effective fire-suppression strategies, issuing targeted public warnings and conducting safer prescribed burns. Amicus is a new fire behaviour prediction system that will help fire agencies achieve these goals.

Developed by CSIRO, Amicus has been designed to improve the reliability of bushfire behaviour predictions. Reliable fire behaviour predictions communicate the likely progression and arrival of a bushfire. These predictions are prepared by highly trained specialists using a broad range of data sources and fire science—including models—along with their own expert judgement.

Amicus enables the combination of scientific fire knowledge with expert judgement in a direct, transparent way. It presents the results of state-of-the-art fire

behaviour models for the major Australian fuel types in an intuitive interface, allowing informal supplementary knowledge to be easily captured and used. Through this process, Amicus aims to improve the reliability of manual bushfire behaviour predictions.

The process of predicting fire behaviour

While the tools developed to predict fire behaviour are constantly evolving, there will always be gaps in our knowledge. Expert judgement is often needed to provide quality assurance in the application of the science, and helps to fill the gaps in the formal knowledge—such as when input data are outside the conditions covered by fire behaviour models.

Expert judgement is usually applied to predictions during the manual preparation of fire-spread maps and their interpretations. Manual predictions require fire behaviour specialists to select and take responsibility

for the assumptions that are used. Expert judgement cannot be readily incorporated into the automatically generated spread maps from fire-spread simulators, where assumptions, such as those related to fire shape, are embedded within the software.

Combining formal, model-based predictions with informal information, such as expert knowledge, in a consistent and effective way is a key challenge. Amicus aims to combine the science with the informal, expert knowledge to help improve the quality of fire behaviour predictions and increase confidence in prediction results.

How does Amicus work?

Amicus calculates fire danger and key fire behaviour characteristics for fires burning in major Australian vegetation types (grasslands, forests, shrublands and plantations, including pine) in both bushfire and prescribed-fire situations. The models used in Amicus—such as

Future versions of Amicus will hopefully include a searchable database, allowing comparisons with historical fires, such as Black Saturday pictured below, in similar conditions.

PHOTO: COUNTRY FIRE AUTHORITY

the CSIRO grassland model, the dry eucalypt (Vesta) forest fire model and pine plantation pyrometrics model—have been recommended in recent reviews and are fully validated against their original sources. The models cannot be modified by users; therefore, all predictions are reproducible.

There are three main input types in Amicus: weather (meteorology), fuel (vegetation) and location (topography). Forecast, historical or hypothetical weather streams are entered on the meteorology panel, while fuel and topographic data are entered on separate panels. Site-specific fuel characteristics can be saved and stored as a 'fuel scenario' and can be modified later if required. Users can also explore the impact of variability in inputs by generating multiple fuel scenarios and comparing the predictions.

Fuel scenarios are matched with a weather stream to calculate fire behaviour outputs (e.g. rate of spread, flame height, fireline intensity, maximum spotting distance) where models exist. The outputs are presented in graphical and tabular formats and can be easily exported for use in other software. Rates of spread can be displayed for a range of topographies.

Amicus is unique among fire behaviour prediction systems because it notifies users when the reliability of a model prediction is reduced by inputs being outside the model's confirmed reliability range. These warnings provide details of breached assumptions, and thereby act as a prompt for users to consider expert intervention only in situations where they are necessary. The warnings also allow users to understand that there is increased uncertainty in any predictions made under these conditions.

The system's predictions are saved in a project file that can be archived

and later revised to produce updated predictions. The software can also collate user-entered information on input sources, fuel scenarios, models used and accompanying notes. This allows users to keep track of decisions made during the prediction process and produce summary reports.

Amicus enhances the expertise and knowledge of a well-trained, experienced fire behaviour specialist by enabling the best quality information to be incorporated into highly specialised fire behaviour predictions.

Availability and future development

Amicus is currently available as a beta version for common operating systems, including Windows 7/8/10, MacOS X and Linux. Users can also access training videos and other documentation, including a user guide, from the website.

While these beta versions of the software are suitable for operational use, Amicus is still under development, and will be continually tested and refined by CSIRO in response to feedback. New versions of Amicus will be issued with additional functions and features as fire science evolves, and new models and fire behaviour knowledge become available. Users are alerted if a new version is available whenever Amicus is started with an active Internet connection.

Some high-priority features already under development include:

- ◆ ensemble model simulation to assess the impact of input uncertainty
- ◆ visualised output analysis to allow users to compare the effects of different drivers of fire spread
- ◆ direct downloads of weather forecasts for specific locations, automated generation of prediction summary

PHOTO: JASON KLEINIG, CFS PROMOTIONS UNIT



A beta version of Amicus is now available for use by fire agencies.

PHOTO: MATT PLUCINSKI, CSIRO



Amicus will help fire behaviour analysts use their expert knowledge to better predict the path of fires.

reports, and comparison of multiple weather streams

- ◆ integration with existing agency workflows and existing systems.

CSIRO's long-term vision is for Amicus to evolve into a complete knowledge-base system that will enable users to upload details of their predictions along with relevant observations and documentation (e.g. photos and videos) of fire behaviour, fuels and weather. This will improve future predictions by providing users with a searchable database that allows comparisons with historical incidents in similar conditions, enhancing users' expert knowledge and extending the range of effective predictions. ■

The Amicus fire behaviour prediction system and its related resources are available at: research.csiro.au/amicus.



SCIENCE-BACKED TOOLS IMPROVE WATER CATCHMENT MANAGEMENT

An AFAC case study has examined the success factors for using complex science to manage water catchments and identify potential water quality risks.

BY **BRENDA LEAHY**

Communications Officer, AFAC

Heavy rain in areas burnt by bushfire can mobilise massive volumes of sediments and nutrients into rivers and water reservoirs. This threatens the quality and supply of water to Australia's capital and regional cities, and damages freshwater ecosystems.

Researchers working with ACT Parks and Conservation Service (ACT PCS) and AFAC's Rural and Land Management (RLM) group have developed an innovative suite of tools and resources to help end users identify water catchments susceptible to post-fire soil erosion, flooding and water quality risks.

Throughout 2015-16 ACT PCS successfully managed and trialled the suite of tools. The agency now uses the

resources to plan prescribed burning operations, and target drainage and infrastructure works in identified risk-prone areas with significant water assets and important ecosystems.

The evidence-based toolkit draws on research undertaken by Dr Petter Nyman and Dr Gary Sheridan of the University of Melbourne for the former Bushfire CRC's Fire in the Landscape project, and their work with the Victorian



Eroded material from burned areas consists of ash, organics and mineral soil.



A very large debris flow near Licola (East Gippsland, Victoria) after the 2007 bushfires.

Bushfire Rapid Risk Assessment Team (Bushfire RRAT). The researchers investigated the link between factors such as fire severity, rainfall intensity and post-fire debris flow processes in site-specific studies in north-eastern Victoria.

"Burnt headwaters catchments contain large amounts of ash, sediment and debris that can be flushed into rivers and water supply reservoirs," said Dr Nyman. "High sediment loads from debris flows cause high turbidity and water contamination due to increased nutrient and metals from pollutants in the runoff."

This type of contamination occurred from post-fire debris flows after the Canberra bushfires in 2003, resulting in ACT water restrictions until a new water treatment plant was constructed.

"We also saw this type of contamination in the Ovens River after the eastern Victorian alpine bushfires in 2003 due to sediment and nutrient from debris flows in burnt headwaters," Dr Nyman continued.

"Debris flows also led to contamination of Lake Glenmaggie after the 2007 bushfires in Victoria. The impacts of burned catchment on water quality have been documented elsewhere in south-east Australia,

including the Nattai Catchments near Sydney and the Lofty Ranges near Adelaide, although we have not yet observed the extreme type of debris flow processes in these areas.

"These scenarios from various landscapes across south-eastern Australia highlight the importance of considering water quality issues when managing fire in high-value water supply catchments."

Dr Nyman and Dr Sheridan collaborated with ACT PCS as the lead end user agency, AFAC's Research Utilisation Manager, Dr Noreen Krusel, and the RLM group to develop and deliver two key outputs for utilisation.

The initial output, funded by AFAC in 2014, was an Australia-wide assessment of post-fire erosion risk accompanied by generic guidelines for evaluating risk to water quality. This was followed by the development of a suite of GIS tools, which was funded, managed and successfully trialled by ACT PCS in 2016. The tools generate post-fire risk assessments of erosion, flooding and water quality and build on other collaborative work by the researchers for the Bushfire RRATs in Victoria.

ACT PCS lead end user, Dr Adam Leavesley, says the work has changed

the way the agency identifies and manages the potential impact of post-fire erosion.

"The tools have enabled us to integrate water quality risk into our burn planning and implementation, plus they have given us the capacity to assess the risk after planned and unplanned fires," said Dr Leavesley.

The latest AFAC case study, available on the Research Utilisation page of AFAC's website, examines the key factors that enabled this complex research to be utilised effectively. The researchers and end users agree that the key success factor was their partnership approach, which was built on mutual trust and commitment to deliver practical, science-backed resources. ■

For further information on the research, contact Dr Petter Nyman (nymanp@unimelb.edu.au) or Dr Noreen Krusel (noreen.krusel@afac.com.au).

For further information on the ACT trial, contact Dr Adam Leavesley (adam.leavesley@act.gov.au).

To download the case study, visit www.afac.com.au/initiative/research.



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Laboratory testing of foam concentrates can be done easily, but the real challenge is interpreting the results.



TESTING FOAM CONCENTRATES

Foam concentrates should be tested every year as part of the normal service for foam systems. Although testing is essential, it is difficult to do effectively.

BY **DAVID MEYER**

Managing Director, Orion Fire Engineering

There are many different types of foam concentrates, and many manufacturers. In the middle of last century, protein-based foams were the most common, but since then many different types of foam concentrate have been developed, including high-expansion foams, Class A foams, Aqueous Film-Forming Foam (AFFF), Alcohol Resistant Film-Forming Foam (ARAFF), Film-forming fluoroprotein foam (FFFP) and Alcohol-Resistant Film-Forming Fluoroprotein Form (ARFFFP). More recently, we have a range of fluorine-free Class B foams added to the mix, and they are bringing in new foam concentrate

technologies. To be practical, I will limit the discussion in this article to low-expansion foam concentrates.

Testing all these different foam concentrates is challenging. It would be nice to have a simple set of criteria to judge them against, but that is not realistic. Every product has unique physical properties, and different classes of concentrate have different firefighting properties. Concentrates are designed to meet specific standards—some for UL 162, others for EN 1568—and there are many other standards, such as ICAO, IMO and meet the specific requirements of various defence organisations around the world.

All too often, when a foam sample is received for testing, the customer doesn't really know what their product

is, making the testing laboratory's task even harder.

What is the goal of testing?

In testing, we are attempting to determine whether the foam concentrate is fit for purpose. From my experience, the most common problem found in the field is water contamination of foam concentrates. This can occur due to valve leakage, accidents with valves being opened incorrectly, or even rainwater entering a tank. In the absence of contamination, AFFF's have proven to be very stable, with samples remaining effective for more than 20 years. High-viscosity foam concentrates are more sensitive to storage-tank design, and can suffer for problems due to dehydration

of the top layer, or less commonly from microbial attack. Protein-based foams are much less chemically stable. Even in well-designed storage tanks, they won't last more than about ten years. The protein oxidises from contact with air and eventually breaks down and produces noticeable sediment. Foam properties begin to change also, particularly expansion and drain time.

We need tests that pick up water and other contamination, as well as chemical degradation. I have seen AFFF samples with a pH of 3 (probably due to incorrect cleaning of a tank when it was fabricated) pass all other tests. The concentrate didn't show any loss of other properties over the few years that it was tested, showing how robust AFFF is, but it still fails because at that pH it can damage equipment.

Testing

Testing laboratories can test various properties of foam concentrates, but the real challenge is in the interpretation. We can't redo the full range of testing for the products that might be required by UL 162 or other standards, so we need to settle for testing what is practical, but in a meaningful way. Common tests include:

- ◆ density (specific gravity)
- ◆ pH
- ◆ sediment
- ◆ surface tension
- ◆ expansion ratio
- ◆ 25% drain time
- ◆ film-forming capability
- ◆ refractive index.

While some defence standards set limits for the expansion ratio and the 25% drain time, it is educational to note that UL 162, EN1568 and other certifying standards do not set limits for any physical properties—and these are the standards to which most foam concentrates are formulated. These physical properties are irrelevant if the product puts the fire out.

There are no narrow limits that can be set for physical property tests that will provide an accurate assessment of all (or even most) products. Wide limits lead to false negatives and false positives. For example, one manufacturer specifies a density of 1.03+/-0.02 in their product literature. This means that any density reading from 1.01 to 1.05 is within the manufacturing specification. However, if the actual batch density was 1.030, a reading of 1.015 would quite possibly represent a 50% dilution with water or some other major problem with the foam concentrate. Clearly, the product should be failed under these circumstances, even though is still within the manufacturing tolerances.

Similarly, arbitrarily narrow tolerances

will lead to a lot of false negatives. For most synthetic foam concentrates, density is not a very sensitive test. If you have benchmark data for the product, the refractive index is a more sensitive test for water contamination. Measuring the density for high-viscosity foam concentrates is also very difficult to do accurately, due to the potential for entrained.

It is quite likely that the expansion and drain-time tests would pick up a problem with 50% water contamination, but these tests are not very sensitive to lower levels of water contamination (up to 10%), which would still seriously compromise a foam concentrate's fire-extinguishing performance. Clearly, foam testing based on arbitrarily selected limits of physical properties will not enable a test laboratory to identify foam-compromised concentrates. A different and more holistic review of the entire suite of test data is needed. This requires considerable experience and judgement from the laboratory, and requires the customer to provide more information on the product being tested.

Ideally, we should have batch-test data for the foam concentrate batch to use for comparison, though this is not often available. Lack of batch-test data can be rectified by obtaining a sample from the customer when the foam is purchased, and setting a benchmark based on these tests. This option is not commonly available either, but could be obtained if the customer required the testing.

The next-best option is to use data from another batch from the same manufacturer. While less accurate, it does give you some reasonably representative data—but again, this is not commonly available.

In the absence of any benchmark data, the testing laboratory is left with the very difficult task of doing a more qualitative assessment. A laboratory-scale fire test is about the best option, maybe combined

with a film-forming test (for film-forming products). At the sort of scale that can be economically carried out in the laboratory, the results are very subjective. Different types of foam concentrate extinguish in different ways, and simply looking at speed of extinguishment will favour AFFF's over protein foams or the new fluorine-free foams.

Conclusions

Foam concentrate testing as we do it at present is less reliable than it ought to be. There is a risk that some concentrates that are not fit for purpose are not being identified, as well as a risk that customers will be forced to replace foam concentrate that is perfectly OK. The quality of testing can be improved if we have better information on the properties of foam concentrates when they are first purchased. Two steps would be required:

1. a regime of labelling foam tanks with the exact foam concentrate stored, including batch numbers, so that contents are properly identified
2. the above combined with a requirement to have new concentrates supplied with a batch-test report when purchased.

Some customers already have some of these measures in place.

These two changes would greatly improve the quality of foam concentrate testing. They could best be addressed by changes to AS 1940 and any other standards that deal with foam systems or testing and service of foam systems. I would also strongly urge that the refractive index be a required property test. It quite effectively measures the level of solids and solvent in the foam concentrates, so is sensitive to water contamination. ■

Note: This article was peer reviewed by Fire Protection Association TAC 11/12.



Foam concentrates need yearly testing to ensure effective operation.

SAFE DISPOSAL OF PORTABLE FIRE EXTINGUISHERS



Different fire extinguishers have different requirements for disposal.

Disposing of portable fire extinguishers is a matter of environmental safety. It is taken extremely seriously by the governing environmental authorities in each state under the relevant state and federal environmental protection legislation.

The requirements for the disposal of portable fire extinguishers depend on the type of extinguishers and the jurisdiction (state or territory).

Water extinguishers can simply be discharged and the empty extinguisher disposed of in normal waste.

Extinguishers containing halon



Yellow halon extinguishers can be disposed of in several different ways.



You can be fined for incorrect disposal of fire extinguishers.

State environmental authorities

Victoria	Environmental Protection Authority	www.epa.vic.gov.au
NSW	Environmental Protection Authority	www.epa.nsw.gov.au
Queensland	Department of Environment and Heritage Protection	www.ehp.qld.gov.au
Northern Territory	NT Environment Protection Authority	ntepa.nt.gov.au
ACT	Environment Protection Authority	www.act.gov.au
Western Australia	Environment Protection Authority	www.epa.wa.gov.au
South Australia	Environment Protection Authority	www.epa.sa.gov.au
Tasmania	Environment Protection Authority	www.epa.tas.gov.au

(yellow extinguishers) can be provided to your local fire station, a licensed fire protection servicing company, or sent directly to the National Halon Bank for disposal.

All other extinguisher types—foam, carbon dioxide (CO₂), wet chemical or dry chemical powder extinguishers—may also require disposal in a controlled manner. The environmental protection authority in your jurisdiction should be able to provide information on this.

"Knowing how to dispose safely and legally of portable fire extinguishers can be complicated," said Fire Protection

Industry (ODS & SGG) Board Executive Officer, Mark Potter.

"It is always worth checking with your local state environment protection authority to ensure you are properly obeying the rules. There are fines for incorrect disposal, as well as potentially other serious consequences that could affect your licence to operate within the industry." ■

For further information on the disposal of halons, refer to: www.environment.gov.au/protection/ozone/halon/halon-disposal.

LEARNING ABOUT A DIFFERENT KIND OF FIRST AID

Psychological first aid (PFA) can have a direct impact on a person's ability to perform their job effectively, regardless of their role.

Incident Controllers and Incident Management Teams regularly deal with situations of heightened stress, responsibility and expectations. This can affect decision-making. In these situations, knowledge of PFA and its principles can help support incident management personnel.

In early 2017, AFAC held a free webinar on the principles of PFA. Presenters included: Jim Higgins ASM, CEO, Metropolitan Fire and Emergency Services Board (MFB); Amanda Lamont, Manager Policy and Planning, Australian Institute for Disaster Resilience; and clinical psychologist Heather Bancroft.

The webinar provided a key professional development opportunity for the emergency management community, particularly those involved in the Emergency Management Professionalisation Scheme. Participants were awarded one hour of continuing professional development in line with the scheme.

Why psychological first aid?

During the webinar, Mr Higgins explained that "Psychological injury is like any other injury; we need to help people recover from it."

Before joining MFB, Mr Higgins worked with the Victorian Department of Human Services and served as Commissioner of the Queensland Ambulance Service.

Reflecting on his time as a paramedic in the early 1980s, when PFA and psychological well-being was not well understood, Mr Higgins said he was "pleased that the doors are opening up on this issue and we have the ability to talk about it more freely."

Mr Higgins said that an understanding of PFA and its impact is something he would strongly advocate for Incident Controllers.

Ms Lamont's experience ranges from emergency management, international community development and humanitarian leadership. She is a volunteer with the Victorian Country Fire Authority and the Australian Red Cross, where she provides PFA and delivers training for others.

Ms Lamont said it was important to distinguish what does and does not constitute PFA.

"It is not debriefing or counselling; it is not something that only professional people are required to provide," she explained.

Ms Bancroft is studying a PhD investigating mental health in Australian firefighters. Her research is funded through the Bushfire and Natural Hazards CRC and undertaken at the University of Melbourne. Previously she worked with the Victorian Ambulance Counselling Unit where she was involved in developing a PFA model.

Ms Bancroft said PFA was important across all emergency services to ensure that responders "feel safe, calm, in control, competent and connected with their workforce and support networks." ■

To find out more about the Emergency Management Professionalisation Scheme or continuing professional development, visit www.afac.com.au/emps.

Understanding psychological first-aid principles can help Incident Management Teams deal with stressful situations.



DATA, DIVERSITY AND CULTURE AT AFAC17

The emergency management community will come together at AFAC17 powered by INTERSCHUTZ to share research and learnings on collaboration, driving performance through data, and how positive cultures strengthen organisations.

BY **FREYA JONES**

How will using data drive the performance of emergency management organisations into the future, and why is maintaining an understanding of data so important?

AFAC17 powered by INTERSCHUTZ will bring some of the leading data experts together to share their insights, experiences and ideas about how we can move forward in our use of data.

Among the keynote speakers is Bart van Leeuwen, a senior firefighter and 'big data' expert from the Netherlands. Bart is one of several international and local speakers who will join the emergency management community at AFAC17 in Sydney at the International Convention Centre from 4–7 September. Grasping the opportunities provided by data—whether big data, small data or smart data—is complex. For fire and emergency services, government departments and others who operate within emergency management, the ability to capture, analyse, interpret and make decisions informed by data is imperative to their success.

Mr van Leeuwen will present on day two of AFAC17, sharing how leveraging big data can ensure firefighters and communities are safer from fire. He believes this requires more than just giving data to firefighters; data needs to apply to real-world circumstances and offer real solutions.

Using data helps inform decision-making, whether it's in response, policy change, new objectives, driving efficiencies or budget allocation. But to effectively use data, both within and across agencies, people must have a sound understanding of its impact and implications.

Emergency managers face an increasing need to understand how to source, access, store, share and use data. Often, external stakeholders obtain information before those responsible for responding to emergencies. This

can present a range of complexities and challenges for the emergency management sector.

Mr van Leeuwen and other leading data experts will discuss how we can use data to drive performance, what makes data useful and how we can leverage off each other by sharing data across organisations.

More broadly, AFAC17 will explore collaboration both within the sector and across other sectors, departments and industries under the conference theme of Collaborating for Success – improving performance in emergency management.

AFAC17 will attract people from a wide range of industries and roles. Speakers will share different approaches to collaborating and engaging with governments, NGOs, the private sector and researchers to give our communities more effective and efficient services.

Measuring success through culture

Workforce culture is a key metric for measuring organisational success. AFAC17 presenters will also explore how inclusive cultures strengthen organisations, and what inclusive and diverse organisations look like.

Victorian Equal Opportunity and Human Rights Commissioner, Kristen Hilton, will give a keynote presentation focusing on how we can foster inclusive cultures and leverage workforce social capital.

Ms Hilton was appointed as the Commissioner in June 2016. Before that she was the Executive Director, Legal Practice, with Victoria Legal Aid and has a strong background in community justice.

The Commission is an independent statutory body that offers independent assessment of government, local councils and other public authorities. It was established to inquire into discrimination, investigate complaints and resolve disputes, as well as provide education, training and community education programs to Victorians. One



Kristen Hilton



Bart van Leeuwen

AFAC17 KEYNOTES

Research Forum (4 September)

- ◆ Professor Ed Galea, University of Greenwich (UK)
- ◆ Ann Bostrom, University of Washington (US)
- ◆ Professor Shane Cronin, The Resilience to Nature's Challenges, National Science Centre (NZ)

AFAC Conference (5-6 September)

- ◆ Bart van Leeuwen, Big data expert, owner netage.nl (NL)—How leveraging off big data can improve community and first responder safety
- ◆ Graeme Head, NSW Public Service Commissioner—Collaborating for success
- ◆ Kristen Hilton, Victorian Equal Opportunity and Human Rights Commissioner—Diversity and inclusion within fire and emergency services
- ◆ Steve Vamos, Non-executive Director Telstra, Former CEO Microsoft Australia and New Zealand—Driving creativity and innovation in a world of disruption

of its key roles is to promote diversity within workforces.

Ms Hilton's experience makes her uniquely placed to present on the topic of strengthening organisations through workforce culture. You can hear her presentation on Day 3 of AFAC17. ■

To access the full conference program or to register, visit www.afacconference.com.au.

AFAC17 POWERED BY INTERSCHUTZ EXHIBITION

The AFAC17 powered by INTERSCHUTZ Exhibition is on track to be even larger than last year's event in Brisbane.

The exhibition will occupy more than 9,000 m² of internal floor space, with an external open-air deck area offering an additional 5,000 m² of space.

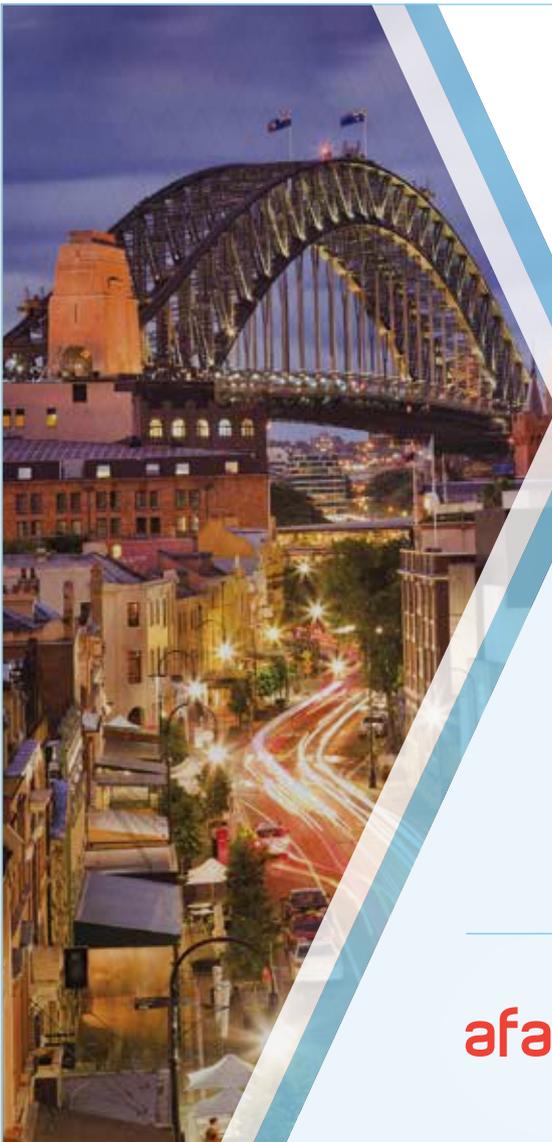
Currently, 160 organisations have signed up to exhibit at AFAC17, including a vast array of local and international companies. There will be something for everyone who requires fire, emergency and rescue, first responder and public safety sector products and services.

The Expo Stage Theatre Program will offer a comprehensive program of presentations, while the open-air outdoor deck area will feature live demonstrations.

Free exhibition visitor passes are available at: www.afaconference.com.au.



The 2016 AFAC exhibition proved a hit with conference goers—this year's is shaping up to be even bigger.



afac17

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Deutsche Messe

DECISION-MAKING UNDER PRESSURE

How does pressure affect decision-making in incident management teams and what can you do about it?

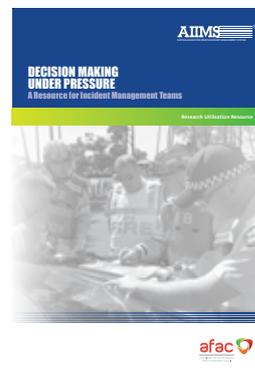


PHOTO: BUSHFIRE AND NATURAL HAZARDS CRC

Decision-making can be challenging for incident management teams when facing high levels of uncertainty and constantly changing conditions.

Decision-making can be particularly challenging for incident management teams (IMTs) facing an emergency. They are often faced with high levels of uncertainty and constantly changing conditions. Yet, their decisions are time critical, and have major consequences for people's lives and property.

It's not only the nature of the incident that influences decision-making. Many human factors—such as standard operating procedures, agency and team norms, interpersonal relationships, levels of expertise, biases, stress, fatigue and situational awareness—all affect the quality and timeliness of decision-making.

IMTs have to make decisions in wide-ranging conditions. Incident management personnel can better monitor and manage their team's decision-making—and identify potential threats—if they understand what is important in decision-making.

To help incident management personnel better understand these concepts, the Australian Institute for

Disaster Resilience is running a one-day clinic called Decision Making Under Pressure in Brisbane on 1 August 2017.

The clinic, to be held at the Hilton, will use a variety of case studies to explore decision-making and draws on research from the the Bushfire and Natural Hazards CRC and the former Bushfire CRC. The clinic will explore various models and processes that may be more applicable at different times (e.g. initial escalating phase versus steady state), and in different circumstances (e.g. routine versus novel incidents). Participants will also have the opportunity to practise using the decision aids outlined in the AFAC *Decision Making Under Pressure* guide.

Key highlights

Drawing on a range of Bushfire and Natural Hazards CRC, Bushfire CRC and emergency sector research, this workshop examines the decision-making processes relevant to incident management, including the:

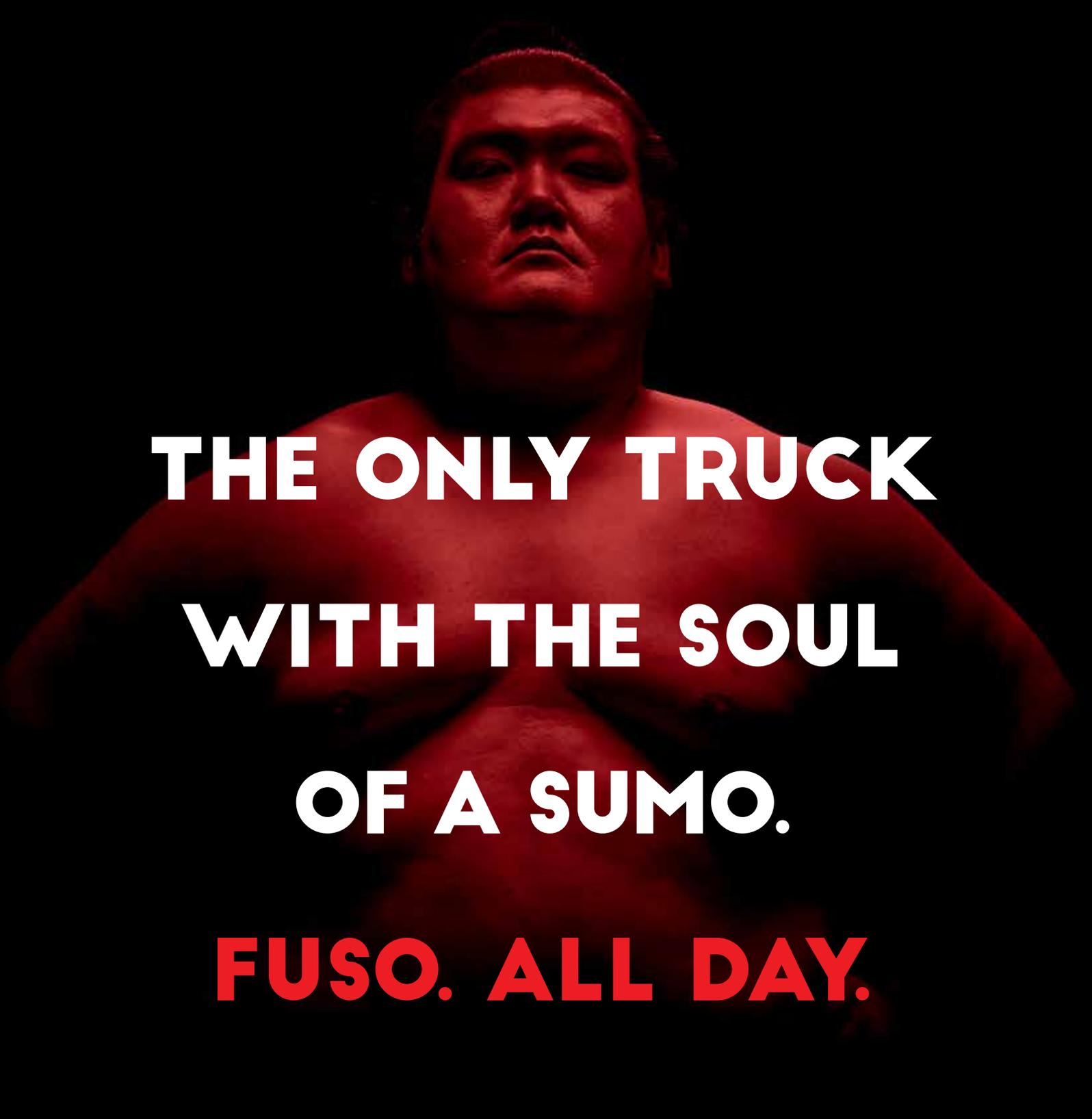
- ◆ decision-making challenges for incident-management personnel
- ◆ various decision-making models used in incident management
- ◆ prerequisites for sound decision-making in teams
- ◆ factors that can undermine decision-making
- ◆ techniques that can assist decision-making.

Who should attend?

This event is essential capability building for:

- ◆ people who work in functional roles within IMTs
- ◆ people who work with IMTs
- ◆ trainers who want an introduction to the theories of decision-making to build their own understanding. ■

This forum offers six hours of continuing professional development for the Emergency Management Professionalisation Scheme. For more information, contact events@aidr.org.au or visit: www.aidr.org.au.



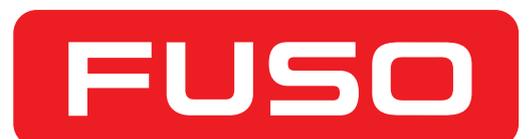
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THE ROLE OF CHILDREN IN BUILDING BUSHFIRE-RESILIENT COMMUNITIES

School curriculum changes have made the study of bushfire impacts compulsory for NSW primary students in Year 5 and 6, giving fire agencies a unique opportunity to improve community resilience.

BY **JACQUELINE MURPHY**

New South Wales Rural Fire Service

In the northern suburbs of Sydney at St Ives North Public School, Year 5 and 6 students have been presented with authentic bushfire-related scenarios and asked to come up with innovative solutions. The results have been remarkable for the students, the school and for the New South Wales Rural Fire Service (NSW RFS).

At an end-of-year showcase in November 2016, teams of 11 and 12-year-old students presented 70 remarkable solutions to bushfire problems. The NSW RFS Commissioner, Shane Fitzsimmons AFSM, attended the showcase.

"It was really wonderful," Mr Fitzsimmons said. "It reminds me that our future is in safe hands when you see the work of these young people."

The Commissioner described the students as "pretty powerful, emotionally driven, informed" agents of change for their community.

A curriculum update

A change to the curriculum has made the in-depth study of the impact of bushfires compulsory for NSW students in Year 5 and 6. For fire agencies in NSW, that means that around 195,000 students will be studying bushfire, every two years.

In 2015, the national Australian Curriculum Assessment and Reporting Authority revised how the study of hazards—either bushfires or floods—is reflected in the national curriculum for Year 5 and 6. The curriculum stipulates that students study the

impact of bushfires or floods on environments and communities, and how people can respond. In NSW, the NSW Education Standards Authority provided greater focus by requesting that students investigate the impact of one contemporary bushfire hazard in

A ROBOT FOR SENSING BURNING EMBERS

BROOKE WATT, YEAR 6, ST IVES NORTH PUBLIC SCHOOL

"We found out that most houses burned down not because of the fire but by the embers. So then we came up with our robot which drives around and senses heat and it beeps when it detects heat."

Brooke and her team imagined that information about embers from the robot in the field would be returned to a central hub, providing firefighters with early detection of small fires.



PHOTO: NSW RURAL FIRE SERVICE

Australia as part of the new geography syllabus.

The students and teachers will use an inquiry-learning approach. This means the students themselves identify bushfire-related questions or problems and then research, investigate and present solutions. Students and teachers from more than 2,600 NSW primary schools will require resources and guidance to investigate fire. The opportunity for fire agencies to develop greater community resilience is therefore immense.

Mark Unsworth is captain of the Ku-ring-gai Rural Fire Brigade, located close to St Ives North Public School. He visited the school three times over the course of the project.

"It's just brilliant," Mr Unsworth said. "This project has shown up the kind of ideas, the enthusiasm and the taste for learning these kids have. Rather than our community engagement being focused on parents and adults, perhaps we should spend more time focusing on kids."

Generational change

The NSW RFS has always valued the role of children in building bushfire-resilient communities. The opportunity to be engaged more deeply in building resilience within this specific age group is truly a once-in-a-generation chance to influence change and awareness of fire safety.

"I see this Stage 3 geography syllabus change being just really valuable for the Rural Fire Service for the longer term," said NSW RFS Community Engagement Coordinator Tony Jarrett.

"There is a great opportunity for us to build the resilience of children to disasters and emergencies that may affect them. That is a generational change process ... there is evidence from around the world that children can be agents of change.

"As a fire service, we are now respecting that children can be active participants in dealing with bad events, particularly bushfires. They don't need to be passive participants who rely on adult support. I think this is a really important shift for fire agencies around Australia."

St Ives North Public School delivers a first

In 2016, the St Ives North Public School obtained a NSW Department of Education and Training Science, Technology, Engineering and Maths (STEM) grant. The grant stipulated that the school design, implement and report the outcomes of an integrated STEM project structured as a project-based learning task. They chose to focus on bushfire as the brand-new requirement within the Year 5 and 6 geography curriculum.

The students' solutions ranged from building their own websites and software packages to prototyping robots, drones and other equipment. They presented ideas for preparing and planning for fire, detecting fire, dealing with fire, responding to fire, looking after firefighters, looking after homes, and complex programs for community recovery after large bushfires.

St Ives is a bushfire-prone area with a history of destructive fires: in the late 1960s, 1994 and 2007. Sean Walsh, who

"I learnt a lot about bushfires in this process ... [This project] made me realise how dangerous bushfires can actually be ... I never realised how close we are to the bush and how susceptible we are to having a bushfire close to us."

— Chloe Huang, Year 6 student at St Ives North Public School



PHOTO: NSW RURAL FIRE SERVICE

is the IT and STEM coordinator at the school, was quick to see the long-term benefits in the program.

"I think we underestimated from a teacher point of view just how little [the students] knew about bushfires in the local environment," said Mr Walsh. "I would say fewer than five percent of families who live on the bush front had a fire plan that the children were aware of."

"The main thing that the students have learnt from my perspective is their role in preparation and survival and recovery from bushfire. [They have learnt] that they can be really active agents of change in their local community."

How is the NSW RFS responding?

The NSW RFS has collaboratively developed two key tools of a scaled response to this educational change:

- ◆ an effective, educationally focused schools education page on the NSW RFS website, reflecting inquiry-based learning principles, with information pathways for students and teachers
- ◆ skills development for NSW RFS members to support Stage 3 students and teachers, including an RFS member's pathway on the school's education website landing page, workshops and written guides.

The RFS has also worked closely with the NSW Geography Teachers



PHOTO: NSW RURAL FIRE SERVICE

Association, education sectors, schools and interested teachers to develop tools that reflect an emphasis on educational values and outcomes.

The STEM project outcomes, such as teaching models, are being shared across the education sector—including via the STEM network and at a formal STEM conference.

There will be significant learnings about the methods of engagement with Year 5 and 6 students that can be shared with NSW RFS members to complement the approach of the *Guide to Working with School Communities*, which targets younger kindergarten to

Year 4 students.

This work complements key elements of the research utilisation roadmap 2016–21 for the Bushfire and Natural Hazards CRC Child-centred disaster risk reduction (CC-DRR) project. It will help to create effective CC-DRR programs that can be sustainably implemented at scale, increasing resilience and reducing current and future disaster risk. ■

***We had massive ideas* is a short documentary created by the NSW RFS about the project. Watch it on the NSW RFS YouTube channel at: youtu.be/Z7vjeHef8xU**

SAVING FIREFIGHTERS' LIVES

BY BLAKE GILLIAN, YEAR 5, ST IVES NORTH PUBLIC SCHOOL

"What we created is the Heartbeat Pro. It will save firefighters' lives. Three warning lights on a firefighter's helmet will turn on and off showing the firefighter when they need to get out of the fire because their heart rate is too high. It will be connected by wifi to a chest strap or maybe something on your wrist. When the light goes from yellow to orange to red, you need to get out of the fire as soon as possible."

Blake and his team discovered that most deaths of firefighters on the fireground are caused by heart failure. The Heartbeat Pro is a Fitbit-style monitor that gives the firefighters—and their crew leaders—real-time data on their physical fitness.



PHOTO: NSW RURAL FIRE SERVICE

A SMART IDEA FOR THE LOCAL NSW RFS BRIGADE

BY SHIR GOODWIN AND GEMMA WALKER, YEAR 6, ST IVES NORTH PUBLIC SCHOOL

"We invented shutters for the windows at the local brigade station. They are automatic and they have smoke and heat sensors. You can send a message to the robot and it automatically slides and closes. We had four prototypes and none of them worked until we tried the sliding shutters—that succeeded."

The captain of the local Ku-ring-gai Brigade, Mark Unsworth, approached the students at St Ives with the problem of how to shut the brigade station's fire-proof shutters when the crews were out fighting fires.



PHOTO: NSW RURAL FIRE SERVICE

THE GREAT ESCAPES

Prescribed burning can be a highly effective bushfire mitigation strategy, but despite good science, planning and practice, it is an inherently risky business.

BY **DR NEIL BURROWS**

Fire Research Scientist, Department of Parks and Wildlife,
Western Australia

Preventing burns from escaping and becoming a damaging bushfire is of great concern to fire managers. Escapes, as with most accidents, are usually the culmination of many factors, but in this article I take a look at two significant burns that escaped and identify three primary causal factors.

Bushfires develop speed, energy and killing power from the amount and structure of live and dead vegetation that burns, which builds up and

becomes increasingly hazardous over time. Done at the right spatial and temporal scales, prescribed burning reduces the overall flammability and quantity of fuel across a region, thereby reducing the intensity and speed of bushfires. This makes them easier and safer to suppress, and less damaging to the built and natural environments. Even under severe fire weather conditions, if fuel load and fuel flammability are low to moderate as a result of prescribed burning at the right scale, there will almost always be somewhere on the perimeter that the fire can be safely and effectively attacked. If fuel loads are low, the portion of attackable perimeter can

increase significantly when fire weather conditions abate.

Rotational prescribed burning has been implemented over much of the 2.5 M ha of the south-west Australian forests since the late 1950s. Over that time, several thousand burns have been carried out, amounting to some 14.4 M ha of prescribed burning. Over the same period, about 1.2 M ha was burnt by bushfire. Even with this extensive burning experience, and even though the program has a firm scientific underpinning, the practice is not without risk. Ensuring a prescribed burn does not escape is paramount to firefighter safety, community safety and community

An aerial shot of the damage from the Margaret River fire in 2011.



confidence in the fire management agency. In Western Australia, successive agencies responsible for carrying out prescribed burning on public lands have a good track record, with only about 2% of burns escaping. In most cases, the escaped fires have been quickly contained, with little damage done. However, in the 2011–12 fire season, several prescribed burns escaped. One (the Margaret River fire) caused significant property damage (32 homes, nine chalets and four sheds) and another (the Milyeannup fire) was at the time the largest bushfire in the south-west region since 1961.

Because of the high property losses, the Margaret River fire was the subject of a special inquiry commissioned by the Western Australian Government and led by MJ Keelty AO. In handing down his findings, Mr Keelty identified a range of factors, acting together or alone, that contributed to a) the prescribed burn escaping and b) the consequent damage caused by the escape.

Because there was little harm done, the Milyeannup fire was not the subject of a special inquiry, but was the subject of an internal report by the Department of Environment and Conservation, the responsible management agency.

The Margaret River and Milyeannup fires were quite contrasting—not only in size, but in their location and community impact. The Margaret River fire was relatively small (about 3,400 ha) but resulted in significant property losses, whereas the Milyeannup fire was large (approximately 52,000 ha) but caused no significant losses. Fortunately, there was no loss of human life in either incident. The environmental damage of bushfires is less tangible, but is

The severity of fire behaviour and likelihood of the fire escaping will depend on the size, age and fuel properties of the unburnt patch, its proximity to the burn boundary, the fuel condition of the edge, the weather conditions and the detection and suppression response.

MODIS image of the Margaret River fire (on the west coast) and the Milyeannup fire (to its south-east). Both fires were escapes from prescribed burns of long-unburnt vegetation in spring 2011.



usually commensurate with the scale and intensity (severity) of the fire. These ecosystems are well adapted to fire, and will recover in time.

Inherent risk

Prescribed burning is inherently risky because of uncertainty surrounding interactions between weather, topography, fuels, fire behaviour and human behaviour. The post-incident investigations of these escapes list many strategic, tactical, planning and procedural factors that contributed to burn security being compromised and the fires escaping. The reports and inquiries made sensible recommendations, most of which have or are being adopted by the fire and land management agencies concerned. While there were differences between the two prescribed burns in terms of the vegetation and fuel types involved, the complexity of the burns, the size of the escaped fires, the terrain and the consequent damage done, three primary causal factors interacted to compromise burn security in both cases. These were:

- ◆ burning long-unburnt vegetation
- ◆ diverse vegetation (hence fuel types) within the burn
- ◆ burning in a warming, drying weather phase (spring).

No prescribed burning is without risk of fire escape, but the risk escalates with increasing vegetation age. This is because fuel load and fuel depth increase, fuel structure becomes more flammable, and in forests, ember

sources (such as the amount of loose, flammable bark on trees) increases. Prior to core ignition of aerial burns, the usual practice is to create a surface fuel-free edge of at least 50–100 m deep around the inside perimeter of the burn, effectively increasing the width of the fuel break. This is usually done by ground crews walking the burn perimeter, which is a mineral earth track or road, with drip torches (flamethrowers are used in some cases), lighting up according to a pre-determined ignition pattern ('edging'). It is important that edging is done under relatively high fuel moisture and mild weather conditions conducive to mild, containable fire behaviour.

So that fire behaviour does not escalate, old fuels need to be burnt under much milder conditions than young fuels, that is under a lower fire danger index and soil dryness index (higher fuel moisture). By design these conditions reduce the amount of available fuel, thereby reducing the potential fire behaviour and risk of fire escape. However, it results in burn patchiness, or incomplete combustion of the fuel complex in multiple dimensions.

The residual unburnt fuel can occur both in the horizontal and vertical dimensions of the fuel complex. In the vertical plane, long-unburnt, deep-surface litter fuels with moist profiles may not burn down to mineral earth under mild prescribed burn conditions, with only the drier top centimetre or so of the fuel bed burning. Edging is designed to extend the width of the fuel



Buildings destroyed during the Margaret River fire.

break around the burn, so improving burn security. However, if the surface (litter) fuels are not mostly burnt to mineral earth, clearly the edge is not going to function as a fuel break when the residual duff fuel dries later on. In the horizontal plane, low-lying vegetation, such as along creek lines, vegetation on south-facing slopes and areas of dense canopy cover, may not be sufficiently dry to burn at all or will burn patchily.

In addition to variation in fuel moisture, variation in fuel structure can result in fuel patchiness. Less flammable vegetation types, such as sparse low heaths or open canopy woodlands, may not burn under mild prescribed burning conditions. The extent and nature of the flammability differential across the landscape—due to variability in fuel moisture content and fuel structure—will largely be a function of the burn season and the fire danger index. In a Mediterranean-type climate, stronger differentials exist in spring, so burns are more likely to be patchy.

The nature of the vegetation mosaic itself will reflect variability in fuel properties, which is more pronounced under mild burning conditions (i.e. low fire danger index) but dissipates with the onset of summer and a rising fire danger index. Patchy or mosaic burning is often ecologically desirable, because it provides habitat diversity, refugia and soil protection, thereby reducing the acute impacts of fire on wildlife and the environment and enhancing post-fire recovery.

Patchy burning of old fuels under

mild conditions in spring will more often than not result in the later re-ignition of the landscape as residual unburnt fuels dry out with the progression of spring to summer. In a large burn, there is almost always an ignition source, such as a smouldering log, spar, stump, peat or duff ('sleepers'), which may go undetected for days or weeks but then flare up on a warm windy day, reigniting the unburnt, residual fuels. Fuel that didn't burn during the initial prescribed burn completed days or weeks earlier is now flammable, because it has dried and the fire danger index has increased.

The severity of fire behaviour and likelihood of the fire escaping will depend on the size, age and fuel properties of the unburnt patch, its proximity to the burn boundary, the fuel condition of the edge, the weather conditions and the detection and suppression response. In long-unburnt vegetation, the fire behaviour on re-ignition, including spotting potential, will be significantly greater for the same weather conditions and patch size than if the unburnt patch was younger fuel. Not only is the burn more likely to escape by spotting over the burn boundary, but because of the residual surface fuel on the edge of the burn—which has now dried—the fire can run across the 'burnt' edge and break containment lines. The scenario is made a lot more dangerous and difficult for firefighters if the fire breaks out into adjoining long-unburnt fuels, as was the case for both the Margaret River and Milyeannup fires.

Reducing the risk

The single greatest strategic measure that can be taken to reduce the risk of well-planned prescribed burns escaping, and reducing damage potential should they escape, is to maintain much of the landscape in a young fuel condition by maintaining an active prescribed burn program. The more prescribed burning that is done, the easier and safer it is to do prescribed burning, and the reverse is true. It is easy to take prescribed fire out of a landscape, but very difficult to put it back. In south-west jarrah forests, for example, this means keeping about 45–50% of the landscape at a fuel age of less than about six years and about 80% less than about eight to ten years.

Attempting to burn old fuels surrounded by old fuels is costly and high risk, especially in spring. If burning old fuels is unavoidable, and you have to start somewhere, then it may be preferable to burn in autumn after some rain. You should take extra measures to reduce the size and location of unburnt patches within the burn, and take measures to ensure the edging is of a sufficiently high standard to stop flame spread, such as mechanical treatment of edge fuels or multiple ignitions. On the other hand, young fuels can be burnt in spring with much a lower risk of re-ignition and escape than older fuels.

As mentioned above, burn patchiness can be desirable for ecological reasons. For burn security, bushfire mitigation and ecological benefits, many scattered, small, unburnt patches are preferable to a few large, clumped, unburnt patches, which are likely to be lost following re-ignition and create headaches for fire managers. In south-west Australian forests, achieving and maintaining fine-scale patchiness is more likely when burning younger fuels, and less likely as fuels age. Relatively cheap technology—such as drones mounted with infrared cameras—can be used to locate unburnt patches and hot spots to assist with further risk assessment and burn security measures.

There is no evidence that the managed fire regime outlined above will have deleterious impacts on the forest biota. In fact, by the nature of fire behaviour, it is not only safer to carry out prescribed burning regularly (so burning younger fuels), but it enhances the likelihood of the development of a fine-scale mosaic of vegetation at different structural stages. On the other hand, infrequent burning (in older fuels) is risky, costly, dangerous and will result in more large summer bushfires—leading to homogenous vegetation structures and less habitat diversity. ■

Lismore in northern NSW experienced severe flooding as a result of ex-Tropical Cyclone *Debbie*.

SCIENCE TO SHOW IMPACT OF CYCLONE DEBBIE

PHOTO: NSW STATE EMERGENCY SERVICE

CRC research is investigating the impacts of Cyclone *Debbie* and helping to inform mitigation and resilience to severe wind.

BY **FREYA JONES**

Bushfire and Natural Hazards CRC

A team of Bushfire and Natural Hazards CRC researchers have investigated the damage caused by Tropical Cyclone (TC) *Debbie* in Queensland's Whitsunday region during March. In the lead-up to and immediately after TC *Debbie*, the team

set up wind monitors and assessed building damage. The team members were Dr David Henderson, Dr Geoff Boughton, Dr Daniel Smith, Ms Debbie Falck, Mr Mitch Humphries and Mr Korah Parackal of the Cyclone Testing Station at James Cook University, and Mr Thomas Kloetzke of the University of Queensland.

TC *Debbie* made landfall near Airlie Beach on 28 March 2017. The

subsequent investigation will inform the CRC project Improving resilience of existing housing to severe wind events. Issues investigated by the team included:

- ◆ performance of contemporary buildings, including wind-driven rainwater ingress
- ◆ assessment of older housing
- ◆ storm tide damage to buildings.

The team installed six Surface Weather Information Relay and Logging Network (SWIRLnet) towers to measure wind speeds, direction and pressure in the potential path of the cyclone: from Ayr, just south of Townsville, through to Proserpine. The 3.2-m-tall towers used anemometers to continuously collect data in the affected areas before, during and after landfall. The highest wind gust recorded by the SWIRLnet towers was 125.7 km/h in Bowen.

On 30 March, the team headed south to Proserpine and Bowen. In Proserpine, they conducted street surveys and observed minor structural damage of contemporary housing, while some older housing and commercial properties suffered damage to sections of roof structure.

The team noted partial separation of roof members, even though no major structural roof damage was initially obvious from the outside. After seeing similar damage—such as battens partially separated from rafters—in investigations following TC *Larry* (2006) and TC *Yasi* (2011), the researchers recommended inspections by qualified builders, building surveyors or structural engineers of the inside roof structure of buildings (typically older houses) in areas where structural damage to other buildings has occurred (i.e. Bowen, Proserpine and Airlie Beach).

In Airlie Beach, the investigation focused on issues relating to water ingress of contemporary housing and

strata buildings. The issues identified were primarily associated with windows and doors, though other water paths were noted, such as loosened or bent barges, removed flashings and blocked gutters.

Nearby Dingo Beach and Hideaway Bay reportedly experienced the eye of TC *Debbie*, but showed fewer signs of structural damage. The team spoke to residents who described a two-hour lull during the passage of the eye.

"Despite experiencing severe winds during the event, most houses at Dingo Beach and Hideaway Bay had no obvious signs of damage," Dr Henderson noted. "The majority of houses observed were relatively new, built since 2000."

Along the Whitsunday coast, at Conway and Wilson Beaches, the team noted wind and storm tide damage to properties. In Wilson Beach, water levels and wave action saw one older house lifted off its piers. Water levels throughout houses varied from less than 300 to 1,100 mm.

"Residents who remained during the cyclone reported that the rising seawater came from over the beach dune and from the mangroves and channel to the rear of community," Dr Henderson explained.

With the absence of substantial wave action on most properties, structural damage was minimal. However, inundation damaged most of the linings, cabinetry and wiring.

Hamilton Island, along with the other

Whitsunday Islands, bore the brunt of TC *Debbie*. Tree and vegetation damage appeared to be much worse across the island than at Airlie Beach and Proserpine.

"Structural issues with window fixings and frames were observed in some of the buildings on Hamilton Island," said Dr Henderson.

Issues ranged from window reveals not being secured to the building frame to minimal-capacity lintels unable to resist lateral wind pressures, and sliding doors bowing out of tracks. Examples of wind-driven rain entering buildings were also seen.

"Several modern buildings at Hamilton Island and on the mainland had roof overhangs or awnings that had failed at the structural supports and then peeled back over the building, causing more damage," Dr Henderson noted.

Further damage to larger buildings was reported, including the airport, multistorey apartments, apartments under construction and newer houses in locations exposed to the south-east.

The team has completed a formal report, available at www.jcu.edu.au/cyclone-testing-station. ■

The Cyclone Testing Station has a series of videos for both homeowners and builders that provide information about repairing damaged roofs from cyclones.

The videos can be found at www.youtube.com/user/cyclonesandbuildings/videos.



Many homes around Lismore were inundated with floodwater from ex-Tropical Cyclone *Debbie*.

PHOTO: NSW STATE EMERGENCY SERVICE

CYCLONE AND FLOOD OPERATIONS

- ◆ TC *Debbie* made landfall near Airlie Beach, Queensland, on 28 March 2017 as a Category 4 cyclone.
- ◆ The cyclone was downgraded to a tropical low on Wednesday 29 March.
- ◆ Nine people lost their lives—three in Queensland and six in New South Wales.
- ◆ On Friday 7 April, the Fitzroy River at Rockhampton peaked at 8.9 m.
- ◆ 139 interstate personnel were deployed to assist Queensland Fire and Emergency Services from:
 - ◆ NSW—Fire & Rescue (FRNSW), Rural Fire Service (RFS) and Police
 - ◆ ACT—Fire and Rescue and State Emergency Service (SES)
 - ◆ VIC—SES, Metropolitan Fire Brigade and Country Fire Authority
 - ◆ SA—Country Fire Service and SES
 - ◆ TAS—Fire Service and SES.
- ◆ NSW SES were also in sustained operations with support from FRNSW and NSW RFS.
- ◆ Queensland and New South Wales have transitioned to recovery.

NATIONAL BEST PRACTICE GUIDELINES FOR PRESCRIBED BURNING

AFAC and the Forest Fire Management Group (FFMG), through the National Burning Project, have taken on the challenge of building national guidelines for prescribed burning. A set of principles have been developed to support practitioners and assist those reviewing systems, procedures and policy, so that greater consistency in approaches to prescribed burning can evolve over time.

BY **WAYNE KINGTON, AFAC**

The National Burning Project has completed one of its final milestones, the *National Guidelines for Prescribed Burning Strategic and Program Planning*. Together with the *National Guidelines for Prescribed Burning Operations* released last year, these documents build a set of best practice principles that span strategic planning, program planning, operational planning and burn implementation phases of prescribed burning.

Developing national guidelines such as these is challenging, primarily due to significant differences in approaches to prescribed burning that have evolved across Australia.

These varying approaches are the result of diversity in:

CLIMATE: leading to significant differences in how fire behaves, how fire is used in landscapes and the planning cycles that are relevant or most suitable. This is especially evident between northern and southern parts of Australia.

FIGURE 1 Outline of the prescribed burning process framework

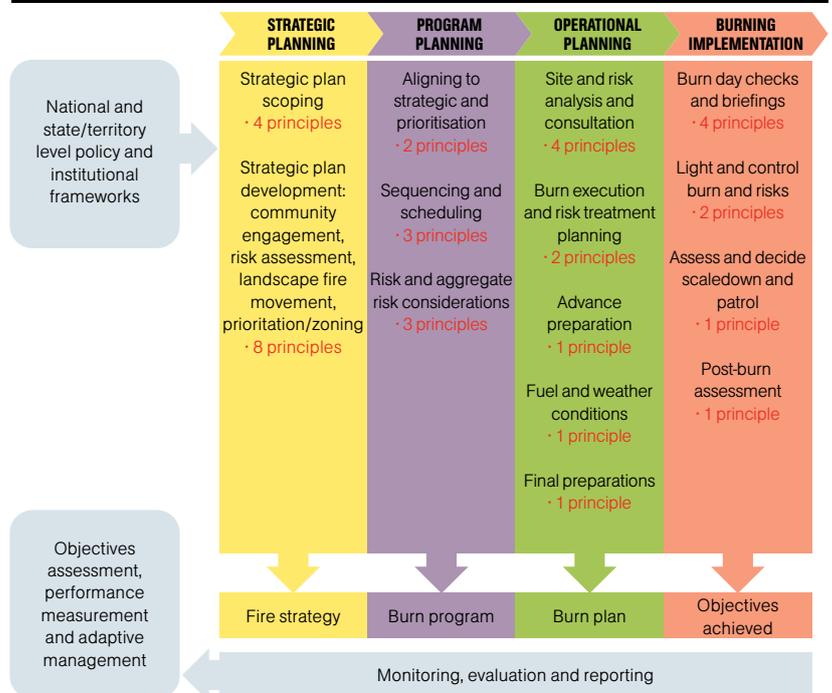


FIGURE 2 Outline of the collaborative consultation process





National level best practice guidelines are supporting prescribed burning planning and implementation.

PHOTO: IAN TANNER, DEPARTMENT OF ENVIRONMENT, WATER AND NATURAL RESOURCES, SA.

LANDFORMS AND VEGETATION: significantly influencing the type of burning and approaches required.

SETTLEMENT PATTERNS: greatly influencing risks, risk assessments and management approaches, the types of fires that can be used and the level of community engagement and risk management planning that is appropriate.

CULTURE: influencing approaches to fire management, with significantly different attitudes existing in different sectors of the community, including urban populations, rural populations, Traditional Owners and government land managers.

HISTORY: The history of government inquiries, legislation, policies and procedural requirements leads to differently evolved approaches to prescribed burning, this is particularly evident between the west and east of the continent.

In order to bridge these differences and build consensus toward national guidelines, AFAC undertook a collaborative consultation process (outlined in Figure 2)

Emerging from this process was a key lesson: it is possible to bridge the differences, because the underlying principles of prescribed burning are consistent, no matter who or where you are in Australia.

As a result of this, the national guidelines have taken a high-level principle-based approach that identifies the common underlying themes, irrespective of jurisdictional or local differences in approaches.

Thirty-seven best practice principles have been identified across two documents. The principles address concerns such as ensuring strategic planning carries through to operational phases, that planning is realistic and meaningful and based on good-quality information, that there is good-quality community engagement, that risk management is addressed at all levels, that prescribed burning is led by measurable objectives and that there

are adaptive management processes.

The principles are contained within a process framework spanning the four phases of prescribed burning (the framework is outlined in Figure 1). ■

The national guidelines are available for purchase from the AFAC shop: www.afac.com.au. AFAC members can download free copies from: www.afac.com.au/initiative/burning.

Emerging from this process was a key lesson: it is possible to bridge the differences, because the underlying principles of prescribed burning are consistent, no matter who or where you are in Australia.

NEW NATURAL HAZARDS SCIENCE FOR AUSTRALIA

A new direction of natural hazards research is set to begin, with nine new research projects from the Bushfire and Natural Hazards CRC.



PHOTO: SHARON QUANDT, NSW RURAL FIRE SERVICE

NSW Rural Fire Service volunteers clean up after a storm. Research is examining the changing practices required by emergency services to adapt their volunteering strategies.

BY **NATHAN MADDOCK**

Bushfire and Natural Hazards CRC

An exciting series of new research has begun at the Bushfire and Natural Hazards CRC, with nine new projects now underway. Joining the existing platform of natural hazards science, the projects will cover mental health and well-being, coastal

management, emergency management capability, risk communication, land use planning, sustainable volunteering and recovery post-disaster.

Marking the next phase of national research into natural hazards, the projects will support fire, emergency service and land managers as they work to prevent, prepare for, respond to and recover from natural disasters.

These important projects will build on the existing foundation of natural hazards research established by the CRC in 2013. The CRC has reached an exciting point in its life, with many of its existing projects beginning to mature. Some of the original projects have now finalised their research, while many others are set to begin the next stage of the science.

The nine new projects outlined below

will broaden the scope of the existing national natural hazards research and offer vital outcomes for fire, emergency services and land managers—and through them, Australian communities.

National mental health and wellbeing study of police and emergency services

In conjunction with beyondblue, up to 20,000 current and former personnel from 35 police and emergency organisations across Australia will be asked to participate in a survey about their mental health and risk of suicide. Undertaken through the University of Western Australia, the *National mental health and wellbeing study of police and emergency services* will develop evidence-based strategies to support individuals, improve organisational culture and address systemic concerns that affect mental health and wellbeing.

These strategies will be developed in collaboration with a cross-section of the police and emergency services sector, including agencies, unions, government departments, individuals, and family and community groups.

Forecasting impact for severe weather

Led by the Bureau of Meteorology and Geoscience Australia, the *Forecasting impact for severe weather* project aims to develop a pilot capability to make useful predictions of the impacts of extreme weather, influencing the ability for agencies and individuals to take actions to reduce damage. The project will focus on case studies along the east coast, looking at damaging winds, flooding and heavy swells.

Urban planning for natural hazard mitigation

Led by the University of Melbourne and the University of Adelaide, the *Urban planning for natural hazard mitigation* project will produce innovative ways of integrating urban planning and natural hazard risk management. It will increase the understanding of what planning and emergency management can and cannot do, separately and together. It will also develop new ways to apply the tools and methods available for planning systems to the design and management of communities as they change, including population growth and where development occurs.

Flood risk communication

Previous CRC research has showed that most flood fatalities are avoidable. Continuing this line of research, the *Flood risk communication* project

will develop an understanding of the motivations, beliefs, decision-making processes and information needs of at-risk groups for flood fatalities.

Led by Macquarie University, the study will cover both age and gender, including an understanding of what a 'Plan B' would look like, how to motivate proactive decision-making before the journey, what the current challenges and barriers are to this, and what further support and information is needed. Outcomes from this project will include targeted risk-communication materials.

Diversity: building strength and capability

Led by Victoria University, the *Diversity: building strength and capability* project will investigate how diversity is understood and practised in emergency management. The project will seek to identify the constraints and enablers in implementing inclusion activities, and understand how diversity can improve current operational environment and systems.

Catastrophic and cascading events: planning and capability

Led by Macquarie University, the *Catastrophic and cascading events: planning and capability* project will identify how to improve management approaches to catastrophic events. These events can take many years to recover from, with many of the affected population choosing to permanently relocate to other areas. Economic losses can be severe when industry is disrupted, businesses close, and further demands are made for capital injections from government to support recovery costs.

Hazards, culture and Indigenous communities

Led by Western Sydney University and Deakin University, the *Hazards, culture*

and *Indigenous communities* project will investigate the hazard priorities of diverse Indigenous communities in southern Australia, and the emergency management sector's engagement with these communities. Collaborative research involving Indigenous peoples and emergency management practitioners will explore how better engagement can be supported, with a focus on the interaction of scientific, Indigenous and other knowledge sources.

Factors affecting long-term community recovery

Led by the University of New England and Massey University, the *Factors affecting long-term community recovery* project will investigate two complementary areas of research relating to the long-term recovery of communities after a disaster.

The first area looks at community connectedness from the perspective of people who move home often and live in different locations, and the role this plays in both their, and the community's, social recovery after an emergency. The second area will use case studies to examine the enablers and barriers to successful recovery, looking at natural, cultural, human, social, political, built and financial capital.

Enabling sustainable emergency volunteering

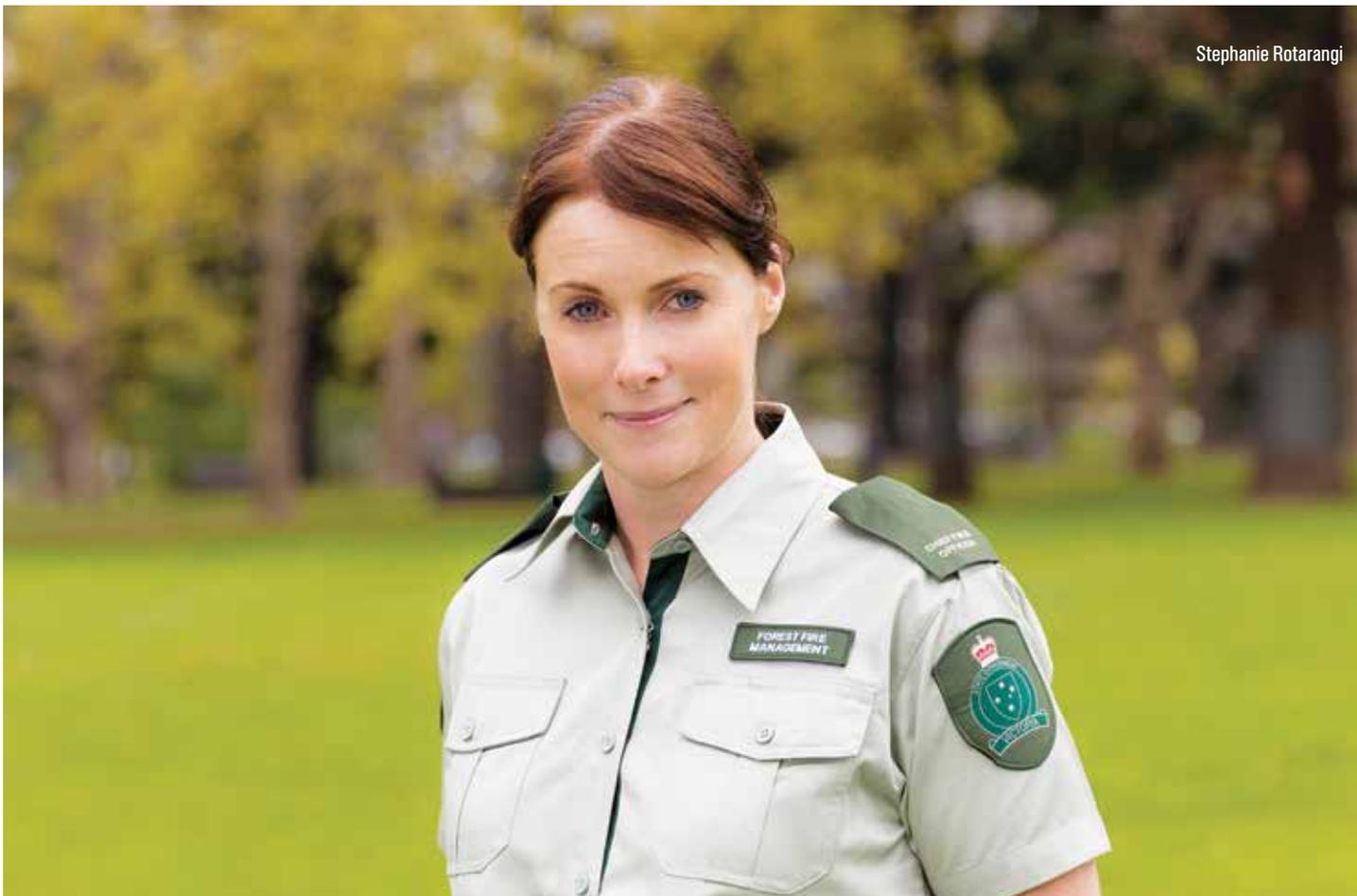
Led by RMIT University and the University of Western Australia, the *Enabling sustainable emergency volunteering* project will investigate how to adapt the emergency management sector to new ways of volunteering. It will also identify the change management practices required to achieve this goal. ■

You can find out more about the projects at www.bnhcrc.com.au.



PHOTO: COUNTRY FIRE AUTHORITY, VICTORIA

For the first time, emergency services and police across Australia will be surveyed about their mental health and wellbeing.



PERSPECTIVES ON THE SECTOR FROM VICTORIA'S FIRST FEMALE CHIEF FIRE OFFICER, STEPHANIE ROTARANGI

In this ongoing series, AFAC CEO Stuart Ellis interviews a senior AFAC leader for each issue of *Fire Australia*. This edition he caught up with Stephanie Rotarangi, Chief Fire Officer of Forest Fire Management Victoria (Department of Environment, Land, Water and Planning).



BY **STUART ELLIS**

Chief Executive Officer, AFAC

Welcome to the AFAC community. How have you found the switch from a NZ Rural Fire Authority?

It has been a fairly smooth transition, with more similarities than differences in the way our fire services operate. That said, Victoria has a unique fire environment, so it has been extremely beneficial for me to travel around the state and begin to understand the expectations and priorities of our staff and communities. I have loved getting out and about, meeting people and of course visiting Victoria's iconic landscapes.

As the first female Chief Fire Officer on any fire agency in Victoria, how do you feel about breaking new ground in what has been a very male-dominated environment?

It is an honour and a privilege, and of course comes with responsibility. However, I am in good company, working alongside many inspiring women and men within my team and the broader emergency management sector. I draw a lot from the people around me.

What are your immediate priorities for Forest Fire Management Victoria?

The safety and well-being of our staff

is absolutely a priority for me. I will do everything I can to make sure everyone goes home safely at the end of each day—and by safely I mean both mentally and physically. We must look after our colleagues as if they are family. The work we do is tough and we must not underestimate the impact it can have.

Service excellence in our planned burning program is also at the forefront. I want to make sure we have the best procedures and systems in place for our teams to support them to do what they do best.

I am also big on having strong ownership and accountability. We must have a commitment for transparency, continuous learning and improvement

in our day-to-day work. This is the kind of culture we all want in Forest Fire Management Victoria.

Prescribed burning is a major priority for Forest Fire Management Victoria in keeping communities safe and the environment well managed. Do you envisage this will continue?

Living in Victoria, and many parts of Australia, we all have to be committed to minimising the threat of bushfire. Planned burning will continue to be a major priority to keep communities safe and ecosystems thriving.

I get to see the benefits of planned burning in slowing or stopping bushfires. I also get to see the hard work that goes into planning and delivering them. I am proud to deliver such a rewarding program with our partners, seeing homes and potentially lives saved through this important work. Our continued investment in new technologies and systems is a key part of this.

Planned burning does of course come with risk and impact, and we keep the community at the centre of our planning to deliver best practice in this area.

The relationship between land managers and fire services is critical in Australia for effective bushfire mitigation and management. How do you see that relationship evolving in Victoria?

Victoria has a proud history of land managers and fire and emergency services working together, and I

want to play my part in making sure this continues. Using our combined knowledge and resources is how we will deliver the best community outcomes. Gone are the days of one agency delivering individually on its promise.

We met on the AFAC Strategic Command Program last year at the Australian Institute of Police Management. Was that course of benefit prior to taking up this role?

Absolutely, this program is great. The most compelling thing I reflected on was the sheer breadth of experiences and challenges we face in this sector. I also took away that for the most part, you are not the first (or the last) to experience whatever scenario you are dealing with. That is why it is so important to have strong networks across the sector and to learn from each other.

You have joined AFAC when the National Council is implementing the Male Champions of Change initiative and you are a special adviser to the Group. What is your view of this plan and how it will relate to initiatives already in place at the Department of Environment, Land, Water and Planning?

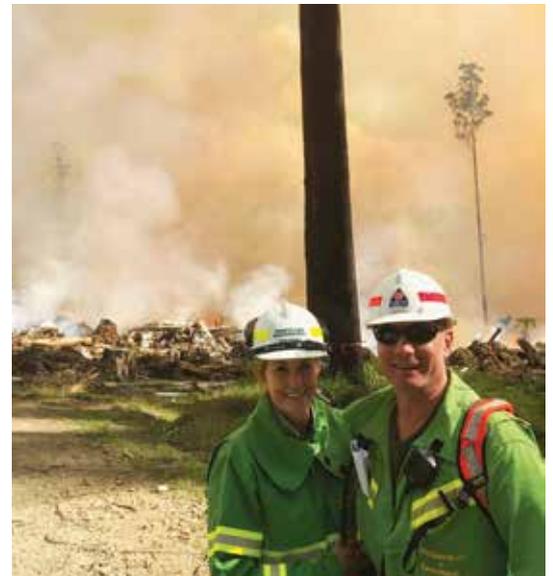
It is great to see us come together nationally as a sector with an objective to create safe, diverse and inclusive agencies. We are of course on different parts of the journey, and our individual plans are fit for purpose based on our organisation; however, there are so many similarities in our collective visions.

I am really proud of the three-year

Action Plan we have developed with our staff to remove barriers for women in Forest Fire Management Victoria to progress into fire and emergency management leadership roles. This is an exciting piece of work that will be a key focus for us.

Have you had contact with AFAC previously, and what are your impressions now that you are a member of the National Council for Australia and New Zealand?

AFAC plays an essential role in a very diverse sector. It helps bring cohesion, defines best practice and provides an important forum for us to learn together. It is privilege to be on the National Council and I am excited to contribute where I can. ■



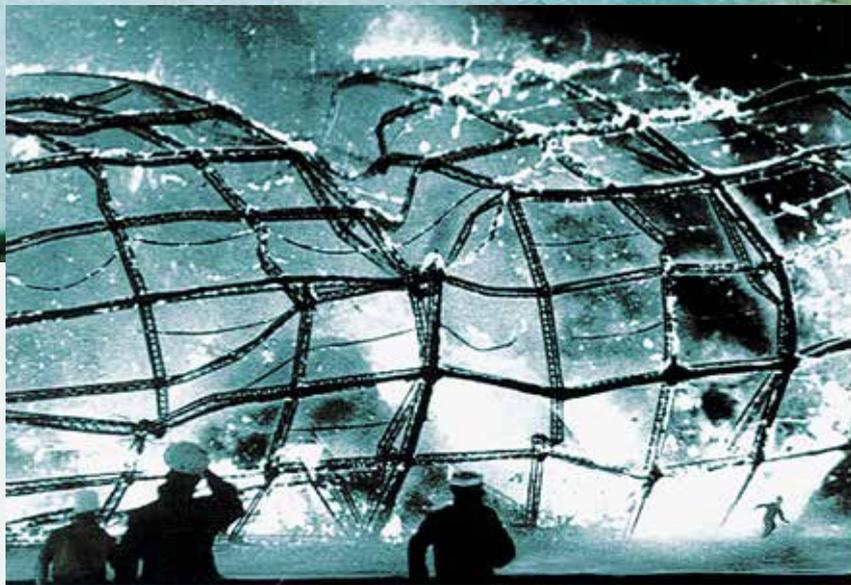
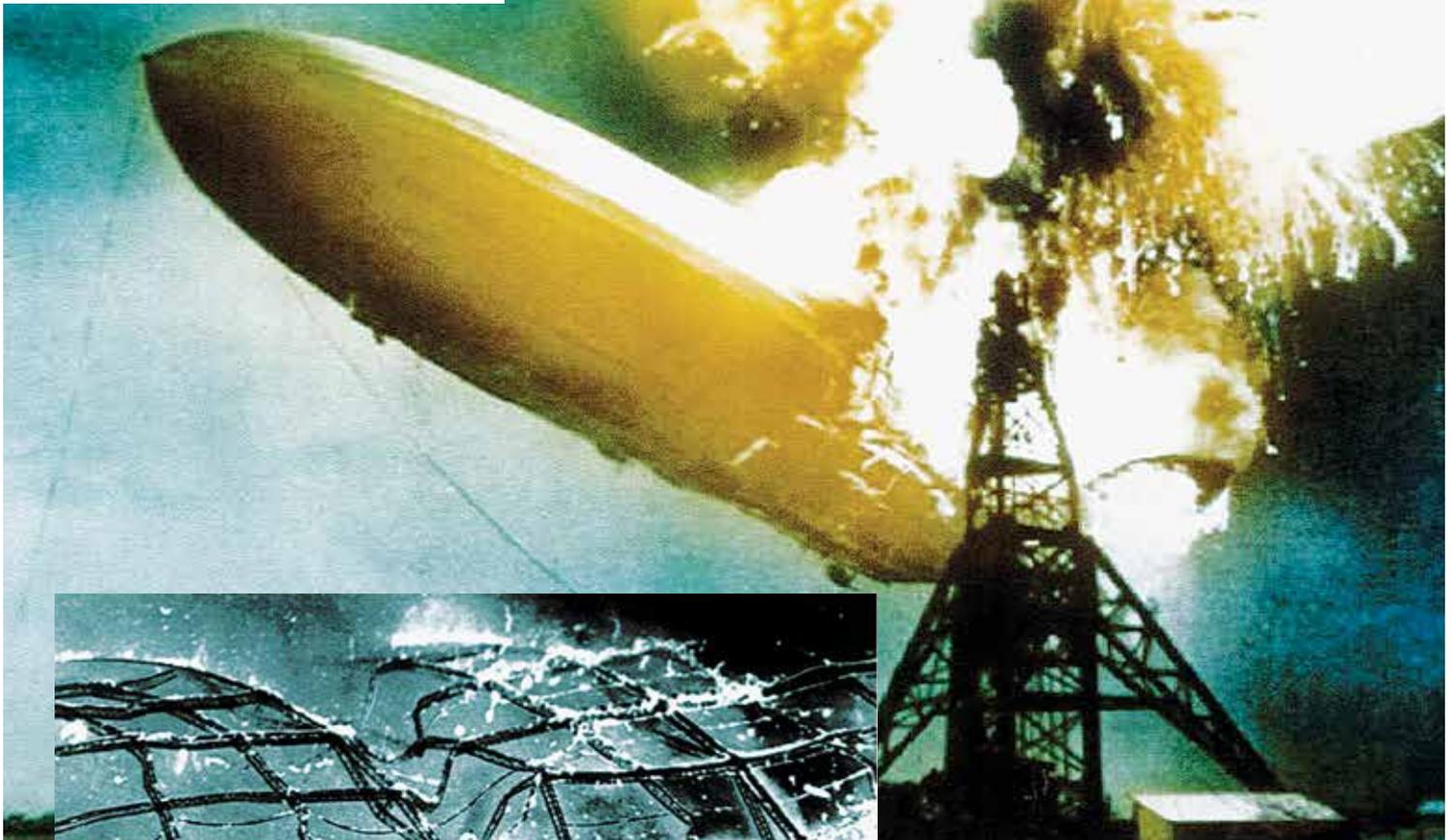
Stephanie Rotarangi is Victoria's first female fire chief.

Stephanie Rotarangi (third left) says Forest Fire Management Victoria has developed a three year Action Plan to remove barriers for women in the organisation.



“Using our combined knowledge and resources is how we will deliver the best community outcomes. Gone are the days of one agency delivering individually on its promise.”

— Stephanie Rotarangi



HYDROGEN (H₂)

Hydrogen is the most abundant element, comprising 98% of the known universe. It is an essential part of all hydrocarbons and other organic substances, minerals and acids. It is the lightest of all gases.

Specific gravity: 0.071

Auto ignition temperature: 560°C

Flammable limits: lower, 4%; upper, 75%

LOSS OF THE *HINDENBURG*—1937

BY **BARRY LEE, OAM**

The largest loss fire of 1937 occurred on 6 May, when the German zeppelin LZ-129 *Hindenburg* was docking at Lakehurst, New Jersey, US at the end of one of its transatlantic flights. The disaster killed 35 people on the airship and one member of the ground crew. Miraculously, 62 of the 97 passengers and crew survived.

Like all but one of its predecessors, the *Hindenburg* was filled with flammable hydrogen. The 245-metre airship initially burst into flames near the tail. Once started, the flames spread at an estimated rate of 45 metres per second, with some of the many competent observers at the scene noting that the

destruction happened in 32 seconds. It all ended so quickly because above the elegant passenger quarters were hundreds of cubic metres of hydrogen gas.

By mid-afternoon on the day of the disaster, the *Hindenburg* had reached Manhattan and continued to the Naval Air Station at Lakehurst, where it was scheduled to land shortly after 4 pm. However, bad weather forced the captain to fly out over the New Jersey coast, delaying the airship's arrival for three hours. Just after 7 pm, it turned back to the landing field. Following a series of tight manoeuvres and water ballast drops, the mooring lines were dropped at an altitude of 90 metres.

At 7.25 pm, a few witnesses saw

the fabric in front of the upper fin flutter as if gas were leaking. Others reported seeing a dim blue flame—possibly static electricity or St Elmo's fire—a few moments before the fire appeared on the top and back of the airship. According to the *New York Times*: 'The nose of the airship was jerked upward, then the whole flaming hulk plummeted to the ground, where the wreckage was instantly enveloped in dense black smoke'.

To this day, the exact cause of the fire remains unknown. However, experts agree the most likely culprit was static electricity that ignited hydrogen leaking from the inflation cells. ■

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BY IAN FINDLAY

Technical Coordinator, FPA Australia

STANDARDS AUSTRALIA

FP-002 Fire detection and alarm systems

FP-002 continues to work on a large range of projects. Projects to amend AS 1670.1 and AS 1670.4 kicked off at a meeting in late March. Working groups for projects for AS 1603.11 and AS 1603.17 have been formed and started work. FP-002 has endorsed the direct text adoption of ISO 7240-6:2011 *CO fire detectors* and the AS 1603.3 public comment has been resolved and will go to ballot soon. Projects on AS 1670.3 and AS 4428.6 continue and should go to public comment soon.

FP-004 Automatic fire sprinkler installations

FP-004 has resolved the combined procedure (public comment and committee ballot) comments and is now awaiting resolution of the requirements for covered balconies before this is progressed to publication.

FP-008 Fire pumps and tanks

The draft amendment AS 2304-2010 *Water storage tanks for fire protection systems* is currently with Standards Australia's editors, after which it will go back to FP-008 to endorse to go to public comment.

FP-009 Fire hydrant installations

The comments from the combined procedure for the revision of AS 2419.1 have been resolved and the draft revision updated accordingly. A pre-publication draft is now being prepared by Standards Australia.

FP-011 Special hazard fire protection systems

Amendment 1 to AS 4487-2013 *Aerosol systems* was published on 27 March. Standards Australia continues to work on resolving some issues before releasing the revision of AS 14520 (recombined and redesignated AS 4214) to public comment.

FP-018 Fire safety

The draft revisions of AS 1530.8.1 and AS 1530.8.2 *Testing of elements of construction for buildings to simulate bushfire attack* went to public comment and closed on 13 June.

FP-020 Construction in bushfire prone areas

Work continues on progressing the

draft revision of AS 3959 *Construction of buildings in bushfire-prone areas* to public comment.

LG-007 Emergency lighting in buildings

While LG-007 met in December to resolve the public comment for the draft revisions of AS/NZS 2293 Parts 1, 2 and 3 *Emergency escape lighting and exit signs*, this resolution process has subsequently been delayed as particular issues were addressed. With these issues now resolved, LG-007 will recommence the resolution of the public comment received.

TECHNICAL ADVISORY COMMITTEES

As per the previous edition, there are now three rounds of TAC meetings per year rather than four. The most recent was in March and the next rounds are scheduled for July and November.

TAC/1 Maintenance of fire protection systems and equipment

The draft Technical Advisory Note on routine servicing of aspirating smoke detectors with respect to emerging technologies was endorsed by TAC/1 subject to further consideration by TAC/2.

TAC/2 Fire detection and alarm systems

A draft of the Good Practice Guide for speaker layouts is near ready for FPA Australia review. The TAC also continues its active involvement with FP-002 projects.

TAC/3/7 Portable and mobile equipment

The Australian Building Codes Board Final Regulatory Impact Statement (RIS) on fire hose reel requirements for new (Class 5) office buildings was released, recommending Option 1. This option reflects FPA Australia's submission's suggestion of replacing fire hose reels with extinguishers for Class A fires in sprinkler-protected buildings. However, unlike our submission (which recommended retaining fire hose reels for non-sprinkler-protected buildings), this option replaces fire hose reels with extinguishers for non-sprinkler protection buildings. This Final RIS does recognise, however, that this option requires an increased ratio of extinguishers to fire hose reels replaced (i.e. it is not a one-for-one

replacement of an extinguisher for a fire hose reel).

TAC/3/7 has also begun preliminary work for a possible revision of AS 2444 and will be seeking input from members on changes required to the standard.

TAC/4/8/9 Fire sprinkler and hydrant systems, tanks and fixed

TAC/4/8/9 is working on a draft document on clearances around sprinkler control assemblies and continues to work on the development of fire pumpset checklists with Pump Industry Australia. A large number of technical issues from the field were also discussed at the meeting.

TAC/11/22 Special hazards fire protection systems

TAC/11/22 continues to work with regulators to address environmental concerns regarding firefighting foams. In particular, the TAC has been working on a submission on the South Australian Environment Protection Authority's proposed draft amendment to their Environment Protection (Water Quality) Policy 2015. TAC/11/22 also continues to contribute to FP-011, including providing feedback on ISO standards.

TAC/17 Emergency planning

TAC/17 continues to work on a variety of projects, including monitoring of and contributing to the development of Amendment 2 to AS 3745-2010.

TAC/18 Fire safety and TAC/19 Passive fire protection

TAC/18 and TAC/19 continue to work on several projects, including a Good Practice Guide on access panels, as well as the ongoing and significant project of a Good Practice Guide on fire stopping systems and associated considerations.

TAC/20 Bushfire safety

TAC/20 discussed a large number of technical issues, including fire shutters, the ongoing work on the ABCB verification method for bushfire protection, and the NSW Rural Fire Service's draft revision of Planning for Bush Fire Protection (released for public comment from 15 May to 25 June). TAC/20 also continues to monitor and contribute to the development of the AS 3959 revision.

TAC/T

TAC/T continues to monitor the work by Skills Service Organisation Artibus Innovation on the future revision of fire protection qualifications under the construction and property services training packages.



FIRE PROTECTION INDUSTRY AWARDS GALA 2017

9 November 2017, Metropolis, Southbank, Melbourne

The Fire Protection Industry Awards gala 2017 will recognise and award businesses and individuals leading the professional standard of commitment, excellence and contribution in the fire industry.

Information including award application details, partnership opportunities and dinner ticket registration will be released shortly, with tickets to go on sale in September.

For more information or to download a nomination kit, visit:
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Attendees enjoy the 2016 AFAC conference at the Brisbane Convention and Exhibition Centre.

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JOINT EDITORS

Tom Bicknell (FPA Australia)
 TEL +61 3 8892 3118
tom.bicknell@fpaa.com.au

Nathan Maddock (Bushfire and Natural Hazards CRC)
 TEL +61 3 9412 9600
nathan.maddock@bnhrc.com.au

Zoe Kenyon (AFAC)
 TEL +61 3 9419 2388
zoe.kenyon@afac.com.au



Fire Protection Association Australia (FPA Australia)

ABN 30 005 366 576
 PO Box 1049,
 Box Hill VIC 3128,
 Australia
 TEL +61 3 8892 3131
 FAX +61 3 8892 3132
fpaa@fpaa.com.au
www.fpaa.com.au



Bushfire and Natural Hazards Cooperative Research Centre

ABN 21 163 137 979
 Level 1, 340 Albert Street,
 East Melbourne VIC 3002,
 Australia
 TEL +61 3 9412 9600
office@bnhrc.com.au
www.bnhrc.com.au



AFAC

ABN 52 060 049 327
 Level 1, 340 Albert Street,
 East Melbourne VIC 3002,
 Australia
 TEL +61 3 9419 2388
 FAX +61 3 9419 2389
afac@afac.com.au
www.afac.com.au

Production and design: Coretext
 TEL +61 3 9670 1168 www.coretext.com.au



FIRE AUSTRALIA

To submit a contribution or to advertise in *Fire Australia*, please contact the editor:

Tom Bicknell
 FPA Australia
 PO Box 1049
 Box Hill VIC 3128
 Australia

tel +61 3 8892 3118
magazine@fpaa.com.au

RHYS JONES

Rhys Jones has been appointed as the Chief Executive Officer of the newly established Fire and Emergency New Zealand, which commenced on 1 July 2017. Mr Jones is a former Chief of the New Zealand Defence Force and has experience leading large and complex organisations through periods of change. For further details on the new organisation see page 6.

KEVIN O'CONNOR

Kevin O'Connor has been appointed as the National Manager of Rural Fire and Emergency Operations at Fire and Emergency New Zealand. Mr O'Connor previously led the National Rural Fire Authority in New Zealand as the National Rural Fire Officer. He has had extensive experience in rural fire throughout his career having been with the Department of Conservation and National Rural Fire Authority since 2014.

PAUL MCGILL

Paul McGill has been appointed as the National Commander of Urban Fire and Emergency Operations at Fire and Emergency New Zealand. Mr McGill is an experienced firefighter who comes to the position with 37 years' experience at New Zealand Fire Service. He took over the role of Chief Executive and National Commander of New Zealand Fire Service following Paul Baxter's departure.

JENNY WILLIS

Jenny Willis has been appointed as the Director, Chief Officer Strategy and Capability at Northern Territory Fire, Rescue and Emergency Service.

JASON COLLINS

Jason Collins has been appointed as the Director/Chief Officer, Northern Territory Emergency Service (Northern Territory Fire, Rescue and Emergency Service).

FIONA GILL

Fiona Gill has been appointed to the role of Director, Fire and Flood for the Department of Environment, Water and Natural Resources (DEWNR) in South Australia. Ms Gill comes to the role with a broad range of operational, policy and leadership experience, from 19 years working across DEWNR.

JIM HIGGINS

Jim Higgins, Chief Executive Officer, Metropolitan Fire and Emergency Services Board, has departed the MFB after leading the organisation for more than three years. Mr Higgins's commitment to the MFB and the broader industry is to be commended, in particular his significant contribution to AFAC over this period of time.



Jason Collins



Jim Higgins



Fiona Gill



Jenny Willis



Paul McGill, Rhys Jones and Kevin O'Connor

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