

FIRE AUSTRALIA

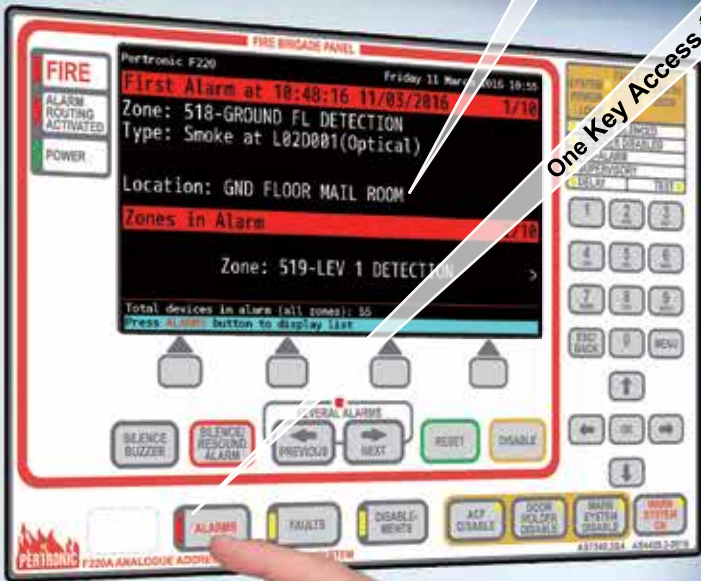
UNDERSTANDING SEVERE FIRE WEATHER

**Australia and New Zealand's
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**Fifty years of Australian
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**Fire Australia Conference and
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PERTRONIC F220 Fire Alarm Panel



Identifies
Exact
Location of
Alarm

One Key Access to Alarm List View

Pertronic F220		Friday 11 March 2016 18:57	
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 55

Item: OPT at LEVEL 6 ELECT CUFB (L020071)

Time: 18:48:21, 11 March 2016

Total zones in alarm: 18

Page up Page Down F81 Page

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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LIFE AND SAFETY

BY
SCOTT WILLIAMS

Chief Executive Officer,
FPA Australia



All industries have an event that acts as a focal point, where its members and the broader, related industries come together to discuss the important issues of today and share their visions for the future. For the fire protection industry, that event is the Fire Australia Conference and Tradeshow, this year being held from 3 to 5 May in Sydney.

Run by Fire Protection Association Australia (FPA Australia) and proudly supported by Tyco Fire Protection Products and Kidde as the joint Platinum sponsors, Fire Australia 2017 will be an outstanding event. The conference and tradeshow generates excitement each year, but probably now more than ever, when there is so much anticipation about the opportunities and

challenges of the future within the fire protection industry.

This year's conference is shaping up as the biggest one to date. Not only are we returning to a three-day program, but we will have our most extensive tradeshow. Our fresh format has streams dedicated to fire protection, fire safety engineering (thanks to a partnership with the Society of Fire Safety), hazardous materials and dangerous goods, and emergency planning and response.

To help us open the conference, we will be joined by leading Ministers of the New South Wales Government who have recently lead regulatory change in the fire protection industry in their state. Keynote speakers will include Jim Pauley, the President and Chief Executive Officer of the National Fire Protection Association of America; Neil Savery, General Manager of the Australian Building Codes Board; Stephen Kip, undoubtedly one of Australia's leading fire safety engineers; and Andrew Battye, Manager of Dangerous Goods and Explosives at SafeWork NSW.

As in other years, our charity dinner, sponsored by Chubb, will be a highlight of the proceedings. This year, funds will be raised for the Fiona Wood Foundation, to help advance research into the treatment of burn injuries.

I am looking forward to joining my industry colleagues and friends at the spectacular new International Convention Centre Sydney. There is so much to talk about and no better place than at this year's Fire Australia Conference and Tradeshow.

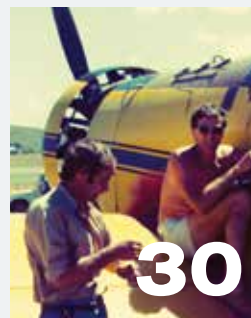
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FIRE AUSTRALIA



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OUR COVER

Research has shown that the fire behaviour escalated from the 2011 escaped prescribed burn in Margaret River, Western Australia, due to extreme fire weather caused by a weather phenomenon called a mountain wave (see page 22).

PHOTO: DEPARTMENT OF FIRE AND EMERGENCY SERVICES, WESTERN AUSTRALIA

ABOUT FIRE AUSTRALIA

Fire Australia is a joint publication of Fire Protection Association Australia, AFAC and the Bushfire and Natural Hazards CRC. We aim to bring the latest news, developments and technical information to the fire protection industry, emergency services and natural hazards research organisations. *Fire Australia* is produced quarterly and distributed throughout Australia and New Zealand. Editorial submissions are welcome and can be sent to: john.rees@fpaa.com.au. For more details on submitting a contribution, please contact the editors.

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IMPROVING EMERGENCY WARNINGS



PHOTO: OCKSYDNEY/FLEURY/CC

CRC research is informing emergency warnings for storms, fires, floods and cyclones.

With the multitude of warnings issued when an emergency hits, how can emergency services ensure their critical safety advice is heard and acted upon, rather than dismissed as noise?

Bushfire and Natural Hazards CRC research, undertaken through the Queensland University of Technology, is helping emergency services warn communities by actively testing the wording and structure of warning messages. The research aims to better

understand how messages are understood and translated into direct action.

The Connecting Communities and Resilience Team, led by Professor Vivienne Tippett, has sought to support broader initiatives in communications and warnings. This has not just been for individual organisations, but also applies at the national level, by providing reviews and helping develop evidence-based warning doctrine.

The researchers are collaborating closely with the industry. So far, reviews of the warning information have been requested by the Inspector-General of Emergency Management Queensland, Queensland Fire and Emergency Services, Emergency Management Victoria, Victoria State Emergency Service, Country Fire Authority, New South Wales State Emergency Service, Country Fire Service, the Department of Fire and Emergency Services Western Australia and the Bureau of Meteorology.

Katherine Philp, Manager of Regional Engagement at the Bureau of Meteorology, believes the research is providing valuable insights that will make a difference.

“We are working to constantly improve our communication, particularly during severe weather, so the observations and findings are of huge interest,” she said.

Local councils are also benefiting, with the Bundaberg Regional Council looking at the frequency of their warnings, the wording of the information they disseminate during an emergency, and their delivery methods.

“Improvements to existing pre-formatted warnings will be captured in the next review of the Bundaberg Local Disaster Management Plan and subordinate plans,” said Matt Dyer, the council’s Disaster Management Officer.

Seqwater is also benefiting from the science, and have sought input from the team on how to improve their messaging about releasing water from dams during a flood, with a focus on proactive community action.

Highlighting the wide-reaching implications of this research, ABC local radio in Wide Bay, Queensland, is also engaged with the research team, looking at how they can improve their emergency broadcasting. ■

EDUCATE THE CHILD, EDUCATE THE COMMUNITY

Primary school students across New South Wales are now front and centre in statewide bushfire plans.

Based on Bushfire and Natural Hazards CRC research that identified the importance of involving children in active bushfire preparations to benefit the whole community, the NSW Rural Fire Service (RFS) has recently developed a bushfire education kit.

The *Guide to working with school communities*, which is being rolled out to all schools through the NSW RFS, was developed using the CRC’s findings, along with the knowledge, skills and experience of CRC researchers.

The Guide follows the earlier publication of an ebook—available nationally—and is based on the same principles: that if you educate children about hazard safety, their families and the wider community



PHOTO: BEN SHEPHERD, NSW RURAL FIRE SERVICE

NSW Rural Fire Service Commissioner Shane Fitzsimmons launching the *Guide to working with school communities*.

will also benefit. This line of research, led by the CRC’s Dr Briony Towers of RMIT University, has provided fundamental insight into how children learn about bushfires and how they share those learnings with their families.

The combined CRC and NSW RFS team will now evaluate the Guide, gathering data to measure its impact on community safety over successive fire seasons.

Collaboration is at the heart of the research at every stage, with researchers and end users involved in all aspects of the study, from undertaking the research to developing plans for its use and writing journal papers. This collaboration will continue to be of benefit when the research reaches maturity and is implemented in all schools across the country. ■

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TRAINING RESOURCES TO ASSIST PRESCRIBED BURNING



The prescribed burn learner resources reflect best practice principles and support burn operational planning and implementation.

AFAC has released three new learner resources aligned to its national guidelines for prescribed burning. Targeted at prescribed-burn trainers, as well as students intending to assist with, plan or conduct prescribed burns, these resources reflect best practice principles and support burn operational planning and implementation.

The National Burning Project (NBP) is a multi-year project bringing together interrelated aspects of prescribed burning across Australasia to design guiding frameworks and principles for a more

consistent approach to prescribed burning. As part of this project, AFAC's Workforce Development and NBP teams collaborated to produce three learner resources, which cover five prescribed burning national competencies as shown in the table (right).

The safe and effective conduct of a prescribed burn requires careful, thorough planning to ensure that the agreed objectives can be safely achieved. With this in mind, the learner resources address topics such as:

- ◆ prescribed burning principles, policy and the organisational environments governing its use
- ◆ setting objectives for prescribed burning
- ◆ risk management and safety
- ◆ identifying and protecting values, including built assets, community infrastructure, ecological and cultural heritage
- ◆ fire ecology and fire regimes
- ◆ burn management and situation awareness
- ◆ fire behaviour and characteristics
- ◆ key ignition strategies
- ◆ working in teams
- ◆ using equipment.

The learner resources can be used by anyone interested in prescribed burning, but are particularly relevant to trainers of the prescribed burning competencies. The resources can help inform the trainers' own material, or be provided to students as a learning aid. Their modular structure means that trainers can draw upon relevant sections as required.

The learner resources are part of

Table 1 New learner resources help to deliver national prescribed burning competencies.

Learner resource	Competency
Assist With Prescribed Burning Learner Resource	PUAFIR213 Assist With Prescribed Burning
Simple Prescribed Burns Learner Resource	PUAFIR413 Develop Simple Prescribed Burn Plans
	PUAFIR412 Conduct Simple Prescribed Burns
Complex Prescribed Burns Learner Resource	PUAFIR513 Develop Complex Prescribed Burn Plans
	PUAFIR511 Conduct Complex Prescribed Burns

the Public Safety Training Package, which supports a range of fire sector qualifications, and are available at: www.afac.com.au/auxiliary/shop. ■

More information on the NBP is available at: www.afac.com.au/initiative/burning. AFAC members can access free downloadable versions of the NBP documents, which provide guidance on bushfire fuel classification, prescribed burning risk management, guidelines and training materials.

RESEARCH DRIVING CHANGE – SHOWCASE 2017

The Bushfire and Natural Hazards CRC is hosting a special event in Adelaide on 4–5 July: a showcase of our research achievements from 2013 to 2017. This year marks a midway point for the CRC, which began with a spectacular launch in late 2013 in front of Parliament House in Canberra.

Research Driving Change – Showcase 2017 is an opportunity to listen to, discuss and digest the learnings from across the whole research program, and highlight how the findings are being put into practice. Hear the views of end users on what works in directing research, and how to make it easier to absorb the findings into operations and policy.

All attendees will take home a package of publications that summarise the key

findings of each project and point to ongoing ways of participation. Attendees will also be invited to participate in a range of new projects that are beginning this year.

This is a time to celebrate achievements and reaffirm the goals that will take us through the next four years of national research into natural hazards.

Some of the original projects have finalised their research, while many others are set to begin the next stage of the science. But that is not the end of the story: researchers and partners continue to work together to make sure the outputs are making a difference in natural hazards management.

New projects are also poised to begin, which will take the research program



into exciting new directions and build on the work done in recent years. Topics include: catastrophic event planning, land use planning, flood risk communication, predicting impacts on the built environment along the coast, diversity and wellbeing in emergency services, and mental health. ■

Register now at: www.bnhcrc.com.au/showcase2017

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A1311FG	MITSUBISHI Lancer, Mirage, Outlander
A1397FG	TOYOTA Hilux RZN Petrol, Landcruiser Prado VZSJ95R
A1412FG	NISSAN Patrol GU (Diesel)
A1438FG	TOYOTA Hilux (Diesel & Turbo Diesel) (02-14) various
A1449FG	MITSUBISHI Pajero (02-14)
A1495FG	NISSAN Navara D22 Series (Diesel & Turbo Diesel)
A1504FG	HOLDEN Jackaroo Turbo Diesel 3.0L (3/98-04), Rodeo Turbo Diesel 3.0L RA,TFR6,R9
A1512FG	HOLDEN Colorado RC (Petrol), Rodeo RA (Petrol) 2.4L & 3.5L; MITSUBISHI Challenger PB, PC (Diesel), Triton ML,MN,MQ
A1522FG	TOYOTA Landcruiser VDJ76-79 (Petrol), Landcruiser Prado KZJ (Turbo Diesel), RZJ120R (03-04)
A1527FG	SUBARU Liberty, Outback, Forester, Tribeca, XV
A1541FG	FORD Ranger PJ,PK (Turbo Diesel); MAZDA BT50 DX (Turbo Diesel); TOYOTA Hilux (Turbo Diesel) w/1KDFTV & 2TRFE (Petrol) Engines
A1619FG	NISSAN X-Trail & Dualis (Petrol), Qashqai
A1622FG	MITSUBISHI ASX, Lancer CJ (incl. Evolution), Outlander ZG, ZH
A1784FG	FORD Ranger PX (Turbo Diesel), Everest UA (Turbo Diesel); Mazda BT50 UPOY
A1789FG	NISSAN Navara NP300
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RSK25CFG	A1784FG	R2720P	R2724P	RCA227P	FORD, MAZDA	Ranger PX; BT-50 UPOY (Turbo Diesel)
RSK2FG	A1541FG	Z418	R2619P		TOYOTA	Hilux, Hilux Surf, KUN16/26
RSK30FG	A1412FG	R2593P	Z712		NISSAN	Patrol GU ZD30D (09/07 - on)

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HELP TO MAKE HIGH-STAKES DECISIONS

How can incident management teams function to the best of their ability in challenging, high-stakes environments?

Bushfire and Natural Hazards CRC research aims to help emergency managers function in complex situations. The research team is developing practical techniques and strategies that are being trialled by the South Australian Country Fire Service, Tasmania Fire Service and NSW State Emergency Service.

Emergency services have been engaged throughout, with information sought from 18 separate agencies, including state emergency services, urban and rural fire

services, and local councils. This has allowed the research team—led by Dr Chris Bearman at CQUniversity—to understand more about decision-making and team-monitoring issues. The agencies have allowed the researchers to monitor both real and simulated emergency situations from within incident management centres, as well as providing feedback throughout the prototype stage. This has led to better results.

Heather Stuart, Manager of Knowledge and Lessons at the NSW State Emergency Service, believes this feedback is critical.

“The project is providing practical



PHOTO: COUNTRY FIRE AUTHORITY

techniques and strategies to help people to function in complex emergency management environments now and into the future,” she said. “The interest in trialling the techniques developed by the research has shown the value of this project to the sector.” ■

Incident management is being informed by CRC research into decision-making

FPA AUSTRALIA'S 20-YEAR ANNIVERSARY

It is now 20 years since the Australian Fire Protection Association (AFPA), established in 1960, and the Fire Protection Industry Association Australia (FPIAA), established in 1926, agreed to amalgamate. They formed one representative body, known as Fire Protection Association Australia (FPA Australia).

That decision, taken back in January 1997, recognised the outstanding work and history of the AFPA and FPIAA. By merging them, a foundation would be established that would benefit the broader fire protection industry, and ultimately, the Australian community.

Major decisions like these are never easy. Reflecting on the discussions through 1996 leading up until the merger, FPA Australia National President Chris Orr said: “There are always wonderful opportunities—and of course, there is always risk.”

“When you merge two entities together, you bring different services and value propositions to the table, varied personalities and cultures, but it is important to remember that the end result must be a better combined outcome from which everyone will benefit,” Mr Orr explained.

“When you look at the Association today, there is no doubt that its profile and positioning within the industry would never have been realised unless the merger occurred. I could not be prouder of what has been achieved. It is just outstanding.

“FPA Australia is the peak body for the fire protection industry at every level. Whether you are a manufacturer and

supplier of fire protection products and services, contractor, firefighter, building owner or manager, insurer, designer, certifier or surveyor, government officer or legislator, educator or student, our membership is just so broad and comprehensive.”

Commenting on the merger, FPA Australia CEO Scott Williams said he felt very privileged to be leading the Association today.

“I recognise the history of this great Association, with its heritage dating back to 1926. I acknowledge the enormous contribution our members make to fire protection and to improving, every day, fire-safety outcomes for all of our community,” said Mr Williams.

“We have experienced significant growth and by the end of this year, we will see the Association approaching 50 staff, with future plans to expand our presence by placing additional resources in New South Wales and for the first time, staff in Queensland.”



Mr Williams said the Association's highlights for him personally since joining in early 2009 were the:

- ◆ expansion of the Association's training capability, with a dedicated training centre now positioned in Sydney
- ◆ success of FPA Australia's Fire Protection Accreditation Scheme and Bushfire Planning and Design Accreditation Scheme, with many thousands of individuals now accredited in the areas of inspection and testing, system design and certification, and bushfire services
- ◆ Association's representation with the Australian Building Codes Board, our commitment to all Australian Standards related to fire and the production of highly informative technical documentation for the industry
- ◆ FPA Australia's Workplace Relations services to members
- ◆ strong engagement with all federal, state and territory and local governments.

Mr Williams also said that one of the most important aspects to any success is assembling the right team.

“People are the heartbeat of any organisation, and it is important to recognise this and continue to invest in your people. I believe FPA Australia has assembled an outstanding team—individuals who are committed and tirelessly work to deliver the vision of the Association, to lead and support a professional industry to minimise the impact of fire on life, property and the environment for a safer community.” ■



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NATIONAL MEMORIAL SERVICE FOR FIRE AND EMERGENCY SERVICES PERSONNEL

AFAC will hold a memorial service for fire and emergency services personnel on 28 April 2017.



Memorial wreaths were laid at the 2016 service to honour the lives of those who died while on duty.



The Attorney-General of Australia, Senator the Hon George Brandis, spoke on behalf of the Prime Minister at the 2016 service.

Established as an annual day of commemoration for the fire and emergency services sector, the third annual memorial service will honour the courage and sacrifice of those who have died in the line of duty. During the service, an AFAC memorial medallion will be given to the families of those who lost their lives.

AFAC CEO Stuart Ellis AM says the memorial service is an important initiative to pay tribute to the dedication of fire and emergency personnel and to support their families.

“We hope this service and the giving of an AFAC Memorial Medallion to the families of those who have been killed, will hopefully, in some small way, provide a level of comfort to those who have lost

so much,” Mr Ellis said. “We want these families to know that our industry and our country acknowledge their loss and that we offer our support.”

This year’s service will be attended by Members of Parliament and is open to all AFAC member agency staff and the general public. The 2016 service was attended by the Attorney-General of Australia Senator the Hon George Brandis, on behalf of the Prime Minister, and more than 200 family members, friends and supporters of fire and emergency services personnel.

The 2017 National Memorial Service will be held at the National Emergency Service Memorial, located on the northern shore of Lake Burley Griffin, ANZAC Parade in Canberra, ACT. ■

LAUNCH OF THE AUSTRALIAN DISASTER RESILIENCE KNOWLEDGE HUB

The Australian Institute for Disaster Resilience has launched the Australian Disaster Resilience Knowledge Hub—a central collection of information, news and resources relating to disaster resilience and emergency management.

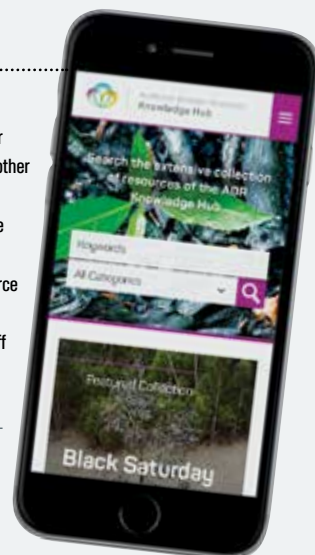
The Hub includes Australian disaster information, the Emergency Management Library, the *Australian Journal of Emergency Management*, the national collection of disaster resilience and emergency management handbooks and manuals, and resources for teachers.

Other resources and information will be added regularly, including guest collections from emergency services agencies and relevant national and international organisations. Additional contributions are welcomed

from anyone with further information or resources on Australian disasters and other relevant topics, and links to contribute content will be available throughout the website.

The Hub will be an invaluable resource for students, teachers, researchers, historians and emergency services staff and volunteers. ■

Visit the Australian Disaster Resilience Knowledge Hub at: www.knowledge.aidr.org.au



NON-COMPLIANT LOGBOOKS CREATE SIGNIFICANT LEGAL EXPOSURE

The fire protection industry is well aware of the importance of compliance in their professional work.

Whether it is a sprinkler head, fire door or a document that records the legislated routine servicing of fire protection systems (AS 1851), compliance is absolutely necessary—not optional. The legal liability of not complying is endless, and when it comes to AS 1851 or AS 2293.2 logbooks, the necessity to meet various pieces of legislation around Australia is complex. It is easy to overlook vital information.

Fire Protection Association Australia (FPA Australia) has created a bespoke suite of logbooks for maintenance recording and reporting activities in the fire protection industry. Complying fully with the appropriate service requirements of AS 1851 and AS 2293.2, including keeping appropriate records, is one way of demonstrating that you have met your legal obligations should a fire emergency situation arise or enforcement action be pursued. Meticulous planning has been undertaken to ensure that FPA Australia logbooks accurately reflect the specific requirements of the standards, and strive for best practice in reporting results to end users.

Like many technical documents, AS 1851 and AS 2293.2 are not always

explicitly clear about exactly what data must be documented during routine service. However, FPA Australia's logbooks are specific about exactly what data must be documented.

FPA Australia will shortly release its updated AS 1851-2012 logbooks to include the recently published Amendment 1 requirements. This is just one of the many examples where FPA Australia logbooks remain up to date and inclusive of not just amendments, but also industry best practice.

When you are considering buying a logbook, make sure it is compliant. What might be a few dollars saved by purchasing or using other cheaper books might mean a non-compliant logbook that does not meet the regulations in your state or territory.

FPA Australia logbooks:

- ◆ are compliant in all states and territories—some states, such as Queensland, require a strict set of words to ensure compliance with QDC, MP6.1. Without the correct and approved wording, the logbook is not compliant to the Building Fire Safety Regulations 2008
- ◆ have space to record your licence and/or Fire Protection Accreditation Scheme number, which is necessary in some

states, such as Queensland

- ◆ are fully compliant with AS 1851 -2012 Amendment 1 and AS 2293.3
- ◆ contain three copies of each page—one for you, one for the customer and one to be kept in the book
- ◆ have a document ID—look for a document number and electronic identifier, such as a barcode (some customers and users will not accept the logbooks unless it has a barcode)
- ◆ meet the design standard—FPA Australia logbooks meet recognised best practice to ensure they are clear and easy to use, uniform in presentation to show all technical requirements and easily scanned or electronically interpreted for record management systems
- ◆ contain best practice guidelines that prompt you to undertake various tasks
- ◆ are simple to use, have all the required information on one page and contain succinct statements that accurately paraphrase the required task
- ◆ can be customised with your own company information and logo. ■

For information about logbook compliance, specifically relating to the Queensland Building Fire Safety Regulations 2008, go to: www.fpa.com.au/sales/logbooks-as1851-2012.aspx

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MODELS FOR ‘WHAT IF?’ SCENARIOS



PHOTO: ADAM STEICHLER, NSW RURAL FIRE SERVICE

With the cost of natural hazards rising, it's important to prepare for possible disasters and reduce risk through activities such as prescribed burning

What if an earthquake hit central Adelaide? The Yarra River flooded Melbourne? Or a bushfire ravaged the slopes of Mount Wellington over Hobart?

The Bushfire and Natural Hazards CRC's 'What if?' scenario modelling is helping government, planning authorities and emergency service agencies think through the costs and consequences of various options when preparing for major disasters. For instance, what might happen to their infrastructure and natural

environments, and how these might change into the future.

The CRC's research is based on an integrated approach that considers multiple hazards and mitigation options to reduce both the risk and cost of natural disasters.

The Decision Support System project, led by Professor Holger Maier at the

University of Adelaide, is completing a case study for Adelaide and has begun further case studies for Melbourne and Tasmania.

The Adelaide modelling, which will be completed this year, incorporates flooding, coastal inundation, earthquakes, bushfires and heatwaves, as well as land use allocation.

The expected impacts of these hazards have been modelled from 2015 to 2050, with an annual time step under different plausible future scenarios that were developed by end users, showing the change in risks in different localities. Melbourne's model will incorporate the risk of bushfires, flooding, coastal inundation and earthquakes, while Tasmania's model will include the risk of bushfires, coastal inundation and earthquakes.

Taking into account future changes in demographics, land use, economics and climate, the modelling will analyse areas of current and future risk, test risk-reduction options, and identify mitigation portfolios that provide the best outcomes for a given budget. It will also consider single or multiple types of risk-reduction options, such as land-use planning, structural measures and community education. CRC partners and local governments have been engaged in the entire process—providing direction on hazards to include, feedback on the process and advice on how the modelling will be used when complete and by whom. ■

LANDMARK MoU FOR SHARING RESEARCH

On 1 March 2017, a Memorandum of Understanding (MoU) was signed between two national institutions—AFAC and the Chief Fire Officers Association (CFOA) in the UK.

The MoU outlines arrangements for reciprocal sharing of research and data during 2017–22 and facilitates an ongoing partnership of knowledge sharing into the future. It represents the first step in an unprecedented level of exchange between the two countries.

"The positive discussions we have had with CFOA bode well for future progress on a range of initiatives across a broad spectrum of issues impacting on fire and emergency services agencies," said Mr Stuart Ellis AM, CEO of AFAC.

Anticipated benefits include the improved use of existing resources, greater access to international fire research and data, and development of new data and best practices that would not otherwise have occurred.

Mr Neil Odin, Deputy Chief Officer of the Hampshire Fire and Rescue Service, said on behalf of the CFOA: "This is another important step in helping to reduce the risk from fire in all our communities, with research leading the way in evidence-based decision-making."

The agreement initiates closer collaboration, working towards the joint aim of safer firefighters and safer communities. At the heart of the MoU

is a shared belief in the importance of gathering and leveraging data to promote more effective and efficient public services.

As the Australian and New Zealand National Council for fire, emergency services and land management, AFAC represents more than 288,000 staff (including volunteers), who operate in the mitigation and response phases of emergency management and support the transition to recovery.

The CFOA's Integrated Data and Research Programme brings together fire and rescue services from across the UK to understand and use their own and others' fire data to improve fire outcomes for communities. ■

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LSZH (Halogen Free) options	✓	?	ActivFire listed	✓	✗



A CONTRASTING SUMMER

Australian and New Zealand summers are becoming less predictable and more severe, posing many challenges for our emergency services.

PHOTO: DEPARTMENT OF FIRE AND EMERGENCY SERVICES, WESTERN AUSTRALIA

Multiple bushfires threatened homes on Perth's fringe.

Emergency services in Australia and New Zealand were kept busy over summer. Some had to contend with more fires than others, while severe weather produced challenges such as sudden heavy rainfall and flooding.

Fire Australia worked with the Australian Bureau of Meteorology, New Zealand Fire Service, and Australian state and territory emergency services to build a comprehensive overview of the region's summer 2016–17, capturing activity from December to the end of February.

Bureau of Meteorology

The past summer was another hot one for Australia, with a range of extremes. Averaged across the nation mean temperatures, maximum temperatures, and minimum temperatures were all above average (see table, page 17). Rainfall was the fourth-highest on record for Australia as a whole.

The national figures mask the distinct and stark contrast of what unfolded during summer in the east and west. Conditions were generally dry and warm

in the eastern states, with cool and local record wet conditions in the west.

In the east: large areas across the eastern quarter of Australia recorded below-average rainfall. Short-term rainfall deficiencies (November 2016–February 2017) emerged in pockets of eastern Queensland, north-eastern New South Wales, and in much of Gippsland, Victoria.

Prolonged and extreme heat occurred in the east during summer. Three distinct heatwaves affected NSW, southern Queensland, SA and areas of northern Victoria in January and early February. Each of these events elevated the fire risk, with the third heatwave (31 January – 12 February) seeing significant property loss from bushfires in NSW and the ACT.

The persistent warmth in NSW and Queensland across the summer period resulted in numerous records being set. These included record runs of consecutive warm days, record total number of hot days, and record high daily temperatures (especially on 11 and 12 February).

In the west: temperatures were below average in the northwest,

southwest and much of the NT. WA, the NT and SA had above to well above average summer rainfall, with areas receiving record high falls.

For WA as a whole, it was the wettest summer on record, and cool temperatures prevailed across areas that received above average falls. Perth also recorded its wettest summer on record. Many towns in the southwest that typically have a very dry hot summer received unusual summer rainfall.

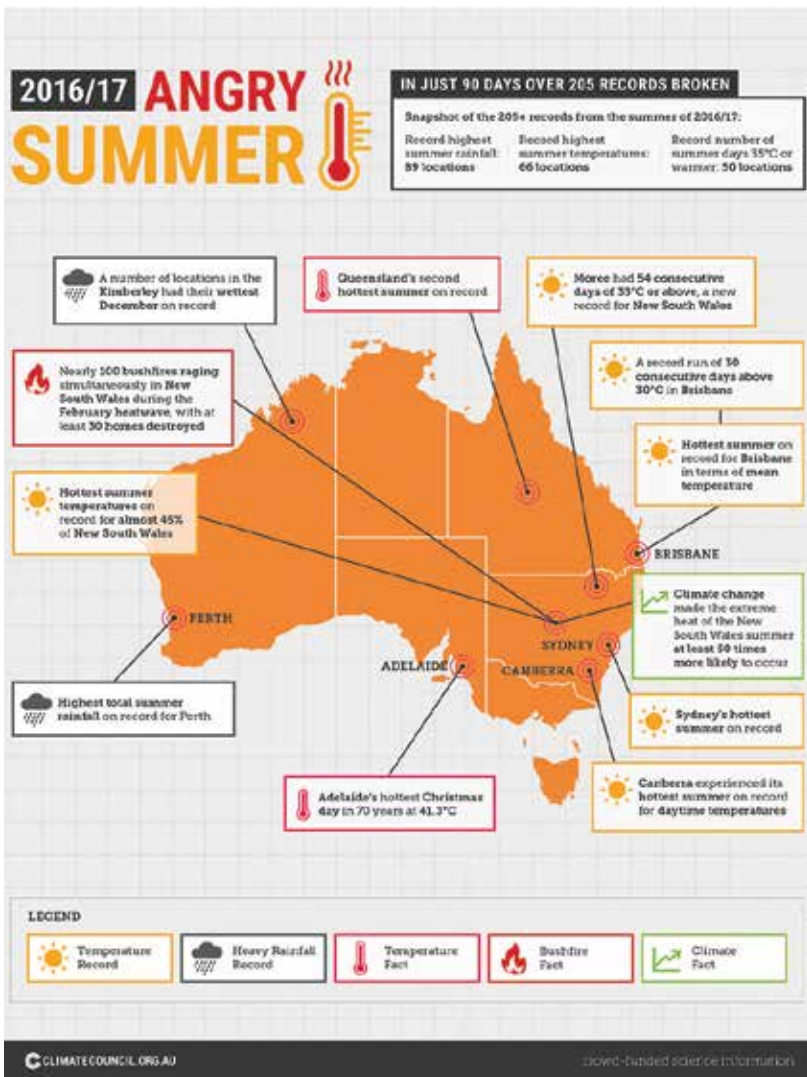
Across the country, the extreme temperatures provided a favourable environment for fire weather. Hot, dry and windy conditions contributed to the development of several severe fires.

The forest fire danger index (FFDI) decile map for summer 2016–17 shows areas that had above-average to record high FFDI values in the east (see figures 1, 2, 3).

Emergency services summer reports

Wet summer for South Australia

The 2016–17 fire danger season started



SOURCE: CLIMATE COUNCIL

off wet in South Australia, and continued with this trend for most of the season. SA agencies were kept busy with several storms, assisting with fallen trees, flood prevention and general storm damage.

Emergency services responded to flash flooding from heavy rains across metropolitan Adelaide in late December, January and February. SA Country Fire Service (CFS) provided incident management team support and strike teams to assist SA State Emergency Service colleagues with flooding at Gawler River.

Fires of significance in the state were started mostly by lightning. The largest fire was on the Nullarbor, and burnt 17,000 hectares, while a fire at Yacka in the state's mid-north burnt 1,200 hectares.

A fire at Waterloo, started by harvesting, threatened a wind farm, but CFS crews managed to contain it to 59 hectares with no damage to the turbines.

The CFS were kept busy with several haystack fires and a structure fire in a hay-processing plant that caused \$14 M damage. Crews used compressed air foam systems to help

extinguish the fire, which burned for approximately five days.

This season, the number of grass fires attended has halved, whereas storm-related callouts are more than twice the annual average. Extreme heat conditions also saw SA Metropolitan Fire Service and CFS respond to a number of structure fires across the state, caused by air conditioners, evaporative coolers and fans.

Heavy rains in Northern Territory

The Northern Territory Emergency Service (NTES) and its partner emergency management agencies were concurrently operational in January and February.

In a steady flow of severe weather, tropical lows and heavy rains across the Top End, there was rarely a day between Christmas 2016 and the end of February 2017 where no form of weather-related watch or warning was posted.

More than 1200 mm of rain was received over three months in the western Top End, with many other parts receiving 400–600 mm in the same

period—most of it during February.

Severe weather has seen parts of the southern NT experience flash flooding, with the community of Kintore affected on Boxing Day after receiving more than 200 mm of rain in two hours.

Many communities became isolated as normally dry watercourses ran, with numerous instances of vehicles attempting to cross flooded causeways.

Two lucky Japanese tourists survived after their vehicle was washed several hundred metres down a creek after attempting to cross a fast-flowing crossing.

Alice Springs and Tennant Creek received heavy rainfall, with numerous calls for assistance for flood and storm damage attended to by volunteers.

In the north, 2017 opened with severe weather across Darwin as the monsoon settled over the Top End. Major rivers and streams steadily filled and flood plains have reached saturation as the monsoonal flow has remained active.

Calls for storm damage and flood assistance were attended to by NTES in Darwin and Katherine regions and the service has its flood boats on constant standby in case of serious flooding.

Remote areas of the north have steadily become isolated and two communities have become partly inundated with flood waters. Regrettably, three lives were lost near Peppimenarti when an overcrowded 4WD attempted to drive through a flooded crossing. Seventeen other people survived.

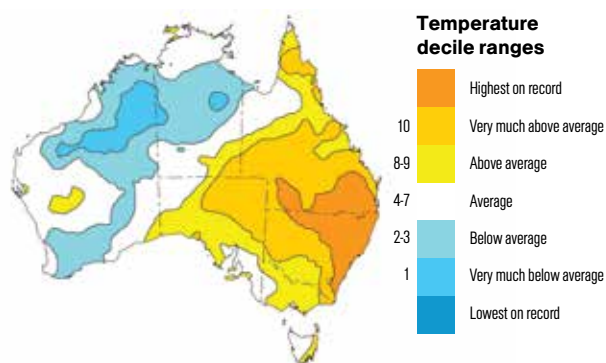
While not directly attributed to flooding, a man attempting to cross the notorious Cahills Crossing in Kakadu was taken by a crocodile. His two companions made it across safely.

Record temperatures and catastrophic conditions in New South Wales

NSW experienced its hottest temperatures on record during the 2016–17 bushfire season. The bushfire pre-season and season was affected by many weather factors. A wet winter and an early spring postponed hazard reduction. In the urban bushland interface, risk management stretched well into the bushfire danger period.

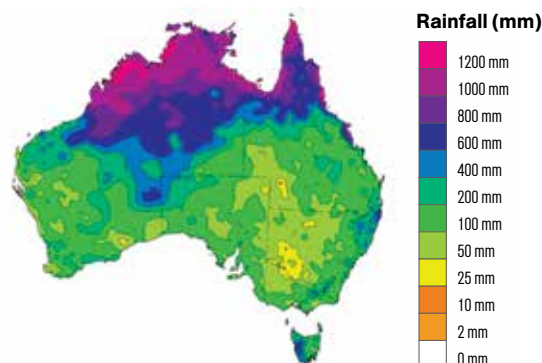
From 4 November New South Wales Rural Fire Service (NSW RFS) and Fire

FIGURE 1 Mean temperature deciles (all available data) 1 December 2016 to 28 February 2017



SOURCE: AUSTRALIAN BUREAU OF METEOROLOGY

FIGURE 2 Australian rainfall analysis (mm) 1 December 2016 to 28 February 2017



SOURCE: AUSTRALIAN BUREAU OF METEOROLOGY

& Rescue New South Wales (FRNSW) responded to a season of significant bushfires and grassfires that peaked with catastrophic-rated conditions in February 2017. An allegedly deliberately-lit bushfire at Cranebrook and Llandilo—driven by strong winds, high temperature and very low humidity—threatened dozens of houses. Large waterbombing aircraft played a significant part in controlling this fire.

During the numerous fires in the

upper and lower Hunter in December, local strike teams deployed thermal imaging cameras to check for hotspots in house eaves. This was risk mitigation against embers settling in roof voids and igniting coal dust deposited over many years.

In a demanding February, NSW agencies responded to large-scale fires that included Carwoola in Queanbeyan, Sir Ivan in the Warrumbungle area, Papinbarra Road in Port Macquarie,

Kains Flat, Boggabri, Red Hill Road at Limekilns near Bathurst and Fig Tree Hill Drive at Lennox Head.

The Sir Ivan fire burnt more than 55,000 hectares of land during the worst fire conditions ever experienced in NSW. Thirty-five houses were destroyed with another 11 damaged. Despite these challenging conditions, firefighters and the community saved 80 homes and 125 outbuildings.

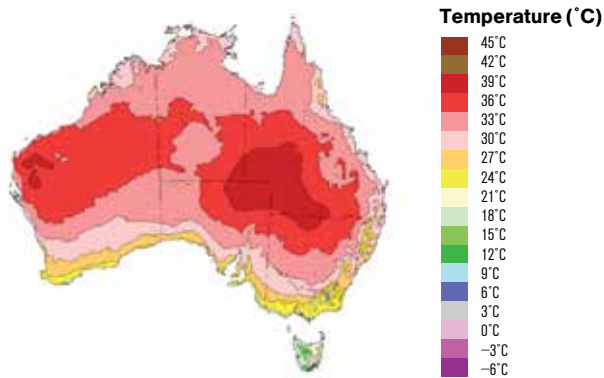
NSW RFS's initial assessment of the

PHOTO: NSW RURAL FIRE SERVICE

A demanding February saw NSW agencies respond to large-scale fires, including the Carwoola blaze near Queanbeyan.



FIGURE 3 Maximum temperature
1 December 2016 to 28 February 2017



SOURCE: AUSTRALIAN BUREAU OF METEOROLOGY

Australian weather extremes in summer 2016–17

Hottest day	48.2°C	Tarcoola (South Australia) on 9 February 2017
Coldest day	3.2°C	Kunanyi (Mount Wellington Pinacle) (Tasmania) on 13 February
Coldest night	-3.7°C	Mount Hotham (Victoria) on 18 December
Warmest night	34.2°C	White Cliffs (New South Wales) on 11 February
Wettest day	351.0 mm	Tung Oil Alert (Queensland) on 9 January

Australian average temperatures

Mean	+0.61°
Maximum	+0.39°
Minimum	+0.82°

Carwoola fire affected area confirmed that 11 homes and 45 outbuildings were destroyed while 12 homes and 40 outbuildings were damaged. Fortunately there was no loss of life.

FRNSW responded to almost 1,000 bush or grass incidents over the 2016–17 season, with its Strategic Operations Centre, Bushfire Incident Control Centre and bushfire officers delivering support and incident intelligence to the commands.

During February and early March heavy rains lashed coastal and south-east areas of NSW. The NSW State Emergency Service (SES) responded to a number of calls for assistance.

In February severe weather and hailstorms affected the Sydney and Wollongong areas, with leaking roofs and localised flash flooding the main impacts. NSW SES volunteers were supported in the field by local councils as well as other emergency services.

Victoria’s all-emergencies summer season

Victoria had an all-emergencies season in 2016–17. Summer is no longer just about fire—there have been incidents involving sharks, heat, flash floods, storms, thunderstorm asthma, water-safety, a broken-down cruise ship, the tragic Bourke Street incident and the Essendon plane crash.

For emergency services, the summer period has highlighted the way they

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PHOTO: ANDREW WESTON

**QFES
firefighter
damps down**

work together to manage emergencies and protect the community. The management of emergencies in Victoria has been moving towards an 'all communities, all emergencies approach' with a strong focus on building safer and more resilient communities.

Water safety was a key issue this summer. An increase in shark sightings saw a number of beaches closed. Life Saving Victoria volunteers were kept busy patrolling beaches, performing rescues and undertaking training. Despite their efforts, sadly 13 people drowned.

Severe thunderstorms across the state trapped people in floodwater, brought trees down, damaged properties and agriculture, caused power outages, disrupted the public transport network and led to poor water quality in Melbourne's bay areas.

The season saw a strong focus on community health and relief and recovery, particularly in relation to thunderstorm asthma, the Bourke Street tragedy and the Essendon plane crash. Agencies worked together to manage and mitigate impacts and provide information and support to the community, with relief and recovery services continuing into the future.

The fire season kicked off during the harvesting season across the north of the state and has continued

Heat emergencies are an emerging issue. This season, Heat Health Alerts were issued for significant heat days, while heatwave conditions swept across the state in early February.

with several bushfires and grassfires. Grassfires have been the greatest risk this season. Thanks to the quick response of emergency services and the ability of our firefighters and aircraft to work together, small fires have been kept small.

Victoria's fleet of 48 aircraft has been integral to minimising the impacts of bushfires and grassfires. Pre-determined dispatch enables aircraft to respond to fires at the same time as fire trucks, providing rapid response in the early stages. Victoria sent 14 aircraft, including the two large air tankers to NSW to

provide support when parts of that state experienced catastrophic bushfire conditions.

Heat emergencies are an emerging issue. This summer, Heat Health Alerts were issued for significant heat days, while heatwave conditions swept across the state in early February. A State Controller—Heat was appointed for the first time to operate alongside the State Response Controller, making sure appropriate arrangements were in place to manage heat impacts.

Victoria's all-emergencies summer highlights a changing climate and the need for a whole community approach to the way we prepare for, respond to and recover from emergencies, with government, agencies, business and communities working as one.

Early Queensland rains delay summer

Above-average rainfall throughout winter and early spring delayed the onset of Queensland's 2016–17 fire season, with predictions that a dry, hot summer would bring the most challenging fire weather.

Bursts of activity from November through to January saw Queensland Fire and Emergency Services (QFES) issue 222 community warnings, with some of the more challenging incidents for firefighters including fast-moving

and protracted fires at Russell Island and Coolum. These fires were the only incidents across the state to escalate to an Emergency Warning level.

Throughout the season, firefighters responded to 4,725 vegetation fires statewide from 1 September 2016 to 31 January 2017. A total of 61,407 hours was spent attending these fires, of which 38,186 were contributed by the Queensland Rural Fire Service.

Social media played a significant role in communicating information and warnings to the public, with activity on the QFES Facebook page alone reaching more than 10 million people.

Bushfires and flooding in Western Australia

Fire crews in WA responded to several large-scale bushfires throughout the season, with no loss of lives or homes at time of print. This included an October bushfire in the Kimberley region that burnt through 1.5 million hectares, as well as fires on Perth's rural-urban fringe that came alarmingly close to homes, but were swiftly brought under control.

A natural disaster was declared following widespread flooding across most of the state during February. In

response to ongoing flooding in the north, the Department of Fire and Emergency Services worked tirelessly to resupply isolated communities, transporting supplies by helicopter, as well as undertaking a month-long fuel resupply operation. Emergency services also rescued community members who became stranded or endangered by floodwaters.

State Emergency Service volunteers were kept busy responding to more than 680 requests for assistance for flood and storm damage and were involved in more than 30 search operations, while the Volunteer Marine Rescue Services undertook more than 750 rescues.

Wet spring in Tasmania leads to below normal fire season

Due to a wet spring—combined with mild temperatures and periodic rainfall throughout summer—Tasmania Fire Service (TFS) encountered a later start to the season. As of 2 March, TFS reported a below normal fire season in terms of responses and area burnt. TFS issued Advice Alerts for four different fires, including one at Runnymede in the state's south, which was deliberately lit on 13 December and burnt for more

SUMMER IN BRIEF

- Warmer than average across eastern Australia
- Cooler than average across the north-west
- Record warm days and nights for southern Queensland and northern to eastern NSW
- Drier than average for the much of the eastern mainland
- Above average rainfall across WA, the NT and SA
- Heavy rainfall and flooding in south-west WA during late January and early February
- Very heavy rainfall in late December across the Kimberley, Central Australia and the south-east, associated with tropical systems.

than two weeks over 3,200 hectares.

A fire at Lindisfarne on Hobart's eastern shore threatened homes on 15 February, and a Watch and Act alert was issued for this urban interface area. The day had been declared as a day of total fire ban. Quick action by firefighters, supported by rotary and fixed-wing aircraft, brought the fire under control with no property loss or injury. Unfortunately, this fire was also deliberately lit.

A fire permit period for the southern and northern regions of the state was declared on 22 December 2016, with the north-west region beginning their fire



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permit period on 10 January 2017.

Tasmania had only one total fire ban for the fire season, and responded to fewer than 200 uncontrolled bushfires for the summer months. This is well below the ten-year average of 700 uncontrolled bushfires from December through to February.

ACT avoids major bushfires

The ACT started the fire season with very wet conditions. More than 500 mm of rain fell through winter and spring, causing a surge in grass growth and available fuel as it cured.

The official fire season was delayed to the beginning of November because the ground was completely saturated and dams were full. The Bushfire and Natural Hazards CRC Southern Australia Seasonal Bushfire Outlook for 2016 indicated a wetter than average start to summer. The prediction held true and elevated fire danger indexes didn't occur until the middle of January.

The first total fire ban of the season was on 18 January 2017, coinciding with the 14th anniversary of the devastating 2003 Canberra firestorm. At the time of writing, had been six total fire ban days

in total, including three days in a row from 10–12 February.

The ACT has been fortunate throughout the season, with only three bushfires of note, though a constant run of smaller fires have occurred in and around the urban area. The surrounding area of NSW has been less fortunate, with a significant run of fires to the east, including the Carwoola fire that caused significant damage. The ACT has willingly assisted at all these incidents with multiple strike teams, incident management team support and aircraft.

The ACT Rural Fire Service, ACT Fire and Rescue and ACT Emergency Services Agency, remain committed to supporting NSW and the broader community when required. The ACT, like all other jurisdictions, relies on volunteer members to provide the bulk of the firefighting personnel. Without the continued dedication and selfless commitment to the community shown by volunteers and their families and employers, ACT agencies could not protect the region.

LATE BREAKING NEWS

As *Fire Australia* was going into production, Cyclone Debbie and its after effects had ripped across Queensland and NSW causing enormous damage to property and the tragic loss of multiple lives.

Despite mass evacuations and preparations for one of the biggest storms to hit the Australian east coast in recent history there was widespread damage with early estimates running into the billions of dollars.

Fire Australia will follow this story in its next issue.

“As I flew past it, I thought, ‘my God’. I’ve been on big fires in a lot of places and I haven’t seen anything like this”

– Richard McNamara, New Zealand Fire Service

New Zealand faces fire tornado

Christchurch’s Port Hills fire was one of the biggest and most complex in New Zealand’s recent history. It required firefighting on a number of fronts, including urban, rural and air attack. Two large fires merged into one inferno, destroying homes and land on the outskirts of the city.

At its peak, the fire had 100,000 kilowatts of energy—the equivalent of three atom bombs. Eleven homes were lost. Tragically, helicopter pilot and former Special Air Service soldier David Steven Askin died when his helicopter went down while fighting the blaze.

Many of the responding firefighters have seen big fires on their deployments overseas, including Australia. For seasoned firefighter Richard McNamara, seeing and hearing a 50-metre ‘fire tornado’ showed him the level that this fire was on.

“As I flew past it, I thought, ‘my God’. I’ve been on big fires in a lot of places and I haven’t seen anything like this,” Mr McNamara said.

To put the size of the fire in context for the New Zealand environment, the Port Hills fire burnt through 1,819 hectares. Last year, 3,507 hectares in total were burnt across the whole of New Zealand by 4,582 recorded rural fires.

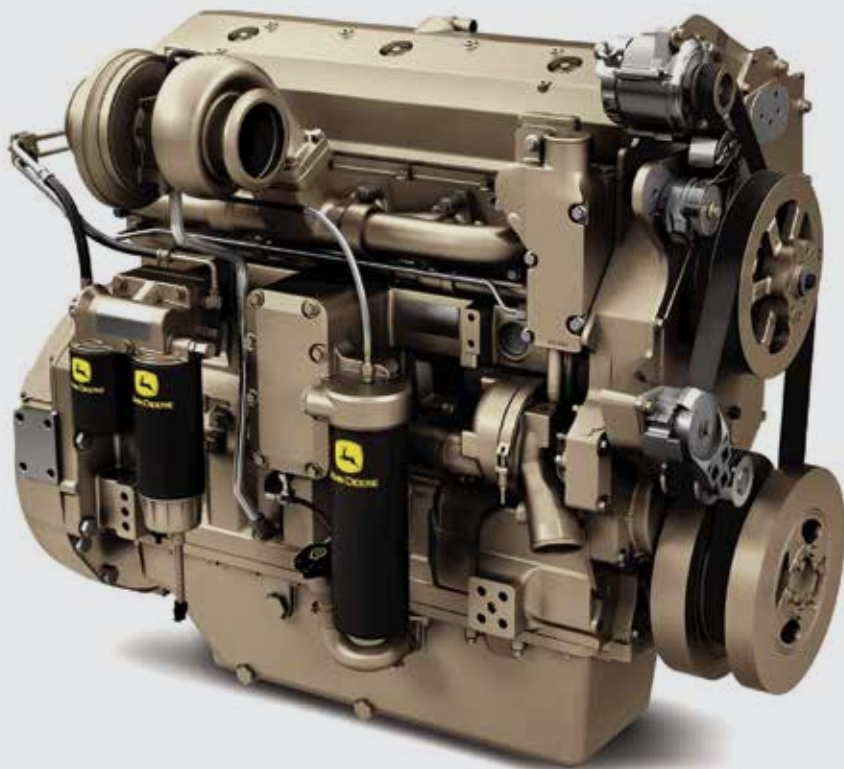
Cordons were in place for a number of days. The fire response was maintained for several weeks with different crews working on priority hotspots across the fireground, to ensure that the fire was fully extinguished. ■



PHOTO: RICHARD MCNAMARA

Conditions during the Port Hills fire in New Zealand caused a 50-metre fire tornado

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Research has studied the 2013 State Mine fire in the NSW Blue Mountains to understand what caused such severe fire behaviour.



MOUNTAIN WAVES

AND EXTREME FIRE BEHAVIOUR

A weather phenomenon is challenging forecasters' powers of prediction.

BY **DR JEFF KEPERT**

Bushfire and Natural Hazards CRC and the Bureau of Meteorology

One of the most challenging situations in fire management is when relatively non-threatening weather conditions are expected, but a severe fire eventuates. These situations can result in significant loss of property or even life.

Identifying the cause of such incorrect expectations can help to prevent them from recurring in the

future. Through analysis of recent bushfires, Bushfire and Natural Hazards CRC research has identified three cases where a weather phenomenon known as 'mountain waves' have contributed to severe fire behaviour.

Mountain waves are atmospheric oscillations that occur due to air flowing over hills or mountains. They can result in particularly disastrous consequences during a fire, and can arise in several different ways—some more predictable than others. Often, mountain waves cause strong downslope winds on the

lee slope of a hill or mountain. They are extremely complex to predict because their existence and amplitude is sensitive to the atmospheric temperature structure and vertical variation of the wind.

Modelling weather conditions

As part of our research into bushfire meteorology, the team uses the Bureau of Meteorology operational numerical weather prediction system, the Australian Community Climate and Earth-System Simulator (ACCESS), to



PHOTO: GARY PHARES, SUPPLIED BY NSW RURAL FIRE SERVICE

conduct case studies into severe fire weather events. We configure ACCESS in research mode, to simulate the weather at very high resolution, with a grid spacing of around 440 m. After running the model, the simulation is verified against the observed weather from the event. If the simulation proves to be sufficiently accurate, we can assume it is a good representation of what actually occurred.

In many cases, the team has uncovered instances of finescale meteorology—too small in scale to be resolved by the operational models or captured by available observations—that would have contributed to more severe fire behaviour. Often these features would either not have been depicted in the traditional fire-danger parameters of surface temperature, humidity and wind, or they would have been filtered out in a broader-scale depiction of the data.

After analysing several significant bushfires, we uncovered mountain waves as a factor in three fires: the NSW State Mine fire in 2013, the Margaret River fire in WA in 2011, and the Victorian Aberfeldy fire in 2013. This suggests that the impact of mountain waves on fire is a reasonably common problem—one that we need to learn more about.



SOURCE: COUNTRY FIRE AUTHORITY

The dark shading shows the areas burnt by fire at the Victorian Aberfeldy fire in 2013.

State Mine fire, NSW

In October 2013, large and destructive fires burnt through the Blue Mountains, destroying more than 200 homes.

A detailed case study of the fires focused on 17 October, when the majority of the damage occurred. On this day, the State Mine fire grew from 1,036 to 12,436 hectares in around 10 hours. This was severe fire behaviour by any definition—especially occurring so early in the fire season, even though preceding conditions had been dry.

Modelling of the weather during the fire showed that a band of strong winds extended downwards towards the surface in the vicinity of the fire. Looking at the vertical motion of the model, alternating bands of ascent and descent are present. Together, these bands are the characteristic features of mountain waves. While wind speeds at higher altitudes are often significantly stronger than those at the surface, here the mountain waves have provided a mechanism to bring these strong winds downwards to where they can directly impact the fire.

The modelling also showed a marked 'dry slot' of drier air passing over the fireground during the day. A dry slot, in the context of fire weather, is a relatively long, narrow band of dry air often associated with a wind change. The slot can cause sudden drops in humidity and increases in wind speed if it mixes down to the surface. The onset of dry air can reduce fine-fuel moisture and thereby elevate the fire risk.

Margaret River fire, WA

In 2011, a prescribed burn in the Margaret River region escaped overnight. Strong winds on the following

day resulted in the fire destroying 39 homes in the communities of Prevelly and Gnarabup.

While the fire activity was reasonably consistent with the fuels and weather on the day, the behaviour overnight was not. For the days preceding the escape, the fuels had been reluctant to burn—to the extent that it was decided to leave the fire overnight. Early the following morning, fire crews returned to find that the fire had dramatically intensified, and was in the process of crossing control lines. As it spread into heavily inaccessible terrain they were unable to contain it burning into Prevelly and Gnarabup.

The area of the prescribed burn included the southern slopes of a small hill about 200 m in height. Modelling of the event showed that overnight, as the wind tended northerly, strong downslope winds developed on this slope (see Figure 1 overleaf). This reinvigorated the fire, pushing it towards the containment line. In this particular case—and in contrast to the State Mine fire—strong near surface atmospheric stability due to a nocturnal temperature inversion were crucial to the development of the mountain waves. A further meteorological contributor to the unexpected fire behaviour was the dry continental air that moved over the fire earlier in the night, making the fuels more flammable.

Aberfeldy fire, Victoria

In January 2013, a fire that ignited in Aberfeldy, Victoria, tragically took one life and destroyed dozens of houses. The fire experienced unexpected activity on the night of 17 January. Like the Margaret River fire, this was against

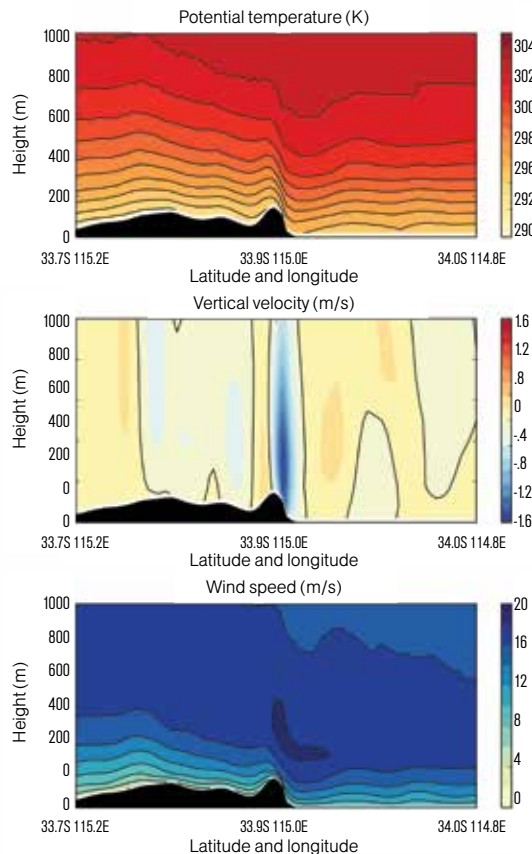


PHOTO: DEPARTMENT OF FIRE AND EMERGENCY SERVICES, WESTERN AUSTRALIA

Above: The Margaret River fire burnt through tourist areas along the coast, destroying 39 homes and coming very close to others.

Right: Cross-sections of potential temperature (top), vertical velocity (middle, blue is down) and wind speed (bottom) through the fireground of the Margaret River fire. Overnight, the fire intensified and escaped on the lee of the small hill near the centre of the domain. The flow direction is left to right.

FIGURE 1 Margaret River fire



the usual diurnal trend. In contrast to the Margaret River fire, however, the Aberfeldy fireground was at a much higher elevation, being on the southern slopes of the Great Divide overlooking the Latrobe Valley.

Modelling showed clear evidence that mountain waves and strong downslope winds developed overnight. These winds would have directly increased the fire intensity and spread, as well as contributed to firebrand transport. However, other factors also likely contributed. One influence was the steep and rugged topography. Another was that the fireground, being elevated, was in the warm, dry air above the nocturnal inversion. This would have limited overnight recovery of the fuel moisture.

Forecasting in the future

So what do mountain waves mean for fire management? The ingredients that led to the Margaret River fire are well known: nocturnal cooling, reasonable strong synoptic flow, gentle upwind slope and steeper downwind. Other mountain wave forecasting cases are more difficult, because mountain wave activity is sensitive to the atmospheric wind and temperature structure, to the shape of a particular hill or mountain, and to the topography upwind.

Forecasters could be reasonably confident of some activity, but unsure whether it is strong enough to cause a serious problem.

Theory helps in some cases, but not all. For example, attempts to fit the Blue Mountains case study into one of the existing theoretical paradigms were not successful. On the other hand, sufficiently high-resolution modelling can capture at least some of these events, and the Bureau of Meteorology's new 'city domain' versions of ACCESS have a grid spacing of 1.5 km, which should suffice in many circumstances. However, these are only available in those regions covered by those models—in most cases, a roughly 1,000-km square centred on the state capitals.

A further problem is that the area affected by mountain waves is often comparatively small. In the case of the Margaret River fire, for instance, it was only a few kilometres across. District-level forecasts may be too broadscale to capture the effect, as will forecasts based on anything but the finest-resolution numerical weather prediction.

Even if numerical weather prediction could reasonably correctly resolve the occurrence and amplitude of mountain waves, the information still needs to reach the fire manager. A request for a spot forecast from the fire manager,

mentioning the precise location and perhaps the possible concern regarding mountain waves, might be necessary. But this approach could rapidly become impractical when there are many fires, and fire managers might be reluctant to request a spot forecast when they expect the fire behaviour to be benign. Both meteorologists and fire managers might require training in the potential impacts of mountain waves on fires.

These studies show the usefulness of high-resolution numerical weather prediction in diagnosing the cause of unexpectedly severe bushfires. This ability should translate into skill in a forecast situation. But high-resolution numerical weather prediction contains a wealth of finescale three-dimensional detail—only a small part of which will be relevant to a particular situation. Teasing out the useful information, and avoiding swamping the user with unnecessary detail, are challenges that will become harder as forecast capabilities increase.

These studies also illustrate the value of research. As we become more aware of the subtle ways that meteorology, topography and fire can interact, we can learn from adverse outcomes and be better prepared into the future. ■

For more information about this research, visit: www.bnhcrc.com.au

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FIRE AUSTRALIA CONFERENCE AND TRADESHOW

INTRODUCTION BY **CHRIS ORR**

National President, FPA Australia

Fire Protection Association Australia's (FPA Australia) role is to provide leadership, bring the fire protection industry together, and equip fire protection practitioners with the information and knowledge that will advance and improve their everyday practices.

Each year, our industry gathers at Fire Australia to learn, network, collaborate and discuss the important issues of the day. Fire Australia has become a tradition—a showcase of our industry's expertise, technology, systems, research and insight.

Fire Australia 2017 will be the largest event FPA Australia has ever staged. It brings together topics covering three dedicated technical streams: fire protection, hazmat and fire safety engineering. Each stream will attract key members of the industry—specialists who can provide in-depth knowledge for fire protection practitioners to incorporate into their work within the broader community.



Chris Orr,
National
President, FPA
Australia

This year I will introduce to the conference stage some very high-profile participants who will show why they have positions of leadership within fire protection and fire safety. They include senior representatives of the NSW Government, who have shown such vision in their reform of the fire protection industry; the President and Chief Executive Officer of the National Fire Protection Association of the US, Jim Pauley, and his colleague, Vice President of Electrical and Engineering, Chris Dubai; the Australian Building Codes Board's General Manager, Neil Savery; leading fire safety engineer, Stephen Kip; and work safety specialist, Andrew Battye.

But the star of the show may well be the incredible location—at Darling Harbour, in the recently opened International Convention Centre Sydney. Fire Australia 2017 is among the first customers of this new centre. Darling Harbour is itself a jewel in Sydney's crown, with the addition of the International Convention Centre Sydney adding to its brilliance.

Enjoy the conference and the tradeshow—now the largest of its type in the country—and don't forget to take in the stunning surroundings. I look forward to seeing you there and taking the opportunity to catch up and discuss the future of our industry.

Fire Australia 2017 keynote speakers

Jim Pauley, President and Chief Executive Officer – National Fire Protection Association (NFPA)

TOPIC: INTERNATIONAL LEADERSHIP IN FIRE PROTECTION STANDARDS DEVELOPMENT AND RESEARCH

Mr Pauley has served in several leadership positions, including Chair of the Board for the American National Standards Institute and Chair of the



Jim Pauley, President and Chief Executive Officer – National Fire Protection Association (NFPA)

High Performance Building Council for the National Electrical Manufacturers Association. He has received numerous awards and recognitions, including his recent induction into the Engineering Hall of Distinction at the University of Kentucky. Mr Pauley holds a Bachelor of Electrical Engineering from the University of Kentucky and has been a licensed engineer in the state of Kentucky.

Andrew Battye, Manager – Dangerous Goods and Explosives Team, SafeWork NSW

TOPIC: IS A TRUSTING RELATIONSHIP WITH REGULATORS GOOD FOR BUSINESS WHEN MANAGING THE RISK OF HAZARDOUS CHEMICALS IN THE WORKPLACE?

Mr Battye has worked for SafeWork NSW (formerly WorkCover NSW) for the last 11 years. He joined the Regulator as an Inspector in 2006 and has held several key positions in both operations and investigations, before spending the last three years in the Dangerous Goods and Explosives Unit, where he was responsible for granting the first licences

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Andrew Battye

to major hazard facilities in NSW.

Prior to joining the Regulator, Mr Battye was self-employed as a dangerous goods consultant, and has worked in the downstream petrochemical industry for 23 years in the UK, Asia and Australia. He has a Bachelor of Engineering and is currently a full member of the Australasian Institute of Dangerous Goods Consultants.



Stephen Kipp

Stephen Kip, Director – SKIP Consulting

TOPIC: ARE PERFORMANCE-BASED FIRE SAFETY CODES DOOMED TO FAILURE?

Mr Kip has been a Director of SKIP Consulting, an engineering and regulatory consultancy firm, for the past ten years. Prior to that, he held senior engineering positions with Warrington Fire Research (now Exova Warrington Fire) and the Building Research Association of New Zealand, and was the deputy to the Building Commissioner at the Building Control Commission in Victoria, Australia.

Mr Kip is a Fellow of Engineers Australia, an Honorary Fellow of the University of Melbourne School of Architecture and Building, an Adjunct Associate Professor of the School of Engineering and Science at Victoria University, a member of the Emergency Management Commission of Victoria's Bushfire Construction Advisory Panel, and a former member of the Victorian Building Appeals Board.

Neil Savery, General Manager – Australian Building Codes Board (ABCB)

TOPIC: ABCB STRATEGIC UPDATE AND INITIATIVES

Mr Savery is currently involved in transforming the business model and outlook for the Code's development and the role of the ABCB. Prior to this, he was Deputy Commissioner of the Victorian Building and Plumbing Industry Commissions, where he was responsible for managing the process of change arising out of the 2011 the Victorian Auditor-General's report.

For eight years, Mr Savery served as the inaugural Chief Planning Executive for the ACT Planning and Land Authority. Previous roles include Executive Director of Planning SA, and Director of City Planning and Special Projects at the City of Greater Geelong. He holds qualifications in town planning, urban design and ecologically sustainable development, and is an Adjunct Professor in Urban Design with the University of Canberra, a Certified Practising Planner and a graduate of the Australian Institute of Company Directors.

Fire Australia 2017 will again bring together some of the brightest minds in the fire protection industry here and overseas. In addition to the key note speakers they include:

Chris Dubay, Vice President of Engineering and Electrical NFPA (US)

TOPIC: FIRE SAFETY DANGERS INVOLVED WITH LITHIUM ION BATTERIES

Mr Dubay is a recognised expert in the fire sprinkler field. He is former chair of the American Water Works Associations Fire Protection Committee, and former board member of the International Water Mist Association. Within NFPA he was responsible for the automatic sprinkler technical committees, and served as editor of *The Automatic Sprinkler Systems Handbook* and *The Residential Sprinkler Systems Handbook*.

Andre Mierzwa, FM Global

TOPIC: RESEARCH AND DEVELOPMENT OF FIRE SPRINKLER TECHNOLOGIES FOR BUSHFIRE EXPOSURE, SPRINKLER PROTECTION AND RADIATION ACTIVATED SPRINKLER SYSTEMS

Winner of the 2016 Fire Protection Association Australia Barry Lee Technical Excellence Award, Mr Mierzwa began working in the industry as a Loss Prevention Engineer (Fire) with FM Global in 1975. His work since then has taken him around the world including Europe, Asia and the US. Mr Mierzwa demonstrated his technical excellence in many areas most recently his work on AS 2118.1-2016. Over the years, Mr Mierzwa has established himself as a leading professional in the industry and regularly shares his knowledge with industry members.

Al Ramirez, Underwriters Laboratories, Illinois (US)

TOPIC: FASTER RATE OF FIRE SPREAD IN NEW HOMES VERSUS DWELLINGS CONSTRUCTED 50 YEARS AGO

Mr Ramirez is Regional Manager for Underwriters Laboratories, a global leader in advancing safety science. The company has more than a century of expertise innovating safety solutions – from the public adoption of electricity to breakthroughs in sustainability, renewable energy and nanotechnology.



Graeme Leonard

Graeme Leonard, Reliable Automatic Sprinkler Co., Inc (UK)

TOPIC: CASE STUDIES OF RETROFITTING SPRINKLERS IN HIGH-RISE HOUSING IN THE UK

Mr Leonard is Vice President – International Sales and Operations for the Reliable Automatic Sprinkler Co., and is based in southern England. He holds an MBA from the University of Durham and a BA (Hons) from the University of Essex. As Treasurer of the British Automatic Fire Sprinkler Association he is a leading figure in sprinkler systems.

OTHER PRESENTERS

W.V. Peter Hunt, Director and Principal Consultant Whampcorp, Board Member AIDG

The board member and former Chairman of the Australian Institute of Dangerous Goods will discuss the difficulties in managing the hazards intrinsic to the production of whiskey and other distilleries. Australia's distillery industry is experiencing rapid growth, but do distillers have enough understanding of managing the risk associated with the manufacture and storage of a highly flammable product?

Neil Bibby, Editor MDM Publishing

The former CEO of Victoria's Country Fire Authority and past National President of the Australian Fire Protection Association (now FPA Australia), current editor of Asia Pacific MDM Publishing and Chairman of the Emergency Services Foundation will discuss whether built-in fire protection systems are being used by fire services when they attend emergency events, and are those system designs guided by how a fire service operates?

Steve Perkins, Fire & Rescue NSW

Steve will present a first-hand account of what it's like to attend a HAZMAT incident from a first responder's perspective. Using a recent incident as an example Steve and his F&RNSW colleagues will demonstrate the challenges involved in being first on scene when dangerous materials are involved in an accident while in transit.

Franz Venter, Technical Director, Fire Engineering WSP Parsons Brinckerhoff

Franz's paper "Designing to Resolve Conflict between Security and Fire Safety in a Lockdown Environment" discusses the issues associated with the built environment when that environment is designed to keep occupants in. Franz looks at building types including punitive correctional centres, police watch houses, secure mental health care centres and even secure cyclone shelters while in lockdown.

Ryan Dodd, Director Operations and Training Critical Fire Protection and Training

Ryan's paper "Bullsbrook Fire – Evacuation Strategies and Techniques for a Retirement Village and Nursing Home Case Study" looks at how the operators of a retirement village and nursing home managed a bushfire that broke out in the Perth north east suburb of Bullsbrook in 2015 and what other similar facilities can learn from them. ■

To see the full program, visit the conference website: www.fireaustralia.com.au



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Below: Forests Commission Overseers Noel 'Mopsy' Fraser (left) and Neil Hodge in front of a Transavia Airtruk sometime in the early 1970s. Both men were heavily involved in setting up the original aerial firebombing trials and mixing base.

Below right: The sign at Benambra Fire Bombing Base was updated to recognise the 50-year anniversary.

FIFTY YEARS OF AUSTRALIAN AERIAL FIREFIGHTING

Last February, a small remote Victorian country town commemorated a full half-century of operational aerial firebombing in Australia.



PHOTO: BEN BUCKLEY



PHOTO: JULIANNE SARGANT

BY **JAMES KIGHTLY**

On 6 February 1967, two Piper Pawnees—contracted from Alpine Aviation of Benambra—made the first operational drops of retardant on a small lightning strike fire in north-eastern Victoria. This marked what has now become a classic application of firebombing: they were able to contain a remote fire until the ground crews were able to walk in some five hours later to ensure it was 'safe'.

That first firebombing operation proved the foundation for what has become an efficient and effective firefighting method used across Australia today. A small gathering unveiled a sign commemorating this event on 6 February 2017. Even before that day, a remarkable range of aerial



firefighting experiments had been trialled.

In the 1930s, people realised that water, while being the obvious fire suppressant, wasn't much use when dropped from the air—it dispersed and evaporated too quickly. So, Royal Australian Air Force aircraft were used to trial a waste product from salt manufacture called bitterns. It was dropped in cartons from the air, and also applied by men on the ground. But the logistics proved to outweigh the benefit.

After World War II, air force Mustang fighters were used. In 1946, they dropped tanks holding 200–300 litres of 15% ammonium sulfate on a test fire, with fair to good results for accuracy. Heavy, four-engine bombers proved less effective. Over the next 20 years, more trials established some basic principles, including the concept that retardant should be dropped across the path of the advancing fire front to avoid potentially wasting it on areas that were already burnt.

Further materials were tried, including bentonite—a clay that increased the viscosity of a water solution. It ultimately proved hard to mix, and trials moved on to calcium sodium borate, known as 'Firebreak'.

Although firefighting aircraft are the most visible aspect of the aerial attack component, they are only a part of the country's fire management system.

In the 1960s, a mix with the key ingredient of diammonium phosphate was finally chosen when two selected bases at Benambra and Snowy Plains in eastern Victoria were set up.

On that Monday in February 1967, the first call for an operational attack was received at Benambra, and the two Pawnees went into action. They were flown by Ben Buckley and Bob Lansbury—experienced agricultural aviation pilots who remain friends to this day.

From that first operation of 15 drops by two small, temporarily adapted agricultural aircraft, the air component of firefighting has come a long way.

Current aircraft range from the airliner-sized very large air tanker (VLAT) down to specialised helicopters and single seater bombers, with other specialised aircraft integrated into a remarkable range of fire evaluation and attack technology.

The core fixed-wing type, with more than 40 examples deployed in recent years, is the Air Tractor AT-802. This is used in both landplane and amphibious float-equipped versions. The float-equipped version—known as the Fire Boss—can scoop directly from a lake or large river and drop at the fire front multiple times without needing to land back, as non-scooper aircraft do. At a glance, the Air Tractor looks like the Pawnee used in the 1960s. Although both are single-engine single seaters, the Air Tractor (which is actually classified as a single-engine air tanker) is much larger. It can drop 3,200 litres of retardant, suppressant or water, against the Pawnee's maximum of 570 litres.

Modern aerial arena

In 2003, the National Aerial Firefighting Centre (NAFC) was created to ensure a nationally coordinated approach for contracting and managing the country's air assets. Advances have included the

Keith Davidson and John Hirschfelder sit on the wing of an Air Tractor, taken during a firebombing operation out of the original base at Benambra in about 1980



PHOTO: BEN BUCKLEY

Above: Two Pawnees and a Transavia Airtruk outside Ben Buckley's hanger at the original Benambra mixing base.



PHOTO: JAMES KIGHTLY



PHOTO: GEOFF GOODALL

Above: In 1967, a Piper Pawnee like this one completed the first aerial firebombing operation in Victoria.

Top: Aerial firefighting has come a long way in 50 years, shown by one of the current large air tankers, Lockheed L100 Hercules Tanker 390, making a demonstration drop in Victoria.

2015 introduction of the national ARENA system—a collaborative information system supporting the management of fire and emergency aviation. Using cloud-based services, ARENA enables anyone involved to access relevant information on a wide range of commonly used electronic devices.

In 2014–15, the national fleet included 94 aircraft—53 fixed-wing and 41 rotary-wing. These were activated on nearly 2,500 occasions (1,487 firebombing and 1,010 support operations). They made more than 23,000 firebombing drops, delivering in excess of 54 million litres of fire retardant. The following 2015–16 season saw the total number of aircraft activations almost double (2,525 firebombing and 2,411 support operations). More than 29,500 firebombing drops delivered in excess of 68 million litres of fire retardant and suppressant across the country.

Australia's current heavy-attack options are the large air tankers and a VLAT contracted via NAFC to NSW and Victoria. These include two Hercules from Coulson, with 13,250-litre maximum loads; the Avro RJ85 four-engine jet, carrying 11,350 litres; and the tri-jet VLAT Douglas DC-10, capable of delivering up to 45,000 litres. These have all been proven effective assets for firefighting—not just in their contracted home states,

but across Australia. On government request, they have even been sent overseas, with Hercules Tanker 132 deployed in Sumatra, Indonesia in 2015.

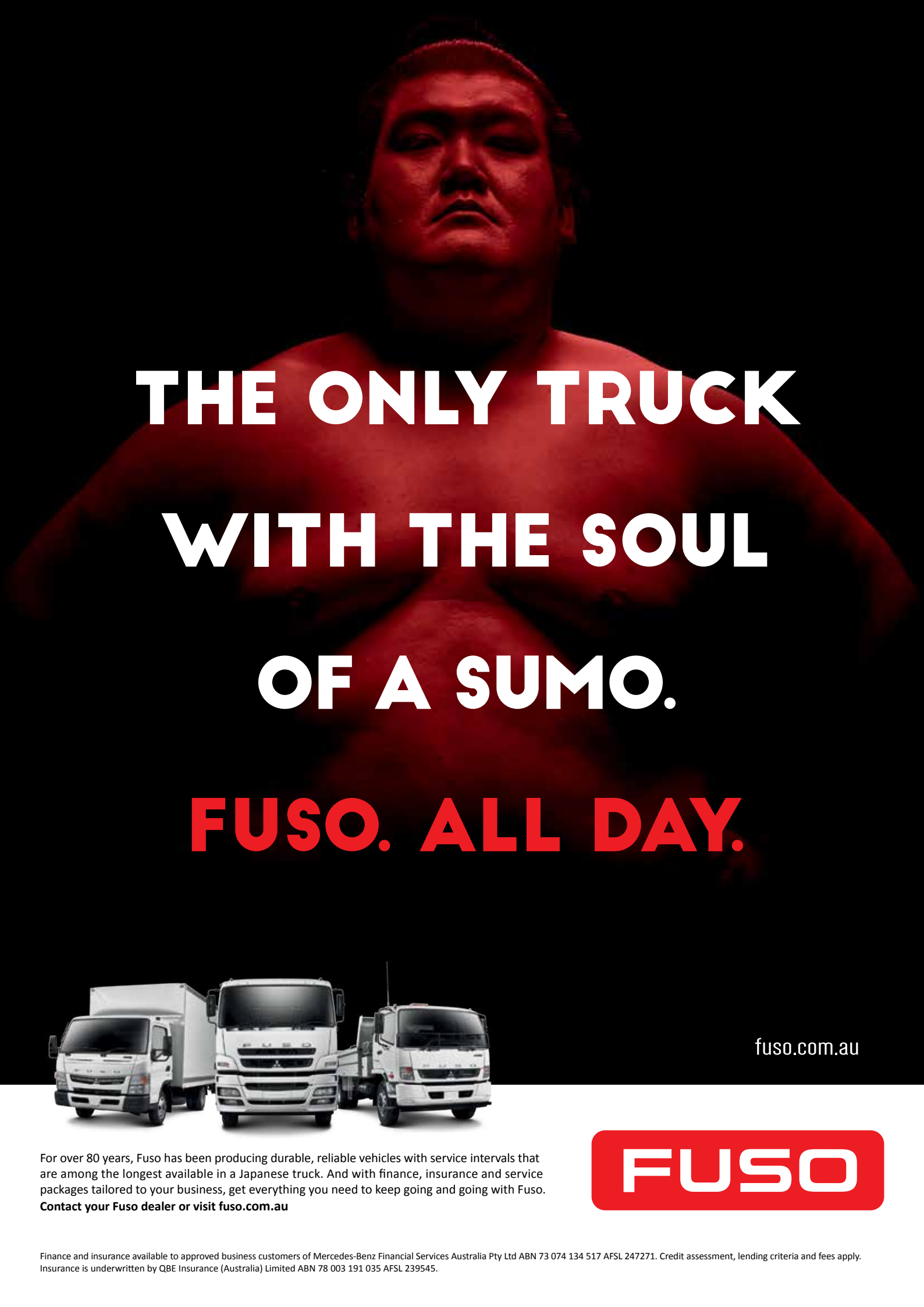
Today, most rural Australians are familiar with medium and light helicopters widely deployed to tackle fires. The one that almost everyone knows is the heavy helicopter: the Erikson S-64 Aircrane, erroneously known as *Elvis*. This is a fully redeveloped, dedicated firebomber based on the Sikorsky S-64 transport helicopter design.

Since 1997, other examples of aircranes, including *Elvis*, as well as *Gypsy Lady*, *Ichabod*, *Millie*, *Georgia Peach* and *Incredible Hulk* have appeared in Australian skies. The names may seem cartoon-like, but the helicopters are all business, able to precisely drop 7,560 litres of suppressant exactly where it's needed. *Elvis* gained its undying fame for firefighting efforts in the Sydney region, and intervening to protect 14 firefighters threatened in a Burratorang Valley fire in NSW in 2001. Since then, up to six aircranes have been deployed around the country each season.

Firefighting aircraft provide support to ground-based firefighters, and should not be regarded as a means of putting out fires on their own. Each aircraft type can be considered as a specialist tool from a diverse toolkit, able to be used where appropriate.

Although firefighting aircraft are the most visible aspect of the aerial attack component, they are only a part of the country's fire management system. The other aspect of aerial firefighting is the range of technological tools available to direct and inform everyone, from the pilots on their run in, to the coordinators and controllers. While the aircraft are still hand flown by experienced aircrews—something that has not changed from the earliest days—today every drop is forensically monitored. GPS, infrared and other analytic data tools are integrated at many levels to enable real-time evaluation of the effectiveness of each attack.

Huge strides in capability and technology have been made over the last 50 years. Many advances in fire aviation owe thanks to developments in computer technology and miniaturisation—enabling previously undreamt-of tools that are almost taken for granted today. Of course, in reality, firefighting is a complex science. The evolving nature of the fire environment and the challenges facing Australia's firefighters means that aerial attack approaches must continually be improved. And these aircraft—from the smallest helicopter to the largest fixed-wing—will continue to provide critical support to the firefighting crews on the ground. ■



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FAILING THE TEST

What happens when a fire hydrant system is left unmaintained and unserviced? When subjected to a routine hydrostatic test, they can sometimes fail.

Fire hydrant systems are required to be hydrostatically tested by AS 1851-2012 every five years. Hydrostatic testing involves subjecting the system—including pipes, valves and connections—to the required amount of pressure to determine its reliability. If the system passes the test, it should reliably operate at the design working pressure, and the fire brigade should be able to use it in a real fire scenario effectively.

Unfortunately, some building and asset managers roll the dice with inspection and testing of these essential fire protection and life-safety systems, hoping they will just work when needed the most. But ignorance is not bliss.

“Fire protection routine service providers are often contracted on up to three-year contracts and often owners don’t know, understand or detail that the required five-yearly hydrostatic test needs to be conducted every half decade,” said Fire Protection Association Australia (FPA Australia) Senior Technical Officer, Brett Dundules.

“As the fire protection service provider’s contract is for three years and the hydrostatic test is required every five, it’s not uncommon for it to be overlooked or ignored. The building owner should have awareness of this and liaise with their routine service provider to ensure the hydrostatic test is carried out when it’s due.”

Correct service periods

Lengthy periods (beyond five years) between hydrostatic tests increase the risk of system failure. This could result in the uncontrolled release of water, which can damage property beyond the need to repair the hydrant system. Damage as a result of failures—demonstrated via hydrostatic tests—is often erroneously levelled at the fire protection service contractor engaged to test the system.

In reality, by undertaking the test, the



Neglected hydrants can burst on testing.

“If the system was routinely serviced and tested properly, then the likelihood of bursting would be minimised.”

— Mr Alan Wilson

fire protection service contractor often simply demonstrates that the system may have been neglected for a long time, and would not have functioned as expected in a fire. As a result, firefighters and occupants would be exposed to a higher fire risk.

Managing contractor risks

So what should be done to reduce the risk and potential exposure faced by the service contractor when conducting routine tests?

According to Alan Wilson of Alan Wilson Insurance Brokers, who has managed many claims because of this issue, many fire protection industry members mistakenly proceed with the hydrostatic pressure test without informing their clients of the potential risks and issues.

“Some systems will not have been properly tested for more than five years and it may look okay from the outside,” explained Mr Wilson. “[But] over time, the insides of pipes deteriorate—sometimes very severely and relatively quickly.”

“Without testing, it’s likely that this potentially catastrophic situation will remain unknown until there is a fire and the system is used by the fire brigade, who should be able to rely on system performance to assist them to undertake their role.”

Testing requires the pressure in the system to be gradually increased to 1.5 times the design working pressure of the approved design. This allows for some redundancy to account for the additional pressure caused by water hammer, and the variable operation of fire brigade pumping appliances that might be boosting the system during a fire.

Mr Wilson said that in his experience, most owners, clients, building managers, facility managers and their insurance companies automatically blame the routine service contractor for bursting the pipes.

“If the system was routinely serviced and tested properly, then the likelihood of bursting would be minimised. However, this is at a cost to the client.”

To reduce legal liability, Mr Wilson advises that routine service contractors preparing to undertake hydrostatic tests on hydrant systems should:

- ◆ advise their client about the risks
- ◆ clearly explain what they will be doing and why
- ◆ have their client sign a waiver stating they understand the risks and therefore do not hold the contractor responsible if the causal issue is system failures that the hydrostatic test is intended to identify, including corroded pipes or fittings, poor connections or lack of routine servicing.



"This is a real issue!" said Mr Wilson. "Why should a contractor be responsible for their clients' rotten pipes, especially if they got that way through neglect?"

Of course, if a pipe bursts through the contractor's error—such as putting too much pressure in the system when testing—then their public liability or professional indemnity insurance will cover this.

Mr Wilson recommends that all contractors carrying out hydrostatic tests should use a hydrant and sprinkler

testing information form, similar to the type he provides his customers.

"It is basically a waiver form. It states the issues and the results and the client must sign it off. If the client refuses to sign the waiver, we tell our insured customer not to do the testing," he said.

"But the golden rules are: communicate with your customer, ask questions, keep them informed and don't assume they know that keeping records is their job too." ■

Fire hydrant systems must be hydrostatically tested every five years or risk corrosion and malfunction during fire.

PHOTO: DANA FAIRHEAD

WHERE, WHY AND HOW ARE AUSTRALIANS DYING IN FLOODS?

CRC research into where, why and how Australians are dying in floods is helping to increase flood safety and awareness.



BY **FREYA JONES**

Bushfire and Natural Hazards CRC

Fatalities from floods form a major proportion of natural hazard deaths around the globe. Here in Australia, floods are ranked second only to heatwaves in terms of the total number of natural hazard fatalities since 1900.

In June 2016, flooding in NSW and Tasmania led to six deaths and hundreds of rescues, while three people died in the NT in January 2017. At the time of print, six people had died during the flooding that occurred in

Research shows that the most common way people are killed during a flood is when they attempt to cross a bridge or flooded road.

“The highest proportions of men and women are dying while they are attempting to cross a bridge or flooded road.”

— Dr Katharine Haynes

Queensland and northern NSW in the aftermath of Cyclone Debbie. Several people were also rescued from floods in SA and Victoria in September and October 2016. These recent cases highlight the significant dangers of floodwaters. And as Bushfire and Natural Hazards CRC research suggests, many flood-related deaths are avoidable.

To gain a greater understanding of human behaviour and why people choose to enter floodwaters, the CRC research project Analysis of Human Fatalities and Building Losses from Natural Disasters has measured the impact of floods on human life, injuries

and building damage.

This study is one of the first to explore the trends and characteristics associated with flood fatalities in such detail. Focusing on the Australian context, the research considered the sociodemographics, circumstances, capacities, knowledge and motivations of those who died in floods. Spatial and temporal trends within the data and the relationship between the fatalities and known characteristics of the hazard were also analysed.

The NSW State Emergency Service (SES) has drawn on the CRC research to back their latest flood safety campaign. Featuring videos of real-life stories—with

people recounting their experiences of trying to drive through floodwater, what happened to them and the consequences of their actions—the campaign emphasises that no-one should ever drive through floodwaters.

Who is most at risk when it comes to floods?

Between 1900 and 2015, 1,859 people died in floods in Australia. The CRC research team, led by Dr Katharine Haynes (Risk Frontiers, Macquarie University), analysed the social and environmental circumstances that led to each of these fatalities.

The research revealed significant trends in relation to gender, age, activity, location and reason for entering floodwaters. The majority of people that died were male (79%), with children and young adults aged 29 or under being most at risk. The analysis of flood severity against numbers killed per event indicates that most fatalities occurred in minor or moderate floods, where one or two people died. There is also evidence to suggest that most people who died after entering floodwaters were travelling home.

"The highest proportions of men and women are dying while they are attempting to cross a bridge or flooded road," explained Dr Haynes. "Where the information is available, we can see that most of these people are trying to make their way home."

Since 1960, the highest numbers of fatalities have occurred in Queensland and NSW, with the toll from these states accounting for 75% of all fatalities. Death rates per capita also highlight the increased level of risk in the NT, where fatalities per capita since 1960 has been five times as great as NSW and more than three times as great as Queensland.

Andrew Richards, State Manager of Community Engagement at NSW SES, is one of the lead end users for the project. He said it was vital that the SES safety campaign was backed by research.

"The campaign shows important facts about the most at-risk groups, such as children and young adult passengers in cars, as well as those in 4WDs. Both CRC research and some additional commissioned research were vital here,

"We are trying to increase public safety, to educate people to make the safe choice."

— Andrew Richards, State Manager of Community Engagement, NSW SES

as it showed us where we needed to focus our safety efforts as a result of recent and historical events."

Fatalities associated with 4WD vehicles have increased steeply over the last two decades. Almost 75% of all 4WD flood deaths have occurred since 2000. The vast majority of those driving a motorised vehicle were men at about 84%, while the gender breakdown of passengers shows that about 53% were men and 47% were female. This implies that most flood-related vehicle fatalities involve male drivers, with passengers roughly equally distributed between the genders.

"The research showed us that fatalities involving a 4WD have dramatically increased in the last 15 years," said Mr Richards. "People often think that a 4WD is capable of traversing flooded rivers and the 4WD advertisements often reinforce this, but the reality is far from that. We really want to reach this group of people in the hope that the next time they come across a flooded road, they will make the safest decision."

Getting the message—if it's flooded, forget it!

The CRC research suggests that not only were many flood deaths avoidable,

but that most victims were capable of independent action and aware of the flood. Despite knowing the risks, many people are still deciding to enter floodwaters. However, 45% of people in a vehicle died during twilight or darkness, when visibility would have been poor, and so they may have been unaware of the extent of the danger. This suggests the need for structural measures, including barricades and road design, in addition to better risk communication and education.

The NSW SES campaign includes accounts from a mother who entered floodwaters under the pressure of her passengers, a 4WD enthusiast sharing his experience crossing creeks and rivers, a young male who was trying to impress his passengers, an SES member recounting his experiences rescuing people from floodwater, and a farmer who nearly drowned after entering floodwater to rescue cattle.

Mr Richards said the NSW SES is hoping that by using real stories and experiences they will be able to target these groups engaging in risky behaviour.

"We are trying to increase public safety, to educate people to make the safe choice," he said.

"We think that the best way to achieve this is by highlighting true stories about what has happened to people when they have tried to drive through floodwaters, their close calls, and their remorse about making some of those risky decisions in the first place."

As well as inspiring the NSW SES campaign, the research will help emergency services across Australia ensure their messages are effectively targeted. It will also influence policy, practice, engagement initiatives and resource allocation across the sector.

The research team now plan to evaluate the messaging and terminology used with different sociodemographic groups, as well as education programs and signage used during floods. By understanding the decision-making processes of those who do drive through floodwaters, emergency services will be better equipped to prevent flood fatalities. ■

For more information, visit: www.bnhcrc.com.au

Table 1 Flood fatalities by activity prior to death and gender, 1960–2015 (% of column totals)

Activity	Male fatalities	Female fatalities	Unknown fatalities	Total fatalities
Attempting to cross bridge/causeway/crossing/culvert/ford/watercourse	183 (46.6%)	80 (55.2%)	2 (25%)	265 (48.5%)
Attempting to cross floodwaters away from watercourses (water over fields/town)	17 (4.3%)	3 (2.1%)	0 (0%)	20 (3.7%)
Engaged in an activity near the water (on the bank/bridge)	32 (8.1%)	11 (7.6%)	0 (0%)	43 (7.9%)
Engaged in an activity in/near stormwater drain	21 (5.3%)	9 (6.2%)	0 (0%)	30 (5.5%)
Engaged in an activity in the water (rescue, swimming)	48 (12.2%)	12 (8.3%)	0 (0%)	60 (11%)
Engaged in an activity on the water (boat)	22 (5.6%)	1 (0.7%)	0 (0%)	23 (4.2%)
Engaged in an activity not near usual watercourse (e.g. in their home)	28 (7.1%)	18 (12.6%)	0 (0%)	46 (8.4%)
Other	2 (0.5%)	1 (0.7%)	0 (0%)	3 (0.6%)
Unknown	40 (10.2%)	10 (6.9%)	0 (0%)	56 (10.3%)
Total	393 (100%)	145 (100%)	8 (100%)	546 (100%)



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MONITORED FIRE ALARM SYSTEMS GET NBN-READY



Communications are changing with the roll out of the National Broadband Network (NBN) and the switch from the old copper wire service to a digital network. As a result, any monitored fire alarm systems on the copper wire connection need to be migrated.

Fire Protection Association Australia (FPA Australia) has been working with the Federal Department of Communications and Arts to produce the *Migration of monitored fire alarms and lift phone services good practice guide*, which has now been published.

FPA Australia General Manager Technical/Deputy CEO Matthew Wright chaired the Department's Fire Alarm and Lift Phone Migration Roundtable Working Group, which reported to the Fire Alarm and Lift Phone Migration Roundtable.

"It has been a great experience to be able to coordinate and provide technical assistance from a range of key stakeholders to develop the Guide," said Mr Wright.

Kathleen Silleri, Chair of the Roundtable, says in her introduction to the Guide:

Migrating monitored fire alarm and lift phone services from the existing fixed line networks over which they currently operate to a new telecommunications network is not simply a matter of moving a service over

'from A to B'. Rather, it is a complex process involving technical, regulatory and policy considerations, as well as multiple parties.

Monitored fire alarm and lift phone services are safety critical services and it is crucial that service continuity be supported for them during their transition from the existing networks. A key challenge is identifying which existing phone lines have a monitored fire alarm or lift phone service running over the top of them, so that these services do not get caught up in the business as usual disconnection process.

A key element of a smooth and successful migration process is role clarity for all involved parties. To this end, the Roundtable and its Working Groups have developed this Good Practice Guide which outlines the roles and responsibilities of relevant parties, what they need to do in this complex and

multi-faceted process, and considerations for continued provision of services in the post-migration environment.

The Guide is designed to facilitate the migration of monitored fire alarm and lift phone services as smoothly and successfully as possible, and to support service continuity for the community.

Mr Wright said that the published Guide will provide the steps that need to be taken, and by whom, to migrate old monitored alarm systems to the digital network.

"This is vital, as these old, fixed line services are being progressively disconnected and replaced by the NBN," he explained.

"There are a number of different connection options based on your facility's particular circumstance and the services you have access to. Regardless of the option chosen, there is still an expectation to retain the network reliability goals in AS 1670.3 to ensure alarm monitoring performance is maintained when current fixed line services are disconnected."

The Guide is intended as a handbook for use by the fire protection and lift industries, building owners, building managers and bodies corporate, application service providers, telecommunications retail service providers, equipment providers, and regulators and government agencies. It aims to help them carry out their roles and responsibilities in the migration process.

"Monitored fire alarms provide fire and emergency services with the vital



Different parties play different roles in migrating monitored fire alarms and lift phones.

warning and information they need to manage incidents," said Mr Wright. "So anyone who has a role in installing, servicing and maintaining a monitored alarm has a role to play in the migration of the old services, making this Guide a 'must-read' for practitioners." ■

The Migration of monitored fire alarms and lift phone services good practice guide can be downloaded from the FPA Australia website at: www.fpa.com.au or the Department of Communications and the Arts: www.communications.gov.au

NEW TECHNICAL DOCUMENTS AVAILABLE FROM FPA AUSTRALIA

Fire Protection Association Australia (FPA Australia) has published three technical documents providing much-needed guidance on matters important to the industry:

- ◆ IB-06 V2 *Selection and use of firefighting foams*
- ◆ PS-07 *Vehicle system service technician competency*
- ◆ GPG-05 *Baseline data for routine service of fire protection systems.*

IB-06 V2 SELECTION AND USE OF FIREFIGHTING FOAMS

This information bulletin on selection and use of firefighting foams focuses on a holistic approach, including firefighting performance, environmental impact and system and equipment compatibility.

Version 2 of this Information Bulletin updates and replaces Version 1 (published in June 2014). It provides new information and recommendations on environmental best practice, including:

- ◆ the use of foams in training, testing and commissioning
- ◆ containing fire water effluent
- ◆ remediation of contaminated soil and water
- ◆ cleaning out and changing existing foams.

PS-07 VEHICLE SYSTEM SERVICE TECHNICIAN COMPETENCY

This position statement advocates FPA Australia's position on the

requirements for technicians servicing non-gaseous, pre-engineered vehicle fire-suppression systems to help vehicle system owners select competent technicians.

It covers nationally endorsed units of competency, access to and knowledge of manufacturer's service manuals, and manufacturer's training.

GPG-05 BASELINE DATA FOR ROUTINE SERVICE OF FIRE PROTECTION SYSTEMS

FPA Australia has prepared this comprehensive document to provide guidance on baseline data for the routine service of fire protection systems by:

- ◆ clarifying the purpose of baseline data when undertaking routine servicing in accordance with AS 1851
- ◆ explaining why baseline data is important, and highlighting its value and necessity
- ◆ describing how baseline data can be obtained
- ◆ detailing how baseline data should be recorded and used
- ◆ providing specific details of individual system and equipment baseline data. ■

Access these and other technical documents at: www.fpa.com.au

MAKING DISASTER PREPARATION NORMAL

WHAT CAN WE LEARN FROM INDONESIA?

From a young age, people on northern Indonesia's Simeulue Island learn that when the earth shakes, run to the hills. What can we learn from Simeulue, and how can we make disaster preparation normal in Australia?

BY **STEVE SUTTON**

Bushfire and Natural Hazards CRC and Charles Darwin University PhD student

Steve Sutton inspects the remains of a house on Simeulue smashed by the 2004 tsunami

Wouldn't it be good if we could make disaster preparation a normal part of Australian life? If in the next fire, flood or cyclone season, we didn't have to worry about all the homes and people at risk, because we had done all we

could to prepare for it? Think about the savings. Think about the reduced anxiety for homeowners, emergency service volunteers and workers.

Researchers in the Bushfire and Natural Hazards CRC and its predecessor, the Bushfire CRC—as well as in other disaster institutions around the world—have been asking this question for some time now.

A picture is now emerging of why

people don't prepare – but this picture is derived from studies of calamities. Although this information helps, of course; but to use a metaphor, it's really a bit like psychologists studying the mentally ill to understand what a healthy mind looks like. Studying episodes of psychosis really only informs us about what the unhealthy mind is. What we really want to know is what makes a normal, healthy mind.

If we apply that metaphor to disaster research, we need to find examples of people who prepare for disasters in the normal course of their lives—we need studies of communities of everyday people who are prepared for disasters.

It turns out such communities exist. One such place is Simeulue (sim-oo-loo) Island, or Pulau Simeulue, which lies between Sumatra and the Sumatran subduction zone in the Indian Ocean. On 26 December 2004, while hundreds of thousands died as the tsunami struck, only five people from a population of 80,000 died on Simeulue. The story is told that the then president, Susilo Bambang Yudiyono, assumed everyone on Simeulue would be dead, because it was the place closest to the earthquake's epicentre. When a military reconnaissance flight saw thousands of people waving from the hills, he is said to have exclaimed "Impossible!".



PHOTO: STEVE SUTTON



“The people of Simeulue have clearly embedded something that is a very effective protection from tsunami into their everyday lives.”

— Steve Sutton

Last year, I visited Simeulue to research how the community managed to achieve this amazing statistic. The first thing I noticed about Simeulue had nothing to do with disasters. What struck me was its stunning beauty—it’s a classic tropical paradise. Glorious white, sandy beaches with crystal clear water are fringed with groves of coconuts. The view stretches on to rainforested capes. Amiable buffalo graze on dune grasses, or wallow in creeks leading to the ocean. Small outrigger fishing boats glide out to reefs rich in fish. Only a short distance inland, steep rainforest ridges leap up from the coastal plain and macaques stare out from the thick jungle.

There are few foreigners, or ‘bule’. They are mostly keen surfers attracted to the glorious breaks along the west coast where small surf lodges have been set up. Of course, just after the tsunami,

there were a lot more foreigners. A huge program of aid and reconstruction took place, with Australia having a prominent role rebuilding villages that were destroyed by a wave that in places was “as high as the coconut trees”. Homes, businesses, mosques and indeed whole villages were destroyed – but hardly any people were killed.

The second thing you notice is that the people of Simeulue are not preparing for the end of the world—they are a normal Indonesian community. Their health statistics reflect those of the rest of Aceh province, with slightly lower life expectancy than the Indonesian average. They don’t seem overly safety conscious; the men smoke ‘kreteks’ (a type of cigarette) in large numbers and construction workers wear only rudimentary personal protective equipment. Traffic is dominated

by motorbikes, with many drivers helmetless, and many carrying three or more unhelmeted passengers, including children. They do not seem obsessed with maintaining tsunami evacuation routes, either—some I saw were overgrown with tangles of lianas.

Previous studies of the 2004 tsunami revealed a strong history of local or indigenous knowledge about tsunamis that derives from a similar event in 1907. People learn from a young age that “when the earth shakes, run to the hills”. But this only partially explains the survival of most of the population.

One issue, for example, is that the towns on the mainland coast devastated by the 2004 tsunami were also hit by a tsunami in 1907. They also have local knowledge and Indigenous traditions. So how come they didn’t have a similar story? There is also the issue of taking action. While knowledge about what to do might exist, experience shows that not everyone acts upon it. In our own pluralist society, individuals may dispute the validity of knowledge for a range of reasons, often relating to their own set of values. One response might be to jump in the car and drive away from the coast, as happened in Samoa in 2009. Others might adopt the all-too-common ‘wait and see’ approach. Not on Simeulue;

A bay on the west coast of Simeulue where seismic uplift has pushed the shore out by around 100 metres



PHOTO: STEVE SUTTON

It is not hard to get the beach to yourself on Simeulue



PHOTO: STEVE SUTTON

Buffalo wallow near the beach on Simeulue

everyone dropped what they were doing on a quiet Sunday morning and ran.

Finally, there is the interesting point that even the locals themselves attribute their success to a range of factors. “Allah” is a common response, with people nodding and pointing skyward. Others believe it to be due to seismic uplift, which raised some parts of the island by nearly one metre. This is not likely to be the case, because the areas subject to uplift also had some of the biggest impacts from the tsunami— but some people still express that view.

The different explanations for success really seem to underline how ‘normal’ the people of Simeulue are. The interesting point is that while they may say a range of things in relation to how they avoided the tsunami, when the time comes, they all acted in the same way. In fact, a large earthquake in the middle of the night in March 2005, which devastated nearby Nias Island, saw the Simeulueans running to the hills again.

Somehow, the people of Simeulue have clearly embedded something that is a very effective protection from tsunami into their everyday lives. In fact, there are at least three somethings.

First, they understand earthquakes. Living near the tectonic plate subduction zone, they have a relatively high number of earthquakes and seem to understand which ones are likely to induce a tsunami. Second, they have established a universal understanding of how to respond when they estimate a tsunami is likely. An effective universal plan of action seems too good to be true in disaster risk-reduction circles—but here it is, alive and well on Simeulue. Third, despite all the theorising about the low casualty rate afterwards, they all acted on the knowledge during the event. All 80,000 of them. As if it were normal. ■

Learn more about this research at: www.bnhcrc.com.au

INTERNATIONAL AGREEMENT REFLECTS COLLABORATION ON FIRE MANAGEMENT

This year marked a milestone for international collaboration within fire and emergency services.



PHOTO: US EMBASSY, CANBERRA

Mr Goodwin (left) and Mr Crowweller (right) met with US Embassy's Chargé d'Affaires, James Carouso earlier this year to sign the renewed International Agreement



PHOTO: US EMBASSY, CANBERRA

Director General of Emergency Management Australia, Mark Crowweller (left) and US Embassy's Chargé d'Affaires, James Carouso formalised the fire management agreement between Australia and the US

For the first time, a country-to-country International Agreement on Fire Management between the US and Australia was formally recognised. This was a significant step in renewing the longstanding agreement and moving it to a national level.

The previous form of the agreement saw Australian states and territories as necessary parties. With this transition, collaborating and sharing resources and knowledge between Australia and the US will be less complex.

The renewed agreement builds on 15 years of close collaboration between Australian and US firefighters and the broader emergency management sector. It was the result of collaborative efforts between Emergency Management Australia, AFAC, the US Department of Interior and the National Interagency Fire Centre in Boise, Idaho, US.

An Australian cohort that included Emergency Management Australia Director General, Mark Crowweller, AFAC CEO Stuart Ellis and Alan Goodwin from the National Resource Sharing Centre, travelled to the US to finalise the agreement. Mr Crowweller and the US Embassy's Chargé d'Affaires, James

Carouso, signed the renewal of the Agreement at the US Embassy office in Canberra.

Elevating the International Agreement between the US and Australia to a national platform establishes this important international covenant at the right level. The agreement has also been broadened to include training, research and professional development.

Under its provisions, the agreement allows for personnel exchange and technology and research sharing to improve our mutual bushfire management capabilities. This exemplifies Australia's ongoing partnership with the US and builds on our shared values, knowledge and expertise. Additionally, the distinct fire seasons are ideal for the sharing of resources to support firefighting operations, though a trend towards longer fire seasons in Australia may mean there is some crossover.

The US-Australia International Agreement complements a similar fire management agreement reached between Australia and Canada in early 2016. ■



PHOTO: US EMBASSY, CANBERRA

The renewed International Agreement builds on 15 years of close collaboration between Australia and the US

PERSPECTIVES ON THE SECTOR WITH COMMISSIONER GREGSON

In a regular series, AFAC CEO Stuart Ellis interviews a senior AFAC leader for each issue of *Fire Australia*. This time he caught up with Wayne Gregson, Commissioner of the Department of Fire and Emergency Services, Western Australia and AFAC Board Director.



BY **STUART ELLIS AM**

Chief Executive Officer, AFAC

You were appointed in September 2011 to the then Fire and Emergency Services Authority, which evolved into DFES. In your sixth year leading the organisation, what would you consider your highlights as Commissioner?

I think we have made some significant progress in revitalising and modernising the agency. I am proud of the fact that we have put a great team together that has achieved some wide-ranging strategic organisational and cultural change. We have greatly improved governance arrangements, gained a clear operational focus and developed an innovative approach to business. Some of the highlights will hopefully secure long-term organisational benefits, such as future fleets, new station builds and expanded operational capability, as well as some more personal benefits, such as improved welfare services and career and volunteer presumptive cancer legislation. I take great satisfaction in developing personal and professional relationships as we move forward with our reform agenda.

“I think one of the most important traits in a leader is to have a very clear understanding of what you stand for as an individual, and where you want to take your followers.”

— Commissioner Gregson

During your time as Commissioner, WA has experienced several major events and subsequent inquiries. What are some of the major learnings for the Department?

Like every state in Australia, WA has had its share of recent emergency situations, and everyone involved has been subjected to high levels of post-event scrutiny. Many of the recommendations from WA inquiries have led to demonstrative improvement in standards, structures, systems and style of all involved, and there are always opportunities for ongoing, continuous improvement. However, there has also been a noticeable unfairness about some of the scrutiny, which has often had a blame flavour. This is based on unrealistic expectations of the public, the media and some politicians of what can be done by emergency services facing overwhelming challenges. A major learning from this is to continue to educate the public about shared responsibility and the probable consequences of placing an over-reliance on miracles.

What do you see as major challenges for the emergency management sector nationally in the immediate future?

While there has been great progress at the national and inter-jurisdictional level—notably the National Aerial Firefighting Centre, National Resource Sharing Centre (NRSC) and Commissioners and Chief Officers Strategic Committee (CCOSC) — I still see major future challenges around resource sharing and greater interagency collaboration and standardisation. There have been some improvements in risk identification, but more now needs to be done about response and recovery planning—particularly for rare, but catastrophic, impact scenarios. Additionally, the journey of professionalisation across the emergency services sector will be a major challenge, but an important one to address.

We have seen several senior police transfer across to fire and emergency services. Was it an easy transition?

It would be fair to say it was not without its challenges. I think that it is always a little more challenging to take on a leadership role when you come from outside an organisation and more so if you come from a different background. Some aspects of the Department of Fire and Emergency Services (DFES) are similar to police. Both are hierarchical government agencies with uniform and non-uniform elements; this was familiar. However, some aspects are very different, especially the much higher level of community and stakeholder engagement and the cadres of volunteers. DFES is, to a much greater extent than police, a hybrid of cultures. This took some getting used to, and also required a period of time to build trust and mutual respect with a new set of work colleagues and many others.

For some years you have been completing a professional doctorate. Apart from committing the time, what other challenges and satisfaction have you found in pursuing this?

I have always believed ongoing study improves the journey of a career, whether it involves professional development courses or more formal study. A professional doctorate is immensely satisfying, as it allows for in-depth study of aspects of one's work in the context of the work environment. This endeavour has allowed me to consider my agency through a practical, academic and personal lens, and allowed for a better understanding of my role and the impact of my decisions on others. It is indeed both a challenging and rewarding endeavour.

You were recognised as Murdoch University 2015 Leader of the Year at the Institute of Public Administration Australia WA Awards in Perth. What advice would you give aspiring commissioners and chief officers of fire and emergency services?

I think one of the most important traits in a leader is to have a very clear understanding of what you stand for as an individual, and where you want to take your followers. A leader without followers is not a leader at all. I think there is a need to demonstrate exactly what you are wishing to collectively achieve and what you are striving for, and to continuously communicate that to all involved. I also think a good leader listens to his or her troops; rank doesn't give you a monopoly on good ideas. At the end of the day, you will ultimately be responsible for the decisions made, but the troops should also have a role in shaping the future. Finally, I would advise them to be themselves as much as possible while always maintaining the dignity of their appointment.

You have been on the AFAC Board since 2013 and held the position of Treasurer in recent years. Are you confident about AFAC and its future?

I think AFAC continues to grow as an important voice in the sector. In recent years, it has developed a clearer role and vision for its membership, and is increasingly becoming a well-regarded organisation across governments and industry. It is also beginning to normalise new business operations, particularly with the CCOSC, the NRSC and the AFAC Conference. I think AFAC has a great future. ■

PHOTO: DEPARTMENT OF FIRE AND EMERGENCY SERVICES, WA



Commissioner Gregson has lead DFES through several major events and subsequent inquiries

“I am proud of the fact that we have put a great team together that has achieved some wide-ranging strategic organisational and cultural change.”

— Commissioner Gregson

PHOTO: DEPARTMENT OF FIRE AND EMERGENCY SERVICES, WA



Commissioner Gregson (centre) with his senior leadership team



ENRICHING LEADERSHIP OF VOLUNTEERS IN THE EMERGENCY SERVICES

The focus of this research is to find out why volunteers leave an agency, and developing ways to improve volunteer retention.

While some of us spend lazy, hot summer days in the pool, thousands of volunteer firefighters and support crews battle fires across the country. And it is not just in summer. Emergency services volunteers are there for us rain, hail or shine—365 days a year.

BY **ASSOCIATE PROFESSOR MICHAEL JONES AND DR YOKE BERRY**

Bushfire and Natural Hazards CRC and the University of Wollongong

In Australia it is economically impractical to employ the number of emergency service workers needed to adequately respond to fires, storms and floods. As a result, Australia benefits from the benevolent support of around 235,000 emergency services volunteers, many of whom have followed in the footsteps of their family's tradition to volunteer.

This volunteering is a way of life for many in our communities, and has been for a long time. Volunteer fire brigades were established as early as the mid-19th century. Emergency and rescue agencies, such as the state emergency services, have their origins in the Civil Defence established in the aftermath of World War II.

Volunteer brigades and units are managed by the volunteers themselves. This quasi-independence of volunteer groups—in contrast to the corporate environment of paid staff in a regional, district or head office—can sometimes cause tensions, especially related to communication and authority along hierarchical structures. However, these tensions also occur within volunteer groups, where effective leadership is a critical element for job satisfaction and for the retention of recruits. As a result of these problems, many volunteer-based emergency service agencies experience high rates of volunteer turnover.

In some cases, volunteer turnover is as high as 20% each year. At times, up to half of all new recruits leave within the first two years.

Volunteer turnover is an economic liability to volunteer-based agencies. Training, uniforms and protective equipment are expensive. More importantly, volunteer turnover has

a bearing on operational capacity, flexibility, resilience, and to some degree, morale. Research on poor volunteer retention is therefore valuable for the emergency sector.

Finding out why this happens—and developing ways to improve volunteer retention—has been the focus of a Bushfire and Natural Hazards CRC project with the University of Wollongong team. Along with Associate Professor Dominique Parrish, Ms Vivien Forner, Dr Joakim Eidenfalk and Dr Senevi Kiridena, we have been investigating changes in volunteer leadership behaviour.

We found that there was no need for a leadership program per se, because most agencies offer a variety of programs that meet the traditional needs of leadership development. Instead, our interdisciplinary team—all experienced in leadership—were keen to find other angles for developing changes in leadership behaviour. We

PHOTO: BRENTON EDWARDS, CFS PROMOTIONS UNIT



Research is showing that advancing leadership skills among volunteers can help retain them at their agency

PHOTO: QUEENSLAND FIRE AND EMERGENCY SERVICE



Our emergency service volunteers are there when needed

have now identified self-determination theory as a simple method to introduce to volunteer leaders.

Self-determination theory recognises that people have three basic psychological needs for optimal functioning and wellbeing:

- ◆ autonomy—having the opportunity to express personal initiatives and ideas
- ◆ belonging—perceiving themselves to be part of the group
- ◆ competence—feeling effective through positive feedback and appropriate training.

This 'ABC' of self-determination theory has been taught to people who interact with others in diverse environments, such as homes, workplaces, schools, sports, universities and volunteering. Organisational research shows that when self-determination theory principles are

applied in the workplace, employees and volunteers are more motivated, engaged and satisfied with their jobs, and also less likely to leave the organisation.

A nine-week program, called Inspire. Retain. Engage, was developed, which consisted of:

- ◆ one day of learning about leadership, self-determination theory and generation of ideas
- ◆ nine weeks of on-the-job application and active reflection on the principles of self-determination theory with the support of an online mentor
- ◆ a final day of reflection and sharing within communities of practice.

The program was piloted with volunteer leaders in 2014 with the NSW State Emergency Service and the NSW Rural Fire Service. It was delivered again in 2016 to volunteer leaders and staff

of Victoria State Emergency Service and Queensland Fire and Emergency Services.

The Inspire. Retain. Engage training and the use of self-determination theory improved the retention rate of volunteers, as shown by the statistical effectiveness of the program on behavioural change in the participants, job satisfaction and turnover intention of team members.

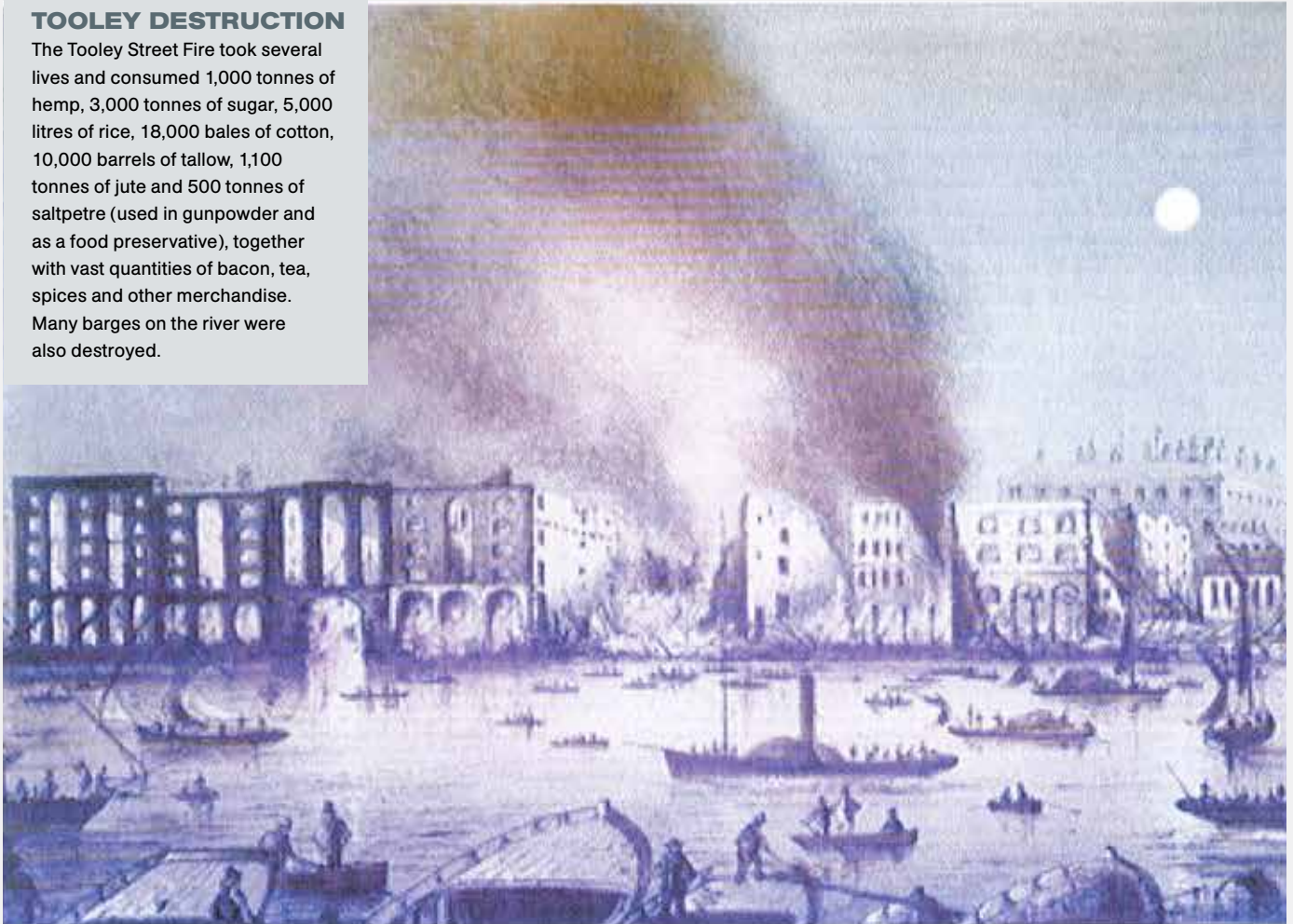
While more longitudinal measures would provide a more in-depth evaluation of the Inspire. Retain. Engage program, we are satisfied that the simple tools offered to volunteer leaders, staff and their organisations will benefit their lives, agencies and communities. The program is available to all emergency service agencies in Australia. ■

For more information about this research, visit: www.bnhcrc.com.au

In some cases, volunteer turnover is as high as 20% each year. At times, up to half of all new recruits leave within the first two years.

TOOLEY DESTRUCTION

The Tooley Street Fire took several lives and consumed 1,000 tonnes of hemp, 3,000 tonnes of sugar, 5,000 litres of rice, 18,000 bales of cotton, 10,000 barrels of tallow, 1,100 tonnes of jute and 500 tonnes of saltpetre (used in gunpowder and as a food preservative), together with vast quantities of bacon, tea, spices and other merchandise. Many barges on the river were also destroyed.



THE GREAT TOOLEY STREET FIRE—1861

BY **BARRY LEE, OAM**

London's Tooley Street Fire in 1861 was the greatest conflagration in the metropolis between 1666 (the Great Fire of London) and World War II. It burned for the greater part of two days, and could not be fully extinguished for several weeks.

Just east of London Bridge was a complex of large quays and warehouses fronting the River Thames and backing on to Tooley Street. The river at this point was almost 250 m wide and the quayside stood 1.5 m above the high-water mark during spring tides. There was a difference of nearly six metres between high and low water at London Bridge.

On Saturday, 22 June 1861, there was a full moon and the spring tides were on. High water at London Bridge was at 1.41 pm. At 4.30 pm, with the ebb tide ripping downriver, several men were still working in the Cotton's Wharf warehouse. Smoke

was seen issuing from baled jute on the third floor and rapid fire spread followed. The first engine from Tooley Street fire station arrived at 4.45 pm. James Braidwood, first superintendent of the London Fire Engine Establishment, turned out from Watling Street and made all possible speed, galloping south-east towards London Bridge.

Braidwood knew that the site involved a row of six-storey warehouses, and that the communicating iron fire doors were probably open, because men were still on the premises. He also knew the buildings were packed with cotton, sugar, tallow, rice, gum, spices, hemp, jute and saltpetre. He noted too that the tide was rushing out, meaning that the two floating steam engines moored on the Thames would encounter severe water throw problems. By 6.00 pm, the fire had spread alarmingly, and by 8.00 pm all the warehouses were alight.

At about 7.30 pm, a wall collapsed on Braidwood, killing him instantly. Through his outstanding ability and unflagging energy, Braidwood has come to be called the 'father' of modern fire service. Queen Victoria wrote in her diary: "...poor Mr Braidwood...had been killed...and the fire was still raging... it made one very sad."

The total loss from the Tooley Street Fire was estimated at the time to be £2 million, equivalent to more than £100 million today. The aftermath of the fire led to the Metropolitan Fire Brigade Act 1865, and the founding of the fire and rescue service as we know it today. ■

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BY IAN FINDLAY

Technical Coordinator, FPA Australia

STANDARDS AUSTRALIA

FP-002 Fire detection and alarm systems

AS 1603.3 (heat alarms) went to public comment late last year, with minimal comment received.

Work continues on revisions of AS 1670.3 *Fire alarm monitoring*, AS 4428.6 *Alarm signalling equipment* and the new handbook for fire detection, warning, control and intercom systems (to complement AS 1670.1 and 1670.4). Also, projects to amend AS 1670.1 and AS 1670.4 to address issues identified since they were first introduced will kick off at a meeting in late March.

FP-004 Automatic fire sprinkler installations

Work continues at FP-004 to progress the revision of AS 2118.1 *Automatic fire sprinkler systems – General systems* following the meeting in early November 2016 to resolve the public comment and votes from the combined procedure (public comment and committee ballot).

FP-008 Fire pumps and tanks

The kick-off meeting for Amendment 1 to AS 2304-2010 *Water storage tanks for fire protection systems* occurred in late September 2016, where it was agreed to expand the scope of the amendment to also cover baseline data and commissioning.

FP-009 Fire hydrant installations

FP-009 has met and continues to meet to review the feedback from the combined procedure (public comment and committee ballot) for the revision of AS 2419.1 *Fire hydrant installations – System design, installation and commissioning*, which closed in December 2016.

FP-011 Special hazard fire protection systems

Committee ballot on Amendment 1 to AS 4487-2013 *Aerosol systems* has now closed. It is expected to be published soon. 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

FP-018 met in December 2016 to discuss the ongoing progress of revisions of AS 1530.8.1 and AS 1530.8.2 *Testing of*



elements of construction for buildings to simulate bushfire attack, and agreed to progress the drafts to public comment.

FP-020 Construction in bushfire-prone areas

Work continues on the revision of AS 3959 *Construction of buildings in bushfire-prone areas* with a meeting scheduled for March with the aim of progressing this to public comment.

LG-007 Emergency lighting in buildings

LG-007 met in December and went through the public comment for the draft revisions of AS/NZS 2293 Parts 1, 2 and 3 *Emergency escape lighting and exit signs*. They will be meeting again in April to continue to resolve the public comment received.

TECHNICAL ADVISORY COMMITTEES

The meeting structure for FPA Australia's Technical Advisory Committees (TACs) has changed from four meetings per year to three meetings per year to allow greater scope for work to occur between meetings. The first round of meetings for 2017 is in March, with subsequent meetings scheduled for July and November. Given this, only minor updates have been provided for the TACs where activity has occurred prior to these meetings.

TAC/1 Maintenance of fire protection systems and equipment

A final draft of the Technical Advisory Note on routine servicing of aspirating smoke detectors with respect to emerging technologies is to be considered by TAC/1 at their upcoming meeting.

TAC/3/7 Portable and mobile equipment

FPA Australia and TAC/3/7 are awaiting a formal response to their submission on the ABCB Consultation Regulatory Impact Statement on *Assessment of the National Construction Code's fire hose reel requirements for new (Class 5) office buildings*.

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

Work with the Pump Industry Association on fire pumpset checklists and certification documentation for use by designers, manufacturers and certifiers continues to progress.

TAC/11/22 Special hazards fire protection systems

An updated version of Information Bulletin IB-06 Selection and use of firefighting foams was published in January. The Position Statement PS-07 on Vehicle system service technician competency was also published in February.

TAC/11/22 continues to work on how the Queensland Department of Environment and Heritage Protection firefighting foam policy will be implemented. Discussions are also beginning with regulators in NSW and SA, which are starting to consider the stance they may take in regards to firefighting foams.

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

TAC/18 and TAC/19 continue to work with the national office to progress the draft Good practice guide on fire stopping systems.

NATIONAL MEMORIAL SERVICE FOR FIRE AND EMERGENCY SERVICES PERSONNEL

28 April, Canberra

AFAC will hold a National Memorial Service for fire and emergency service personnel to honour the lives of those who have died while on duty.

The 2017 National Memorial Service will be held at the National Emergency Service Memorial, located on the northern shore of Lake Burley Griffin in Canberra, ACT.

The service is open to the emergency services community and the general public.

For more information, visit:

www.afac.com.au

FIRE AUSTRALIA CONFERENCE AND TRADESHOW

3-5 May 2017, International Convention centre, Sydney

The premier event in fire and life safety.

Fire Australia Conference and Tradeshow returns to a three day program and the largest and most extensive tradeshow ever. The fresh format has streams dedicated to Fire Protection, Fire Safety Engineering thanks to a partnership with the Society of Fire Safety, Hazardous Materials and Dangerous Goods as well as Emergency Planning and Response.

For more information, visit:

www.fireaustralia.com.au

RESEARCH DRIVING CHANGE—SHOWCASE 2017

4-5 July 2017, Adelaide

The Bushfire and Natural Hazards CRC is hosting a special event—a showcase of our research achievements 2013 to 2017. Research Driving Change – Showcase 2017 is an opportunity to listen, discuss and digest the learnings from across the whole research program, and highlight how the findings are being put into practice. Hear the views of end users on what works in directing research and how to make it easier to absorb the findings into operations and policy. All attendees will take home a package of publications that summarise the key findings of each project and point to ongoing ways of participation in utilisation. Attendees will also be invited to participate in a range of new projects that are beginning this year.

Register at:

www.bnhcrc.com.au/showcase2017

AFAC17 POWERED BY INTERSCHUTZ

4-7 September 2017, International Convention Centre, Sydney

Collaborating for Success – improving performance in emergency management

Co-produced with the Bushfire and Natural Hazards CRC, AFAC17 powered by INTERSCHUTZ will explore how collaborating and improving performance is essential for success in emergency management. AFAC17 will focus on how we can work together to improve our performance, what leading the way looks like and who will benefit from our collective effort.

AFAC17 will be powered by INTERSCHUTZ—the world-leading fire, emergency and rescue trade exhibition. Over two and a half days, the exhibition will attract and showcase the latest developments in fire, rescue and emergency services equipment and technology from around the globe to the Australasian region.

AFAC17 will attract delegates from across the emergency management sector, all levels of government, non-government organisations, research and education institutions, and sectors such as health, building and construction.

Register at:

www.afaconference.com.au



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Mark Potter

Mark Potter has been appointed Executive Officer for the Fire Protection Industry (ODS & SGG) Board. Mr Potter, who started on 23 February, has an extensive managerial background as an executive within the Victorian Country Fire Authority. His roles and responsibilities have included community infrastructure (bushfire and structural), community safety and fire safety. In recent times, Mr Potter has been the Chief Operating Officer with Federation Training, a public training organisation in the Gippsland area of Victoria, where he led a team of approximately 150 staff.



Mark Potter

Nigel Foss

Nigel Foss has resigned from the position of General Manager, Operations at Forestry Tasmania and subsequently from his position on the AFAC National Council. Mr Foss served as a Council Member from January 2013 until December 2016.

Dean Sheehan

As a result of the departure of Nigel Foss in December 2016, Dean Sheehan, Manager, Fire Management at Forestry Tasmania has been appointed as the organisation's AFAC National Council representative. Welcome, Mr Sheehan.



Dean Sheehan

Mark Smethurst

Mark Smethurst, DSC, AM has been appointed as Commissioner of NSW State Emergency Service effective 27 February 2017. Mr Smethurst joins NSW SES following an extensive career serving 35 years in the Australian Army in a wide variety of operational, training and leadership appointments in Australia and overseas. We welcome Mr Smethurst as the newest member of the AFAC Council.



Mark Smethurst

Carmen Quinn

Carmen Quinn has joined Fire Protection Association Australia as the Engagement and Events Manager. Ms Quinn has worked in events management for a decade, including several years at Moreton Hire and Peter Rowland Catering. Her first major task is to organise the annual Fire Australia Conference, this year being held in the International Convention Centre Sydney.

Carmen Quinn



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