MULTI-AGENCY TRIAL PROJECT ACCELERATES EVIDENCE-BASED AERIAL SUPPRESSION PRACTICE

AFAC RESEARCH UTILISATION CASE STUDY

Critical success factors:

Ensure industry needs drive the research plan and process.

Make sense of the science.

Tailor communications to maximise understanding and uptake.

Consider a trial/pilot or similar mechanism to determine the scope for application and impact.

Support and resource implementation and practice change.

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Synopsis

The use of aerial suppression in rapid initial attack to control bush and grass fires has become a routine firefighting strategy across Australia.

Fire agencies have increasingly used the approach to suppress fires while they are still small and potentially controllable. The logic driving the practice, explains Dr Matt Plucinski, a CSIRO researcher for the former Bushfire CRC, is essentially that "small fires are easier to put out than bigger fires".

"Aircraft can travel quickly and get to fires in locations that are difficult to access from the ground. This often allows them to reach fires before ground crews. And while they cannot fully extinguish all of the burning fuel, their intervention means that ground crews have less fire to deal with when they arrive than they would if aircraft were not present," he says. "This can give fire agencies a much greater chance of containing the fire early, and significantly reduces the threat to lives and property."

In recent years, there has also been growing recognition that aerial bushfire management strategies can deliver additional flow-on benefits to fire and land management agencies. These include reduced demands on firefighters, as well as potential savings in equipment and fleet maintenance, due to reduced cost of repairs from vehicle and appliance damage.

Between 2003 and 2010, Dr Plucinski and his CRC co-researchers delivered one of the first major research projects on the effectiveness of aerial suppression during initial attack in Australia. Among its key findings, the research determined the critical factors for predicting the success of initial attack[1]. The combined results of the phased research project have made a significant impact on firefighting response, operations and strategies, and have provided an important evidence base to support and extend the practice nationally during the past decade[2].

Using the CRC evidence base, and in direct response to recommendations of the 2009 Victorian Bushfires Royal Commission (VBRC), a multi-agency project team of fire and land management agencies joined forces to trial an activation procedure, pre-determined dispatch (PDD), for rapid aircraft dispatch within Victoria.

Launched in the 2012/2013 summer period in Bendigo (CFA District 2), the trial was developed to test PDD's effectiveness and determine how the new rapid dispatch protocol could be systematically and cost-effectively integrated into the State's existing incident management framework.

Since the initial successful Bendigo trial, the PDD protocol has been refined and extended to 16 locations across Victoria using both helicopter and fixed wing firefighting aircraft.

This case study describes how a Victorian multi-agency project team adopted, piloted, implemented and integrated the evidence-based practice within its state-wide incident management operations. The case outlines the research and details its transition to implementation. Importantly, it highlights the obstacles and opportunities encountered by the project team and the factors it considered critical to the project's success and sustainability.

This case is one in a series of research utilisation cases co-developed by AFAC and its member agencies and partners to capture and share examples of good evidence-based practice and principles.

For further information on the PDD trial, contact CFA Aviation Officer Wayne Rigg
e: W.Rigg@cfa.vic.gov.au or Gary Turnham at the DELWP Aviation Services Unit on +61 3 9412 4888
e: Gary.Turnham@delwp.vic.gov.au

For further information on research utilisation, contact Dr Noreen Krusel, Manager Research Utilisation, noreen.krusel@afac.com.au

1 Plucinski M, Gould J, McCarthy G & Hollis, J. 2007. The effectiveness and efficiency of aerial firefighting in Australia, Part 1. Bushfire CRC Technical Report No. Technical Report A.07.01, Melbourne.

2 Plucinski M. 2010. Bushfire CRC Project A3.1: Evaluation of aerial suppression techniques and guidelines Final Report June 2010. Bushfire CRC.

Background

Lessons learnt

In tactical firefighting, it is well established that the best opportunity to control a fire is when the fire is still small and potentially easier to manage.

The aim is to stop the fire spreading or to "keep a small fire small", in turn making it easier for ground crews to bring it under control. Typically, rapid initial attack occurs before an incident management team is fully established.

In Victoria, until recently, authorisation of aircraft was constrained by the State's incident management authorisation system. According to the VBRC, approvals had to go through three layers of authority before they were actioned by the State Air Desk.

Described by the commission as "cumbersome", the process involved requests for aircraft being made to or by the incident controller, then to the CFA operations staff or the relevant government departmental duty officer and finally to approval by the state duty officer.

In its inquiry, the VBRC heard concerns about the dispatch process used during the 2009 Black Saturday fires. As a result of the inquiry, the Commission recommended that the CFA and relevant government department (formerly the Department of Sustainability and Environment) amend their policies on aerial preparedness and standby, together with dispatch protocols and management of aircraft.

The Commission also noted Bushfire CRC research on the cost effectiveness of using aerial firefighting for rapid initial attack.

Mounting evidence

Around the same time, Bushfire CRC researchers, led by Dr Matt Plucinski of the CSIRO, were working on a major research project on the effectiveness of aerial suppression in Australia. The project, which ran for the first era of the Bushfire CRC (2003 to 2010), had three main research components. These were:

- A strategic level operations summary, based on an analysis of the containment of fires that involved aerial suppression. The study was used to determine the critical factors for predicting initial attack success and developed attack success models and decision tools for fire operations personnel.

- Case studies: these were used to compare suppression effectiveness, study aerial suppression extended attack tactics and investigate drop effectiveness.

- Field experiments: this experimental phase examined drop effectiveness in greater detail.

The broader impact of the seven-year project was significant, according to Dr Plucinski. "Despite increasing use of and interest in aerial fire-fighting for rapid initial attack, up until this time there had been a lack of sufficient scientific evaluation."

The researchers analysed more than 500 fires involving aircraft deployments during initial attack. "It was a unique data set due to its national focus and the type of data covered had not been traditionally collected in fire agency databases."

This case specifically focuses on the adoption and use of the first component of the operational research by a Victorian multi-agency project team. In other jurisdictions, similar practices have already been implemented.

Research for purpose

The research was developed in consultation with the Australasian Fire and Emergency Service Authorities Council (AFAC) and the National Aerial Firefighting Centre (NAFC) and around 15 rural fire and land management agencies. Agencies provided input data for the operations study, helped the research team gain access to drops at operational bushfires and provided practical and logistical support during planned experiments. They also briefed the research team on key operational issues.

At the outset, the team presented their research methods and data collection requirements to practitioners at a number of forums such as pre-fire season briefings and training events. Results and progress updates were also presented at key research-agency working forums held throughout each phase of the research.

AFAC, through its Wildfire Aviation Technical Group, operated as an end user advisory group, "steering the initial research directions and establishing a data collection project to review outcomes and outputs," according to Dr Plucinski.

Key findings

The results of the study confirmed that aircraft could have a significant impact on initial attack success, especially when rapidly deployed.

The work also helped to "get the message out to a wide audience of fire managers to consider future implications for the sector", according to Dr Plucinski.

The critical finding was that aerial suppression could be effective in providing support to ground crews and could improve the probability of first attack success by up to 50 per cent or more if the Forest Fire Danger Index (FFDI) was in the low, moderate or high classes. (The FFDI is an index of weather severity designed to indicate the chance of a fire starting, its rate of spread, intensity and difficulty for suppression).

To be effective, aircraft had to be available at call, rapidly dispatched with minimal travel distance, and with logistical systems in place.

Science in motion

In 2012, the former Victorian Fire Services Commissioner (now the Emergency Management Commissioner), formed a multi-agency project team to develop and trial a new activation procedure model, pre-determined dispatch (PDD), for rapid aircraft dispatch within Victoria. Team members were drawn from the CFA and the former Department of Environment and Primary Industries, now the Department of Environment, Land, Water and Planning.

According to the CFA Aviation Officer, Wayne Rigg, the trial had to develop a process that would ensure firebombing aircraft "were working over fires in the shortest possible time".

"The process had to utilise aircraft in a safe, effective and efficient manner," explains Wayne, one of the trial project officers.

It also had to produce data which could be analysed to inform decisions on where, how, when and if PDD should be extended to other parts of the State.

"We launched in CFA District 2, the then DEPI Murray Goldfields area, which gave us a good footprint for the trial," he explains

"The area has diverse terrain and topography, with forest, grassland and farming areas. From volcanic plains to forests, scrub and grasslands, the area poses a variety of challenges for fire agencies. The majority of the land is private, the climate is hot and some parts are notorious for fire. Some of the biggest fires were Ravenswood (1944), the Macedon Ranges (1983), Maryborough (1985) and Heathcote (1987)."

From an economic perspective, the region is estimated to produce more than $680 million in agricultural produce annually, with some existing crop farming techniques potentially increasing fuel loads.[3]

Two aircraft, Helitack 335 (a Bell 214B firebombing helicopter) and Firebird 305 (a Bell 206 air attack supervisor aircraft), were used for the trial.

3 A Review of the Pre-Determined Dispatch Trial (PDD) CFA District 2 – 2012/13

PDD guideline development

The dispatch process included pre-determined dispatch of aircraft if the Fire Danger Index (FDI) (in grass or forest, whichever is higher) was 12 or greater. It set out specific protocols and actions for rostered aviation and ground crews and aircraft operators in the lead up to, during and after fires. The process also enabled aircraft to be re-tasked while airborne.

Traditional CFA process

- Call to 000, Emergency Services Telecommunications Authority (ESTA), Victoria

- Local fire brigade units notified by ESTA and dispatched

- Crew assesses fire and calls for aerial assistance if required via Vicfire to CFA RDO or DELWP DO

- Average dispatch time of 34 minutes for aircraft*
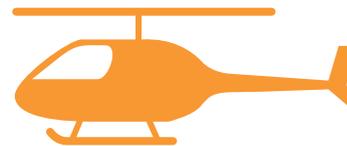
  *Based on 2012/13 fire season.

PDD process

- Call to 000
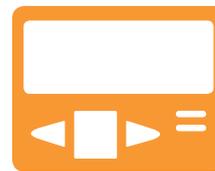
- 000 provider ESTA pages ground units and aircraft (pilots)

- Aircraft dispatched if the relevant FDI is 12 or higher within the specified PDD area

- Average dispatch time of 8.4 minutes for aircraft, more than four times quicker than the traditional process^

  ^Following application of amended procedures and practices.

Critical outcomes

In the 2012/13 trial, aircraft were sent to 44 fires under the PDD guidelines. These aircraft firebombed in 19 cases. Fifteen traditional dispatches were used as a comparison.

The majority of fires were contained and ground crews reported that early firebombing played a major role in stopping the spread of the fires.

The average PDD time was 8.4 minutes, from the initial pager message to airborne, and 24.3 minutes to over the fire. The average time for the traditional dispatch process was 34 minutes to aircraft airborne for the 15 sampled dispatches. This was a result of waiting for firefighters to arrive on-scene and determine if aircraft were required.

CFA District 2 operations officers commented that PDD prevented large running fires within District 2 which had occurred in the neighbouring CFA districts of 12, 14, 15 and 16.[4] Overall, the general opinion was that fire size and duration were significantly diminished as a result of the trial, with a large reduction in costs such as for vehicle damage and in the commitment of resources.[5]

The trial review also reported that immediate intelligence from the air attack supervisor to the fire ground and rostered duty officers "enabled faster and more accurate decision making", which assisted the issuing of community warnings and decision making around resource requirements.

Reports from the CFA District Mechanical Officer In Charge of the Bendigo Workshops was that damage to firefighting vehicles was significantly reduced as a result of the PDD trial.

4 A Review of the Pre-Determined Dispatch Trial (PDD) CFA District 2 – 2012/13
5 Ibid

Qualitative feedback

Feedback from ground crews in the field demonstrated clear support for the PDD trial. Some responses are provided as edited extracts below, as sourced from the report on a review of the Pre-Determined Dispatch Trial (PDD) CFA District 2 – 2012/13.

" **… the firefight would have gone longer had it not been for the directed efforts of the aircraft. Having communications with the aircraft assisted incident controllers greatly, providing them with an 'eye-in-the-sky' picture of the incident. It meant they could gain valuable insight into where they needed to focus their efforts."**

DGO and 1st Lieutenant

" **… 335 was working above us in some pretty rough terrain … I was really impressed with their response and ability to hit targets … Without them, some of those fires could have easily got out-of-control. It was also a great advantage to have an eye-in-the-sky to see what we cannot see on the ground like breakouts … and guide the ground crews to them quickly."**

5th Lieutenant

" **… we were about the third appliance to arrive. The fire had jumped and was heading north. Our tanker went for the north-east corner of the head to try and pinch it in … There was a creek in front of it and we would not be able to chase it across … 335, and a bit later 342, pulled up the head that had jumped the creek … the PDD massively reduced our workload and (the) burnt area, as we would have taken 20 to 30 minutes to go back and find a place to cross the creek to gain access."**

3rd Lieutenant

" **… Without the quick action of the ground crews and the fire head containment from the helicopters we may have been committed for several days/weeks … The fire was halted burning down into the gorge with about 150 metres until it would have taken off up the escarpment and into totally inaccessible country …"**

Incident controller

Next steps

Based on the positive results from the trial, together with feedback gained from fire crews and incident managers via operational debriefing processes, the project team recommended extending the trial.

The Fire and Emergency Aviation Management Group, a leadership group comprising the Commissioner and chief officers in Victoria, adopted the recommendations from the Aviation Capability Management Framework process led by DELWP's Aviation Services Unit, extending PDD to five locations in 2013/14 (Bendigo, Sea lake, Casterton, Hamilton and Benambra). The recommendations also included the use of single engine air tankers (SEATS) activated using PDD within locations identified from the Aviation Capability Management Framework process.

This process ensures that stakeholders from regions and agencies across Victoria provide input into determining the State's aviation needs for fire and emergency management, as well as land management activities. Stakeholders include end users involved with aircraft operations, incident management, regional control and state control, as well as specialist aviation experts. Aviation needs are determined by verifying hazard-specific operating concepts against known and future likely scenarios. Through this process, subject matter experts can determine required capacity and also to identify capability gaps in the aviation fleet and support systems.

Delivering similar successful outcomes in 2013/14, PDD was subsequently expanded for the 2014/15 fire season to Stawell, Colac, Mansfield, Benalla, Shepparton, Albury, Latrobe Valley, Healesville and Bairnsdale.

Minor adjustments to the process continue to be made as a result of learnings from experience which are part of the continuous improvement process for PDD.

The use of PDD was again expanded for the 2015/16 fire season, reaching across 16 locations around Victoria.

Over the 2015/16 fire season the average PDD time was 10.9 minutes, from the initial pager message to airborne, and 23.7 minutes to over the fire. Aircraft were paged more than 580 times, and on 303 occasions aircraft were dispatched. Aircraft were required for 37 per cent of those dispatches, making 361 drops while performing a crucial intelligence function on the fireground.

Moving forward

According to Wayne Rigg, a member of the trial team and project lead for the CFA implementation of PDD, the research provided the theory and the trial allowed a process to be developed, tested and evaluated.

"The trial confirmed the benefits of PDD. It also showed us the likely hurdles for implementation, as well as potential ways forward," he recalls.

"The bottom line was that PDD was a fundamental shift from how we had traditionally operated. It was a completely foreign process to the clunky system we knew and used," he says.

The new process enabled more rapid decision making, clearly defining the activation process for dispatch of aircraft.

According to Greg Murphy, Manager Aviation and Regional Operations at Emergency Management Victoria, as with any change, the move to PDD required a raft of other significant flow-on changes to systems, processes, procedures and practice to allow for effective response, while meeting the State's priorities for safety.

A dedicated project manager was appointed within the DELWP Aviation Services Unit to oversee the trial of aircraft operations and the briefing and training of aircraft operators, pilots and ground firefighting crews in procedures for working together in the air and on-the-ground.

The Unit's Aviation Capability Management Framework was used to determine key factors such as what type of aircraft would best support implementation of PDD and from which operating bases to ensure safety while meeting PDD's overall aim of keeping small fires small. A new approach to resourcing and rostering was also needed to supervise PDD. A key focus was building awareness around safety for ground crews, in particular dealing with firebombing aircraft arriving quickly on scene, in some instances without airborne air attack supervisors. This involved integration of PDD into standard operating procedures such as the Joint SOP 2.06 Readiness Arrangements – Bushfire Aviation Personnel and Equipment (revised) and a review of the Interagency Aviation Operating Procedures (IAOP).

"The PDD experience has improved and continues to evolve," says EM Commissioner Craig Lapsley.

A formal set of protocols has now been developed to further guide PDD operations ahead of the next fire season in Victoria.

From an operational perspective, Wayne Rigg recalls the approach to introduce PDD was to "just get on with it".

"After all, aircraft are just another tanker, but with wings," he explains.

"The fire brigade is a well-networked community. The bush telegraph works quickly. If it had been a flop, the message would have got out ahead of us. Because the rationale and benefits of PDD were obvious, it quickly gathered support in the field. In the end, most brigades wanted and support PDD."

For the roll-out, the project team worked through internal channels and networks, targeting briefing and demonstration sessions to operational staff in districts and brigades.

PDD continues to evolve by gathering feedback and forms part of a continuous review process, including through the Aviation Capability Management Framework.

Critical success factors

From an operational perspective, Wayne Rigg pinpoints a "combination" of key factors critical to the project's success.

"Firstly, and above all, we had the intent and support from the top down to do it. This gave us a clear path forward," he recalls.

"Second, there was a willingness to participate operationally once the members of the fire and land management agencies understood what we were trying to achieve and why.

"And, thirdly, at the end of the day, it succeeded because the goal was a no brainer: to keep small fires small. This meant finding a way to eliminate the in-between steps."

Evaluating the impact

So far, all the indicators show that the PDD trial and staggered implementation plan have been successful, according to measures such as the trial review, post-fire season reports and qualitative feedback from end users.

Baseline data for comparative performance evaluation is still being gathered after the first years of more widespread PDD operation. This evaluation framework is also in development and will be available in future when data is collected.

A key challenge, however, is trying to measure PDD's effectiveness in terms of traditional financial indicators.

"Quantifying the cost benefit of aircraft operations can never be an exact science," says EM Commissioner Lapsley. "PDD stretches this paradigm even further."

"However, the experience of PDD in Victoria over the past three summers strongly suggests that it will remain a key operational option in this State heading into the future."

Read, click , watch

FOLLOW THE LINKS

Fire Notes

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