



Aerial Resources Management Workshop

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Is aerial firefighting still a good investment...?

Is aerial firefighting still a good investment...?

It's a good question to ask....



3 days



= 10-20 years



= lots

Is aerial firefighting still a good investment...?

It's a good question to ask....



7 February 2009
Victoria, Australia

Insured losses
\$1.07 billion AUD
[ICA]

Total costs circa
\$3 billion AUD
[BTE]

Image: Nick Moir
The Age

Is aerial firefighting still a good investment...?

What does AI say...?

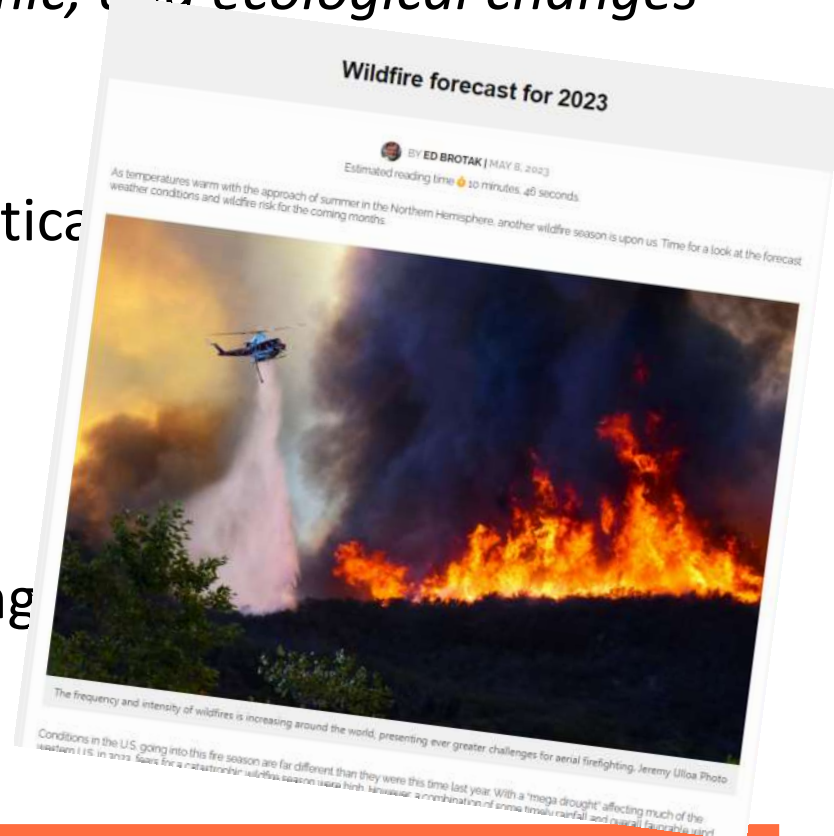
“It depends.....” (ChatGPT)



Aerial firefighting

Context

- *Unplanned and uncontrolled landscape fires are increasing, correlated with social, economic, and ecological changes*
 - Extended seasons
 - Fires in new ecotypes
- Increasing expectations – political
 - Increased accountability
- High public profile
- Increasingly politicised
- Assertive or political marketing



Aerial firefighting

...will only ever be part of the solution...

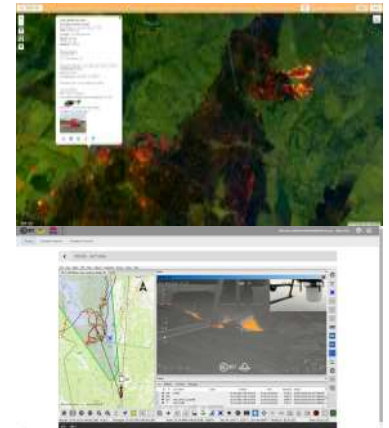
- Aircraft rarely put out fires by themselves....
- But, if properly integrated, they can provide valuable support



Aerial firefighting

Broad range of valuable roles

- Direct or indirect attack on the fire (firebombing) –
 - e.g. initial attack, flanking, asset protection, buying time....
- Delivery of firefighters
 - including specialist insertion smokejumping , winching, rappelling
- Intelligence
 - fire detection, reconnaissance, damage assessment
- Supervision, co-ordination and command
- Warnings or evacuation orders
- Transport of stores, fuel and equipment
- Aerial ignition of planned fires, backburns
- Arson prevention and enforcement
- Communications



Aerial firefighting

Range of aircraft type and capabilities

- Fixed wing aeroplanes
- Helicopters
- Un-crewed or Remotely Piloted aircraft (UAV, RPA, Drones)
- Large and small
- Land-based, amphibious, water based
- Variety of drop (dispensing) systems
 - tanks – variety of doors and controls
 - buckets – short line, long line



Aerial firefighting

Range of supply arrangements

- State or military owned and operated
 - State or military owned, contractor operated
 - Contractor owned and operated
 - Hybrid
-
- Full time, exclusive-use
 - Part time or Call-When-Needed
 - Shared or multi-role

Aerial firefighting

Challenging safety and risk management


- Inherently hazardous environment
- Dynamic, continuous risk assessments required
- Highly stressing, fatiguing
- Changes, diversions and distractions are normal
- Highly variable levels of activity
- Members of the team may be outside the aircraft and may not be aviation professionals
- Often single-pilot operations



Aerial firefighting

Complex resource allocation equations

- Regulations
- Cost/economics
- Objectives to be achieved
- Aircraft suitability to task
- Aircraft & crew performance, capabilities, limitations
- Weather
- Daylight
- Terrain
- Fire behaviour, fuel types
- Suppressants/retardants used – water, gel, foam, retardant (including environmental implications)

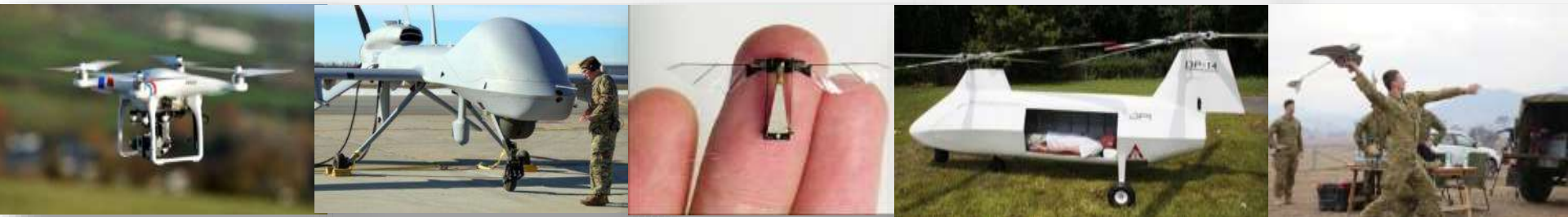


Is it OK to keep the aircraft flying when you know they are not being effective?

Aerial firefighting

Context

- Rapidly developing allied technologies:
 - Un-crewed Aircraft/Aerial Systems (UAS, RPA, drones)



Rain: autonomous firefighting capability could eliminate catastrophic wildfires by 2030

BY BRENT BUNDY | MAY 11, 2023

Estimated reading time 🕒 7 minutes, 8 seconds.

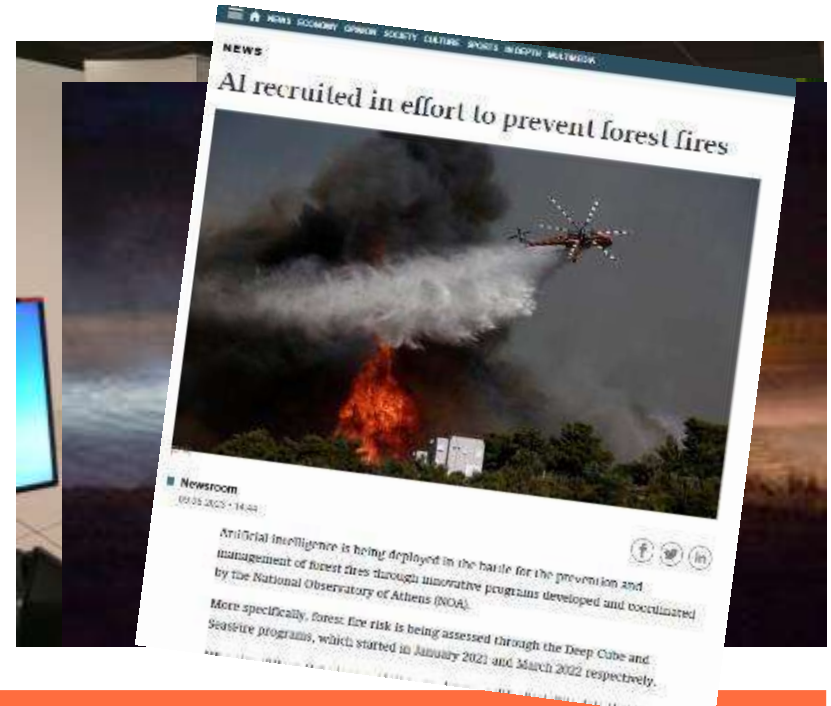
The stage has been set, but it's a show that no one wants to see: the upcoming 2023 wildfire season. Record-setting snow and rain in the western United States over the winter could lead to an elevated risk of disastrous fires, thanks to increased growth of underbrush. As the mountain snow melts, the potential for mudslides also rises, which knock down swathes of trees. This can have a two-fold effect. First, it allows winds to flow more freely to spread fires, and secondly, as the trees are dried by the summer heat, they provide abundant fuel for fires. California-based company Rain hopes to make a difference.



Aerial firefighting

Context

- Rapidly developing allied technologies:
 - Un-crewed Aircraft/Aerial Systems (UAS, RPA, drones)
 - Airborne remote sensing and mapping technologies
 - Night vision/synthetic vision
 - Artificial Intelligence
 - Simulation



Aerial firefighting

Optimisation strategies

- survey of high-level users:

What are the greatest potential opportunities for improving aerial firefighting efficiency and effectiveness?

1. Improved resource sharing
2. Analysis of cost effectiveness
3. Analysis of the effectiveness of resources
4. Training and education

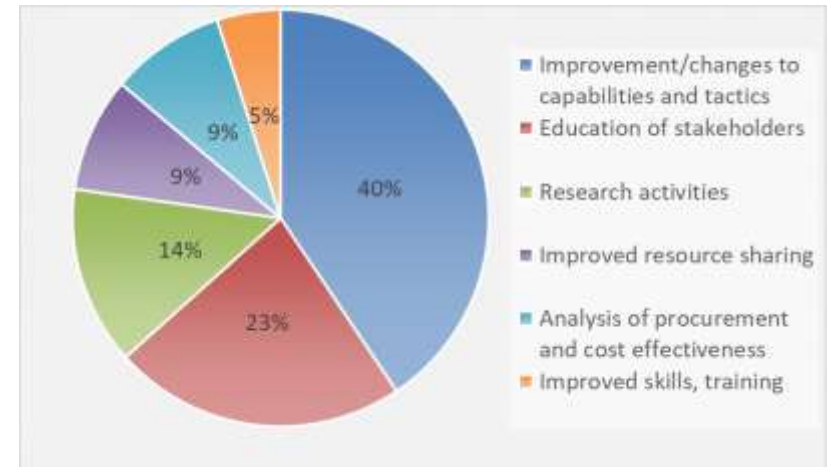
Aerial firefighting

Optimisation

- survey of high-level users:

What changes to aerial firefighting capabilities would you recommend?

1. Focus on better air intelligence capabilities
2. Education of stakeholders
3. Research



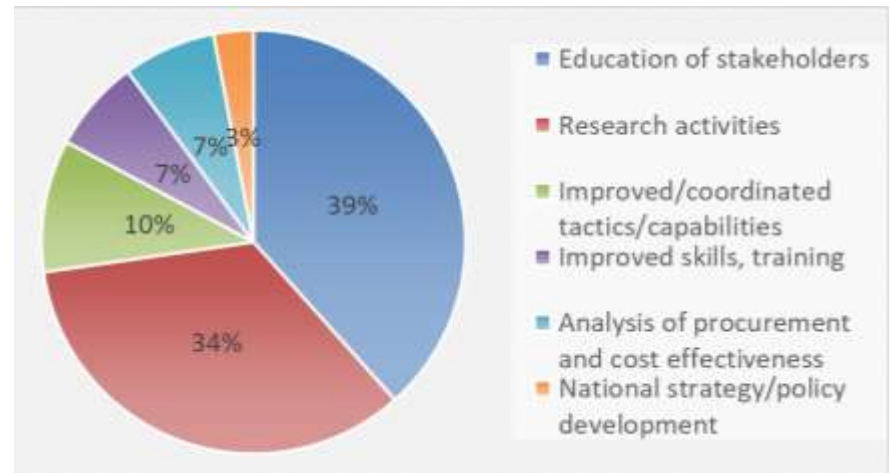
Aerial firefighting

Optimisation

- survey of high-level users:

In the context of increased media, public and political focus on aerial firefighting, how do we ensure that the assets are being used effectively?

1. Education of stakeholders
2. Research
3. Improved co-ordination
4. Improved skills/training

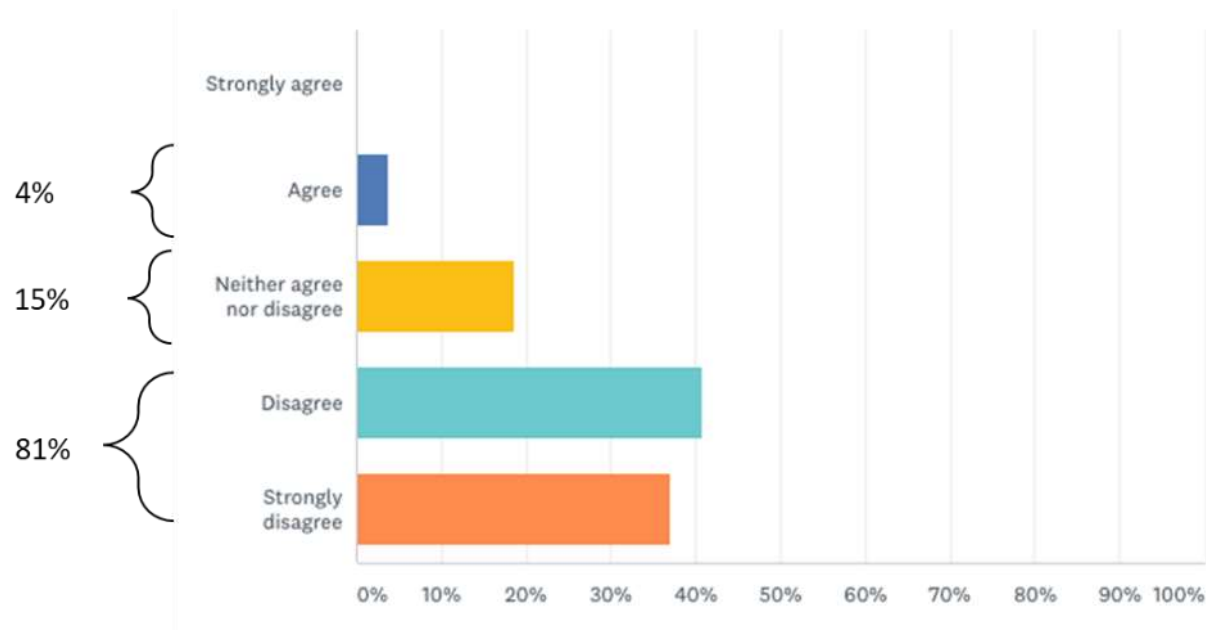


Aerial firefighting

Optimisation

- survey of high-level users:

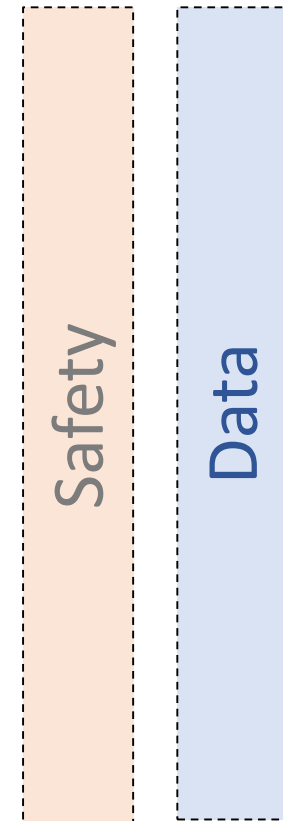
As an industry, do we know, measure and report on the true cost and the benefits of aerial firefighting?



Aerial firefighting

Optimisation – Main areas of focus

- Identify the outcomes required
- Teamwork
- Use early - rapid initial attack
- Right aircraft (& equipment) for the job
- Manage availability
 - ✓ Match risk (AI?)
 - ✓ Share resources, share costs
- Integration
- High standards
- Competent management, supervision and support
- Education – well-trained users
- Education – manage expectations
- Effective support systems
- Research, continuous improvement



Safety



ABC
Feb 2023

Safety

➤ Poor safety record overall

Example comparative statistics:

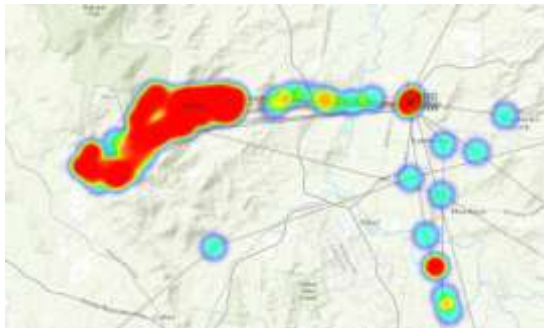
- Oil & gas exploration and production
 - Fatal accident rate 0,64 per 100.000 hours
- Aeromedical
 - Fatal accident rate 0,34 –1,2 per 100.000 hours
- **Aerial firefighting**
 - Fatal accident rate ~ 3,0 per 100.000 hours
 - About 5 times oil and gas
 - About 9 times aeromedical
 - About 50 times airline travel



- Overall the accident rate does not appear to be improving
- Majority of accidents related to human factors

Data

- Safety
- Teamwork and collaboration
- Situation awareness for efficient management
- Incidental intelligence
- Accountability
- Performance measurement against objectives
- Evaluation, Research, Improvement
- Inform AI systems





Australian national information system for supporting the use of aircraft for fire and emergency response.

- Collaborative, national system
- Integrates relevant information from a range of sources and exchange information with other systems
- Web-based, “in the cloud”
- Provides tools to managers to help them use aircraft effectively and efficiently
- Enables efficient sharing of resources between jurisdictions
- Everyone is using the same, high-quality information....





All aircraft are tracked in real-time

- Support vehicles (eg fuel trucks) are also tracked

Event data is transmitted from aircraft along with tracking data

- Engine on and Engine off
- Take-off and Landing (and Hover)
- Firebombing fills
- Firebombing drops
- Amount dropped, coverage level

Tracking and event data is

- Displayed in ARENA for agencies without their own systems
- Made available to integrate into other agency and jurisdictional systems
- Stored in ARENA for later use, including: accounting, performance management, research



Example: Air resources situation display for large screen

The screenshot displays the ARENA interface for air resources. The top navigation bar includes the ARENA logo, menu items (Agency, Availability, Procurement, Returns, Airdesk), user information (NT - DENR, NAFIC Test User), and system status (Last update: 3 minutes ago at 11:52). The main interface is divided into four columns, each representing a different fire incident.

Column 1: NSW - RFS - Glen Innes S44
CTAF: 128.45, Comm: NG023
List of locations: Bees Nest, Captains Ck, Coopers Rd, Red Range, GLENN INNES S44, Kaiore Mountain Trail, Kildare Rd, Kildare Rd, Tennerfield, Kingsgate, Red Range, LONG GULLY RD, DRAKE, Long Gully Rd, Drake, Mount McKenzie Rd, Tennerfield, Pinkett Rd, Backwater, Raspberry Rd, Jeogla, Sandy Creek, Wollomombi, Silent Grove, Torrington, Sunnyside Loop Rd, Tennerfield.
AIRBASE CONTACT DETAILS: John Hopper, 0407 045 182.
RESOURCES (25): B251, B253, FB208, FB212, FB230, FB235, FB286, FB289, HT332, HT337, HT205, HT223, HT224, HT226, HT227, HT263, HT274, HT294, HT297, HT402.

Column 2: Kaputar Fire
CTAF: 130.65 NP, Comm: N008
AIRBASE CONTACT DETAILS: Narrabri Fire Control Michael Brooks, 0427 101 124.
RESOURCES (9): B220, B229, B252, B266, FB233, FB239, HT343, PKAJR4, 1AK-45C.
AVIATION PERSONNEL (2): Jason Lane (19/10 - 23/10), AAS, 0428 273 198; John Whittall, NPWS Contact for Medium hell, 0428 693 909.

Column 3: Jacobs Spur
CTAF: 118.150, Comm: PMR 006
AIRBASE CONTACT DETAILS: Wayne Leader, 0407 007 223.
RESOURCES (8): FB283, FB287, FB293, HT212, HT258, HT270, CA 24 AW, ZKY971.

Column 4: NSW - RFS - BUSBYS FLAT (Richmond Valley s44)
CTAF: 123.85 NP, Comm: TG06
List of locations: Berauds Rd, Bora Ridge, Busbys Flat Rd, Busbys Flat.
AIRBASE CONTACT DETAILS: Boyd Townsend, (02) 6663 0000.
RESOURCES (7): B254, FB224, FB259, FB266, HT230, HT281, TNY614.
AVIATION PERSONNEL (5): Andy Fay (19/10 - 23/10), AOB XXX, 0427 306 845; Col Church (19/10 - 21/10), AAS, 0407 898 970; Geoff Lang (19/10 - 21/10), AAS (NYC), 0412 996 120; Michael Morley VIC (18/10 - 22/10), AOM, 0428 319 145; Mika Saunders (18/10 - 22/10), ABM XXX, 0428 654 029.

Example: Find aircraft nearby to fire (sorted by elapsed time to be on site)

FILTERED BY:

Logged Out. Last update: an hour ago at 17:29 MAP LIST

Incident: Sassafra Creek [-32.93, 150.27]

Search radius: km

Min response time: minutes

Filter:

HIDE REFRESH

	Aircraft	Act	Location & Distance	Availability	Flying Time	ETE	Q
1	B910 [N612AX]		-33.60, 150.78 88 km SSE of incident	Standby 15m Not Seen today	8 mins at 648km/h	23m mins	
2	B132 [N405LC]		-33.60, 150.78 88 km SSE of incident	Standby 15m Parked	10 mins at 556km/h	24m mins	
3	BD273 [VH-LVG]		-33.60, 150.78 88 km SSE of incident	Standby 15m Not Seen today	11 mins at 463km/h	26m mins	
4	B718 [VH-AWU]		-32.56, 149.62 74 km WNW of incident	Available 10m Not Seen today	15 mins at 296km/h	29m mins	
5	B717 [VH-NWU]		-32.56, 149.62 74 km WNW of incident	Available 10m Not Seen today	15 mins at 296km/h	29m mins	
6	B409 [VH-ZIN]		-32.56, 149.62 74 km WNW of incident	Available 10m Not Seen today	17 mins at 261km/h	31m mins	
7	BD275 [VH-HPY]		-33.60, 150.78 88 km SSE of incident	Standby 15m Not Seen today	19 mins at 278km/h	34m mins	
8	FB260 [VH-ZHM]		-32.56, 149.62 74 km WNW of incident	Available 15m Flying	20 mins at 222km/h	34m mins	
9	PARKAIR4 [VH-UAH]		-32.65, 151.01 76 km E of incident	Dispatched Parked	21 mins at 222km/h	Not enough data	

-32.93 150.27

Leaflet | Tiles © Esri

Example: Find aircraft by cost

FILTERED BY: Aircraft Category = FW - Type 4 SEAT

Last update: 2 minutes ago at 18:15 MAP LIST

Number:
Name: Sir Ivan Fire
Data Source: ICON
Jurisdiction: NSW
Location Text: -32,1.43 149.40.18
Date Created: 2017-02-11
Date Closed:
Pub Date: 2017-02-13 18:14:00
Alert Level: Watch and Act
Council Area: Warrumbungle
Fire: Yes
Location: Sir Ivan Doherty Dr, Leadville, NSW 2844
MAJOR FIRE UPDATE AS AT 13 Feb 2017 6: 10PM. More information
Responsible Agency: Rural Fire Service
Size: 49528 ha
Status: Out of control
Type: Bush Fire
Updated: 13 Feb 2017 16:47

Search by expected cost:
 Incident: Sir Ivan Fire [-32.02, 149.67]
 Search radius: km

Expected Deployment:
 Duration: days
 Flying time: hours / day

Filter:

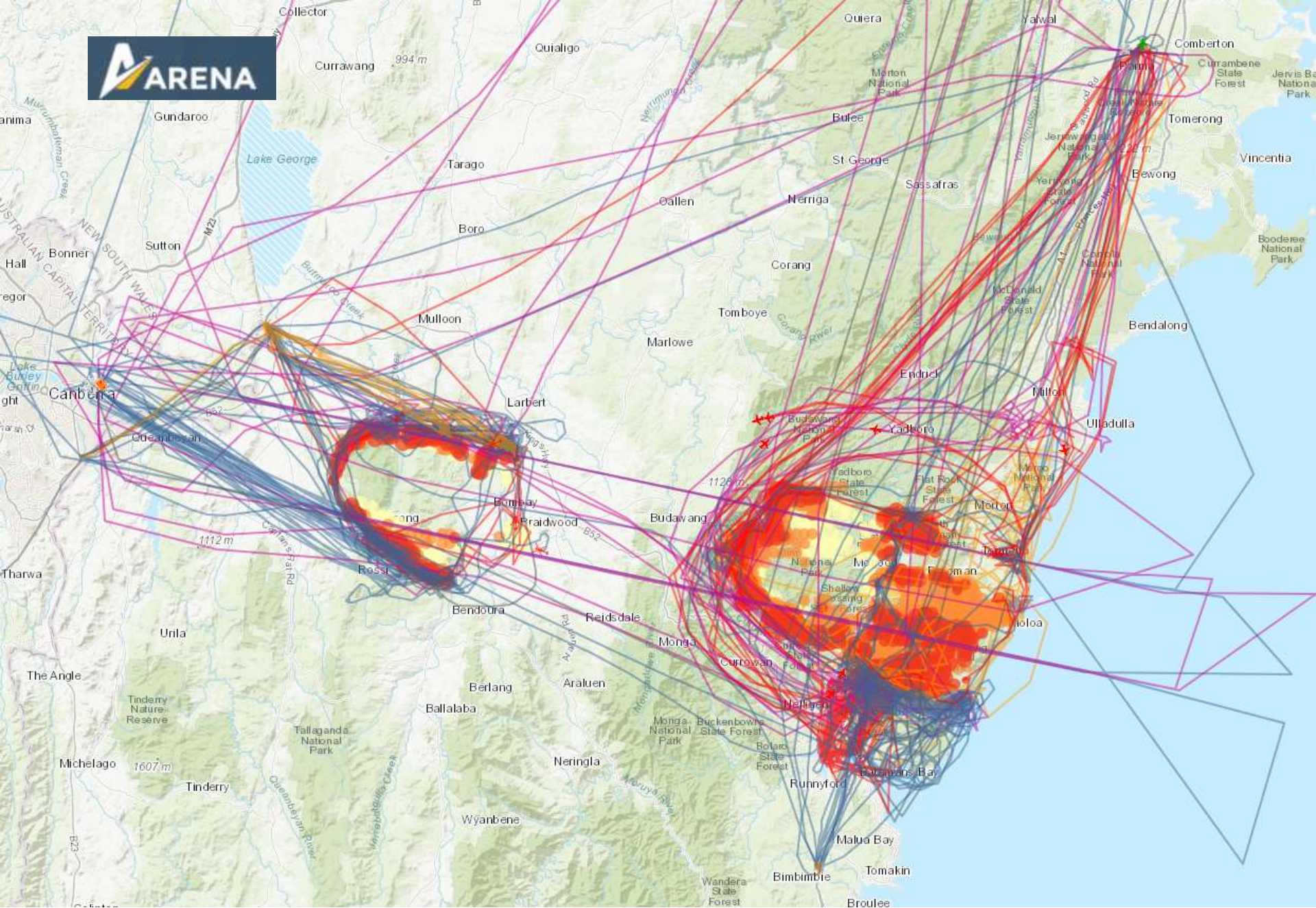
HIDE REFRESH

	Aircraft	Act	Location & Distance	Availability	Flying Time	Cost Percentile	Q
1	B251 [VH-WTJ] Aircar Aviation Operations Pty Ltd	<input checked="" type="checkbox"/> <input type="checkbox"/>	-32.13, 149.96 30 km ESE of incident	Tracking Flying	12 mins at 269km/h	0	●
2	B718 [VH-AWU]	<input checked="" type="checkbox"/> <input type="checkbox"/>	-32.56, 149.62 60 km S of incident	Dispatched Flying	23 mins at 296km/h	72	○
3	B717 [VH-NWU]	<input checked="" type="checkbox"/> <input type="checkbox"/>	-32.56, 149.62 60 km S of incident	Dispatched Flying	23 mins at 296km/h	72	○
4	B409 [VH-ZIN]	<input checked="" type="checkbox"/> <input type="checkbox"/>	-32.56, 149.62 60 km S of incident	Available 10m Not Seen today	26 mins at 261km/h	73	○
5	B266 [VH-XAV] Kennedy Air Ag Pty Ltd	<input checked="" type="checkbox"/> <input type="checkbox"/>	-31.61, 149.52 48 km N of incident	Tracking Flying	21 mins at 259km/h	96	●
6	B227 [VH-LIS] PAYS AIR SERVICE PTY LTD	<input checked="" type="checkbox"/> <input type="checkbox"/>	-31.33, 149.27 86 km N of incident	Tracking Parked	35 mins at 274km/h	100	●

Showing 1 to 6 of 6 entries

- AVAILABLE**
- BOMBER 218
 - BOMBER 227
 - BOMBER 409
 - BOMBER 717
 - BOMBER 718

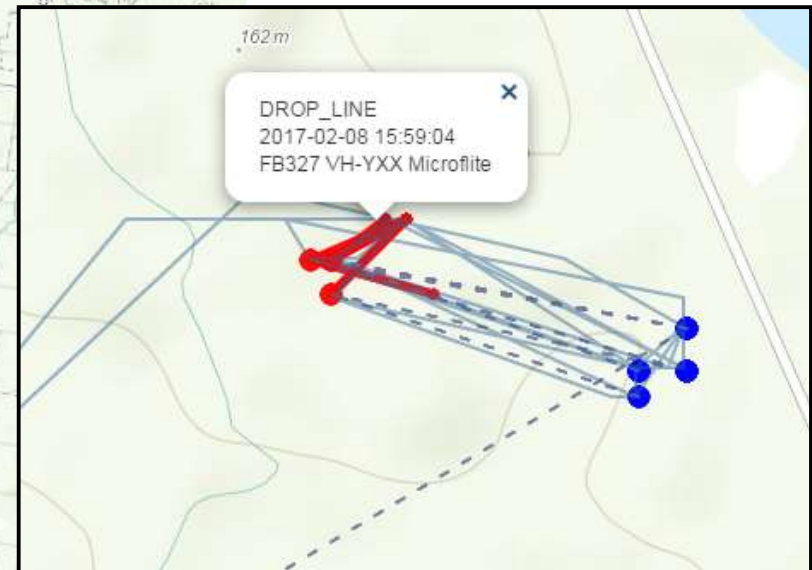
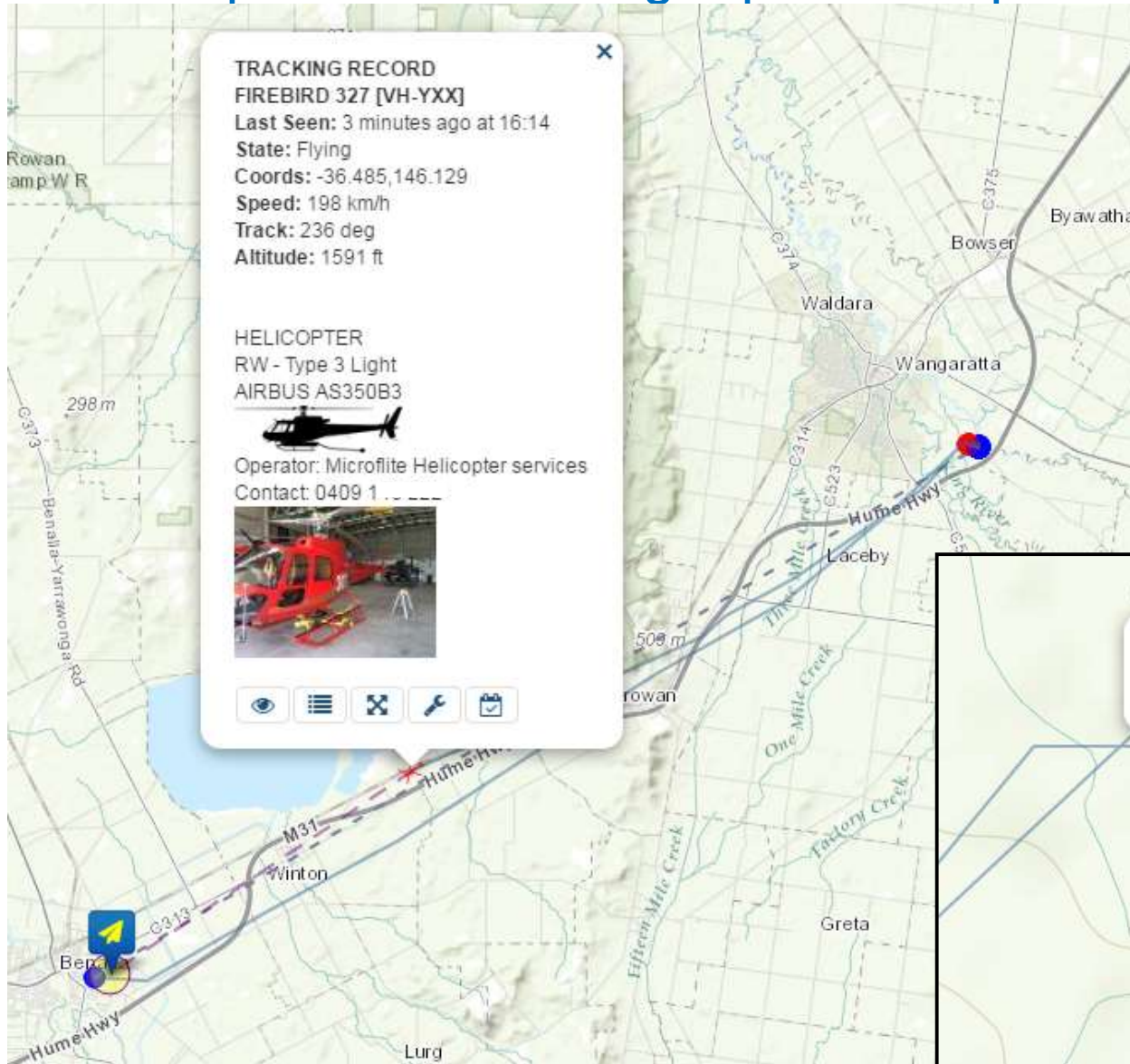
Lat: -32.651 Lon: 151.035





Reports

Example: Firebombing report – drop locations



Is aerial firefighting still a good investment...?

Some Guiding Principles

- Driven by the **communities** we serve
- **Preservation of life** on the ground and in the air is the primary consideration
- Aerial firefighting is just one part of a bigger equation, and must **be fully integrated** with the other parts (and evaluated in that context)
- Decisions regarding the application of aerial capabilities should be made on the **basis of evidence** (and efforts made to further build the evidence base)
- Financial, human and physical resources should be deployed in a manner that is **sustainable and based on assessment of risk**
- Capabilities should be optimised through **cooperation and collaboration**, including internationally and with industry partners.
- Aerial firefighting must be delivered and supported to **high standards**, with **continuous improvement** through ongoing training, research and innovation

Is aerial firefighting still a good investment...?

According to ChatGPT, it “....depends on various factors. Here are some points to consider:

Effectiveness:

Aerial firefighting can be very effectiveHowever, it can depend on a range of factors.....

Cost:

it is important to consider whether the cost of aerial firefighting is justifiable, especially when compared to other fire management strategiessuch as practices that can help prevent fires from starting in the first place.

Safety:

must be a top priority in any firefighting operation,

Environmental impact:

Aerial firefighting can have environmental impacts.....needs to be carefully considered and weighed against the benefits of aerial firefighting.

Overall, whether to invest in aerial firefighting depends on the specific circumstances and needs of a given area. It may be a valuable tool in some situations, but not in others. Ultimately, the decision should be based on a careful assessment of the risks, costs, and benefits of different firefighting strategies.”

8TH INTERNATIONAL WILDLIFE CONFERENCE

GOVERNANCE PRINCIPLES: Towards an International Framework

May 16-19th | 2023
Porto - Portugal

LOCAL ORGANIZER



INTERNATIONAL LIAISON COMMITTEE FOR THE 8TH IWFC



International collaboration in fire aviation

Opportunities

- Sharing of information, experiences
 - especially safety-related
 - > best practice
- Economic benefits can be achieved by sharing high-cost, specialised resources such as aircraft
- Aircraft are often the first or only resources shared between jurisdictions in a developing wildfire emergency

International collaboration in fire aviation

- Many examples of effective sharing of aviation resources
 - via commercial arrangements (e.g. a contractor has complementary contracts in different countries)
 - through pre-planned bilateral or multilateral arrangements
 - The most effective deployments are part of existing, robust, pre-planned mutual-aid arrangements which incorporate common standards, procedures and requirements for interoperability
 - There are significant concerns regarding efficacy and safety aspects of ad hoc deployments that may be driven in part by less-than-prudent political decisions and may be reactive and tokenistic
- Aircraft are a resource for which inter-jurisdictional sharing could be “mainstreamed” – to become a regular component of normal wildfire preparedness and response, not just in times of emergency and disaster

International collaboration in fire aviation

International Fire Aviation Working Group (IFAWG)

Mission

- **Share relevant information**, especially information that will support the promotion and improvement of safety
- Provide a conduit or **facilitation mechanism for the sharing of resources** between jurisdictions
- Identify opportunities for **harmonisation of operating practices** and establishment of **consistent standards**
- **Provide advice** and guidance to nations and the United Nations regarding fire aviation

International collaboration in fire aviation

International Fire Aviation Working Group (IFAWG)

- The voluntary **International Fire Aviation Guidelines** provide:
 - recommended standards and operating practices to enhance interoperability
 - considerations for sharing aircraft resources between jurisdictions
 - a checklist for pre-planning deployment agreements



International Fire Aviation Guidelines

- The current version of the **International Fire Aviation Guidelines** is available online
- Comments and contributions to further development of the guidelines are invited



<http://www.ifawg.net>

<http://gfmc.online/iwpm/ifawg.html>

International collaboration in fire aviation

INSARAG

INTERNATIONAL SEARCH AND RESCUE ADVISORY GROUP

- **“A global network** of more than 90 countries and organizations under the United Nations umbrella
- INSARAG deals with urban search and rescue (USAR) related issues, aiming to
 - **establish minimum international standards** for USAR teams, and
 - **methodology for international coordination** in earthquake response”
- INSARAG Guidelines were endorsed by a UN General Assembly Resolution in 2002, on “Strengthening the Effectiveness and Coordination of International Urban Search and Rescue Assistance”



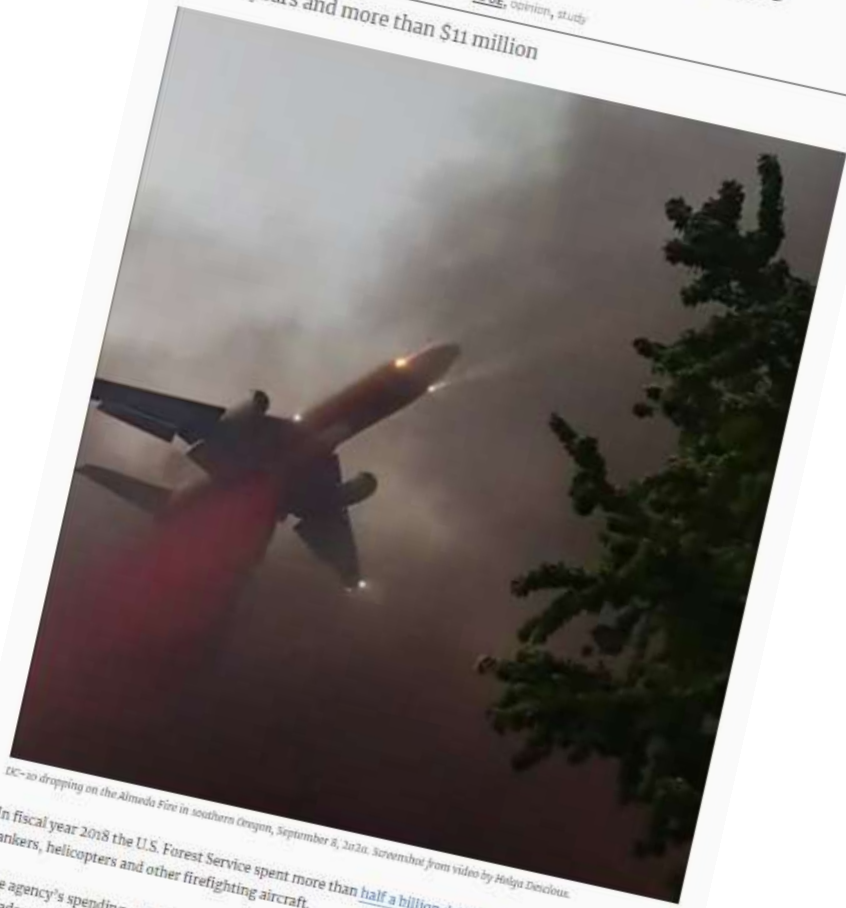
Aerial Resources Management Workshop



What did we learn from the Aerial Firefighting Use and Effectiveness study?

Bill Gabbert April 16, 2021 Fixed wing, Helicopters [AFUE](#), opinion, study

After 9 years and more than \$11 million



DC-10 dropping on the Alameda Fire in southern Oregon, September 8, 2010. Screenshot from video by Holguin Delacour.

In fiscal year 2018 the U.S. Forest Service spent more than half a billion dollars, \$507,000,000, on air tankers, helicopters and other firefighting aircraft.

The agency's spending on aircraft contracts, support, and fire suppression operations has gone on for decades with little meaningful oversight. The Forest Service has been repeatedly asked to justify the