Submission by *Bushfire Waterbombers (BWB)* to the Select Committee on Agriculture and Related Industries: Inquiry into Bushfires in Australia

THE CASE FOR "FLYING RESERVOIR" WATERSPRAYING & WATERBOMBING

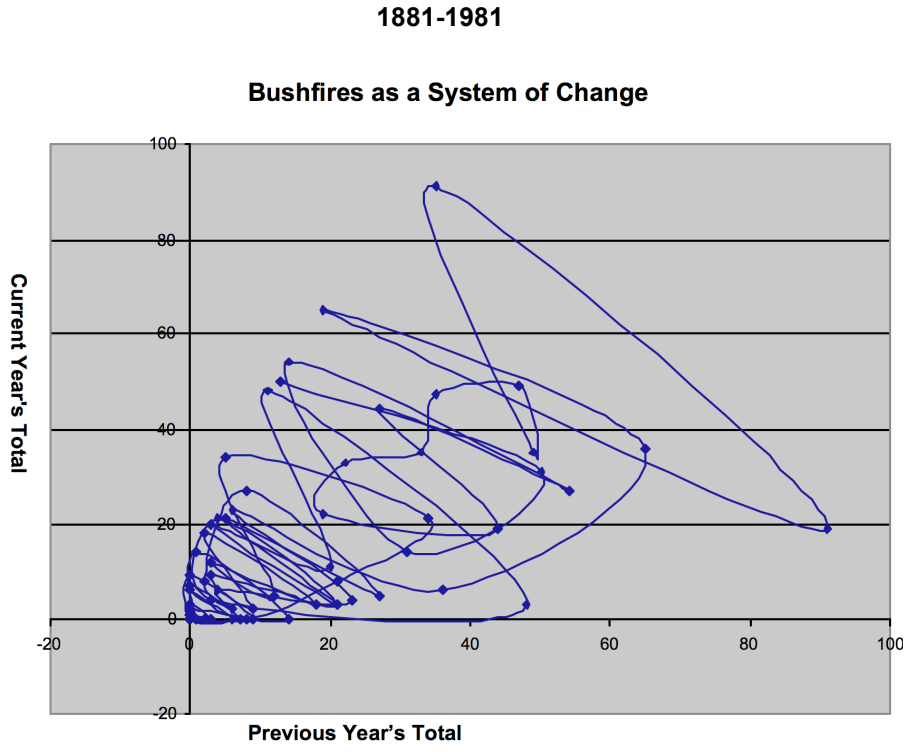


Figure 1 *illustrates the relationship between bushfire operations and the frequency of firestorms. This graph can be used to project from trends. It plots "before" or the year before on the horizontal access against "after" or the year after i.e. at 0, 1881's data on the horizontal axis is plotted against 1882's data on the vertical, 1882 (horizontal) against 1883 (vertical) etc… through to 100, which represents 1981. This measurement tool is known as a system of change and made it possible to forecast firestorms' dramatic increase into the 21st century. The change in firestorm frequency between 1881 and 1981 illustrates system memory in the relationship between before and after. Prior to 1919 or between 0 and 38 on the horizontal axis, the graph is shaped like the tip of a cone. After 1919, bushfire operations increasingly moved away from traditional practices and the graph took on a cyclonic shape.*

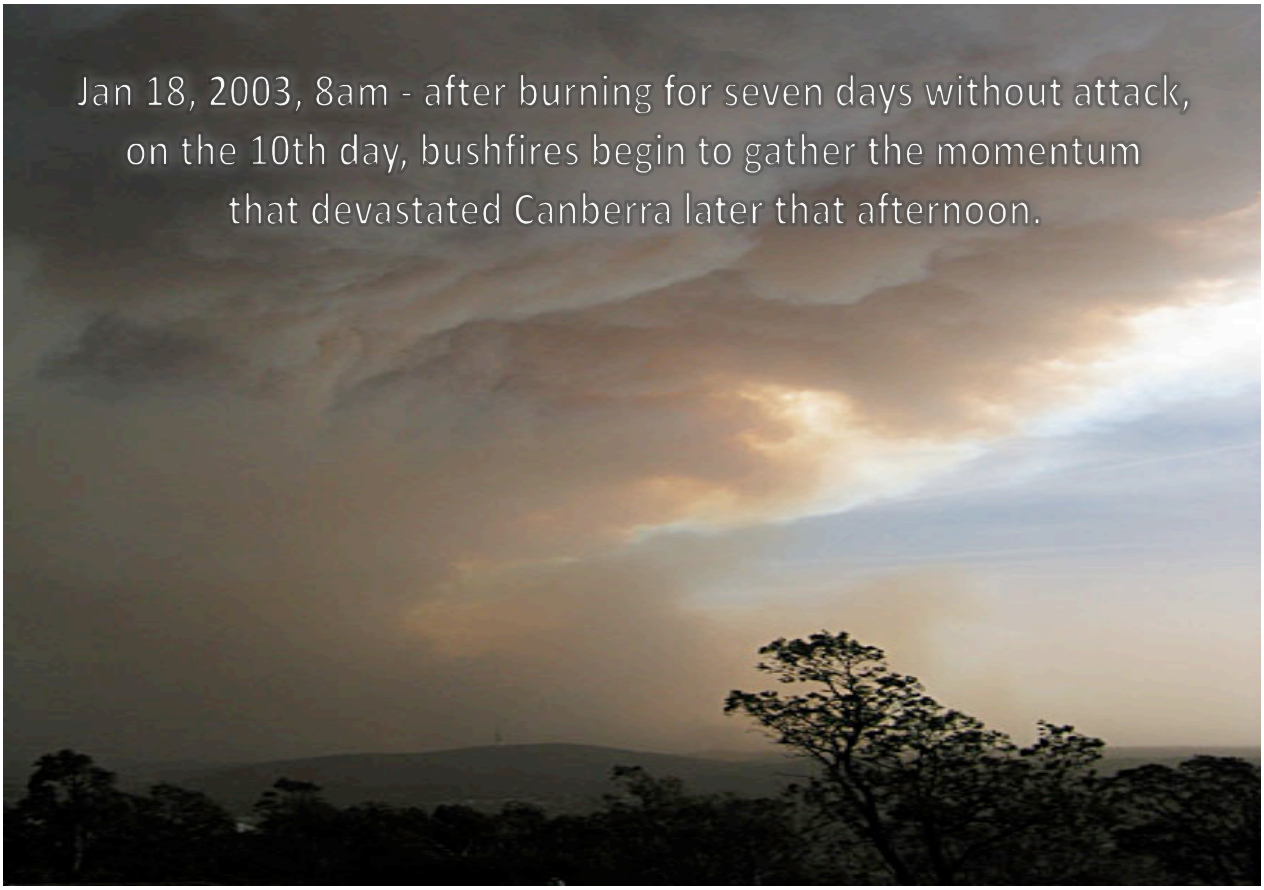
SUMMARY

1. Reasons for the Dramatic Increase in Intense Bushfires or Firestorms

Since the 1920s, bushfire management operations have moved away from:

- Putting out small fires quickly in extreme conditions.
- Hazard reducing, which lowers fuel loads to reduce fire intensity.

Instead, government agencies responsible for bushfire management have negatively sanctioned hazard reduction. And, in the place of rapid attack in extreme conditions, bushfire services tend to leave fires to intensify before attacking. Rural areas have become more sparsely inhabited and national parks have increased in size with fuel loads accumulating since the 1920s.



2. Impacts of the Change in Bushfire Operations

Burning at up to 1,600° C, firestorms are immensely destructive, leaving behind vast tracts of dead and damaged forest with little animal life. Because areas of dead vegetation reduce transpiration, large firestorms create large rain shadows. Also in direct contrast to cool burnt and grazed bush, intensely burnt bush sucks up the runoff from rain at a similar rate to clear-felled forests. Regenerating intensely burnt bush goes into overdrive and sucks up about 40% of runoff.

3. Our Strategy to Improve Bushfire Operations

- Evaluate fixed-wing supertankers (flying reservoirs) including the DC-10, the Ilyushin 76MD and the Boeing 747 as a means of rapid response bushfire attack for ignitions in inaccessible locations, in particular national parks. This rapid response is to be done in close liaison with local bushfirefighters. Knowledge transfer will utilise local knowledge and enable coordination with local crews so they can mobilise safely to move in after water bombing to extinguish burning embers.

- Evaluate other cutting-edge knowledge to locate optimal technology in areas such as bushfire detection and warning systems and fire retardants.

- Use this knowledge to design and implement an emergency response plan for the coming bushfire season.

THE AIM

To persuade the Australian Government to protect lives and property by acquiring large, fixed wing tanker aircraft – "Flying Reservoirs" – equipped for waterspraying or waterbombing. To persuade the Australian Government to fund *Bushfire Waterbombers* for the evaluation of purchasing or leasing aircraft including Boeing-747 and Ilyushin IL76P supertankers. To persuade the Australian Government to fund *Bushfire Waterbombers* to design and implement, based on this evaluation, a management strategy incorporating contemporary bushfire science and other relevant disciplines.

Three bushfires joined to make a fire tornado that blacked out blue sky, lunchtime Canberra, 18 Jan 2003

PERSONNEL

The personnel of Bushfire Waterbombers include:
Dr Christine Finlay, the sole Australian to hold a PhD on aerial and ground bushfire operations that is written from the perspective of a qualified bushfirefighter giving expert analysis of her own and others' eye-witness accounts. Gained in 2006, her PhD is pertinent to the current problem and unique because it incorporates 106 stakeholder interviews – including 90 of victims of fire and emergency response personnel - and develops a bushfire history from the last ice age through to the present. She gives best practice solutions based on a large body of multi-disciplinary evidence for causes and impacts. Dr Finlay is a highly articulate advocate of rapid response and contributes academic strength to the case for Flying Reservoirs.

Dr RJ Solomon is a geographer with a long understanding of land use and urban development and with several highly regarded publications. He is a past President of the Association of Former Members of the Parliament of Australia (AFMPA) and well known to past and present parliamentarians through his editorship of Federal Gallery, the former Members quarterly journal. He has already discussed the *Flying Reservoir* concept with serving Ministers.

Michael Darby, well known for his long involvement in international and local humanitarian causes, is a former army officer (with local responsibility for firefighting), whose civilian firefighting experience includes Saigon in April 1975. He worked with aviation veteran the late John Conley of Australian Aircraft Sales who first proposed fighting fires with supertankers.

THE CASE FOR FLYING RESERVOIR (SUPERTANKER) WATERSPRAYERS AND WATERBOMBERS

Bushfires have a long history in Australia. Adapting Aboriginal examples of fuel reduction or firestick farming, pastoralists in the nineteenth and early twentieth centuries minimised bushfire impact. They used cool burning in winter and autumn and rapidly responded to extinguish fires during hotter months when extreme bushfire conditions could fan flames into conflagrations or firestorms. Despite a Royal Commission calling for the revival of this knowledge following horrendous fires in 1939, the practices of cool burning and rapidly extinguishing bushfires in extreme conditions have waned.

Bushfire Waterbombers (BWB) recommends that in inaccessible or highly dangerous locations rapid response take the form of waterbombing or spraying. Water should be dropped during the early stages of fires when weather forecasts of extreme conditions indicate that intense fires are likely. Rapid response is essential as only changes in weather or large tracts of fuel-reduced land can extinguish a bushfire once it becomes intense (see Milne & Abbott 2005; Luke & McArthur 1978, 1986 & Frost & Vosloo 2006 & Finlay 2006).

In CSIRO trials close to Perth in Western Australia, rapid aerial response proved 100% effective in extinguishing fires in savannah country that was regularly cool burnt to provide firebreaks (Milne & Abbott 2005). When a fire detection system warned of an imminent intense fire, aircraft dropped water within 30 minutes. After water bombing damped down fires, ground crews put out smouldering debris so the area did not re-ignite.

A large body of evidence suggests that supertankers' superior payload and stability will provide the most effective means of suppressing the multiple ignitions characteristic of SE Australia (Finlay 2006: 209-218). BWB proposes evaluating a strategy to use supertankers for the challenges of SE

Australia's large tracts of savannah and inaccessible mountainous bush, linked with the enhancement of existing satellite systems to provide more effective warning of bushfires.

Research affirms that a bushfire-adapted satellite system will optimise emergency response (Frost & Vosloo 2006). Satellite pictures of a fire on control room monitors will allow expert assessment of the fire front and flanks. This will allow water to be dropped in the most effective way using contemporary scientific knowledge and the capacity of airborne GPS technology to direct an aircraft to an exact latitude and longitude.

Rapid response is effective and safe when there is an inversion layer, which occurs typically at night, early morning or late afternoon. The rapid response proposed here is to be carried out in close liaison with local bushfire-fighters, who will implement mopping up after the water drop, and provide local knowledge about conditions and other emergency responses using local resources.

BACKGROUND TO THIS PROPOSAL

Political Shift

A significant political shift in Australia in the last century has heightened the bushfire danger. Reasons for this include:

- Local authorities became influenced – and in many cases dominated - by self-proclaimed conservationists who sought to ban the removal of trees.
- The spread of the scientifically heretical belief that creating an unbroken forest canopy will keep everything beneath cool and moist and therefore safe from fire.
- National parks continually increased in size and number. This is especially serious because access to a park to extinguish fire is difficult by land. There is typically a lack of adequate fire trails so that unchecked fires can reach calamitous proportions and spread rapidly to private property.

Supertankers can solve the problems of supplying adequate water to damp down multiple ignitions in remote locations so that crews can then safely mobilise to extinguish smoldering bush.

- Clearing of land by pastoralists was banned and then heavily restricted. Pastoralists and property owners who had routinely conducted cool weather “burn offs” found such activities heavily circumscribed or outlawed.
- Bans on tree-felling were extended in some areas even to the prohibition of fire breaks.
- Botanical parochialism discouraged the planting of relatively fire-resistant trees and promoted the spread of native eucalypts, which in hot conditions create an inflammable vapour that forms a deadly component of fireballs, fire canopies and fire rivers to incinerate combustible matter such as humans, fauna and flora.
- Prolific tree-planting of rural roads by officialdom created a new road threat as burning forest increasingly claimed lives. Motorists fleeing Victoria’s 2009 fires comprised a significant section of the 173 dead.

Population Shift

During the same period there has been a rapid increase of people moving from cities into rural districts on the fringe of urban settlements. These new settlers tend to have urban knowledge and recreate urban settlement patterns that interface with bushland. Homes are built in areas that are already afforested and then landscaped by planting trees to recreate local native vegetation.

Risk Shift

Combustible material at ground level that has not been routinely cool burnt guarantees that bushfires have the potential to progress to intense fires if adequate management strategies are not introduced. Intense fires generate embers that can ignite new fires at a distance up to 30 kilometres. Large tracts of dead trees from previous intense fires in mountainous national park terrain present a new and as yet unscientifically assessed fuel load. This new threat calls for speedy solutions for fires of greater magnitude than ever experienced in Australia. This is because large dead trees contain higher fuel loads than the ground litter fuelling previous intense burns. Vast tracts of dead mountain ash will burn hotter and longer than previous firestorms.

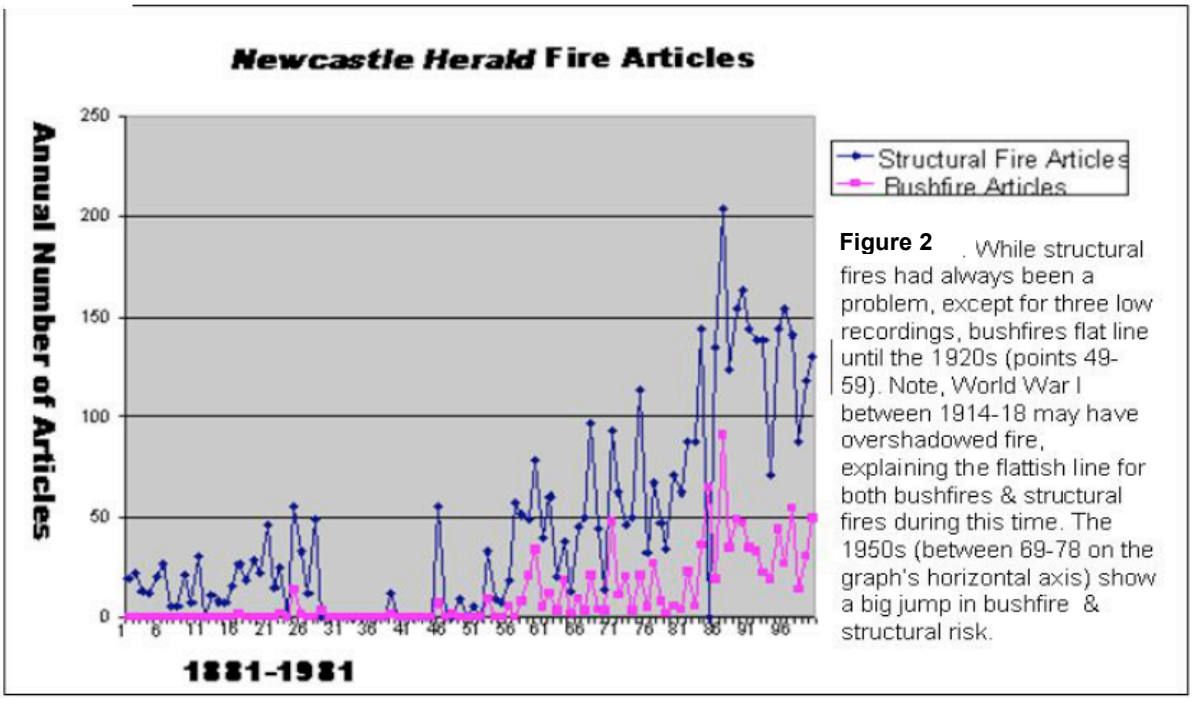


Figure 2 . While structural fires had always been a problem, except for three low recordings, bushfires flat line until the 1920s (points 49-59). Note, World War I between 1914-18 may have overshadowed fire, explaining the flattish line for both bushfires & structural fires during this time. The 1950s (between 69-78 on the graph's horizontal axis) show a big jump in bushfire & structural risk.

One official response to the increasing threat to life and property has been centralisation of firefighting. Hitherto, local independent volunteer fire brigades, working with local property owners, would attempt to extinguish each blaze as rapidly as possible after its discovery. Local initiative and self-reliance were directed at early victory over each fire long before it reached the point of unmanageability. Hampered by the changes that have made bushfires harder to manage, local volunteer fire brigades face steep increases in risk. Australian public opinion may now be moving towards greater local empowerment for fire prevention, especially in hazard reduction, improvement of access and creation of firebreaks. However, major threats to life and property will persist for decades. There will never be a golden age of zero bushfires, even with the most prudent hazard management techniques.

Caledonia, Victoria, 2008

Centralisation of firefighting has discouraged actions that were traditionally part of local independent responses, such as burning to create emergency firebreaks and tactical back-burning. When a fire reaches the proportions of a maelstrom, such responses are of course reduced to the status of high-risk activities with little prospect of success.

Refill at Warragul, Vic. Photo: Luke Corstorphin

Rapid response on the ground and with aircraft is the answer. Rapid response extinguishes fires before they build into intense fires that only weather change can extinguish (see Milne & Abbott 2005; Luke & McArthur 1978, 1986 & Frost & Vosloo 2006).

One aspect of centralisation of firefighting in Australia has been large and growing expenditure on water-bombing aircraft, for the most part helicopters. There is certainly a place for such aircraft in the firefighting arsenal, but helicopters and light aircraft can deliver adequate rapid aerial response only within a very short range of a water source, as in the CSIRO experiments. The Erickson S-64 Aircrane with snorkel can carry 9 tonnes, and buckets from ¼ to 9 tonnes capacity are available for helicopters. Bucket operations are potentially hazardous.

The recent tragic loss of 173 lives in Victoria serves as powerful evidence of serious shortcomings with the present system of fighting bushfires.

Evergreen's Boeing 747

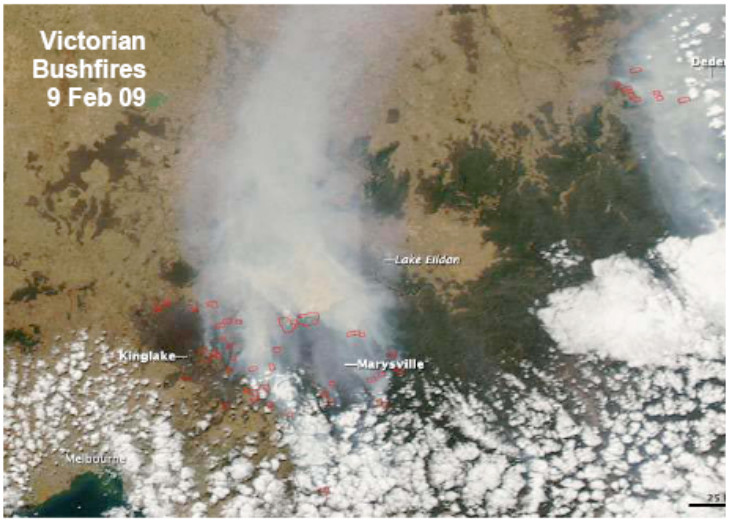
DELIVER THE KNOCKOUT BLOW EARLY

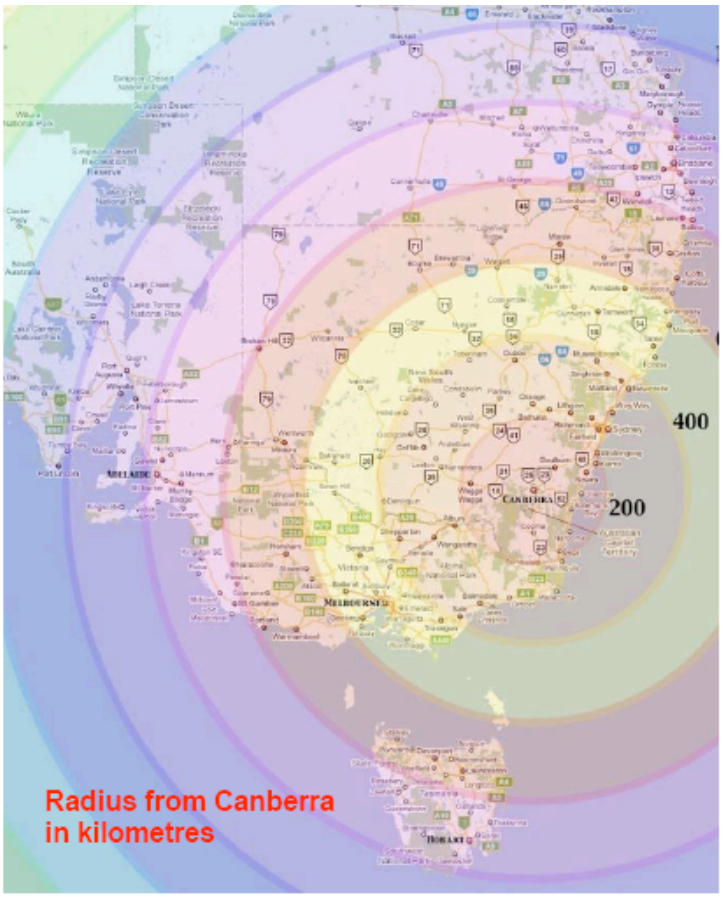
The urgent and essential component of successful aerial firefighting is to deliver a high intensity, rapid response when fires are small. With the analytic capacity to incorporate all relevant data, BWB's rapid response strategies are at the leading edge of world bushfire management.

BWB has shortlisted the Boeing-747 Supertanker. This aircraft can attack multiple small fires on a circuit carefully planned by BWB. According to Evergreen Aviation:

- The water capacity of the 747 Supertanker is 76 tonnes.
- The Supertanker uses a pressurized system to expel the product. The 747s fly in level and allow the pressure to do the work of delivering the product, a much safer and less strenuous flight profile.

• The result on the ground can be varied from torrential rain to a light mist by easing up on the pressure.
• Turn around time on the ground to refill, refuel, and recharge the air pressure is about 30 min.
• The Supertanker operates far below the max takeoff weight, approx 120,000-140,000 pounds, so it is highly maneuverable. It can also land with a full load of product.
• The 747 can operate out of approx 7500-8000ft of runway. It has several potential operating bases in Australia, and because of its speed (600mph) and range, it does not need a lot of bases to cover a great distance.
• It can operate in mountainous terrain. Testing in the mountains of Tucson, Arizona proved the aircraft suitable for this type of mission. The drop altitude is 300-400 feet, and the 747 having the pressurized system to deliver the product enables a very accurate drop, more effective than gravity tankers at lower altitudes.
• It can dash to a fire at 600mph, and then slow to a drop speed of about 135 knots.
• The B-747 takes the same amount of time to turn as smaller aircraft already recognised for their maneuverability such as the C-130 Hercules and P-3 Orion. All three turn at 25 degrees and 170knots.





BWB estimates that two ***flying reservoir*** aircraft will provide adequate emergency response for SE Australia. In times of grave emergency, when spot fires are proliferating, one aircraft can be on patrol, while the other waits in reserve. These large aircraft can provide lifesaving assistance to trapped individuals or support an aerial evacuation with their ability to spray water using pressure hoses that can be turned on and off like taps. One of the Melbourne airports could be the waterbombing headquarters, but BWB recommends Canberra for these reasons:

- An hour and a half of flying time will reach all of SE Australia's significant threat areas. Within one hour, a Boeing-747 can reach all of Victoria and most of the fire-prone areas of Tasmania, New South Wales and South Australia.
- Canberra is convenient for management by or in cooperation with the military, depending on the preference of the Australian Government.
- Operation from Canberra encourages politicians, press and public to see value for their money in the operations.

Comparison with Other Fixed-Wing Supertankers

BWB proposes a comparison with other fixed supertankers be made. In order to do this, BWB seeks funding from the Federal Government to assess the potential of alternative aircraft.

The Russian Ilyushin IL76P or "Pozharniy" can carry 44 tonnes of water or retardant. The Ilyushin can land on poorly maintained and small airstrips and is very maneuverable.

Tanker 910, a converted DC-10 operated in California by 10 Tanker Corp, carries a total of 45 tonnes of water or retardant in three external underbelly tanks.

Other smaller aircraft such as the RAAF's long-serving Lockheed C-130 Hercules deserve evaluation for their possible contributions in solving the current problem. The aim is to manage bushfires more effectively and more cheaply than current bushfire service strategies.

IL-76MD operated by Russia's Ministry of Civil Defence, Emergencies and Elimination of Consequences of Natural Disasters – ЄМЕРКОМ

Two examples of this converted DC-10 are now available for firefighting in California

Bushfire Waterbombers prefers aircraft capable of multiple roles in addition to waterbombing, for example delivery of emergency aid, transport of military personnel and equipment, and service as in-flight refuellers for the RAAF.

FLYING RESERVOIRS	Payload Tonnes	Speed kph	Est range km fully loaded
Lockheed C-130E Hercules	16	550	3,800
Lockheed C-141 Starlifter**	35	800	4,800
DC-10 (Tanker 910)	45	960	6,000
Ilyushin-76TD* - ЄМЕРКОМ	44	850	4,400
Boeing 747 – Evergreen	76	900	12,000
Boeing C-17 Globemaster**	70	830	4,500

** A 66 tonne version may soon be available from ЄМЕРКОМ*

*** Not yet configured for waterbombing*

Monitoring

Presently the National Bushfire Monitoring Service provides information about hot spots, based on source data, processed by Geoscience Australia, from the NASA Earth Observing System (EOS) satellites Terra (launched in 2000) and Aqua (launched in 2002). Terra and Aqua each orbit the Earth in a path 2,300 km wide, reportedly collecting data from Australia up to three times a day. To quote a NASA Bulletin of 16 Jan 2003: "*MODIS Direct Broadcast data are directly supporting Australian summer dry-season fire fighting operations through incorporation with other data into the SENTINEL system for hot-spot detection instituted by CSIRO in Australia.*"

NASA EOS photograph of fires in Greece, 28 August 2007

Proposals for Detection and Control

To maximise effectiveness, BWB proposes these measures:

- An interactive national fire database. This would be analogous to air traffic control systems. It would accept, hold and display as required all current information on every fire and every intended controlled fire.
- This system would embrace the exact location and boundaries of fires so that aircraft can lock into the optimum targets, and spray or drop water on fire spots. Cutting edge techniques for extinguishing fires rapidly should be applied while strictly observing Australian air safety regulations.

BWB RECOMMENDATIONS FOR AUSTRALIA

1. That the Defence Department accept primary responsibility for upgrading Australia's capacity to fight bushfires through improved early detection in its satellite systems that are already in place and well monitored at Defence sites across Australia.
2. That Defence supply aerial expertise and pilot manpower for rapid response using large waterbombing aircraft.
3. That Australia charter one Boeing-747 or Ilyushin IL76P or DC-!0 Supertanker during September and October 2009 for evaluation, training and joint operations with State, Territory and local fire authorities, with activities including supporting controlled burns. The charter agreement should contain an option, exercisable by the end of October, to retain use of the aircraft over the November 2009 to March 2010 bushfire season
4. If the option is exercised, then during the course of the bushfire season a decision can be reached on the purchase of one or preferably two aircraft for delivery in November 2010.
5. In the light of the potential of these aircraft to save many lives and avert many $bn in property damage, the capital cost or leasing cost of the aircraft should be seen as a very prudent investment.

Conclusion

Australian lives are worth preserving and Australian property is worth protecting. Bushfire Waterbombers (BWB) offers the qualifications, skill and experience to assist the Australian Government in the implementation of a cost effective *Flying Reservoir* strategy.

***Bushfire Waterbombers* — Cost-effective defence of life and property**
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