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I am making this submission as	General public
Submission type	Personal
Organisation making the submission (if applicable)	
Your position in the organisation (if applicable)	
Consent to make submission public	Public
Your story	The Australian Bushfires over the summer and observing how fires progressed, the difficulty of stopping them, the damage they did and the ineffectiveness bushfire control actions triggered a number of ideas of how Australia could do a better job. My thought is that they could be considered a a part of a 10 to 20 year plan to reduce our bushfire risk, even with the added pressure that Global Warming will inflict on Australia. The ideas presented are not mature ideas but may warrant some consideration.
1.1 Causes and contributing factors	
1.2 Preparation and planning	Ideas 3 and 4 apply to bushfire preparation and planning.

1.3 Response to bushfires	Ideas 1 and 2 apply to bushfire response.
1.4 Any other matters	
Upload files	Bush-Fire-Control-Solutions.docx - Download File

Bushfire Control Solutions

The loss of life, properly and environmental damage from the 2019-2020 Australian bushfires was horrendous. The risk from bushfires will further increase until the word achieves zero net GHG emissions so solutions to help minimise future bush-fire fatalities and loss must be found. The global greenhouse gas emissions from fires add to our Climate Change problem.

Solution 1 – Specially Designed Unmanned Firefighting Aircraft

Any casual observation of the firefighting capability of either water bombing aircraft or heavy lift helicopter shows many short comings. The main ones being the multiple crashes and deaths over the last few years and their inability to accurately direct water directly at the flame source. It is dangerous work.

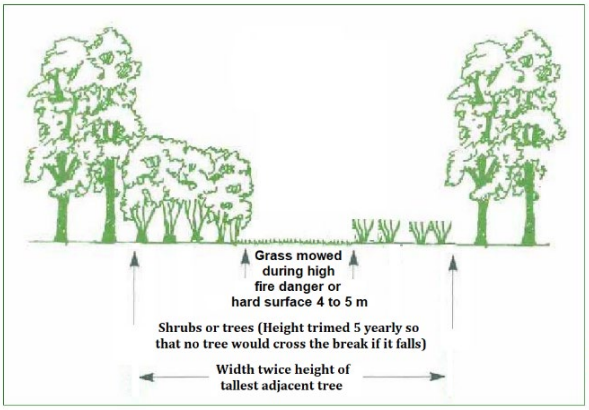
The technology is readily available to develop a low cost unmanned heavy lift helicopter style aircraft that can operate in arduous weather and visibility conditions. The development of low-cost Quad Copter Drones made possible by miniature electronic Inertial Measurement Units (IMU), Gyroscopes and light weight batteries show what is possible. The current Quad Copter technology can't be scaled up to perform heavy lift applications but could be combined with a high power to weight internal combustion engine to make a low cost unmanned firefighting aircraft (550 HP Wankel Rotary Aircraft). The firefighting aircraft would be remotely operated by two people assisted by multiple sensor systems. One operator would fly the aircraft and one would direct a high-pressure water spray directly to the flames. Costs would be kept low by not having the reliability and safety requirement of normal aircraft. It would not be rated to fly over built-up areas. Having a significant number of these firefighting drones would reduce the need to send firefighters into more dangerous fire situations. Firefighting drones would be ideal for a design and construct competition. There would be a large global market for this technology.

Solution 2 – Early Fire Detection and Fast Response Firefighting

Early detection of fires and fast firefighting response is the best way to minimise bushfire damage and loss. Cameras, sensor technologies, computing technology and remote communications capability have become much lower in cost. The advantage of ground-based fire detection systems over satellite and aircraft monitoring is the ability to more quickly, accurately and reliably determine a fires exact location. A network of cameras and sensors at high points in bushlands which will detect fire and smoke and accurately locate them as quickly as possible is what is required. Regionally based firefighting drones would be the ideal way to quickly observe the location of smoke or fire and extinguish it as quickly as possible.

The detection system could also locate common causes of fires such as lightning strikes and power line arcing. The technology to locate ground lightning strikes already exists. Dry lightning strikes are a major source of serious bushfires in remote areas and it is predicted they will increase with Climate Change. Any ground lightning strike risk during a medium or high fire danger period can be predicted and prepared for then immediately checked out to confirm if a fire has started and to put it out as quickly as possible.

Solution 3 – Greater Use of Wide Firebreaks



When there are hot, dry and windy conditions and fire gets into a bushland canopy it is extremely difficult to get it under control. One control option is to have a downwind firebreak wide enough to stop the canopy fire and then control downwind spot fires with firefighting drones. There should be enough wide firebreaks that under normal prevailing winds any bushfire could be stopped in one or two days.

Firebreaks are currently made using standard forestry equipment. A far cheaper and lower environmental impact approach would be achieved by developing and using small remotely operated tree lopping robots with associated mulching equipment. Tree lopping robots would be ideal for a design and construct competition.

Solution 4 – Extensive Use of Green Firebreaks and Cultural Burning

Cultural Burning and Control Burning - Scientific evidence shows that for at least 5,000 years Aboriginals groups used regular cultural burning as a bushfire and land management approach, utilizing each group's strong local bushland expertise. This cultural burning using low intensity fires in patchwork patterns stopped significant build-up of bushland ground fuel loads and greatly reducing the risk of major bushfires. It did this by making it much less likely that fire will get into the bushland canopy. When Europeans took control of the land, they generally had no understanding of this background and with the building of houses, sheds and fences, they actively discouraged bushland burning. This allowed bushland ground fuel loads to significantly increase and Australia has had a major problem with dangerous and destructive bushfires since then.

Firefighting service groups have been using control burning with low intensity fires to remove bushland ground fuel with a similar result to Aboriginals cultural burning. There are major risks with control burning getting out of control, especially around built up areas, regional housing and farms. There is also significant health risk from smoke generated by the fires blowing into built up areas. These risks plus wind, temperature, moisture level, seasonal variation and ground fuel level conditions cause major restrictions of when control burning can be performed and often stops any control burning occurring.

Green Firebreaks – There are other methods of reducing bushland ground fuel loads. Bushland mulching machinery, as shown in the image at right, is well developed. The use of this and similar technology should be considered to reduce fire risks around built-up areas. It should also be used to create what is widely called 'Green Firebreaks'. This is a wide strip through bushland which is occasionally mowed and mulched to eliminate shrub and tree growth. China has 364,000 kms of green firebreaks.

If a matrix of green firebreaks is created through bushland then this will make control burning of ground fuel loads far safer with a lot more options of when it can be safely performed. It will enable patchwork patterns of control burning to be carried out, better duplicating the original Aboriginal cultural burning practices. Well maintained green firebreaks would require far fewer firefighting personnel to manage a control burn. There would be a significant

opportunity to automate the mowing of remote green firebreaks, significantly reducing the cost of maintaining this system. Automated mowers would be ideal for a design and construct competition.

To support the cost of developing and maintaining green firebreaks it is suggested a percentage of the green plant growth collected through mulching and mowing should be transported to regional biogas plants for the creation of methane. The methane would be used for power generation or added to the natural gas pipework system.

This document is a summary and evaluation of ideas from multiple sources
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