



Wildfire Technology Management

Wildfire Technology
Management Market Report
Australia, Canada, & U.S

Overall Trends

Over the last decade, Wildfires have been growing in intensity and frequency across the world. In the U.S. alone, an average of 60,000 wildfires occurred annually between 2017-2021, resulting in over 8 million acres of land burning each year. In Australia, the situation is equally grim, with the average annual forest burned area increasing by as much as 350% over the two periods, 1988-2001 and 2002-2018. This number goes up to 800% when including 2019.

Moreover, a 2022 study by the United Nations (UN) predicts global extreme fires to increase by 14% by the end of this decade, 30% by 2030 and as much as 50% by the end of the century. Climate change and land-use change are the two biggest factors responsible for making wildfires more frequent and intense. These fires are impacting various ecosystems including humans, vegetation dynamics, atmospheric composition, ocean biogeochemistry and ice melt. Apart of the environmental damage, wildfires have had a significant economic impact in the form of destroyed infrastructure, business closures, disrupted transportation and supply networks, reduced employment and falling tax revenues.

All these factors have not only resulted in an increase in related budget allocations in many countries globally but also a change in spending patterns. Previously direct responses to wildfires received over 50% of the budget but off late governments are allocating around two-thirds to planning, prevention, preparedness, and recovery, and only one third for response. A good example of this is President Joe Biden's Bipartisan Infrastructure Law which includes US\$1.5 billion for wildfire management over the next five years. Out of this around US\$1.1 billion has been reserved for preparedness and fuel management and US\$325 million for response efforts such as burnt area rehabilitation.

"Last year's devastating fire season highlighted the importance of wildfire prevention for B.C. communities and, as we saw first-hand in Logan Lake, how it can make a real difference for people's lives. That's why our government is more than doubling the funding available for wildfire prevention activities like FireSmart and making historic investments to transform BC Wildfire Service into a year-round, more proactive service"

Katrine Conroy,
Minister of Forests



One of the key trends in the industry is the pivot from the procurement of equipment such as helicopters, aircraft and ground vehicles, to leasing. This is especially true in the U.S. which is expected to spend around US\$5 billion to lease helicopters and aircraft for wildfire purposes over the period 2022-2026, as compared to around US\$800 million on the procurement of these equipment. The main leasing programs are the U.S. Forest Service's Type 1, 2 and 3 helicopters for US\$2.4 billion and US\$440 million for fixed-wing aircraft.

Moreover, satellites have assumed greater importance as preparedness becomes the main area of focus, with governments opting to partner with various agencies or private players, both domestic and international. A good example is Canada's C\$169.9 million WildFireSat program being developed by The Canada Space Agency (CSA), Natural Resources Canada (NRC) and Environment and Climate Change Canada (ECCC). Another is Australia's A\$100 million Fireshield which involves not only local agencies such as the Minderoo Foundation but also U.S. based private players such as SpaceX, Planet and Salo Sciences.

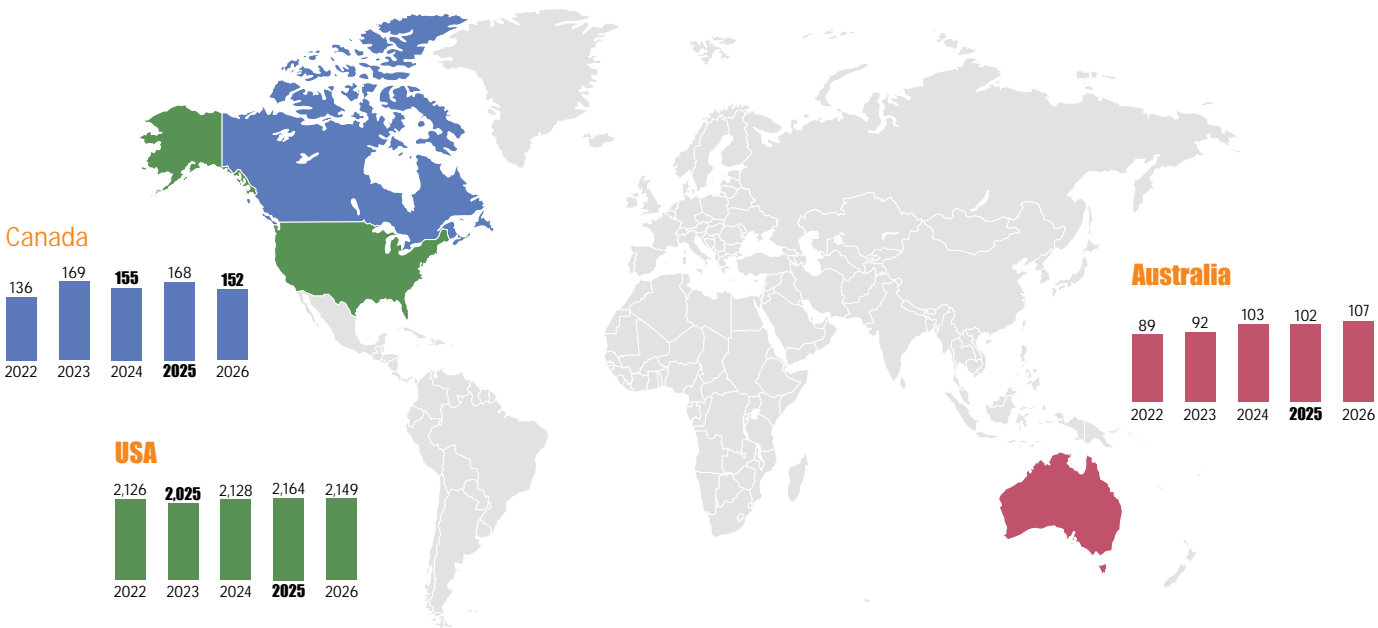
The increasing use of drones for preparedness, response and rehabilitation is yet another novel trend in the industry. In fact, in October 2022, Natural Resources Canada awarded a contract to Canadian reforestation company Flash Forest to plant over 1 million trees in various locations destroyed by wildfires. Interestingly, the banning of Chinese drone manufacturers by the U.S. presents multiple opportunities for other domestic and international OEMs.

Digital technologies such as artificial intelligence (AI), machine learning (ML), deep learning (DL) and robotics are also playing a key role in the early detection of wildfires. A prime example is Australia's early warning system. Developed by the University of Queensland (UQ) and Google, it is considered to be the world's first AI powered real-time bushfire hazard detection and warning system and is already available in the U.S., Canada, Mexico and parts of Australia.

"AI has made the processing of data (collected through sensors, cameras, satellite images, drones, among other sources) faster, cost-effective and accurate. The speed and accuracy of outcomes can provide the crucial 'time edge' that can go a long way in limiting wildfires and protecting our forests and its ecosystem."

Prableen Bajpai, Founder of FinFix Research and Analytics

Projected wildfire expenditure over the next 5 years in US\$ million



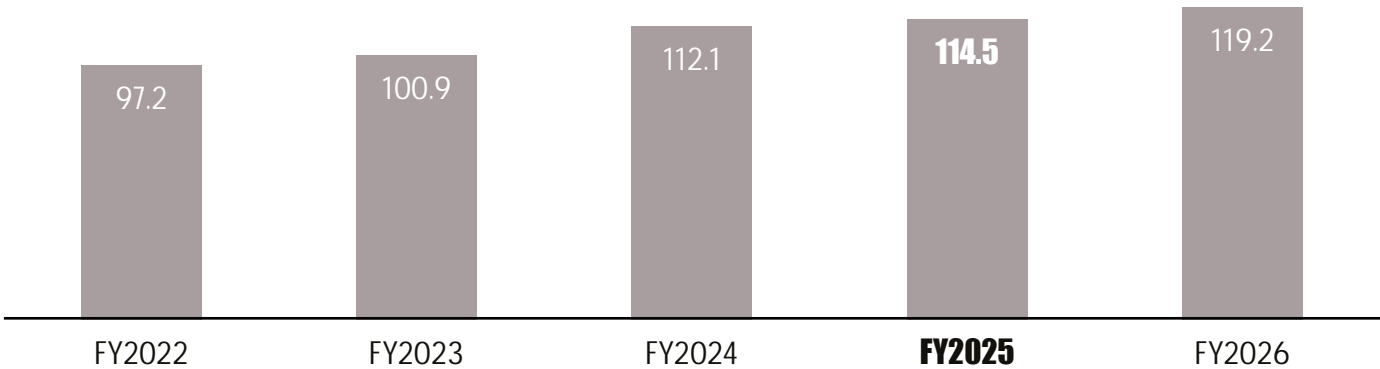
Country Analysis: Australia

Threat Overview:

The Australian wildfire season is spread out over the year depending on the location. In southern Australia it usually runs between December and May, in northern Australia between May and October, and in central Australia between August and March, in varying degrees of intensity. According to a 2022 study by multiple universities and published in the journal 'Reviews of Geophysics', the country's peak wildfire season now lasts 130 days each year, having increased by almost one month over the last four decades. Another study published in the Nature journal found that by the middle of this century, Australia's fire risk is likely to increase well outside to what is possible naturally, thereby pointing towards rising global emissions and the resultant climate change.

Australia: Wildfire Management Market, 2022-2026, US\$ Millions

Key areas	FY2022	FY2023	FY2024	FY2025	FY2026	Total 2022-2026
Mobile communications	21	21.5	21.8	22.2	22.8	109.2
Remote Sensing Technologies	8	9	9	12	12	50
UAS	7.2	8.2	10.2	10.3	11.6	47.5
Aerial firefighting capabilities	42.5	43.9	50.9	52.6	55.1	245
Fuel management and controlled burns	15.2	15	17	14.4	14	75.6
Others	3.3	3.3	3.3	3.1	3.8	16.6
Total	97.2	100.9	112.1	114.5	119.2	543.8



Key Programs:

National Fire Danger Rating System

In September 2022, the Australian and New Zealand National Council for Fire and Emergency Services (AFAC) launched a new fire danger rating system to provide more accurate fire danger warnings across Australia. Developed at a cost of US\$30 million (A\$50 million), this system factors in all regional vegetation types and improved weather predictions, which makes it considerably more accurate than the previous system. In fact, according to the project's lead scientist Stuart Mathews, when tested against 300 fires over the last few seasons, the previous system was successful in estimating accurate risk for only half of those fires, as compared to around 66% for the new system.

OzFuel

In December 2021, the Australian National University launched a CubeSat (or miniaturized satellites) mission called OzFuel that aims to predict bushfires more quickly and accurately. It is expected to monitor eucalyptus forests every six to eight days, mostly during the early afternoon as it is usually when vegetation most easily ignites and take images at a 50-metre resolution. More specifically, it would measure fuel types across the country, by tracking radio wavelengths related to dry matter, water content, and other compounds of eucalypts that make them flammable. Kanyini, the first satellite of the OzFuel mission, is expected to be launched in 2023 as part of a SpaceX Transporter mission. The 12kg satellite is designed and developed by consortium including Myriota, Inovor Technologies, the SmartSat Cooperative Research Centre and the South Australian Government.

Fireshield

Australian philanthropic organization Minderoo Foundation has launched an A\$100 million prediction, surveillance and rapid response program called Fireshield, to strengthen the country's defense and offence capabilities against climate-induced natural disasters, including wildfires. The program's aim is to launch hundreds of low earth orbit (LEO) satellites by 2025, with potential partners including the SpaceX group and San Francisco-based Planet. Minderoo has already partnered with Salo Sciences, a software company that uses satellite imagery and laser technologies to obtain high quality resolution images.

Remotely Piloted Aircraft Systems (RPAS) drones

The New South Wales state government launched a program to acquire Remotely Piloted Aircraft Systems (RPAS) drones for the Fire and Rescue NSW (FRNSW) bushfire and aviation unit. The A\$5.4 million drones come equipped with thermal imaging cameras and laser technology that can not only detect temperature variations but also identify humans and animals under threat and accurately measure the impacted area. Along with assessing wildfire risks, the drones are also expected to be used to reduce forest fuel (controlled burning), trace missing people and establish the best place to place to position fire trucks and crews.

AI Powered Real-time Bushfire Hazard Detection and Warning System

The University of Queensland (UQ) and Google.org, Google's philanthropic arm, are developing what they claim to be the world's first AI powered real-time bushfire hazard detection and warning system. The project, which is led by UQ's Professor Hamish McGowan, from the School of Earth and Environmental Sciences, is designed to detect the movement of embers within 30 kilometers downwind from the fire. Even though the system is still in the testing phase, Google claims that its covered over 30 big bushfires in the U.S. and Canada during the period July-November 2022 and is already available in the U.S., Canada, Mexico and parts of Australia.

New South Wales – Firefighting equipment

In October 2020, the New South Wales (NSW) government announced a five-year US\$127 million (A\$192 million) package to procure new firefighting equipment and technologies such as night-time aircraft, drones, sensors, data analytics and artificial intelligence. The budget is split as follows:

- Extension of the existing integrated dispatch system for the NSW Rural Fire Service (RFS) – US\$5.5 million (A\$8.3 million)
- Upgrade of the RFS aerial fleet and training facilities – US\$3.6 million (A\$5.4 million)
- Upgrades to the RFS Fires Near Me app – US\$1.7 million (A\$2.5 million)
- First responder mental health strategy for emergency services – US\$24 million (A\$36 million)
- Retrofitting the NSW RFS and NSW National Parks and Wildlife Service vehicles and replacing the Fire and Rescue NSW tankers – US\$11 million (A\$17 million)
- Additional personal protective clothing for frontline firefighters – US\$15 million (A\$23 million)
- Initial priority works for the fire trail network – US\$6.3 million (A\$9.5 million)
- Critical equipment for 31 emergency operation centers – US\$1.9 million (A\$2.9 million)

New South Wales – Bushfire Inquiry

In June 2022, the NSW government allocated US\$208 million (A\$315.2 million) for wildfire management as part of the recommendations of the NSW Bushfire Inquiry. Out of this US\$126 million (A\$191 million) has been given to the Rural Fire Service (RFS) to procure new trucks and retrofit old trucks and enhance the number of mitigation crews and strategic fire trails. Another US\$37 million (A\$56.5 million) has been allocated for the construction of new co-located Emergency Operations Centers and Fire Control Centers in various towns such as Moruya, Tumut, Hawkesbury, Grafton, Narrabri and Cooma. US\$6 million (A\$9 million) is provided to Fire and Rescue NSW to procure 16 firefighting tankers. Additionally, US\$133 million (A\$201.5 million) has been given to National Parks and Wildlife Service (NPWS) for upgrades to its firefighting fleet and radio infrastructure, along with new permanent firefighter roles.



Country Analysis: Canada

Threat Overview:

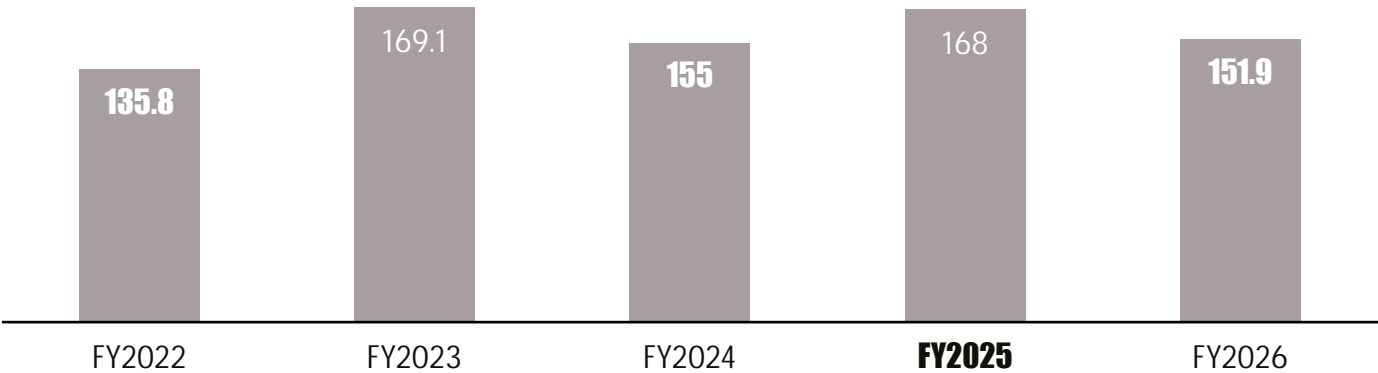
Canada’s wildfire season usually starts in April, reaches its peak in July and ends in October. Southern British Columbia and the boreal forest extending from Alaska to Newfoundland and Labrador are the two major wildfire areas in the country.

According to the Canadian Interagency Forest Fire Centre National Fire Summary, there were a total of 5,449 fires in Canada in 2022, which burnt 1,610,216 hectares. Interestingly, this is well below both, the total number of fires and area burned last year (6,709 fires; 4,078,897 ha), and also the 10-year average (5,900 fires; 2,785,532 ha).

In terms of regions, British Columbia witnessed the highest number of wildfires in the country, while the Northwest Territories experienced the largest total area burned (615,010 ha from 207 fires). Surprisingly, the territory of Yukon experienced more fires and area burned than usual (276 fires; 175,286 ha) surpassing the 10-year average. The area burned in Newfoundland and Labrador, and Nova Scotia was also above average, but lower than that in Quebec.

Canada: Wildfire Management Market, 2022-2026, US\$ Millions

Key areas	FY2022	FY2023	FY2024	FY2025	FY2026	Total 2022-2026
Aerial firefighting capabilities	36.3	41.8	44.0	46.6	54.7	223.3
Fuel management and controlled burns	4.5	5.0	5.4	6.0	6.6	27.5
Mobile communications	4.5	5.0	5.4	6.0	6.6	27.5
Remote Sensing Technologies	70.5	97.5	79.3	82.5	55.9	385.6
UAS	14.5	15.0	15.4	21.0	21.6	87.5
Others	5.5	5.0	5.4	6.0	6.6	28.4
Total	135.8	169.1	155.0	168.0	151.9	779.7



Key Programs:

WildFireSat

The Canada Space Agency (CSA), Natural Resources Canada (NRC) and Environment and Climate Change Canada (ECCC) are designing and developing a new wildfire monitoring satellite system or WildFireSat. The US\$127 million (C\$169.9 million) project, which consists of satellites equipped with infrared sensors, is expected to launch in 2028 and aims to monitor all active wildfires in the country daily. Additionally, it will provide people with information related to smoke and air quality, thereby allowing the authorities to accurately measure carbon emissions, an important requirement of international agreements on carbon reporting. According to government sources, this system is critical because existing satellites are often unavailable during the peak afternoon hours, thereby creating a long blackout period that has resulted in late detection of several wildfires.

Forest Mapping Data Solutions

In early 2022, the Canadian government launched the Innovative Solutions Canada (ISC) program which invites small and medium enterprises (SMEs) to develop forest mapping software that can provide high-resolution vegetation mapping data. This is considered critical owing to the paucity of tools available for quick and cost-effective processing of wildfire fuel attributes. The winners of each challenge receive up to USD112,000 (C\$150,000) to further their research and then up to US\$ 0.75 million (C\$1 million) to develop a working prototype. The Canadian government will be the first customer helping the businesses commercialize their innovations.

Firefighting equipment

Canada's 2022 budget included C\$308.2 million for the purchase of firefighting equipment by provinces, territories and First Nations communities. This included high-pressure water pumps, all-terrain vehicles (ATVs), rock trucks, fire trucks, skidders and aircraft.

A recent procurement is that of the Twin Commander bird-dog aircraft by the Saskatchewan Public Safety Agency (SPSA), to replace its aging Beech Baron bird-dog and an undisclosed air tanker to replace its existing CL215T platform. The bird-dog is expected to monitor how a fire is fought and guide other air tankers to drop the retardants at the right place. The agency also issued a tender for a long-term contract of two medium helicopters for wildfire management, as part of its 2022 Preparedness Plan.

Additionally, the government of New Brunswick awarded six contracts to truck manufacturer Metalfab Ltd for the purchase of fire trucks and related equipment.

In September 2022, the Calgary Fire Department awarded a 10-year contract to Commercial Emergency Equipment Co., to procure all aerial platforms and ladders in an unlimited, as-needed quantity.

Water-bomber amphibious aircraft maintenance

In November 2018, the Manitoba Sustainable Development Agency, awarded a contract to aerial wildfire suppression company Air Spray Ltd. The 10 year program involves the maintenance and operation of the province's fleet of seven Canadair water-bomber amphibious aircraft which include four CL-415s and three CL-215s.

EMBC and Wildfire Service Resources

Canada's 2022 budget includes US\$109 million (C\$145 million) for the British Columbia (BC) Wildfire Service and Emergency Management BC. This will allow the department to not only strengthen its response capabilities but to also switch to a more proactive approach and build capabilities in prevention and mitigation, preparedness, and recovery.

An additional US\$74 million (C\$98 million) over the next three years has also been allotted to fund wildfire prevention work and projects and to maintain forest service roads. This includes US\$20 million (C\$26 million) in capital expenditure to be spent over three years to upgrade the BC Wildfire Service's facilities in terms of increasing capacities, equipping firebases for future wildfire seasons and addressing maintenance needs.

Drones for reforestation

In October 2022, Natural Resources Canada awarded a US\$1 million (C\$1.4 million) contract to Canadian reforestation company Flash Forest. Under the two-year contract, Flash Forest will plant over 1 million trees in various locations around Canada destroyed by wildfires. The company uses advanced technologies such as aerial mapping software, UAS, automation and advanced seed pods to rapidly seed sites impacted by wildfires.



Country Analysis: USA

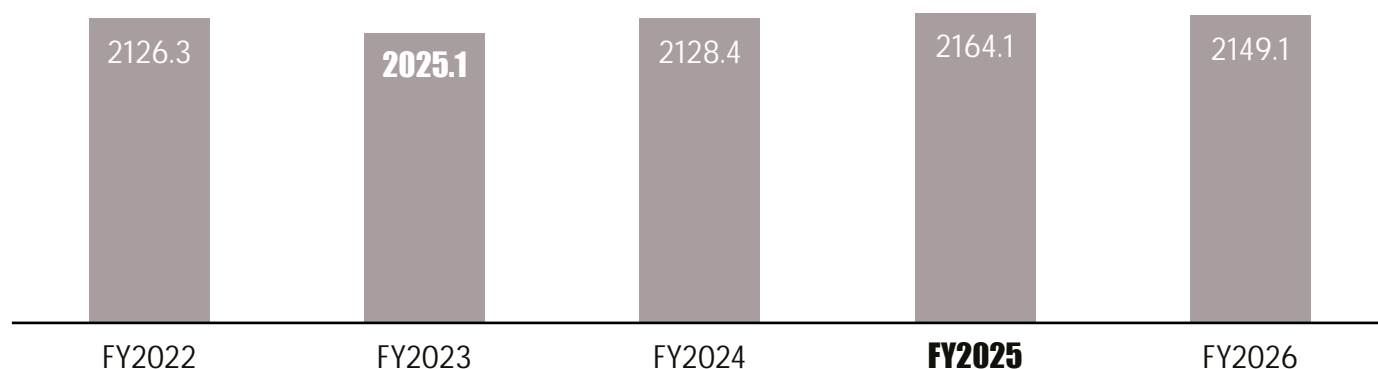
Threat Overview:

The peak wildfire season in the U.S. is from June to August each year. More wildfires occur in the East (including the central states), but the wildfires in the West are larger and burn more acreage (including Alaska, Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington, and Wyoming).

Since 2000, the U.S. has witnessed a yearly average of just over 70,000 wildfires that have burned an annual average of 7 million acres of land in the country. Interestingly, even though the acreage number is over double the annual average in the 1990s, the number of fires has actually reduced (78,600 average). As of November 4th, 2022, a total of 60,700 wildfires have already affected 7.2 million acres in 2022, as compared to a total of 58,968 fires impacting 7.1 million acres in all of 2021. As many as 89% of the wildfires during 2017-2021 were caused by humans. However, the ones caused by lightnings tend to cause more damage in terms of acreage burnt - (52% of the average acreage burned from 2017 to 2021 was ignited by lightning).

Canada: Wildfire Management Market, 2022-2026, US\$ Millions

Key areas	FY2022	FY2023	FY2024	FY2025	FY2026	Total 2022-2026
Aerial firefighting capabilities	1248.7	1211.5	1199.0	1164.6	1080.1	5903.9
Fuel management and controlled burns	347.1	281.8	288.9	295.9	305.9	1519.5
Mobile communications	20.5	21.1	23.4	24.6	25.7	115.3
Remote Sensing Technologies	49.2	27.5	20.2	17.4	19.5	133.7
UAS	7.0	6.9	6.8	7.0	7.1	34.8
Others	453.8	476.3	590.2	654.7	710.9	2885.9
Total	2126.3	2025.1	2128.4	2164.1	2149.1	10,593



Key Programs:

CAL FIRE aviation program

In November 2020, California's Department of Forestry and Fire Protection (CAL FIRE) awarded a three-year maintenance contract to DynCorp International (DI). The US\$352 million program includes line to depot-level maintenance for CAL FIRE's fleet of 57 aircraft including S-2T air tankers, OV-10A aircraft, UH-1H helicopters, S-70i helicopters, and A-200CT King Air training aircraft. It also includes end-to-end flight operations support for CAL FIRE's fixed-wing firefighting aircraft, including seven HC-130Hs, which are being converted to firefighting air tankers with internal gravity-powered retardant tanks. The total cost of this conversion is US\$150 million. According to a statement released by Joe Tyler, the new Director of CAL FIRE, the seven aircraft, which were expected to enter service in 2023, will now be incorporated in 2024.

Helicopter leasing – U.S. Forest Service

The U.S. Forest Service uses three types of helicopters, Type 1, 2 and 3, for various operations including response, reconnaissance and personnel and equipment transportation. Historically, the agency has used 28 of the Type 1s, 34 Type 2s and almost 50 Type 3s, on exclusive use contracts (EU). However, at the start of 2021 it pivoted mostly to the call when needed (CWN) model to control costs, with 100 Type 1, 25 Type 2 and 70 Type 3 helicopters, operating under this model. The remaining 36 Type 2 and 51 Type 3 systems are still operating on EU contracts. In 2021, the total expenditure on these helicopters was US\$449.9 million, a 120% increase over the average amount spent over the last five years. This was mainly due to the additional 20 Type 1 aircraft being used throughout the year. Around US\$2.4 billion is expected to be spent on all three types of helicopters over the period 2022-2026, with Type 1 accounting for US\$1.8 billion, Type 2 – US\$311.2 million and Type 3 – US\$321.6.

Fixed-wing leasing – U.S. Forest Service

The U.S. Forest Service uses fixed-wing aircraft for various missions including smokejumper, leadplane, air attack, infrared imagery, fire suppression, pilot training and transportation of firefighters. In 2021, 54 aircraft were utilized on exclusive use contracts, while 92 were used on CWN contracts. Additionally, the agency also owns and operates 22 light-fixed-wing aircraft for smokejumper, leadplane, and other natural resource management missions. A total of 26,948 hours of total flying time was recorded in 2021, out of which 50.1% was from exclusive use aircraft, 36.5% from CWN planes, and 13.3% were from agency-owned aircraft. Over the period 2017-2021, US\$70.4 million was spent as total contract costs for fixed-wing aircraft. This amount is expected to increase to US\$442.2 million during 2022-2026, with annual expenditure increasing from US\$81.2 million in 2022 to US\$95.6 million in 2026 at a CAGR of 4.17%.

Airtankers – U.S. Forest Service

In 2021, the Forest Service used 18 airtankers – 16 Large Air Tankers (LATs) and two Very Large Air Tankers (VLATs) under EU and five – three LATs and two VLATs, under the CWN agreement. Altogether they clocked 7,678 flying hours in 2021, with 50% of use by flight time being in support of Forest Service Fires and the rest on non-agency fires including those under the ambit of state and local cooperators and the Department of Interior. The various aircraft models in use include the BAe-146 (BAE Systems), Avro RJ85, DC-10 and MD-87 (McDonnell Douglas), EC-130Q (Lockheed Martin) and the B-737 (Boeing). During 2017-2021, the total expenditure on fixed wing aircraft contracting was US\$352.2 million, increasing from US\$67.7 million to US\$77.9 million at a CAGR of 3.57%. According to our estimates, this amount is expected to increase to US\$442.2 million during the period 2022-2026.

Scoopers - U.S. Forest Service

Between May and October 2021, the U.S. Forest Service contracted eight multi-engine water scoopers under the CWN/Multiple Award Task Order Contract (MATOC). Scoopers are essentially firefighting aircraft that can hold around 1,600 gallons of water for operations lasting up to four hours. The eight aircraft flew just over 1,598 hours in 2021, as compared to 1,432 hours in 2020, 679 in 2019, 1,609 in 2018 and 1,676 in 2017. The total cost of operating these scoopers between 2017 and 2021 was US\$232.9 million, which is expected to increase marginally to US\$278 million over the period 2022-2026.

Unmanned Aircraft Systems (UAS) – U.S. Forest Service

The U.S. Forest Service's UAS program is currently in a nascent stage with the agency testing and evaluating multiple models for the first time in 2021. The aim is to deploy a Type III system that could fulfill no less than 80% of its needs. The agency's R&D department has already developed a platform that conducted 2,662 flights totaling 566 flight hours in 2021. With 342 hours, fire operations constituted the majority of these operations. It has also partnered with NASA and other manufacturers to develop two high-altitude long endurance (HALE) drones. The first is a giant mylar balloon called STRATO, or Strategic Radio and Tactical Overwatch. Developed by Aerostar, it is equipped with solar panels, batteries, radio equipment, cameras, and sensors and has the capability to collect infrared and visual data, broadcast an LTE (cell phone) signal and can carry out push to talk communications. This technology is currently in the R&D stage. The second platform is Swift Engineering's SULE HALE-UAS that can stay airborne for over 30 days at a time. The Forest Service has partnered with NASA to issue a development contract to the company and as of March 2021, they had already conducted over 10 demonstrations.

Motor Vehicles - U.S. Forest Service

The agency's motor vehicle fleet includes sedans, station wagons, vans, SUVs, light trucks 4X2, light trucks 4X4, medium duty vehicles, buses and heavy-duty vehicles. At the end of 2021, the fleet had a total of 18,121 vehicles, out of which 17,338 were in service while 738 were being sold. In 2022 alone, the Forest Service plans to purchase a total of 2,338 vehicles including 99 sedans and station wagons, 12 vans, 306 SUVs, 95 light trucks 4X2, 905 light trucks 4X4, 864 medium duty vehicles, 16 buses and 41 heavy duty vehicles. The cost of acquiring these vehicles is expected to cumulatively value US\$250.1 million during 2022-2026, increasing from US\$44.6 million to US\$54.3 million over the period. Over 50% of these vehicles are to be used for wildfire management and suppression.

Mobile Communications

In July and September 2022, the U.S. Department of Agriculture Forest Service (USFS) awarded two contracts worth US\$8.9 million and US\$7.8 million respectively, to BK Technologies Corporation to procure its KNG mobile and BKR 5000 portable communications technology. The system is compatible with legacy radios and equipment, thereby making it apt for the agency's planned system-wide transition.

S-70i Black Hawks

After a competitive bidding process between Leonardo Helicopters and Air Methods/United Rotorcraft, California's Department of General Services (DGS) awarded a contract to the latter in December 2017, for the procurement of 12 S-70i Black Hawks/Firehawks or around US\$288 million. The helicopters will replace CAL FIRE's aging fleet of single-engine Bell UH-1H "Super Huey" helicopters, which have been used to manage wildfires in California for long. The S-70i, which is the civilian version of Sikorsky's UH-60 Black Hawk, can accommodate seven personnel and uses a 250-foot cable for rescue missions. Until September 2022, nine Black Hawks had been delivered with the remaining three expected to enter service latest by 2025. The department is also looking to buy four additional Firehawks for US\$99 million to ensure continuous deployment during critical fire weather conditions when frontline helicopters are due for maintenance.

Helitankers

The California Governor's budget for 2022-2023 includes US\$45 million for the next three years, to exclusively use 10 additional heavy helitankers, while waiting for the delivery of the HC-130H retardant-dropping air tankers. These platforms will be used mainly when a large fire is ongoing and not for an initial attack response.

Fire engines and bulldozers

As expected, fire engines and bulldozers form an integral part of CAL FIRE's initial attack and sustained operations strategy against wildfires. The department already operates 356 frontline fire engines and 59 bulldozers across the state. It is now looking to acquire two additional engines in each of its 21 Units and six contract counties, along with 10 bulldozers, at a cost of around US\$36 million. This equipment is expected to be used either when existing resources are depleted or during critical fire activity.

Fire Integrated Real-Time Intelligence System (FIRIS)

CAL FIRE is spending around US\$6 million to set up the Fire Integrated Real-Time Intelligence System (FIRIS), which will enable California's mutual aid system responders and the public at large to have better access to real-time information on all hazards events, including wildfires. FIRIS is expected to use aircraft, high-definition real time video, infra-red cameras, sensors and AI powered data analytics, to ensure that authorities not only know which areas of the fire to target but also areas that need to be evacuated. The key components of this system are two Beechcraft King 200 aircraft that can detect heat and see in the dark, even through thick plumes of smoke. The two planes cover the entire state and cost between US\$14 million and US\$16 million to operate, according to Orange County Fire Authority Chief Brian Fennessy.

Bell 412 EPX and S-70i Firehawk - San Diego County and SDG&E

In May 2022, the San Diego County decided to buy a Bell 412 EPX helicopter to enhance the region's firefighting abilities and start replacing the Sheriff's Department's ageing fleet of single-engine helicopters. The US\$16 million helicopter is being fitted with firefighting equipment such as a hoist, radios, skids that allow the helicopter to land in rough terrain and a 375-gallon water tank. The contract also includes pilot and mechanic training. The helicopter is expected to be delivered towards the second half of 2023. Additionally, the San Diego Gas & Electric Company (SDG&E), is also buying the Bell 412 EPX and the Sikorsky Firehawk helicopters for US\$13.6 million and US\$21 million respectively. The former is expected to be operational towards the end of 2022 or the beginning of 2023 and the Firehawk in 2023. Eventually, SDG&E is expected to have a total of five helicopters with the Erickson Air Crane and the new Firehawk solely focused on firefighting, while the other three also responsible for everyday patrolling, maintenance and construction work, such as replacing power poles.

Wildland Firefighter Crews

In February 2022, the U.S. Forest Service awarded contracts to eight companies based out of Oregon to provide wildland firefighter crews. These include US\$180 million to Grayback Forestry, US\$160 million to PatRick Environmental, US\$60 million to North Pacific Forestry, US\$60 million to Pacific Oasis, US\$60 million to Miller Timber Services, US\$40 million to Lost River Fire Management Service and US\$40 million each to Diamond Fire and A.S.I. Arden Solutions.

Bipartisan Infrastructure Law

President Joe Biden's Bipartisan Infrastructure Law, which was introduced in November 2021, includes US\$1.5 billion for various wildland fire management activities over the period 2022-2026. These include forest and rangeland restoration, fuels management, investments in advanced technologies to improve the early detection of wildfires, and post-wildfire restoration activities. US\$878 million has been allocated for fuels management which in turn includes mechanical thinning, prescribed fire, employing people and other related services. The Burned Area Rehabilitation provides US\$325.0 million over five years to complete post-fire rehabilitation activities, while US\$10 million has been allocated to the research oriented Joint Fire Science Program.

Fire station construction and maintenance

The Department of Interior has requested the Congress for US\$28 million for various construction and maintenance projects. These include:

- White Earth Fire Station Replacement – US\$3.2 million
- Billings Air Tanker Base Wareyard Repair – US\$0.3 million
- Bonneville Hotshot Fire Station Construction (Phase 1 of 2) – US\$9 million
- San Carlos Fire Station Replacement (Phase 2 of 2) – US\$2.5 million
- Doyle and Palomino Valley Fire Station Renovation (Phase 1 of 2) – US\$2.3 million
- Ekalaka Fire Station Replacement (Phase 1 of 2) – US\$4.5 million
- Pawaki Fire Station Renovation – US\$0.9 million
- Miles City Fire Dispatch Center Repair – US\$0.3 million
- Boise District Air Operations Center at National Interagency Fire Center (Phase 2 of 2) – US\$4.8 million
- Architectural and Engineering Design – US\$0.3 million

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Applications
NASA



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Procurement Operations
US Forest Service



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Southern Marin Fire District
Mill Valley Fire Department



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Prevention and Control



JOHANN GEORG GOLDAMMER

Chief
Global Fire Monitoring
Center (GFMC)



TIM SEXTON

Program Manager,
Wildland Fire Research,
Development &
Applications Program
US Forest Service



DR. CHRIS DICUS PHD

President
Association for
Fire Ecology



GORDY SACHS

Chief, All Hazard &
International Fire
Support Branch
US Forest Service



KIM CONNORS

Executive Director
The Canadian
Interagency Forest Fire
Centre



DOUGLAS CRAM

Associate Professor and
Extension Forest and
Fire Specialist
New Mexico State
University