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Aerial Firefighting in North America

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# Aerial Firefighting in North America

# Alan Warnes looks at the procedures, aircraft and companies that battle with fires throughout the summer in USA and Canada

**STUNNING TV FOOTAGE**, often live of water bombers, dropping thousands of tons of water on fires in the US, illustrates the huge role these aircraft play in saving lives and property. Aircraft remain the main weapon battling the raging fires, in California and other states in the west but the cost to the US taxpayer is phenomenal. The US Forest Service (USFS) claims the annual bill of suppressing these fires is set to leap from \$1.1 billion in 2014 to nearly \$1.8 billion in ten years time. That figure doesn't include an annual fixed fire "preparedness" budget of another \$1billion.

The annual fire suppression budget is based on the ten-year average of what has been spent in the past. Many are saying that the US government needs to fund the Forest Service adequately, by providing 70 percent of the ten year average.

Right now the 2015 wildfire season is bad. While the number of national fires is actually below average for this time of year (mid August) at 36,959, the burnt acreage is well above, at close to six million acres. Incredibly nearly five million of those acres burned in Alaska, which has had the most dramatic wildfire season of any state this year. Washington State is also doing battle with fires, California too.

It is no surprise the USFS is calling upon a larger fleet of air tanker aircraft every year. They are a big part of the fire-fighting mechanism, used to slow down fires to allow teams of fire-fighters to contain them. Many have lost their lives fighting the flames, three died while battling fires in Washington State on August 19.

Aircraft don't only assist in putting out the raging fires, the airborne fire fighting fleets are also delivering equipment and supplies, deploying smokejumpers and rappellers to fires, transporting fire-fighters, providing reconnaissance of new fires, locating fires and their behaviour with specialist ISR aircraft. Smokejumpers and rappellers are also classified as aerial firefighters, delivered to the fire by parachute from a variety of fixed-wing aircraft, or rappelling from helicopters.

The types of aircraft used include both fixed-wing aircraft and helicopters. They use several types of fluids to put the flames out which may include water, water enhancers such as foams and gels, and specially formulated fire retardants. The latest innovation is parcels of water which break on contact with the ground.



# 1. Aircraft Roles

There are several different categories of aircraft that the USFS uses:

**1. Lead Planes** to guide air-tankers to their drop zone. They communicate with firefighters on the ground and with air-tankers, releasing white smoke to show where the retardant should go. Beechcraft King Air 90s are the usual aircraft.

**2. Air Tactical or Air Attack** planes provide coordination of aerial resources over a wildland fire. They provide vital eyes in the sky for firefighters on the ground, and ensure safe aviation operations. Aircraft types include the Twin Commander 500 and 600s.

**3. Smokejumper** aircraft deliver cargo and fireman known as smokejumpers by parachute to remote locations for initial attack and extended support of wildland fires. Each of the aircraft can carry eight to twelve Smokejumpers and their initial supply of gear. Aircraft types include: Douglas DC-3TP, DeHavilland DH-6 300 series Twin Otter, Shorts Sherpa C-23A, Dornier 228, and CASA 212 aircraft.

**4. Single Engine Airtankers (SEATs)** can deliver up to 800 gallons of retardant to support firefighters on the ground. These small aircraft can reload and operate in areas where larger airtankers cannot. Air Tractor AT-802 is the usual platform

**5. Large Airtankers** can deliver between 2,000 to 4,000 gallons of fire retardant to support firefighters on the ground. Aircraft types: P2V, HC-130H, BAe-146, RJ85, MD-87, C-130Q.

**6. Water Scoopers** are amphibious aircraft which can skim the surface of a water body and scoop water into an onboard tank and then release it on a fire. While they are common in Canada and Europe, there are very few in the US. Bombardier CL-215/215T/415 and Air Tractor Fire Boss are the most common.

7. Very Large Airtankers (VLATs) are capable of delivering over 8,000 gallons of fire retardant to support firefighters on the ground. Although results vary with vegetation, terrain, and amount of retardant dropped, VLATs can lay a line of retardant 300 feet wide by one mile long. Aircraft type: DC-10

**8.** The Forest Service uses aircraft for a wide variety of other missions in managing public lands. These missions include forest health- and wildlife surveys, law enforcement, gathering infrared data, spotting new fires, and transporting personnel and cargo. Aircraft types: Cessna 206, Aero Commander 500, King Air 200, DeHavilland DHC-2 Beaver, Piper Super Cub, and Cessna 185.



# 2. More Money

In December 2014, the US Congress provided the USFS, an additional \$65 million to spend on new fire-fighting aircraft. They want large air tankers to attack big fires, to drop thousands of gallons of retardant to stunt a fire's advance, allowing ground crews time to build a fire line. According to the Bill, the \$65 million must be spent on "acquiring aircraft for the next-generation airtanker fleet to enhance firefighting mobility, effectiveness, efficiency and safety."

The \$65 million will allow the agency to own new, longer-lasting planes and pay private firms to operate and maintain them. The explanatory statement the House passed with the spending bill said: "It is critical to begin the process of developing a long-term solution for air support in fighting wildfires."

Over the years the USFS aerial tanker fleet has been depleted as a result of accidents caused by flight structural failures. It was forced to downsize the planes available from 44 in 2002 to eight in early 2013. Three old ex-USAF C-130As crashed, two in California (1994 and 2002) when their wings separated in flight due to structural failure, and one in France in 2000 for unspecified reasons. The France crash involved one of US based T&G's C-130s. As a result of these accidents, the entire fleet of C-130A air tankers was permanently grounded by the Forest Service in 2004, due to safety concerns. The P-3As, all of which were operated by Aero Union, were also initially grounded, but later returned to the air after it was determined they could be operated safely, and remained in service until they were grounded in 2011. The USFS announced on July 29, 2011 that it had terminated its contract with Aero Union of Sacramento, Calif., because the company failed to meet its contractual I† uproar within the aerial fire fighting obligations. caused community. Tom Harbour, director of the Forest Service's Fire and Aviation Management said at the time: "Our main priority is protecting and saving lives, and we can't in good conscience maintain an aviation contract where we feel lives may be put at risk due to inadequate safety practices."

The company was providing six P-3 airtankers under exclusive-use contracts to the Forest Service. The eight P-3s were eventually bought by United Aeronautical Corporation, which specializes in breaking aircraft up and providing their parts as spares. UAC bought other inventory formerly owned by Aero Union which included at least some of the intellectual property rights for the Mobile Airborne Fire Fighting Systems (MAFFS), a self contained aerial firefighting system that can be loaded into the cargo holds of C-130 aircraft.



# 3. Forest Service 'Air Force'

Contractual problems in trying to lease aircraft from the private sector, has also been a big factor to acquiring new aircraft. The Forest Service believes larger air tankers are needed and it wants 18 to 28 modern aircraft at its disposal that can fly faster and carry enough fire retardant to penetrate thick forest canopies. In recent years, the Forest Service has leased large air tankers from private companies. But the procurement process has been fraught with delays as losing bidders challenge contracts given to their competitors.

There have been many sceptics of the USFS owning its own 'air force.' But after seeing companies dispute contract awards, grinding the procurement process to a halt, many have changed their minds. One expert said: 'With a need for up to 17 to 20 large air tankers, if the Forest Service owned a third and private industry the other two-thirds, I think you would have a healthy balance that promotes innovation and product development while assuring that the safety of communities and the protection of resources are not hampered by procurement bureaucracy.'

The intent of the large air tanker contract is to provide the Government with large fixedwing aerial fire fighting aircraft to include the dropping of approved fire suppressant or retardant material on forest and range fires over all types of terrain throughout the United States, including Alaska.

#### 4. Fire-fighting Aircraft

Twenty nine aircraft were to be fielded for wildfire suppression nationwide in 2015, eight owned by the Defense Department. They included: seven 'next-generation air tankers' from contracts awarded in 2013, six 'legacy air tankers' from contracts awarded in 2013, up to seven 'next-generation air tankers' from contracts awarded in 2015, one C-130H owned by the Forest Service acquired from the Coast Guard through NDAA and up to eight military C-130s equipped with MAFFS.

However, according to 'Fire Aviation' website, the USFS now has 33 large air tankers currently activated in the United States; 15 on multi-year, full time exclusive use contracts, nine on call when needed contracts (part time), six borrowed from Canada, and four military Modular Airborne FireFighting System (MAFFS) C-130s. This is the highest number of air tankers working in the United States at the same time in recent years - especially the 23 that under the US Forest Service contract, full time exclusive use or call when needed part time. In 2002 there were 44 large air tankers on exclusive use contracts but that number declined to nine in 2013.



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# Breakdown of aircraft:

USFS Multi-year full time exclusive use (14)		
T-118	HC-130H	US Forest Service
T-105	MD-87	Aero Air (Erickson Aero Tanker)
T-101	MD87	Aero Air (Erickson Aero Tanker)
T-161	RJ85	Aero Flite, Spokane Washington
T-160	RJ85	Aero Flite, Spokane Washington
T-260	CL-415	Aero Flite, Spokane Washington
T-912	DC-10 10	Tanker Air Carrier, Albuquerque, New Mexico
T-131	C-130	Coulson, BC Canada
T-10	BAe-146	Neptune Aviation Services, Montana
T-05	P2V	Neptune Aviation Services, Montana
T-06	P2V	Neptune Aviation Services, Montana
T-07	P2V	Neptune Aviation Services, Montana
T-43	P2V	Neptune Aviation Services, Montana
T-44	P2V	Neptune Aviation Services, Montana
T-45	P2V	Neptune Aviation Services, Montana
USFS Call When Needed (part time) (9)		
T-911	DC-10 10	Tanker Air Carrier, Albuquerque, New Mexico
T-910	DC-10 10	Tanker Air Carrier, Albuquerque, New Mexico
T-01	BAe-146	Neptune Aviation Services , Montana
T-02	BAe-146	Neptune Aviation Services, Montana
T-40	BAe-146	Neptune Aviation Services, Montana
T-41	BAe-146	Neptune Aviation Services, Montana
T-162	RJ85	Aero Flite, Spokane Washington
T-163	RJ85	Aero Flite, Spokane Washington
T-164	RJ85	Aero Flite, Spokane Washington
Canadian government (borrowed) (3)		
T-154	CV580	Alberta
T-173	CV580	Saskatchewan
T-174	CV580	Saskatchewan
Canadian companies (3)		
T-155	CV580	Conair
T-142	C-440	Conair
T-152	CV580	Conair
US military MAFFS C-130s (4)		
MAFFS 2	302nd Airlift Wing, AFRes, Peterson Air Force Base	
MAFFS 5	302nd Airlift Wing, AFRes, Peterson Air Force Base	
MAFFS 1	153rd Airlift Wing, Wyoming ANG	

MAFFS 9 145th Airlift Wing, NC ANG



Aero Flite now has five RJ85s converted, certified, staffed, and actively fighting fires, and Neptune has five BAe-146s doing the same. On August 12, 10 Tanker Air Carrier began flying the third DC-10 under a USFS contract. The company has had a fleet of three aircraft for the last year, but August 12 is the first time all have worked concurrently leading them to drop over 132,000 gallons of retardant on four fires in three states. On August 13, Tanker 910 was ordered to Southern Idaho, based at the Pocatello Air Tanker Base.

# 5. Ex US Coast Guard aircraft

The Forest Service has received the first of seven former USCG C-130Hs and the first one is flying. The transfer was made possible in late 2013 with Congress' passage of the National Defense Authorization Act. The former US Coast Guard HC-130H Hercules 1721 'Tanker 118' has recently entered service with the US Forest Service (USFS) at Forest Service Air Station McClellan (FSAS MCC), Sacramento, California. The aircraft will be repainted later in its USFS scheme. Tanker 118 is temporarily operating with a Modular Airborne Firefighting System (MAFFS) pressurised 3,000-gallon tank. Eventually it along with other six HC-130Hs will have a gravity tank, using the same basic concept employed by all of the Contractor Owned/Contractor Operated large air tankers. It was in operational use by July 26, when it flew a mission to fight the Lowell Fire in nearby Nevada County. The 2014 National Defense Authorization Act (NDAA) authorised the transfer of the seven HC-130H aircraft from the Coast Guard to the Forest Service for use in wildfire suppression. The first HC-130H, Tanker 118, will remain based at FSAS MCC for the next two years.

The tanker had been at Coast Guard Air Station Sacramento since mid-June while maintenance, installation and testing of the MAFFS unit and contractor pilot and maintenance crew training had been taking place. FSAS MCC will be located adjacent to CGAS Sacramento during the initial phase of the programme to allow continued co-operation. A search for a permanent base of operations for all seven USFS HC-130H aircraft is underway.

While the Forest Service and Coast Guard will jointly own and manage Tanker 118, the Forest Service has contracted Consolidated Air Support Systems (CASS) of Temecula, California, for aircrew services and with DRS Technologies of Oklahoma City, Oklahoma, for maintenance services. Tanker 118 will only fly wildfire suppression missions within 500nm (925km) of FSAS MCC so that it can return there each night for maintenance by contract crews and obtain support from Coast Guard crews. An additional HC-130H is expected to arrive at FSAS MCC in October to serve as a training aircraft. All seven of the ex-USCG HC-130Hs airtankers are expected to be modified and transferred to US Forest Service ownership by 2019. The 2014 Defense bill also transferred to the Forest Service 15 C-23B Sherpa aircraft to serve as smoke jumper and cargo transports.

#### 6. CAL FIRE

The CAL FIRE Aviation Management Program is a branch of the California Department of Forestry and Fire Protection. Due to the frequency and severity of wildfires in California, the state has elected to establish its own aerial firefighting force rather than rely solely on national resources. The Aviation Management Program is based at McClellan Airfield near Sacramento, California.



In support of its ground forces, CAL FIRE emergency response air program includes 23 Grumman S-2T 1,200 gallon airtankers, twelve UH-1H Super Huey helicopters, and 14 OV-10A airtactical aircraft (although the latter were believed to have been grounded in mid August). These aircraft are stationed at 13 air attack and ten helitack bases located statewide, and can reach most fires within 20 minutes. During high fire activity, CAL FIRE may move aircraft to better provide statewide air support.

The air tactical planes fly overhead at a fire, directing the airtankers and helicopters to critical areas of the fire for retardant and water drops. The retardant used to slow or retard the spread of a fire is a slurry mix consisting of a chemical salt compound, water, clay or a gum-thickening agent, and a colouring agent. While both air tankers and helicopters are equipped to carry fire retardant or water, the helicopters can also transport firefighters, equipment and injured personnel. The average annual budget of the CAL FIRE Aviation Management Program is nearly \$20 million. A total of 18 CAL FIRE personnel oversee the program with an additional 130 contract employees providing mechanical, pilot and management services.

## 7. Helicopters

Helicopters can come fitted with tanks (as in the S-70 Firehawk) or can carry buckets. The Erickson S-64 AirCrane (ex-US Army CH-54 Tarhes converted to fire-fighting), are equipped with a foam cannon. The buckets are used extensively as a tool for wild-land fire suppression. It is slung below the helicopter, by utilising the helicopter's cargo hook and is cheaper than fixed tanks, a simple installation and easily jettisoned. Filling it occurs by submerging or dipping them in lakes, rivers, reservoirs and occasionally portable tanks. By far the most popular is the Bambi Bucket. The lightweight and portability of the Bambi Bucket makes it possible to carry one within an aircraft most of the time. This is especially useful when operating in remote regions far from other firefighting resources. Popular firefighting helicopters include the S-61s, Hueys and S-64 (see above) – the latter also features a sea snorkel for filling from a natural water source while in flight. The US Army also provide Chinooks. Helicopters also deliver firefighting personnel called helitack crews to fires for initial attack. Some are trained to rappel from helicopters to fires in remote locations.

Helitack crews are teams of firefighters who are transported by helicopter to wildfires. Helicopters provide rapid transport, enabling the crews to quickly respond and assess a wildfire situation. They may land near a wildfire or, if equipped and trained, rappel from a hovering helicopter. Once on the ground, crews build fire-lines using hand tools, chainsaws, and other firefighting tools. They often remain overnight in remote locations. After they have completed their assignment, crew members may pack up to 120 pounds of equipment over difficult terrain to reach a pick-up point. Rappellers often prepare helispots (helicopter landing zones) that provide better access to a fire. Helicopter crew members may also perform other duties such as tree falling, firing operations, delivering people and equipment, and managing helibases.

Firefighter rappellers from all over the US train at the National Helicopter Rappel Program's Rappel Academy, in Salmon, Idaho.



# 8. Unmanned Aircraft Systems (UAS)

The US Forest Service is very interested in new technologies and believes there is potential to use Unmanned Aircraft Systems (UAS) to support a host of natural resource management activities, including forest health protection, wildfire suppression, research, recreational impacts, and law enforcement. The agency has been exploring the potential to use UAS for several years, and it has tested different UAS platforms during wildfires, prescribed fires, and in other natural resource management settings.

Its policy stipulates that UAS must be considered the same as manned aircraft, in terms of acquisition, approval and carding of pilots and aircraft, inspections, maintenance, avionics, training, and operations. However, the agency currently does not have a formal UAS program in place, which is needed to ensure appropriate, safe, and cost-effective use of UAS. The US Forest Service has chartered an interdisciplinary UAS Advisory Group to develop guidance for the use of UAS and associated technologies to support operational needs throughout the agency. The UAS Advisory Group has been tasked with several items, including conducting a thorough review of agency policy, making policy recommendations, completing a risk assessment, and developing a strategic plan. After the UAS Advisory Group has program for the agency.

# 9. CANADA

Canadian companies and provincial wildland firefighting agencies rely heavily on procedures established by the United States Department of Agriculture (USDA) Forest Service, for decisions related to Canadian use of aerial firefighting delivery systems and fire chemicals. Although Canadian government agencies and companies vary in their involvement, approach and process, the general sense is that Canadian dependency on USDA Forest Service process and standards can be restrictive and, or may potentially impede future Canadian business practices.

The mandate to fight wildland fire within Canada lies with each province, territory and, or federal parks. Most Canadian agencies have an aerial firefighting program of some type, and although there are program similarities, there are also differences in program need, approach and process. Companies providing aerial delivery systems, fire chemical products and services to Canadian government agencies are expected to meet government agency program standards, and in some cases provide tested results. This being said, there seems to be a common need for government agencies and companies to approve and, or have aerial delivery systems and fire chemicals tested and approved for use.

A list of Canadian stakeholders and broken into two basic groups: Aviation Service Providers and Aerial Product Companies.



# Aviation Service Providers

Airborne Energy Solutions Ltd, Air Spray Ltd, Alpine Helicopters Ltd, Bombardier Inc, Buffalo Airways, Canadian Air-Crane Ltd, Conair Group Inc, Coulson Aircrane Ltd, Delta Helicopters Ltd, Forest Protection Limited, Great Slave Helicopters, Remote Helicopters, Slave Lake Helicopters Ltd, Tasman Helicopters Ltd, Valhalla Helicopters Inc, VIH Aviation Group, Wildcat Helicopters Inc.

## Aerial Products Companies

Absolute Fire Solutions (AFS), ICL Performance Products Canada Ltd, Mercedes Textiles Limited, SEI Industries, Thermo Technologies, Wildfire Environmental Inc.

## Canadian fixed wing air tanker fleets:

# 1. Air Spray (1967) Ltd, Alberta, Canada

Air Spray owns and operates a fleet of over 40 fixed wing aircraft available for wildfire control in a variety of conditions and terrain. The airtanker fleet includes Lockheed L-188s, BAE 146s, Air Tractor 802s and Fire Boss single engine scooper amphibious airtankers. All of Air Spray's heavy airtankers are equipped with Air Spray's patented Retardant Aerial Delivery (tank) Systems - either the external RADS II or the new internal iRADs. Both are capable of continuous flow through the use of a state of the art computer controlled door system.

#### 2. Conair Aviation Ltd, Abbotsford, Columbia

In Canada, all airtanker actions on wildfires come under the command and control of an Air Attack Team. This team is comprised of an experienced pilot and an experienced fire fighter. Their job is to develop strategy and tactics for aerial attack on a forest fire. This team remains in communication with the aircraft inbound to the fire as well as onsite ground crews and their command center during the operations. Conair operates the Citation Jet 525, Cessna Caravan 208B and Turbo Commander 690A in the Air Attack role.

Its Amphibious Air Tankers, are known as water bombers. These airtankers are capable of scooping water off a lake into the onboard hopper and dropping it on a forest fire. Often, as determined by a particular agency, a suppressant is injected into the load of water after scooping to enhance the effectiveness of the drop. Conair operates the CL-215 and Air Tractor AT802 Fire Boss.

Conair's land based air tankers are typically loaded with long-term retardant at a tanker base prior to departure to a wildfire. They fly the Avro RJ85 AT, Convair CV580, Air Tractor AT 802, L188C Electra, Q400MR Airtanker in the role.





# 3. Coulson Flying Tankers

Operates a EC-130Q equipped with a RADS-XXL tank, which has a flow rate of 1,600 gallons per second. It also has the massive Martin Mars which is now being used to put out fires.

#### 4. Government of Newfoundland and Alberta, Gander, Newfoundland

Operates three CL-415s and two CL-215s.

## 5. Government of Quebec, Ste Foy, Quebec

Flies eight CL-415s, four CL-215s, two CL-215Ts, one DHC-8 and a DHC-8Q.

# 6. Province of Manitoba, Winnipeg, Manitoba

Seven CL-215s and four CL-415s, two Twin Otters and three Turbine Otters.

## 7. Province of Ontario, Sault St Maria, Ontario

Five Turbo Beavers, six Twin Otters, nine CL-415s

# 8. Province of Saskatchewan, La Ronge Saskatchewan

Four CL-215s, two CL-215Ts and five Trackers.





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