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American Helicopter Services & Aerial Firefighting Association

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Aerial Firefighting Tutorial

Introduction

The use of aircraft to drop fire retardant, foam, or water to suppress wildfires is an essential wildland firefighting tool. The speed, mobility and retardant delivery capability of aerial firefighting aircraft make them very effective resources in support of firefighters on the ground. The variety of aircraft available within U. S. aviation assets provides an appropriate firefighting capability for nearly every wildland fire situation, from wilderness to the urban interface.

Aircraft

There are three primary kinds of aerial firefighting aircraft available within the U. S.

- **Multi-Engine Airtankers:** Multi-engine airtankers are comprised of ex-military and retired commercial transport aircraft. They carry from 1800-3,600 gallons of retardant. The speed, range, and retardant delivery capability of these large capacity airtankers make them very effective in both initial attack and large fire support. These airtankers typically make retardant drops from a height of 150 to 200 feet above vegetation and terrain, at airspeeds from 125 to 150 knots. Large fixed-wing airtankers have complex, computer controlled retardant

dispersal systems capable of both precise incremental drops and long trailing drops one-fourth of a mile or more in length. Retardant flow rates can also be controlled to vary the retardant coverage level dispersed as required by the intensity of the fire behavior and vegetative fuel type.

- **Helicopters:** Small, medium and large helicopters carry from 100 to 3,000 gallons of water, foam, or retardant in either buckets slung beneath the aircraft, or in fixed-tanks. Large helitankers can be very cost effective, making rapid multiple drops of 2,000 gallons or more on escaping wildfires by refilling at nearby water sources or at portable retardant bases. The internally mounted retardant tanks for the larger helicopters are also computer controlled, which allow them to drop precise incremental patterns or long trailing lines as required by the fire situation. This is particularly important in urban/ wildland fire interface situations near water sources where they can bring to bear rapid revisit times and precise retardant dropping accuracy. Small and medium helicopters are most effective in the direct support of firefighters on the ground, making precision drops on specific targets.
- **Single Engine Airtankers (SEATS):** These small, fixed-wing aircraft carry from 400-800 gallons of foam or fire retardant. SEATS can operate from remote airstrips and open fields or closed roads, reloading at portable retardant bases. SEATS are predominantly modified agricultural aircraft; however, the 800-gallon Air Tractor 802 is designed specifically for wildland firefighting. SEATS are most effective in the initial attack of small wildfires within 50 miles of a reload base where turn-around times are short and repeated drops can be made quickly.

Flight Crews

Airtanker pilots, co-pilots, mechanics and other support personnel are highly experienced and well qualified for the aerial firefighting task. Pilots and co-pilots must meet rigid federal wildfire agency and FAA requirements. Captains of large airtankers and helitankers typically have 5,200-18,000 hours of flying experience, much of it in hazardous, low-level aerial firefighting. Many have been fighting fires from the air for over 20 years. Pilots engaged in this profession must not only be exceptionally skilled aviators with complete knowledge of their aircraft capabilities and limitations, but they must have a thorough comprehension of fuel models, fire behavior, weather, low level and mountain flying techniques, common fire terminology and tactics, risk and crew resource management, and coordinated retardant dispensing operations that integrate multiple types of aircraft.

Aerial Fighting Materials

Fire retardant, wildland fire foam, and water are dropped by firefighting aircraft. Long-term chemical fire retardant that remains effective for days is preferred for use in indirect attack where retardant lines are expected to hold for long periods of time. Wildland fire foam is effective for several hours and is best used in direct support of ground firefighters. Water is least effective, but most readily available. It can be used in direct support, especially if the supply is plentiful and ground firefighters are in close proximity for follow-up action. Firefighting chemicals must be approved for use by the USDA-Forest Service to ensure both firefighting effectiveness and human/environmental safety. Large airtankers load and reload with retardant at established or temporary airtanker bases located strategically across the country. Helitankers load retardant into fixed tanks at either the fixed airtanker bases or at portable sites set up close to the fire area. They can also dip from a water source that is at least 18-24 inches deep. Normally, loading can be completed within 10 minutes.

Aerial Firefighting Tactics and Management

Aerial firefighting is usually conducted to assist firefighters on the ground in achieving fire suppression objectives. Water and foam are best used in the direct attack of the fire perimeter and on troublesome "hot spots". For water and foam to be effective, ground firefighters must be in close proximity to the drops. Long-term fire retardant is used for the direct attack as well as for indirect attack wherein airtankers lay a continuous line of retardant parallel to the edge (flank) of the fire. Retardant dropped on the head of an intense wildfire is rarely effective. The most effective means of controlling wildland fires in the preponderance of direct and indirect attack missions is the application of long-term retardant.

The most effective use of aerial firefighting is during the initial attack of small wildfires, and to accomplish specific tactical suppression objectives on large wildfires, such as reinforcing fireline and dropping on slop-overs and spot fires outside the fireline.

The management of aerial firefighting aircraft over a wildfire incident varies with the complexity of the situation. Most airtanker captains are approved to use their own judgment in making retardant drops during initial attack. As the aerial firefighting situation becomes more complex on a larger wildfire and numerous aircraft become involved, or urban interface protection becomes necessary, airborne wildland fire management agency personnel flying in Air Attack Aircraft coordinate and direct the aerial firefighting operation to ensure both safety and firefighting effectiveness. Agency aircraft called Leadplanes often "lead" airtankers on their drop runs.

- **Air Attack Aircraft:** The coordination of aerial attack operations over a wildfire with ground firefighting efforts is the responsibility of the Air Tactical Group Supervisor. Both single and twin engine fixed-wing aircraft, as well as helicopters, serve as aerial platforms for this mission. The Air Tactical Group Supervisor directs airtanker operations in the absence of a Leadplane Pilot, but does not lead airtankers through the target area.
- **Leadplanes:** Leadplane Pilots coordinate and direct airtanker operations over a wildfire in concert with the Air Tactical Group Supervisor. The Leadplane Pilot assigns airtankers to specific targets and frequently leads airtankers through drop runs for increased safety and efficiency of retardant drops. High performance, twin engine, fixed-wing aircraft with good cockpit visibility are used as Leadplanes.

Federal and State Programs

The USDA-Forest Service and Department of Interior agencies periodically assess their airtanker needs, then contract for aerial firefighting services with commercial airtanker operators. Contracts are awarded through a negotiated procurement process, generally for 3-year periods, to assure the most cost-effective service is obtained. The negotiated procurement (as opposed to the sealed low bid process) has, over the years, resulted in a significant improvement in airtanker availability for fire dispatch. The Federal wildland fire agencies have established stringent standards for both airtanker aircraft and flight crews; agency personnel inspect to ensure these standards are met. An interagency airtanker board establishes and maintains standards for airtanker performance and approval. Airtankers that do not meet these standards are not eligible to perform on federal contracts.

Heli-tankers and SEATS airtankers are contracted for as either "exclusive use" for a specific period, or on a "call-when-needed" basis in times of emergency.

Several states contract for aerial firefighting services. A few states also operate their own airtanker fleet.

CONTACT AHSAFA

George C. Hill (Executive Director)
41970 McIntosh Court
Hollywood, MD 20636-2384
Phone (801) 673-7324
E-mail: ghill@ahsafa.org