

Saskatchewan Public Safety Agency



Aircraft on Wildfires

Preface

This guide provides basic information on the use of aircraft on wildfires. Aircraft can play a valuable role in the suppression of wildfires in a variety of ways. There are three critical functions that aircraft can perform:

1. Aerial reconnaissance and supervision, which includes mapping, infrared scanning, overhead tactical observation and command.
2. Crew and equipment transport directly and quickly to the fire line.
3. Aerial application of retardants and suppressants.

These functions can be performed by a range of light, medium and heavy aircraft.

Air operations on wildfires are expensive, complicated, have inherent hazards, and are highly regulated. This necessitates active and informed supervision to ensure safe, effective and efficient operations. The elements required to achieve this are:

- Select the best aircraft for the intended role where it is needed, when it is needed and at a cost-efficient price.
- Ensure the air carrier can legally perform the work with trained and licenced flight crew.
- Establish the necessary communications between aircraft/aircraft and aircraft/ground.
- Manage the airspace that is established by Canadian Aviation Regulations.
- Coordinate the air operations with the ground operations to meet wildfire suppression objectives.

Acquiring Aircraft and Requests for Assistance

Aircraft for wildfires, and other emergencies, can be hired directly from air carriers offering charter and specialty air services. Assistance can be requested from the Saskatchewan Public Safety Agency (SPSA). Both options incur costs. If a state of local emergency has been declared, then requests for assistance may be given special consideration.

The costs of charter aircraft vary according to the size and type of aircraft. These costs are normally calculated by an hourly rate plus the cost of fuel and secondary expenses. The charges will include the cost of moving the aircraft to and from its base or current location to the site of the incident. See [Aircraft Prices and Performance](#) on page 6 for prices.

The SPSA has aircraft on alert and working during the summer wildfire season. These may be available, also at a cost, if they are not actively assigned or working.

The SPSA has staff that are trained in air operations supervision in accordance with the Incident Command System who may be requested. Information on SPSA aircraft and aviation services and the wildfire program, including the current Pilot's Handbook, can be found here: <https://www.saskpublicsafety.ca/-/media/project/spsa/documents/guides-and-handbooks/pilots-handbook.pdf>

If you spot a fire, or determine you need immediate assistance, call 911. The process for requesting assistance from the SPSA is found here: <https://www.saskpublicsafety.ca/communities/requesting-spsa-assistance>

Saskatchewan Public Safety Agency

The Government of Saskatchewan is mandated under *The Wildfire Act, 2014* to provide wildfire protection within the province. This *Act* is the primary source of statutory responsibility with respect to wildfire management on forested and prairie land. Under the *Act*, the Saskatchewan Public Safety Agency (SPSA) is responsible for wildfires in the provincial forest, provincial parks, recreation sites or vacant crown land – and the Wildfire Management Area within a 4.5 km strip of land bordering the provincial forest. Rural and urban municipalities are responsible for wildfire suppression on land within their jurisdiction.

Wildfires are managed based on a “Values at Risk” procedure where the priorities are:

1. Human life
2. Communities
3. Major public infrastructure and significant industrial infrastructure
4. Commercial timber
5. Remote structures and natural resources

Communications: Air-to-Air and Air-to-Ground

Communications is paramount when working with any aviation asset. The main point of contact with an aircraft is the pilot, unless a Bird Dog is present, in which case it will be the Air Attack Officer. In either case it is imperative that aircraft have the ability to talk to all other aircraft assets working on the fire as well as ground forces in the area that the aircraft are working. The aircraft will need direction on objectives, advisories on other aircraft working on the fire, and hazards in the area. This information should come from the Incident Commander or designate.

Wildfire Airspace Regulations

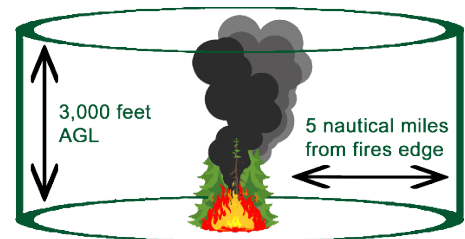
Airspace over fires can be extremely busy. The nature of this work typically involves low flying, frequently reduced visibility, and several aircraft working in close proximity to each other. This is not the place for aircraft that are not involved in fire suppression. Therefore, the federal government, in the Canadian Aviation Regulations, has imposed restrictions to aircraft flying over fires.

Thus, the mere existence of a wildfire invokes an automatic application of the following federal regulation (without NOTAM):

601.15 Forest Fire Aircraft Operating Restrictions

No person shall operate an aircraft:

- (a) over a forest fire area, or over any area that is located within five nautical miles of a forest fire area, at an altitude of less than 3,000 feet AGL; or*
- (b) in any airspace that is described in a NOTAM issued pursuant to Section 601.16.*



601.16 Issuance of NOTAM for Forest Fire Aircraft Operating Restrictions

The Minister may issue a NOTAM that relates to restrictions on the operation of aircraft in the case of a forest fire and that describes:

- (a) the location and dimensions of the forest fire area; and
- (b) the airspace in which forest fire control operations are being conducted.

601.17 Exceptions

Section 601.15 does not apply to:

- (a) persons who are operating an aircraft at the request of an appropriate fire control authority; and
- (b) Department of Transport personnel who are operating an aircraft in the performance of duties related to surveillance and the enforcement of aviation legislation.

CANADIAN AVIATION REGULATIONS DEFINITIONS

- **Fire control authority** means an official of a government forestry service or other fire control agency that is responsible for the protection of persons and property against fire.
- **Forest fire area** means an area on the surface of the earth on which standing timber, grass or any other vegetation or buildings are burning.

Wildfire Airspace and NOTAMS

A **Notice to Airmen (NOTAM)** is a notice that alerts pilots and air operators of potential hazards along a flight route or at a location that could affect the safety of the flight. NOTAMs are distributed by NavCanada upon approval by Transport Canada and circulated through flight briefings supplied to pilots and online pre-flight aids.

A problem can arise from the fact that there is no system that publicizes the existence of fire locations to the aviation community automatically. This is particularly a problem when a fire occurs within 5 nautical miles of an airport or float base.

An appropriate fire control authority can request that a NOTAM be issued. There are different formats that can be used. There is a simple notice that only informs the aviation community that a fire exists and of its location. This kind of NOTAM can be issued quickly.

A second type of NOTAM is issued when there is an active fire suppression activity that encompasses an area larger than the simple, 5-mile and 3,000-foot restriction. The appropriate fire control authority can request an expanded area of flight restriction. This could be necessitated by:

- Aircraft using a nearby lake to work from that is more than 5 miles,
- Where there is a base camp outside the immediate fire area that results in a high amount of low-level air activity to and from the fire, and
- Where there is intense air activity stacked up over the fire exceeding the 3,000-foot altitude restriction.

A more detailed NOTAM may be necessary if there is a need to have non-fire aircraft moving into the fire airspace. This could be the result of an adjacent fishing lodge operating fly-out flights or a nearby airport. If there is a requirement for such an expansion, it must be approved by Transport Canada.

Unless specifically authorized otherwise, only Transport Canada can allow non-fire aircraft within a fire zone. If that authority is granted to the appropriate fire control authority, it will be mentioned in the NOTAM along with a contact phone number.

If there is no such contact procedure detailed in the NOTAM, the appropriate fire control authority does not have the authority to allow non-fire aircraft into the airspace.

If a NOTAM is needed, then the process should be started as soon as the need is recognized, and a NOTAM can be put in place quickly. It is important to remember that an airspace is not closed because people and aircraft are active on the fire, it is closed due to the presence of the fire.

Transport Canada may choose to temporarily designate airspace to a different class than its normal designation. This has been rarely done and is used when there is the potential for a large-scale disruption to air traffic.

If there is any likelihood of non-fire air traffic flying in the vicinity of a fire, or if there is intense fire air traffic, then a NOTAM request should be submitted by the appropriate fire authority. All NOTAM requests regarding SPSA wildfires come from the Provincial Fire Centre and must be authorized by the Provincial Duty Officer after consultation with the Provincial Aviation Services Coordinator or the NAO Safety/Risk Officer.

Note: The restrictions of a NOTAM also apply to remote controlled unmanned aircraft (e.g., Drones, UAV's, etc.).

Air Tanker Efficiency / Effectiveness

Air tankers have proven to be very effective in combatting wildfires. However, with the escalating costs of aircraft and suppressants, effectiveness alone is not sufficient. Therefore, the operation must be conducted not only **safely and effectively**, but **efficiently** as well.

If you require aircraft, it is important to determine what aircraft will bring the best value. This is largely determined by the mission. Predominantly, aircraft are required to drop suppressants and the efficiencies will be determined by the aircrafts' turnaround time, or the distance to the water source/reload base. Only CL-215's can skim from a lake. All other tankers must reload from a land base. In many cases a helicopter with a bucket can outperform a large air tanker if the helicopter has a water source close to the wildfire and the tanker is a long distance to the reload base or a large enough lake to refill. On a case-by-case basis, it should be determined which aircraft can deliver the greater volume of water, in the shortest amount of time, at the most reasonable cost.

All SPSA tanker aircraft require a minimum of 2 miles (3.2 kilometers) of forward visibility before they can address any wildfire.

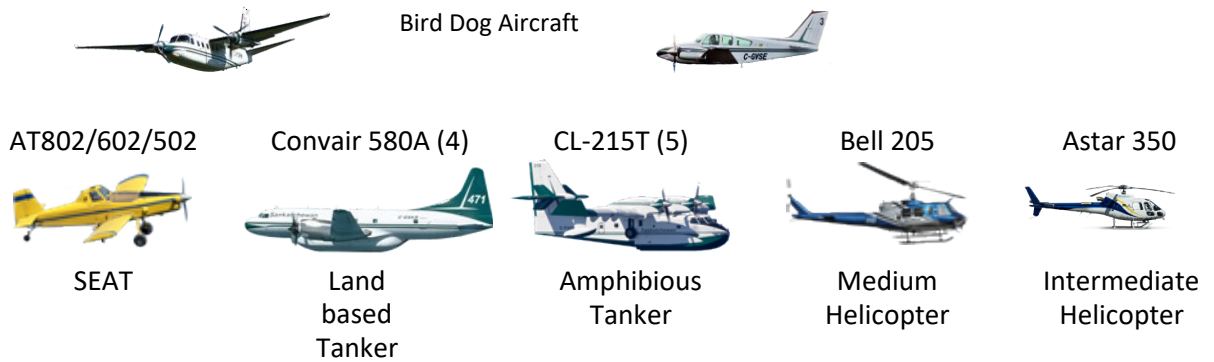
SPSA Fleet Configuration

The fire suppression fleet is owned and operated by the Saskatchewan Public Safety Agency (SPSA). SPSA's fleet consists of:

Air Tankers:

- 5 CL-215T's
 - 1 CL-215P
 - 4 Convair 580A's
- Bird Dog Aircraft
 - 4 Turbo Commanders
 - 3 Beechcraft Baron 55's

Aircraft Prices and Performance



Aircraft Type	Cost per Hour	Suppressant Cost	Speed	Volume
AT802 (SEAT)	\$3,500.00	\$0.00 (water)	175 knots	3,025 litres
AT602 (SEAT)	\$3,500.00	\$0.00 (water)	160 knots	2,385 litres
AT502 (SEAT)	\$3,500.00	\$0.00 (water)	140 knots	1,900 litres
Thrush (SEAT)	\$3,500.00	\$0.00 (water)	140 knots	1,900 litres
CL-215T	\$5,000.00	\$90.00 (foam)	180 knots	5,400 litres
CV580A	\$4,200.00	\$6,000.00 (retardant)	270 knots	7,950 litres
CV580A	\$4,200.00	\$4,800.00 (Gel)	270 knots	7,950 litres
TC690 Bird Dog	\$2,200.00	N/A	260 knots	N/A
Baron 55 Bird Dog	\$1,800.00	N/A	180 knots	N/A
Single Engine Aircraft	\$500 - \$1,000 / hr	N/A		
Twin Engine Aircraft	\$1,000 - \$2,000 / hr	N/A		
Light and Intermediate Helicopter (4-7 passengers)	\$1,200 – \$2,000 / hr	N/A		72 – 190 gallons
Medium Helicopter (8 – 14 passengers)	\$2,000 - \$4,000 / hr	N/A		200 – 420 gallons

Safety in the Drop Zone

Despite taking all precautions, a fire fighter may find themselves in an aircraft drop zone by mistake. The following tips may help prevent injury.

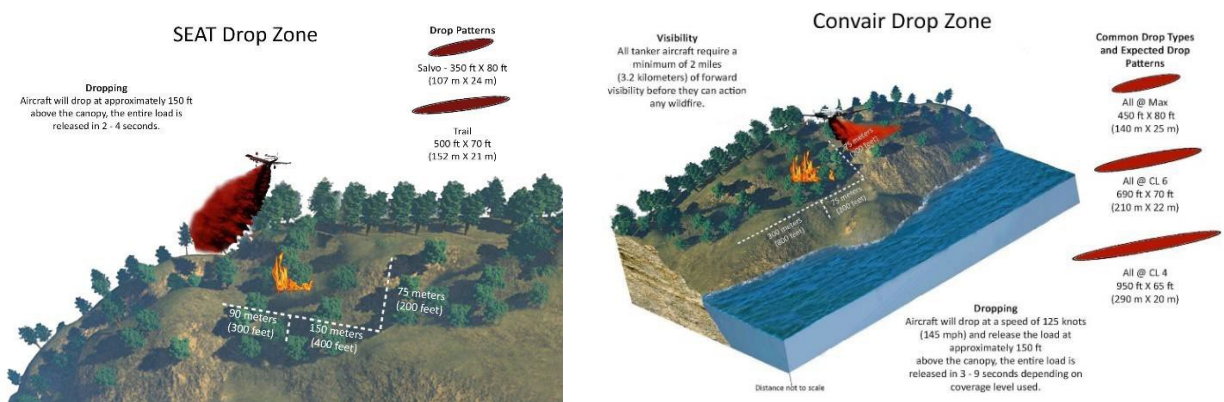
First, if the drop is not coming in **immediately**, and you still have 15 or 20 seconds before the tanker is going to drop, it may be possible to safely exit the zone. Move at right angles to the intended drop line, keeping in mind that you should be at least 35 metres outside the drop zone to ensure your safety. You should only attempt this when tanker aircraft **is not** on its final approach for a drop (see photo).



In most cases, however, you will not know where the tanker is, or time will not permit you to exit the area. When this happens, do the following to minimize your chance of injury:

- Stay calm, move clear of snags and loose debris on the ground.
- Face in the direction of the drop, **hold on to your tools!**
- Lie face down, hardhat on.
- Stay in position until the drop has settled, to avoid exposing your eyes to load drift, or inhaling the drop vapours.

Once the drop has been completed, you may then move out of the drop area. Be careful of the slippery nature of fresh retardant drops, and to a lesser extent, foam and/or water. If retardant, foam or gel has gotten on your skin, in your eyes, or into a cut, immediately wash off the affected area, and rinse thoroughly. Both foam and retardant, while not toxic, can still act as an irritant to your eyes and skin, so precautions must be taken to prevent injury.



Siren Warning System for SPSA Bird Dog Aircraft

All SPSA Bird Dog aircraft are equipped with siren warning systems to warn ground crews of impending drops by the tanker aircraft. The sirens are used in conjunction with radio communication with ground crews. The Air Attack Officer (AAO) will always advise of drops via the radio. In the event of a malfunctioning radio, the siren will still be able to alert crews of impending drops or advise crews without a radio that a drop is imminent.

SPSA Bird Dog Responsibilities

If a Bird Dog is present at a wildfire, one of the roles they fill is the management of air traffic over and in the immediate vicinity of the wildfire. When more than one aircraft, whether helicopter, fixed wing or a combination of both, are employed on a fire, the airspace over and surrounding the fire becomes a managed (controlled) airspace if a Bird Dog is present.

All flight paths between points within a managed airspace must be properly co-ordinated to remove the possibility of a collision. No fire suppression aircraft may enter this zone without clearance. This includes all aircraft that have been dispatched to, and that are arriving at the fire.

Once an aircraft has entered the zone, **all aircraft movements must be cleared by the Bird Dog.**

Personnel in the Drop Zone

If any personnel are observed in the drop area and communication cannot be established, then air tankers will not drop.

The Attack Plan

The standard procedure when attacking fires with aircraft is to stop the head or forward momentum of the wildfire, when visibility and fire behavior permits, and then work down the flanks, and finally tying off the base of the fire. When air attack is involved, the fire behaviour is typically such that ground crews cannot access the head or the fire intensity is too great to perform a direct attack on the fire's head with ground forces. When this happens ground crews generally anchor near the base then work up the flanks with a pincer action to cut off the head. A coordinated effort between air attack at or near the head and ground forces establishing themselves at the rear is often the most effective way to accomplish fire suppression objectives.

Air Tanker Strategies

There are basically two different attack concepts used in aerial suppression: direct and indirect attack.

Direct Attack

One of the most effective methods of getting a fire under control as quickly as possible is to have the aircraft place their drops directly on the edge of the fire, while the ground crews move along with the tankers, staying just behind where the last drop was placed.

Pilots are instructed to release their loads at least 120 - 150 feet over the canopy, to allow the

drop to slow up, and fall into the canopy gently, instead of “driving” it in from a lower altitude. Particularly with foam, which comes in with even less force, working with amphibious aircraft along the fire line should not pose any safety hazards when done correctly.

The simplest method of working together is to establish control of the head of the fire as soon as possible, and then proceed with an attack from the rear of the fire, along a designated flank. This should be coordinated with the Incident Commander. Once the first load is placed along the flank, crews should move into position and commence operations right where the load went in. The next loads will be placed further along the flank, moving towards the head, with crews knowing that the aircraft will now be flying over their position before releasing their loads.

Once the head has been reached on one side of the fire, the same procedure is used along the other flank. In this way, the effectiveness of the aircraft is maximized, and the crews are working in areas that are at their period of lowest activity, and then moving in to work on the line when areas may be starting to pick up again.

Air tanker effectiveness is diminished if ground attack is not carried out directly behind the tanker drop, since the suppressing action of the drop is only temporary, and is lost as soon as the moisture evaporates.

Indirect Attack

When using retardant, the objective is to keep the fire to a finite size by directly applying retardant on the fire or building a line around the fire, and allowing the fire to burn up to the retardant-coated fuel.

This strategy requires the pilot to drop the retardant loads tight to the actual fire line, generally starting at the head of the fire, then along the flanks, and finally at the rear of the fire. It is essential that the retardant line be continuous, with no gaps in the line, and a sufficient coverage level of retardant is used to accomplish the task. Feedback from the ground crews is essential to ensure this happens.



Unlike a direct attack, it is not typical for ground forces to be in the area of tanker drops when retardant is used. Usually there is little advantage to working closely behind retardant carriers, and the viscosity of the loads could create a certain amount of risk to personnel on the ground if a load is dropped too low by accident.

It is acceptable for crews to establish themselves along a different part of the fire, if there is good communication with the aircraft regarding the planned location of each drop.

Fire Retardants and Suppressants

Long-term Fire Retardant – Composition and Function

A long-term fire retardant gains its effectiveness through the use of a chemical (predominantly fertilizer), which alters the combustion process. With long-term retardant, the area receiving coverage from an applied load can resist fire spread for a period of days, or even weeks, after the drop as long as the active ingredients remain on the fuel. This allows retardant carriers to place a series of control lines around a fire, and then leave the area for attack on a new start, without having to return for additional action.

Due to its high salt content, long-term fire retardant can be a skin or eye irritant, and steps should be taken to wash any retardant off the skin, particularly around areas that may have cuts or scrapes. If retardant gets into the eyes, the eyes should be rinsed immediately with clean water, and if irritation is severe, the patient should be sent to a doctor for examination. [LC-95A SDS Sheet](#)

Fire Foams – Composition and Function

Class A fire foams are designed specifically to enhance the effectiveness of water application to a fire, either from tankers or ground pumping units. Foam, like long-term retardant, can be a skin and eye irritant in certain instances. Foam concentrate is very similar to dishwashing detergent in composition and will dry the skin out due to the leeching of skin oils. Prolonged exposure can cause redness, chapping, or even cracking of the skin, but only if no preventative measures are used. Eye irritation can also result from exposure, and the eyes should be rinsed out with clean water if foam gets into them. If eye irritation persists after rinsing, medical attention should be obtained. (For more information, see [PHOS-CHEK WD881C SDS Sheet](#).)

Fire Suppressing Gels (Water Enhancer)

Water enhancers are superabsorbent polymer slurries with a consistency almost like petroleum jelly and are commonly referred to as “Gel.” Gel can be used as a fire suppressant and for structure protection and in direct-attack applications against wildfires.

Gel can provide thermal protection from fire for extended periods, even at 3,500 °F (1,930 °C). Depending on the fire conditions, applied fire gels offer fire protection for periods of 1 to 2 hours and up to 4 to 6 hours, depending on temperature and humidity. After the retained water is completely evaporated from a gel, fire suppression ability is lost. (For more information, see [Firelce Gel SDS Sheet](#).)

Summary

Aircraft are very effective in combating forest fires. To be effective, you need only to achieve the objective of stopping or controlling the wildfire. To be efficient, you must achieve our objective with only the necessary numbers of air tankers and with the minimum amount of suppressant or retardant necessary to do the job. Anything more results in overkill and an inefficient, costly operation.

The loss in air attack efficiency occurs when the fire gains in size and intensity to a point when numerous loads are necessary to contain the fire. When more than one load per dispatched land-based aircraft is required, there is often a critical time factor while the air tanker reloads and

returns to the fire.