

THE USE OF AIRTANKERS FOR  
FIRE SUPPRESSION IN CANADA

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## TABLE OF CONTENTS

	Page
INTRODUCTION .....	1
AIRTANKERS USED .....	2
Water-based Operations .....	2
Land-based Operations .....	4
AIRTANKER PROGRAMS IN WESTERN CANADA .....	6
British Columbia .....	6
Alberta .....	8
FUTURE DEVELOPMENTS .....	9
REFERENCES .....	12

# THE USE OF AIRTANKERS FOR FIRE SUPPRESSION IN CANADA<sup>1</sup>

by

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## INTRODUCTION

Airtankers are an integral part of forest-fire control in Canada. The use of these aircraft for the aerial suppression of wild fires is developed around two concepts: 1) the one-strike concept, and 2) the gallons-of-water-per-hour concept (Linkewich, 1968). The one-strike concept is an initial attack on a fire by a tanker(s) carrying enough retardant to control the fire in one trip. Land-based airtankers and either short- or long-term retardants are employed here. The gallons-of-water-per-hour concept is an initial and supporting attack on a fire based on a fast, continuous water delivery by airtankers until the fire is controlled by ground personnel. Float-equipped or amphibious aircraft, which load while skimming the water surface, and either plain or thickened water are used.

The one-strike concept, or a modified version of it, is practised in parts of British Columbia, Alberta, New Brunswick, and Nova Scotia. In these areas, land-based aircraft and either short- or long-term retardants are used; suitable water pickup sites for float-equipped or amphibious air-

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Based on a paper presented at the Intermountain Forest Fire Research Council Annual Meeting, Park City, Utah, November 5 & 6, 1969.

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craft are not usually available. The gallons-of-water-per-hour concept is practised in the rest of Canada, including parts of British Columbia and Alberta. In the Canadian Shield region, which covers most of northern Canada and a large part of Saskatchewan, Manitoba, Ontario, and Quebec, and in Newfoundland, lakes are so numerous that no fire is usually more than a few miles from water. Airports are virtually non-existent in some of these areas, and water-based airtankers are used almost exclusively. The retardant is, of course, plain or thickened water. There are areas where both land- and water-based operations can be and are being effectively carried out, and where both land- and water-based operations are marginal, yet are carried out.

This paper reviews the concepts of airtanker use in forest-fire suppression and the different types of airtankers employed in different parts of Canada, with emphasis on western Canada.

#### AIRTANKERS USED

Each province, being responsible for the protection of a large part or all of its forest lands, uses varied airtankers and methods of applications. Airtankers of small capacity (< 400 gal), medium capacity (400 to 1000 gal), and large capacity (> 1000 gal) are all utilized in both water- and land-based operations.

#### Water-based Operations

If the protected area is populated and the detection system is effective, the use of small airtankers, which are usually multipurpose aircraft, is feasible. Fast initial attack can be made by these airtankers, or by larger-capacity aircraft, if the latter are available. However, in isolated areas it is almost essential to utilize large airtankers that can

operate independently for at least 5 hr. These aircraft must travel to the fire, which may be of considerable size, assume the role of a waterbomber for several hours, then return to base for fuel. Some medium airtankers are occasionally used to transport ground fire-fighting personnel as close as possible to the fire, then initiate air attack and support the ground crews.

The aircraft currently receiving wide use as water-based airtankers are:

<u>TYPE OF AIRTANKER</u>	<u>CAPACITY (IMP. GAL.)</u>
1. Beaver and Turbo-Beaver	140
2. Otter	230
3. Twin-Otter	460
4. PBY Canso	800
5. CL-215	1200
6. Martin Mars	6000

A review of the number of float-equipped and amphibious airtankers used throughout the country indicates the type of water-based operation conducted by each province:<sup>1</sup>

<u>PROVINCE</u>	<u>AIRTANKER</u>	<u>NUMBER</u>	<u>OWNERSHIP</u>
1. British Columbia	PBY Canso	3	Leased
	Martin Mars	2	Private (F.I.F.T.)
2. Alberta	PBY Canso	2	Leased
	PBY Canso	2	"
	Otter	3	"
3. Saskatchewan	Beaver	6	"
	PBY Canso	2	"
	Otter	2	Government
4. Manitoba	Beaver	7	"

<sup>1</sup>Personal communication. A. J. Simard, Forest Fire Research Institute, Department of Fisheries and Forestry, Ottawa.

<u>PROVINCE</u>	<u>AIRTANKER</u>	<u>NUMBER</u>	<u>OWNERSHIP</u>
5. Ontario	Beaver	2	Department
	Turbo-Beaver	23	"
	Otter	10	"
	Twin-Otter	2	"
	PBY Canso	1	Leased
6. Quebec	PBY Canso	6	Government
	(Beaver/Otter float tanks)	16 sets	"
7. Newfoundland	PBY Canso	4	Government leased to operator
	Turbo-Beaver	2	
8. Nova Scotia	Beaver	2	Government

With the exception of the Province of Ontario, which maintains a large fleet of small airtankers, the "work-horse" of the water-based airtankers across Canada is the PBY Canso. The Canso (Fig. 1) picks up its water load through a probe while skimming the water surface at 75 to 85 knots. Loading time varies between 12 and 17 sec; loading distance is about 1600 ft. The effectiveness of this airtanker has been increased with the use of GELGARD short-term retardant. A nitrogen-injection system mounted inside the aircraft permits the use of GELGARD. The characteristics of the GELGARD retardant mixture permit it to cling to aerial fuels and coat ground fuels, which reduces the flammability of the fuels.

#### Land-based Operations

The aircraft used as airtankers where land-based operations are carried out are:

<u>TYPE OF AIRTANKER</u>	<u>CAPACITY (IMP. GAL.)</u>
1. Snow Commander	250
2. Ag-Cat	250
3. Thrush Commander	330
4. TBM Avenger	500
5. B-25 Mitchell	1000
6. Douglas B-26	1000
7. PBX Canso	800

A review of the number of wheeled airtankers used in Canada indicates the type of land-based operation conducted by each province:<sup>1</sup>

<u>PROVINCE</u>	<u>AIRTANKER</u>	<u>NUMBER</u>	<u>OWNERSHIP</u>
1. British Columbia	TBM Avenger	8	Leased
		13 available	
	PBX Canso (dual purpose)	3	Leased
	Douglas B-26	3	Charter (1969)
2. Alberta	Snow/Thrush	6	Leased
	PBX Canso (dual purpose)	2	"
3. New Brunswick	Snow	2	Leased
	Ag-Cat	2	"
4. Nova Scotia	Snow	1	Charter
5. Yukon	Snow	2	"
	B-25 Mitchell	2	"

<sup>1</sup>

Personal Communication. A. J. Simard, Forest Fire Research Institute, Department of Fisheries and Forestry, Ottawa.

## AIRTANKER PROGRAMS IN WESTERN CANADA

### British Columbia

In British Columbia, the airtankers are assigned to a Forest District and usually remain based there unless a transfer is necessitated by a higher fire hazard in other district(s). Both the TBM Avenger and PBV Canso airtankers are contracted for 60 days (July 1-August 31). The TBM Avenger aircraft is used primarily as an initial-attack tool, although it is sometimes used for tactical support on large wildfires, i.e. reinforcing a weak fire-line or fire-proofing. The amphibious PBV Canso is also used as a land-based airtanker. On land-based operations, either Fire Trol 100 or Phos-Chek 202 long-term retardant is used exclusively. It is also becoming a practice to dispatch the Canso with a long-term retardant on the initial load. The Canso may then return to base for more long-term retardant or, depending upon the distance to the fire and other factors, assume the role of a water-based airtanker.

The one-strike concept is practised efficiently in the Kamloops Forest District in interior British Columbia, where the initial attack force comprises 4 TBM Avengers (Fig. 2), although as many as 7 have been used. Severe burning conditions in this district demand a fast initial attack, and results of carrying out this practice are borne out by the operational statistics<sup>1</sup>:

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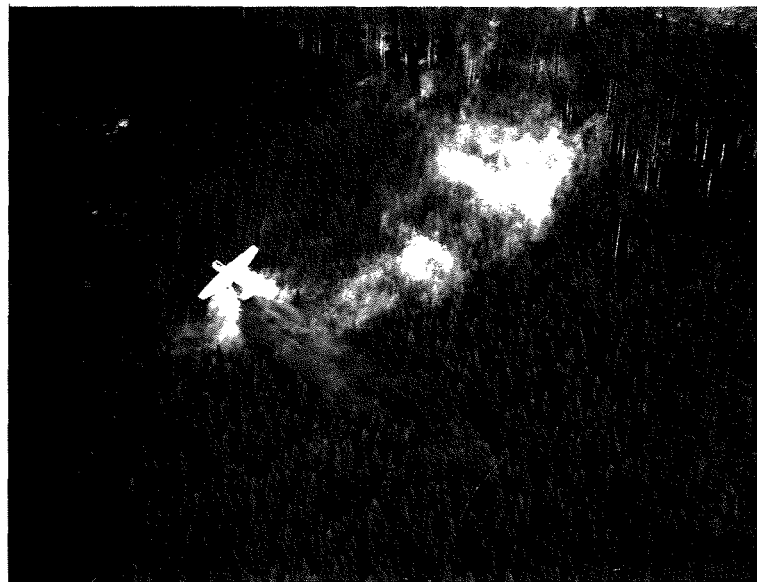
<sup>1</sup>

Personal communication. J. A. D. McDonald, Forester i/c Protection, Kamloops Forest District, British Columbia Forest Service.





**Figure 1.** The 800-gal capacity PBY Canso water-bomber releasing a load of GELGARD M short-term retardant.



**Figure 2.** TBM Avenger dropping a 500-gal load of Phos-Chek 202 long-term retardant onto a spot-fire.

<u>YEAR</u>	<u>NO. OF SORTIES</u>	<u>NO. OF LOADS PER ACTION (AVERAGE)</u>
1967	151	4.5
1968	81	4.8
1969	103	7.2

In 1969, the average distance from main base to fire was 61 miles.

#### Alberta

In Alberta, the 6 Snow and Thrush Commander airtankers are controlled by the Forest Service's central dispatch in Edmonton. The aircraft, usually operating in two groups of three, are dispatched according to the fire hazard, i.e. Buildup Index, weather and lightning forecasts, etc., in the various Forest Divisions.

The lack of suitable airstrips to accommodate large airtankers and the presence of numerous small airstrips, many constructed by oil companies, in the southern half of the province have prompted the use of small airtankers. GELGARD F short-term retardant, which can be mixed easily when applied to water in small quantities, is used at present.

Although the one-strike concept is accepted, the capacity and speed of the airtanker group does not normally permit it to be carried out. The necessity to move and establish operations at a satellite base and the use of a short-term retardant further detracts from this objective. The maximum efficient operating radius for the Snow and Thrush Commander airtankers is considered to be 25 miles, but initial-attack distances are sometimes greater. However, the high degree of mobility of the airtanker group permits it to move to and operate from an airstrip in the middle of a problem area, or from an airstrip located near a fire after the initial loads are dropped. The latter is especially beneficial when support action on project fires is required. The GELGARD F mixing system utilized permits fast loading at the sometimes remote airstrips (Fig. 3). Use of a long-term

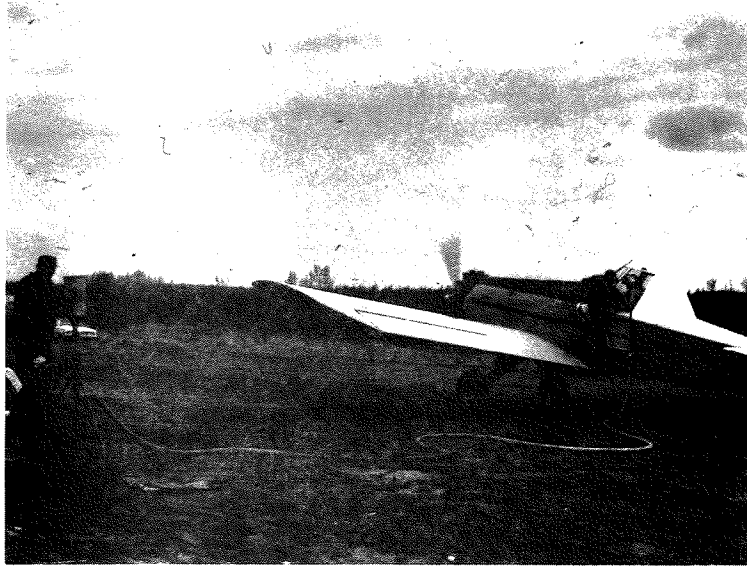
retardant in the near future will increase the initial attack capability of these small airtankers. The PBV Canso airtanker is used on both land- and water-based operations in much the same manner as in British Columbia.

The use of helicopters for support action, and to a lesser degree initial attack, is increasing. At present, only water is used. Numerous small lakes, potholes, and streams permit helicopters, such as the Bell 204B equipped with a 350-gal monsoon bucket, to apply water at fast rates. The bucket shown in Figure 4 empties through the two 12-inch-diameter electrically operated doors in 13 sec.

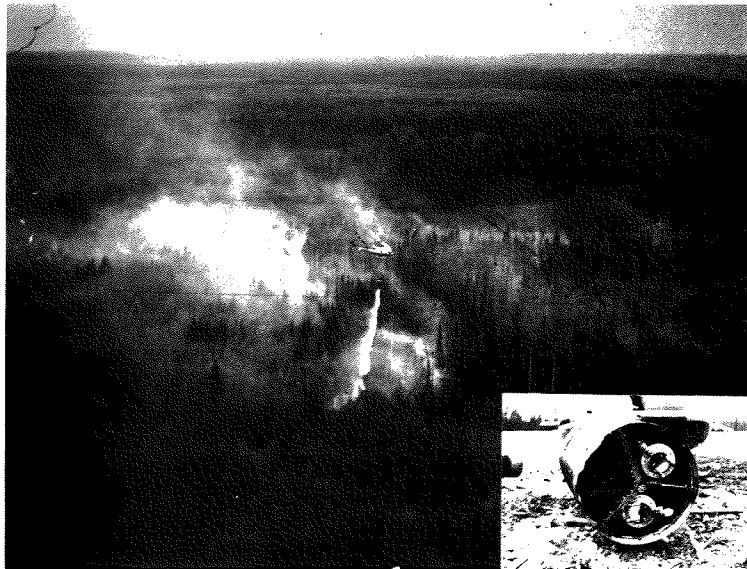
#### FUTURE DEVELOPMENTS

There is little doubt that the use of airtankers for fire suppression will increase in Canada in the future. However, the extent of this increase will largely depend upon the availability of presuppression funds. It is generally recognized that airtankers are most effective when used for initial attack on small fires. This, of course, implies that they must be available for initial attack. Funds to ensure the contracting of sufficient airtankers for the duration of a fire season need to be made available.

Present indications are that the use of long-term retardants will increase in areas where both land- and water-based operations are carried out. This development will favor the utilization of greater-capacity airtankers where land-based operations are currently conducted. Medium-sized land-based airtankers with a load capacity in the range of 500 to 1000 gal will likely be utilized, although in selected areas limited use may be made of large airtankers with the capacity of 2000 to 3000 gal. However, it is not likely that these large-capacity airtankers will totally replace those of medium capacity in the future. But it is entirely possible that a combination of small, medium, and large airtankers will be utilized in any one



**Figure 3.** The 330-gal Thrush Commander being loaded with GELGARD F short-term retardant.



**Figure 4.** A Bell 204-B helicopter dropping a load of water onto a spot fire using a 350 gal monsoon bucket.

region. In British Columbia, the TBM Avenger will continue to be used, likely along with the B-26, while in Alberta, indications are that the B-26 will replace or supplement the Snow and Thrush Commander airtankers, and receive use in the marginal areas currently protected by the PBY Canso. The testing of long-term retardants in Ontario indicates that the utilization of land-based airtankers in areas where water-based operations are exclusive is likely.<sup>1</sup>

The use of helicopters for the aerial suppression of wildfires will also increase. Helitankers, using long-term retardants, will likely assume the role of initial-attack tools in selected areas, and will be used in favor of the fixed-wing airtankers for support action on project fires.

There is also a great need to assure that the airtankers currently in use are utilized most efficiently. The prime objective of a computer-oriented study now being conducted by the Forest Fire Research Institute, Canada Department of Fisheries and Forestry, is to determine whether a Canada-wide mobile airtanker fleet to supplement the provincial air attack forces is feasible (Simard, 1969). Questions like "at what distance from a base does a water-based airtanker using water or short-term retardant become more effective than a land-based plane using long-term retardant" and, "what airtanker load-capacity is most effective for a particular situation" are now being asked. Research programs to provide the answers to these and other questions are being conducted at present at this laboratory and at the Forest Fire Research Institute.

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<sup>1</sup>

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