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USE OF LIGHT AIRCRAFT FOR INSECT CONTROL IN CANADA

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USE OF LIGHT AIRCRAFT FOR FOREST INSECT CONTROL IN CANADA

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Introduction

As with most program titles of a general nature, the topic I have chosen for discussion at this conference may appear presumptuous on my part and somewhat misleading in view of the limited area I wish to cover. I hope, however, to add to your knowledge of the Candaian Forest pest control scene based on the previous presentations of Dr. Nigam (this report) and Messrs. Flieger, Kettela and Randall (see 1970 Report of the Sixth Northeast Aerial Applicators Conference). These gentlemen have reported on field and laboratory trials of insecticides and on operational aerial spray programs for control of the notorious spruce budworm. My estimate is that more than 90% of both experimental and operational aspects of chemical control programs in Canadian forestry have been expended on this particular pest problem. My objective today, then,will be to report on some of that other 10% or so of our chemical control efforts with the hopeful intention of amplifying the scope of the information presented by previous speakers from Canada.

The format for my presentation today will include (1) a brief comparison between agricultural and forestry aerial application programs, (2) a review of certain aspects of the spruce budworm operation for comparison with other forest insect control programs, and (3) discussion of several examples of these "lesser" operations.

Aerial Spraying in Agriculture and Forestry

Approximately four times more aerial spraying is done annually for forest protection than for agricultural purposes during recent years in Canada (this ratio, of course, varies somewhat from year-to-year with the occurrence and extent of outbreak populations of forest pest species and varying agricultural requirements). That is not to say, however, that more spraying occurs in forestry; agricultural spraying with ground equipment accounts for more than 80% of all applications.

I have summarized a few pertinent facts on aerial applications in Table I to point out some of the major differences between forest and agricultural crop protection. The data summarized represent the most recent available information.

Table I. Agricultural and Forestry Aerial Spraying in Canada[1]

	AGRICULTURE (1965)	FORESTRY (1970)
Treatment acreage (ground and air applications in millions of acres, all purposes)	26.3	4.5
Treatment acreage (aerial applications in millions of acres)	1.1	4.4
% of treatments by aircraft	4	98
Materials	mostly herbicides	mostly insecticides
Cost range/acre	$0.55-8.50	$0.50-8.00
Avg. cost/acre (approximate)	$1.00	$0.60
Most common aircraft used	Piper Super Cub, Pawnee	TBM, Stearman
Approx. no. spray aircraft used.	149	50.
No. of major applicators	95	1(Forest Protection Ltd.; occasional contracts with agricultural applicators for custom work)
Major location of work	Prairie Provinces (Alberta,Saskatchewan, Manitoba)	New Brunswick

[1]Table is based on data from Philpotts (1966), unpublished reports of the Canadian Forestry Service, personal communication with federal and provincial agencies, and estimates by the author. Figures for forestry column excludes brush control, aerial seeding, forest fertilizing, etc.

It is of interest to note for those years under comparison that in forestry about one-third the number of aircraft treat four times the acreage at nearly half the cost. There is one major applicator, Forest Protection Limited, which conducts nearly all of this work. By contrast, there are nearly 100 agricultural operators in the country.

The major differences in application influencing costs, acreages covered, etc., are:

	Agriculture (Super Cub, Pawnee)	Forestry (TBM, Stearman)
(a) flying height above crop	0 - 20 ft.	100 - 200 ft. +
(b) Flying speed	usually < 100 mph	90 - 150 mph
(c) load	200 gal. or less	90 - 600 gal. +
(d) formation	single aircraft	2 - 5 aircraft
(e) swath width	50 - 100 ft.	up to 1/4 mi. (3 TBMs)
(f) turns/load	many	few

Review of Spruce Budworm Aerial Spraying

The TBM (Grumman Avenger) has been utilized extensively during the past decade for aerial spray operations in eastern Canada. It has proven to be the most versatile available aircraft for large-scale forest spray operations. When used in sorties of 3 (Fig. 1), large blocks of forested areas can be sprayed economically in very short periods of time.

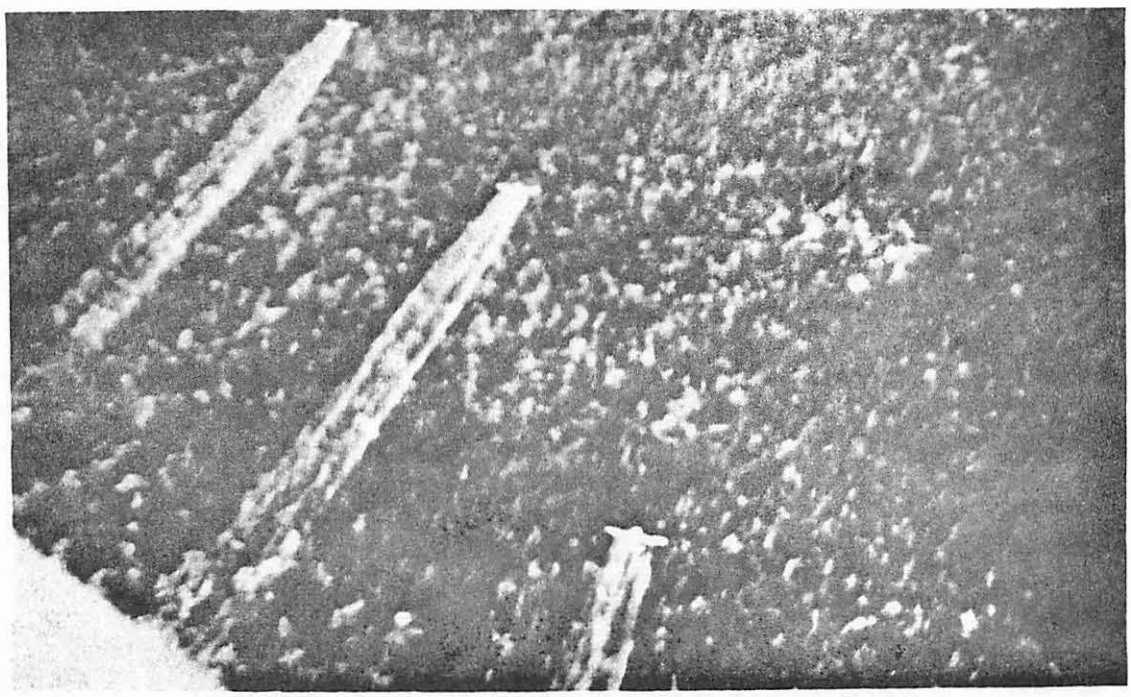

Figure 1. TBMs applying Fenitrothion for control of spruce budworm in New Brunswick.

Formations of Stearmans are used also for budworm spraying (Fig.2), particularly for control of localized infestations (epicenter control) and for applications to high value forest stands (e.g. provincial parks). The Stearman has the longest history of use in spruce budworm control (since 1952), and it has proven to be well suited to this type of work. (Fig. 3). Stearman and TBM aircraft have been used for most of the 42.5 million acres of forest sprayed to 1970.

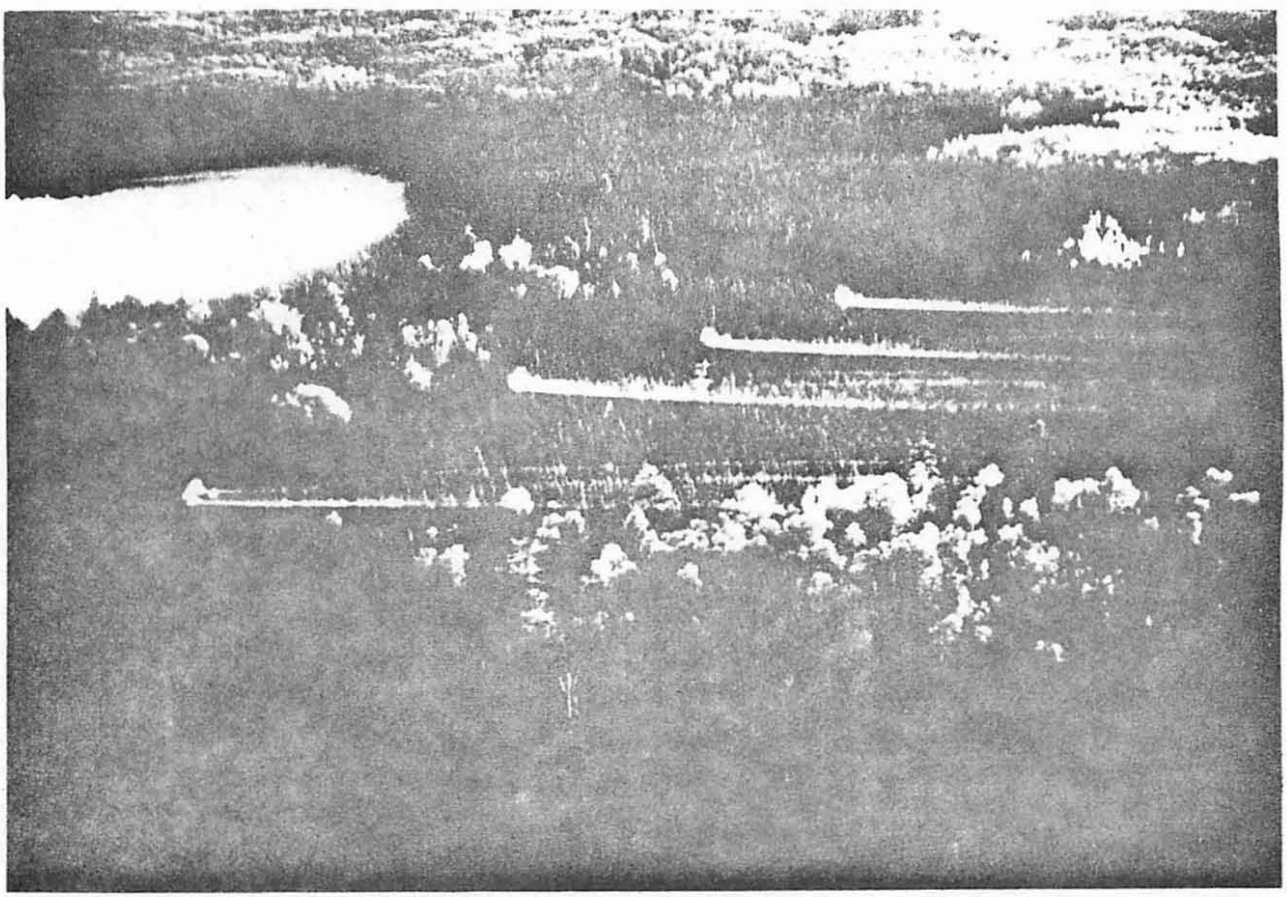

Figure 2. Formation of 4 Stearmans used in Ontario spruce budworm control program.

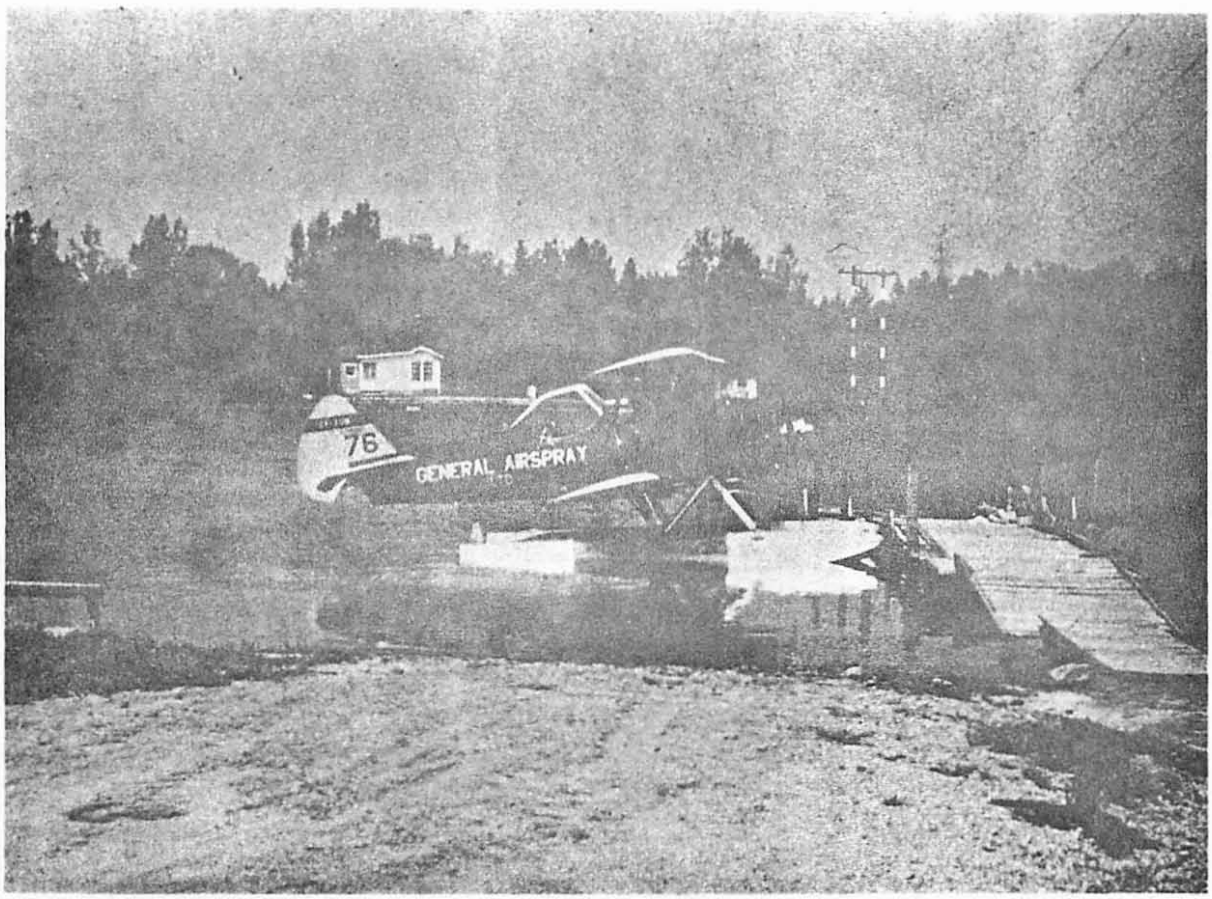

Figure 3. Stearman fitted with floats for spruce budworm control in inaccessible regions of Ontario.

Small-Scale Aerial Spray Programs - Four Examples

Several other large operational aerial spray programs, designed primarily for control of forest defoliators, have been undertaken during the past 10 years. These include 2,500,000 acres sprayed for hemlock looper during one year in Newfoundland, occasional jack-pine budworm spray programs in parks and high-value forest in Quebec and Ontario, and programs for control of black-headed budworm and saddleback looper in British Columbia. I mention these operations briefly in passing on to my major area for discussion today only because similar aircraft, insecticides, logistics, etc., have been used in these cases as in New Brunswick, Quebec and Ontario for control of spruce budworm.

Both provincial and federal agencies are directly involved with forest industries and private tree growers in pest control across Canada. Four typical examples of the types of spray operations conducted in recent years are (see Table II for details):

1. Experimental work in New Brunswick with spray delivery systems and insecticides using Stearmans and AgCats: The experiments are conducted on several 400-acre forested blocks each year. The main areas of research include the fitting and evaluation of new emission equipment (Fig. 4) and the testing of promising laboratory-screened insecticides for safer, more effective control of forest defoliators. The project is intimately related to operational spruce budworm applications, but the basic data derived from these experiments have relevance to most other insect control operations across Canada.

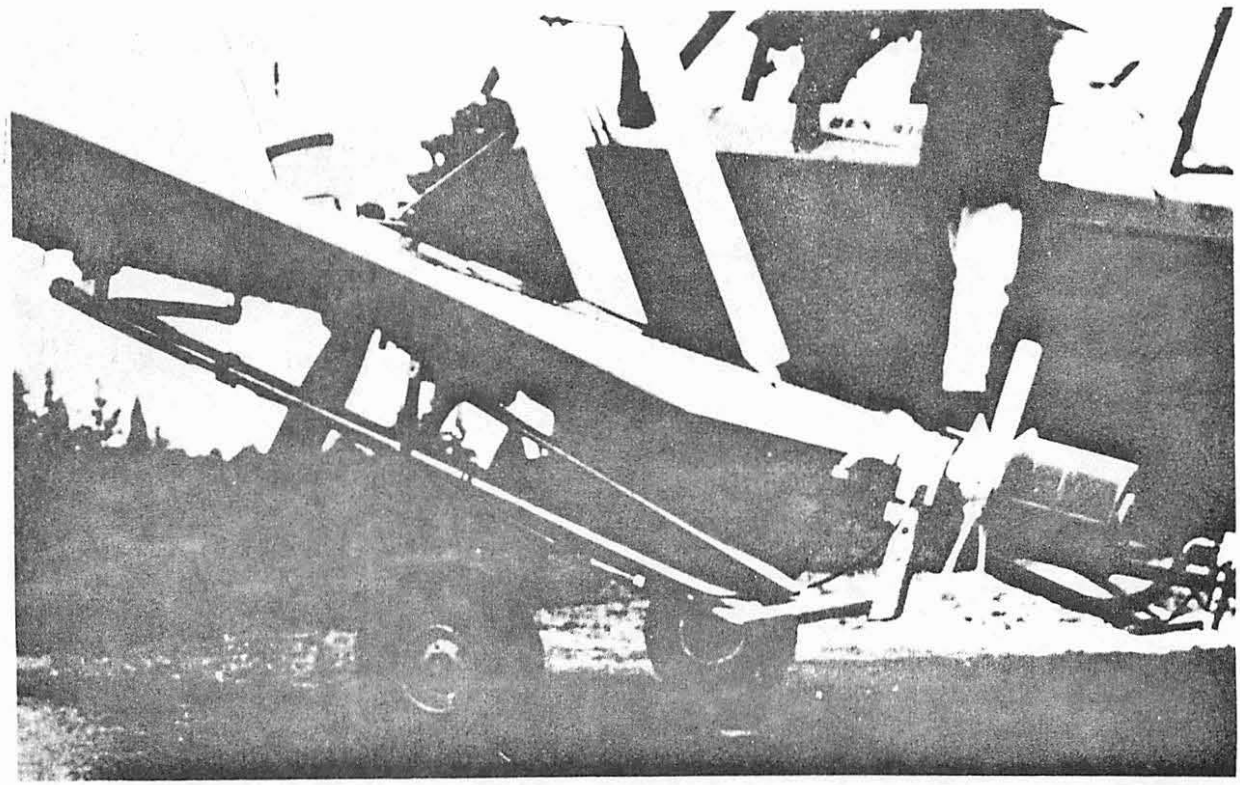

Figure 4. AgCat fitted with Micronair spinning cages for experimental forest spray applications in New Brunswick.

2. Applications of an insecticide by helicopter to plantations for control of the European pine sawfly: Nearly 4,000 acres of pine plantations in Ontario were sprayed by helicopter during 1966 for control of this important defoliator (Fig. 5). The program was conducted by regional staff of the Canadian Forestry Service and the Ontario Dept. of Lands and Forests to protect trees of some 70 growers in five counties. Since then, several similar plantation spray programs (e.g. for control of LeConte's sawfly and white pine weevil) have been conducted in Ontario and Quebec using both helicopters and fixed-wing aircraft.

Figure 5. Bell 47 used in Ontario for control of European pine sawfly in pine plantations.

3. Aerial applications of insecticides for control of jack-pine budworm in Manitoba: In 1967, a Pawnee 235 B was contracted by the Canadian Forestry Service for applications of DDT to approximately 1500 acres of plantation pines near Brandon, Manitoba, and for experimental applications of Matacil and fenitrothion. This agricultural spray plane (Fig. 6) was well suited to tree plantation use and low-acreage forest spraying. By flying only 10-30 ft. above tree tops, the aircraft was capable of providing optimal spray deposit and insect mortality.

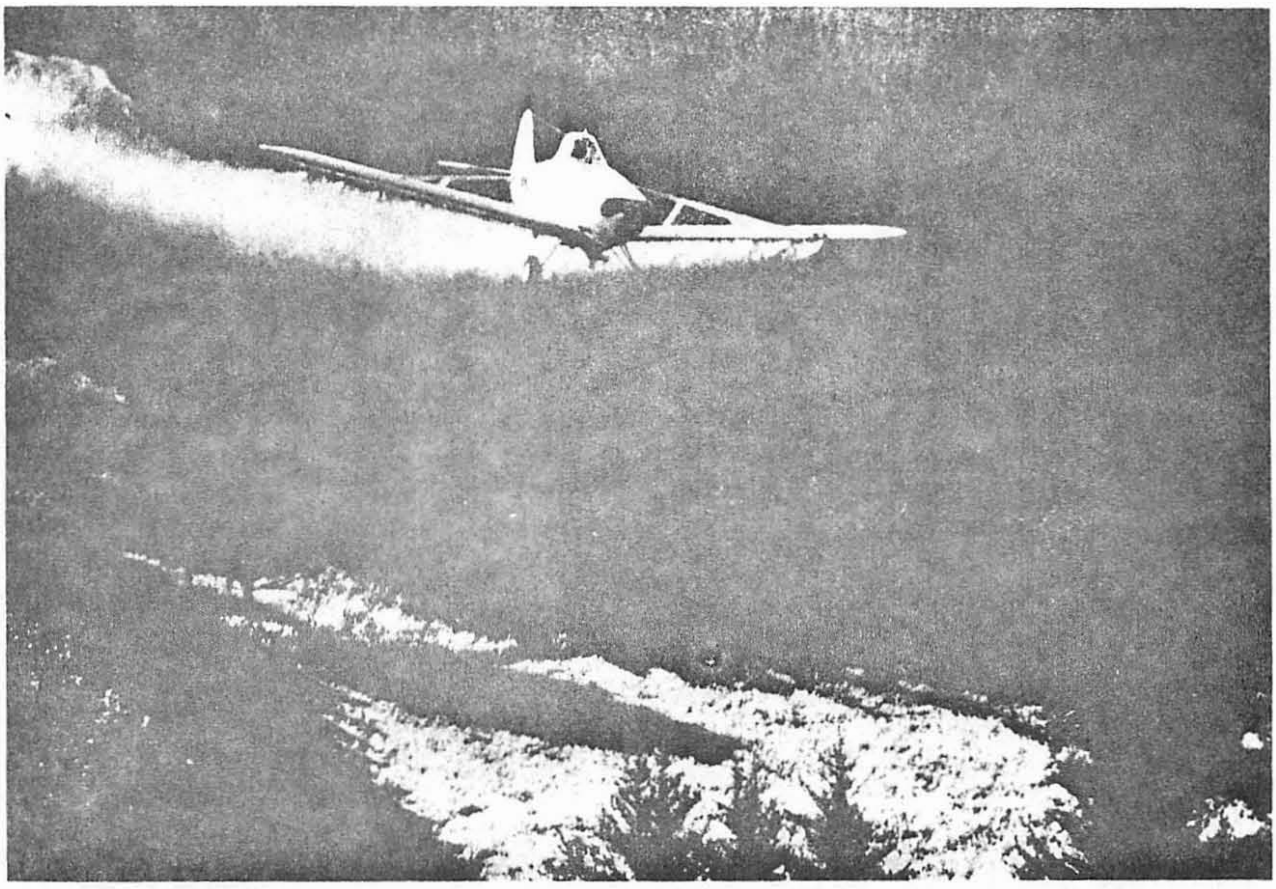

Figure 6. Pawnee 235B over pine plantations infested by jack-pine budworm near Brandon, Manitoba.

4. Applications of insecticides to log booms by helicopter in British Columbia: Logs stored in fresh water lakes have been subjected to considerable degradation due to ambrosia beetle attack. Insecticides have been applied to boomed logs using helicopters fitted with conventional boom and nozzles and with a boom fitted to a bucket apparatus used in fighting forest fires (Fig. 7). Spraying over water with insecticides effective against this beetle, however, is hazardous to fish (particularly salmon) and this practice has been discontinued pending development of non-hazardous chemicals.

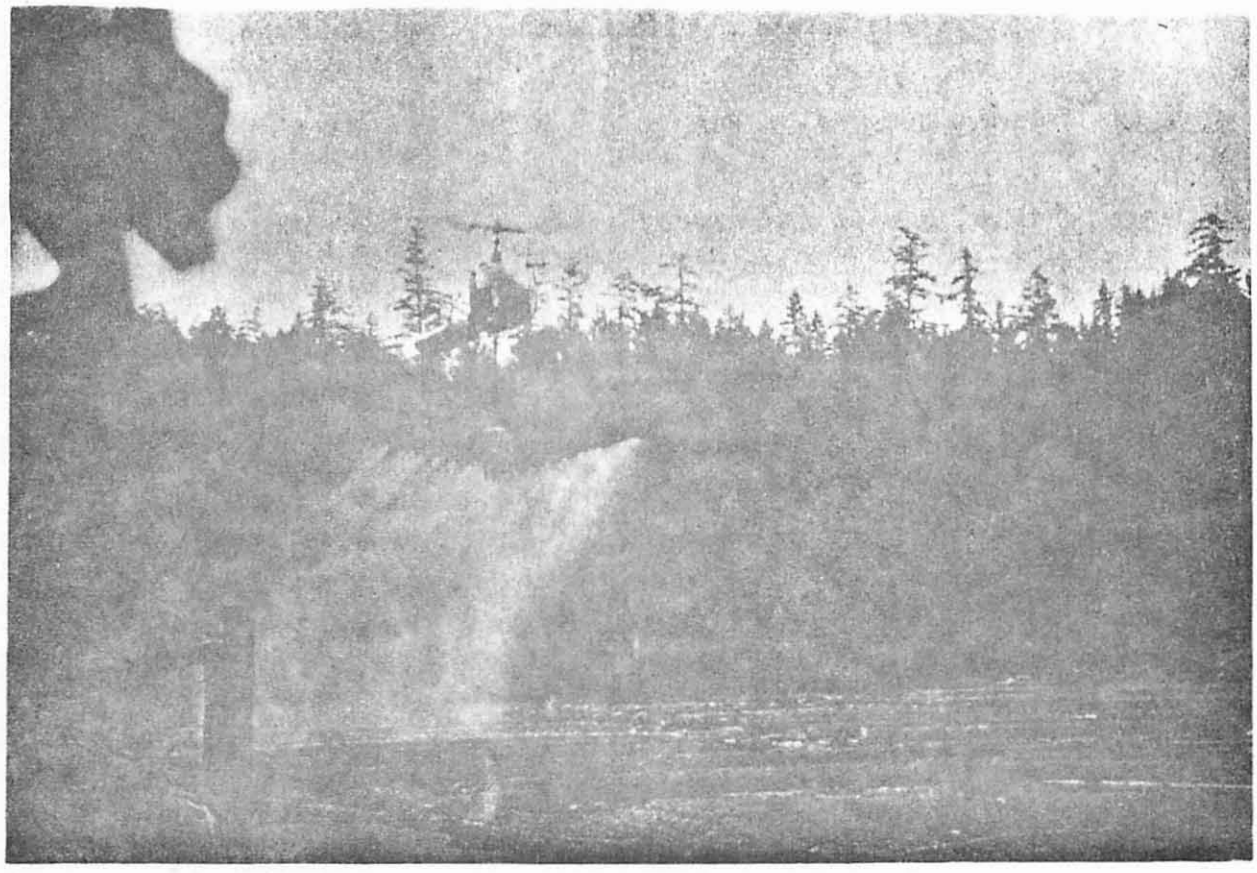

Figure 7. Bell 47 with special delivery system incorporating fire fighting bucket and boom and nozzles used for protection of logs from ambrosia beetle attack in British Columbia.

Table II. Examples of four regional spray programs utilizing light aircraft.

	LOCATION			
	New Brunswick	Ontario	Manitoba	British Columbia
Year(s)	1952-71	1966	1967	1959-60
Project	Emission equip. + Insecticide trials	Operational applications	Operational application, Insecticide trials	Insecticide trials
Target insect	Spruce budworm	Eur. pine sawfly	jack-pine budworm	ambrosia beetle
Aircraft	AgCat, Stearman	Bell 47 G-5 helicopter	Pawnee 235B	Bell 47 helicopter
Emis. Equip.	Spinning cage, Spinning disc, boom + nozzle	boom + nozzle	boom + nozzle	boom + nozzle
Flying Ht.	50-500 ft.	30 ft.	10-30 ft.	10-15 ft.
Swath width	30-200 yds.	100 ft.	50 ft.	<100 ft.
Speed	80-100 mph	60 mph	90 mph	60 mph
Load	15-150 gal.	100 gal.	150 gal.	60 gal.
Insecticides	DDT, phosphamidon, fenitrothion, pyrethrins, Zectran, etc.	phosphamidon	DDT, fenitrothion, Matacil	BHC, methyl trithion
Dosage (active ingr.)/ acre	0.125 to 1 lb. (b+n) 0.1 to 12 oz. (ULV)	1.2 oz.	0.2 to 0.75 lb	N.A.
Contract	via F.P.L.	Interlake Chem Services Ltd.	Aerial Spray + Charter Ltd.	Okanagan Helicopters Ltd.
Cost/acre	N.A	N.A.	$2 (DDT); $4 (others)	N.A.

Summary

Applications of insecticides by aircraft are the most economical and practical methods for forest pest control in Canada. Aircraft such as the TBM and Stearman based at strategic locations and used in formations of from 2-5/treatment block cover millions of acres during a span of only a few weeks. Other types of aircraft are used for the protection of high-value forests, plantations and cut logs. Most of the aerial spray work in Canada is conducted by Forest Protection Ltd. in New Brunswick, although occasional contracts with private applicators are made by federal and provincial agencies in other regions.

Fettes (1968) has summarized our expectations in the years ahead based on over 25 years of both operational and experimental experiences in aerial applications: "The developments taking place in forest insect control are aimed directly at the problem areas. We are emerging from a relatively-primitive plateau which dates back to the immediate postwar years. It is exciting to be a part of a new era which can look to great improvements in chemicals, equipment, techniques and effectiveness. The improvements are, by design, advancing in two seemingly incompatible directions - less material to do more work, and more potent chemicals to do less harm. The expectation is the achievement of better, more economical insect control, while decreasing the hazard to fish and wildlife to nearly zero. We look forward to electronically-guided aircraft, applying minuscule amounts of material per acre, controlling the pest population while creating no real hazard to fish, birds or other forms of life." In closing, I would add that, in addition to low-volume applications of synthetic chemical insecticides, we are currently evaluating aerial applications of bacteria and viruses for forest insect control. Those of us involved in forest protection in Canada are indeed "excited" by the challenge of this new era.

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