Project Report

AN EVALUATION OF THE APPROPRIATENESS OF THE CURRENT FIRE SUPPRESSION METHODOLOGY (STUDY 8)

Prepared for

Steering Committee and Working Group
NWT Renewable Resources
Yellowknife, Northwest Territories

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VIII

The Air Tanker Options

A. Water skimmer air tankers

We briefly reviewed the options for using northern-based Twin Otter aircraft as water skimmer air tankers using float tanks. After consideration, we concluded that this was not an appropriate alternative for the following reasons:

- Twin Otters are in short supply in the north, particularly during summer. However, the number of hours that the Fire Management Division could provide would be inadequate to justify the purchase of additional equipment by northern operators.

- The Province of Ontario is not replacing its Twin Otter air tankers as they age.

- Twin Otter float tanks cost $500,000 per pair.

- The Twin Otter float tanks have a capacity of 400 gallons compared with the CL215s 1,200 gallons. CL215s operate in groups of two. To replace a group would require six Twin Otters. To add Twin Otters without phasing out the CL215s would be adding excess capacity at additional cost. The use of Twin Otters as air tankers in place of casual hire of CL215s would not provide adequate revenue to justify an operators' investment.

- Twin Otters are ineffective in comparison with CL215s. Their basic "punch" is inadequate.

- The Government of the Northwest Territories is facing an attractive offer to locate CL215 maintenance facilities in Fort Smith. This opportunity would be lost if the CL215 fleet were significantly reduced.

- A recent survey by the Province of Manitoba reveals that the NWT has the lowest five-year average operating cost per hour of all CL215 operators. The figures are:

Newfoundland	$4,138
Manitoba	$3,905
Alberta	$3,568
Saskatchewan	$2,470
Northwest Territories	$2,210

B. The use of the DC4 as an air tanker

The suggestion has been made that two northern-owned DC4 aircraft may be used as air tankers in place of the existing DC6s contracted from southern Canada.

In order to compare the capacities and costs of the two aircraft, we requested and obtained technical and cost data from:

- The Territorial Forest Fire Centre.
- The Intermountain Fire Sciences Laboratory of the U.S. Department of Agriculture, U.S. Forest Service, in Missoula.
- Aero Union Corporation of California, which owns and operates a large number of air tankers in the United States.

We have prepared a comparison of costs and performances, summarized in Exhibit VIII-1. Some elements of performance cannot be confirmed. The DC4 is licensed in the United States by the FAA to carry 2,200 US gallons in its tank. However, this does not mean automatic certification in Canada because Transport Canada requirements are substantially different from those of the FAA for air tanker aircraft. The certification in Canada will take time and cost, probably involving engineering procedures and flight tests. For approval against their specification, Transport Canada engineering personnel indicate that this may be done by:

- Restricting the air speed.
- Some structural changes.
- Control of drop systems.
- Decreasing the payload.

The Canadian certification may be for tanks with a capacity of 1,800 to 2,200 US gallons.

Of the two locally available aircraft, one has a front cargo door and the other does not. The DC6s presently operated in the north have front cargo doors because structural bracing to support the tank system prevents the aircraft from being fully loaded with cargo from the rear. The air tanker contracts require the DC6s to carry loads of retardant

Exhibit VIII-1
Comparison of DC4 and DC6 performance

		DC4	DC6	DC4/DC6
Tank capacity	US gallons	2,000[1]	3,000	67%
Tank capacity	Imp. gallons	1,660	2,500	67%
Speed	Km/hour	320	390	82%
Useable fuel	Hours	2.0	4.5	44%
Line spread[2]	Linear feet	925	2,020	46%
Retardant use[2]	Imp. gals./lin. ft	1.79	1.24	144%
Fixed costs[3]	Ratio	0.84	1.00	84%
Variable costs[3]	Ratio	0.86	1.00	86%
Fuel burn3	Imp. gals/hr	208	350	60%

1 *Could be 2,200 or 1,800, depending on Transport Canada requirements.*
2 *Gum thickened retardant, drop height 200 f.t, two US gallons/100 square feet.*
3 *Aero Union Corporation, California.*

concentrate when changing bases. We have determined from Aero Union that similar bracing will not be required in the DC4s, and so a front cargo door (at a cost of $300,000) will not be required for the aircraft that does not currently possess one.

The exhibit shows that the functional capacity of the DC4, measured by line spread (the length of the fire line that can be built with a single drop) is approximately 46% of the performance of the DC6. This is based on the most common drop patterns occurring in the NWT. (90% of all drops). In other words, more than two DC4s would be required to match the performance of one DC6. In doing this, the DC4s would use 44% more retardant. Supply and operating costs of one DC4 are approximately 85% of the costs of one DC6, so two DC4s would cost 70% more to operate than one DC6. Fuel burn for two DC4s is also higher than one DC6.

A single DC4 would be inadequate for 72% of the fires attacked by the DC6s. Two DC4s in combination would be inadequate for 26% of fires. The following table lists the number of fires requiring volumes of retardant that could have been delivered by one, two, or more DC4s:

	One DC4	Two DC4s	More than two DC4s
1990	17	26	20
1991	15	32	14
1992	16	19	10
	48	77	44
	(28%)	(46%)	(26%)

We summarize below the advantages and disadvantages of replacing a DC6 with two DC4s.

Advantages

- Increased benefits to northern business.
- Increased employment (although the three months of employment for five pilots and two engineers are unlikely to provide many full-time northern jobs).

Disadvantages

- Taking account of varying cost ratios and functional capacities, two DC4s would cost almost twice as much as a DC6 to lay a given length of line.
- The useful range of the DC4 is likely to be less than half that of the DC6.
- Appropriate tanks for the DC4 would cost $300,000 each.
- The cost of certifying the DC4s is estimated at a minimum of $200,000.
- Contracts for smaller air tankers are usually issued for two units, with a back-up. The back-up aircraft is not available.
- Replacing a single DC6 is difficult. The present contract is for one machine with a back-up. The remaining machine would still require a back-up, or the Fire Management Division would need to rely on its MARS partners to a greater extent than at present, with the probability of being frequently disappointed.
- The DC4 is old technology and is unlikely to be requested by the Fire Management Division's MARS partners. Little opportunity will exist for earning revenue from the services of the aircraft.

- Only 28% of fires actioned by the DC6 in the three years 1990 to 1992 could have been served by a single DC4. An additional 46% could have been served by two DC4s, but problems would have arisen if one of the aircraft had ever been unserviceable, without a third back-up being available.

In summary, we do not believe that the replacement of the DC6 air tankers with DC4 air tankers is justified on cost or performance grounds.