SESSION 4
Paper (b)

PLANNING FOR LOG EXTRACTION USING HELICOPTERS

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INTRODUCTION

The first reported trials using a helicopter to extract logs were conducted as early as 1956 in Scotland. These first trials were made without incident, however, at a cost six times the economic rate. Further trials were carried out in the late 50's and early 60's by the Russians, Canadians, Norwegians and others. These initial attempts proved uneconomic due to limited load carrying capacities. An attempt was even made to drag loads two times the free lift capacity on even ground. This operation was potentially too dangerous.

With increased lift capacity in the early 70's there was renewed interest which resulted in the first exclusive helicopter extraction sale being let by the U.S. Forest Service in April 1971. Since then, helicopters have been recognised as an optional extraction machine. It is important to recognise that helicopter operations are designed to harvest timber from sites not suitable for conventional logging.

Helicopters have only recently been used for logging in New Zealand. The first reported trial was carried out in August 1978 at Waimahia subdivision of Kaingaroa, using a Hughes 500. This proved however to be uneconomical. A more recent successful exercise has been the extraction of Kauri thinnings at Russell. This proved to be economically sound as well as being environmentally acceptable. Helicopters have also been used to extract posts in difficult situations, although these trials have only been of short duration.

Helicopter logging is expensive. The hourly operating costs can be as much as five times that of a conventional system. This dictates the need for a rigorous operations design and effective economic analysis before making a decision. Any environmental protection requirements should be confirmed from facts not accepted from supposition. The merits of application of other systems should be thoroughly examined prior to selection of helicopters.

APPLICATION

The attempts to date in New Zealand have shown that helicopters do have a future in logging. Below are listed areas where helicopters could have the most potential :

(a) Widely spaced or scattered pockets of high value timber where it would not be worth roading, i.e. Kauri pole stands, scattered or remote blocks of

rimu, totara, etc. A small block of radiata which would yield predominantly peeler or export quality wood.

(b) Areas where road building is either environmentally or economically unsound, e.g. City Water Catchment areas or unstable soils. It is important to remember that logging roads are often of assistance in later silvicultural programmes and this should be taken into consideration.

(c) Areas which cannot be harvested by conventional systems because of remoteness, lack of appropriate equipment or labour. Helicopters are extremely mobile, e.g. from Taupo to Russell is about 2½ hours flying, it would probably take all day and half the next one to get a hauler the same distance.

ADMINISTRATION

This is possibly the most important aspect of a good helicopter logging operation. If the administration is done correctly things flow very smoothly and there are no hitches. Only one person can be in charge and all people involved must recognise this. There are three main areas to a helicopter operation which this person is in charge of:

(a) Bush - he should dictate who does what and ensure that his radio operators are well versed in what is expected of them.

(b) The skids.

(c) The Helicopter - Any decision re flying and maintenance servicing of the machine is the pilots, but factors affecting the operation, such as two short a tagline, not stripping down the machine, parking the fuel tanker, etc, are the controllers.

Decisions to stop the operation due to poor flying conditions must be made between the controller and the helicopter pilot.

Other areas he must control or designate to someone else to control are, pre-operation briefing of all personnel involved, safety consideration, ensuring people are adequately attired for the work they are to be doing, starting the operation in conjunction with the helicopter pilot, crowd control, possibly the most important and difficult, de-briefing after the operation is completed. Other functions that should come under his control are fringe activities such as time studies, forest checks for damage for whatever, photography and publicity, etc. It is preferable that this person is not involved in any other job such as radio operator on skids, as he may be required to sort something out in the bush or be talking to groups etc.

OPERATION DESCRIPTION

Costing from $600 to $3,500 per hour, it is essential that planning for a helicopter operation is kept to a high standard. In conventional logging systems a delay of 15 minutes can be tolerated, however, such a delay in helicopter operation can be very expensive.

There are two essential factors in planning helicopter operations: maximising drag efficiency by having load weights as close as practical to carrying capacity; and minimising cycle times. To achieve these requires careful planning in the felling and crosscutting phase. Logs should be cut to optimum weight whilst remaining within market specifications. Strops should, wherever possible, be pre-set.

(a) Maximising Lift

Payload capacity. This is the most important aspect as far as logging is concerned. It is essential that all unnecessary equipment is removed prior to the commencement of extraction, e.g. passenger seats, non structural panels etc. Manufacturers lift capacities are for sea level operations at standard temperature conditions. The weight which can be lifted decreases with increase in temperature and/or altitude, see Fig.1. Only 30 minutes fuel is carried to maximise load capacity. 4.5 litres = 3.17 kg therefore, 182 litres is 127 kg which cannot be carried underneath the machine.

HELIPCOPTER LIFT CAPACITY

icopter Model	Approximate Payload Capabilities									
	Sea Level		610 metre		1220 metre		1830 metre		2440 metre	
	15 °c	30°c	15°c	30°c	15°c	30°c	15°c	30°c	15°c	30°c
rsky 58T	2290	2290	2290	2279	2290	1838	1858	1383	1383	930
tsky 64E	9412	9412	9276	8845	8459	8164	7643	7507	6872	6232

Figure 1. Helicopter Lift Capacity

(b) Minimising Cycle Times

A typical cycle consists of fly-out, hook-on, fly-in, un-hook. The shortest flight path is often not the quickest. As Fig.2 illustrates this shows the affect a flight path can have on cycle times and that actual horizontal distance is not the most important factor.

(a) The machine must spiral down to a close landing,

(b) The machine flys further but due to more gradual descent cycle time is reduced.

(c) By minimising descent and straightening the flight path the quickest cycles are achieved.

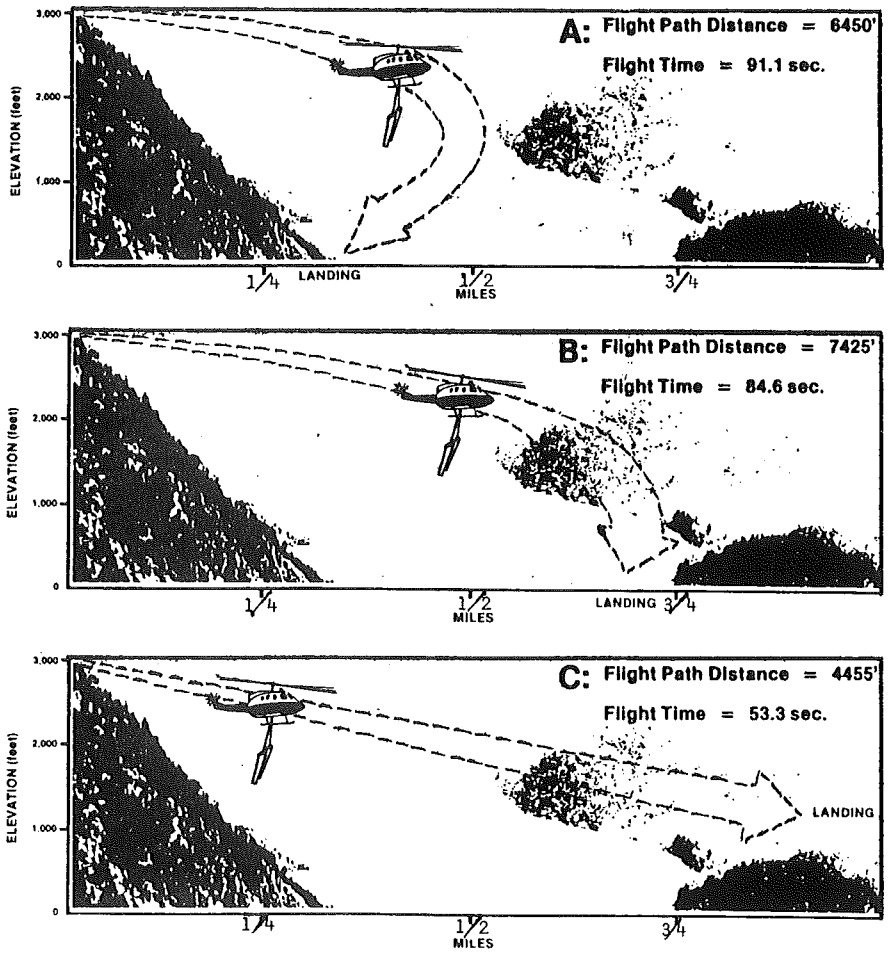

Figure 2. The Affect of Flight Path on Cycle Times

Other factors which affect flight path are wind direction and speed. Better lift is achieved if the machine can lift into the wind, lift is further increased if the machine can fly down rather than having to lift up over a ridge.

OPERATIONAL PLANNING REQUIREMENTS

1. Helicopter

To maximise utilisation it is essential that the machine is correctly prepared for the operation. All the non-essential gear should be removed prior to the commencement of extraction.

1.1 Refueling

The machine commonly used in N.Z., the Lama, uses 4.5 litres of fuel per minute. The machine normally carries only sufficient fuel for 30 minutes flying, plus 10 minutes spare, i.e. 127 kg of fuel. Therefore it is essential that provision is made for re-fueling to take place as easily as possible, i.e. tanker parked on or near skids with sufficient hose reach to refuel without either it or the helicopter having to go out of its way.

1.2 Tag line

This should be long enough to allow the machine to be well clear of the tallest tree plus an allowance for slope on steep country. The tag line should be made of non-rotating wire rope, attached to an electronically operated hook beneath the machine with a hook for attaching strops at the bottom. Electronically and manually operated hooks are best. This facilitates easiest hooking on and unhooking. Time for positioning of helicopter increases with length of tag line so it is essential to keep this as short as practical, allowing for maximum safety.

1.3 Strops

Sufficient strops should be available to pre-set approximately 45 minutes extraction. Therefore the number of strops required is quite considerable, up to 30. These have to be returned to the bush at regular intervals, say after 10 cycles, so they must be able to be retrieved at the skid and bundled and rehooked on to the tag line. The longer the strop the quicker the hook-on. If the hooker can hook on and the pilot lift without him having to get clear this can speed the cycles by up to 15 seconds. Polypropylene are probably the best for helicopter extraction as they often have to be carried some distance through the bush and are easy to work with than wire rope. An eye spliced at each end or a continuous strop is adequate. If larger

lift capacity machines are used then wire strops are better because of their higher breaking strenght to diameter ratio.

2. Felling and Cross-Cutting

This should be done prior to extraction or well ahead and clear of any helicopter logging activity. It is important that when felling is done consideration should be given to ease of extraction and ease of breaker-outs getting clear, i.e. it may be necessary to cut up heads of trees to form a path away from the log. Logs must be crosscut as close to the maximum lift as possible. This requires a crew of two men to scale each log and mark it for cutting, plus the crosscutters to cut it. Ripping of large logs can be carried out, however it is time consuming and on steep country very difficult.

3. Personnel Requirements

3.1 Bush-end

Five people are required for maximum efficiency. One radio operator to direct the machine into the breaker-outs and to keep contact with the skids, to keep the supply of strops constant. Two breaker-outs, one catching the hook and one hooking-on, and one or two pre-stropping, depending on how far apart the logs or bundles are. The radio operator would also be responsible for indicating to the breaker-outs which drag should be hooked on when. With regard to the amount of fuel the machine is carrying and the weight of each individual drag. It is best if drags can be pre-cruised to get the exact rates and the breaker-out has a list of these weights with corresponding numbers attached to the logs.

3.2 Skids

One or two people are required to retrieve strops and prepare them for return to the bush. One radio operator to direct when strops are to be sent back to bush, he is in contact with the bush and pilot.

3.3 Helicopter Service Personnel

This is normally provided by the firm operating the machine and consists of two or three people for refueling and servicing, etc.

4. Radio Communication

It is essential that good radio communication is maintained between the three parts of this operation and that those responsible are aware of their particular duties. The bush radio is possibly the most important as he directs the

machine to the breaker-outs and tells the pilot when to lift.

5. Landing

5.1 Location

Landings should be located to service as much of the area as possible. They should be located to yield the shortest possible average haul distance. This should not exceed 1.6 k with a maximum return distance, i.e. skids to bush of 2.5 k. The difference in elevation between landing and bush should not exceed 14 to 20°, preferably landings should be situated downhill of the pick up point. Service areas should be located as close to the landing as possible to minimise servicing times. Wherever possible the landing should be situated so that the helicopter will be flying into the wind when approaching, loaded.

5.2 Size

The landing should be large enough to handle the longest log to be extracted and provide a safety margin for, sliding logs, early releases and pilot error. A minimum size would be 2½ times the longest log. Any support equipment should be kept at least 15 metres from the outside extremity of the drop zone. If a front-end loader is to be used a safe parking area must be made available for it while the machine is unhooking. An area should be set aside well clear of the drop zone for vehicle parking and spectators. Provision must be made for the machine to land for refueling and service. This should be a minimum of 1½ times the sweep of the main rotor.

6. Safety

Due to the speed at which helicopters extract timber and the fact that they are carrying a suspended load, safety plays an important part in planning the helicopter operation. The following points should be considered.

6.1 Flight path

This should be arranged so as not to cross the access track to the bush.

6.2 All persons involved in the operation should be familiar with the procedures for working around helicopter, i.e. when and how to approach a helicopter, etc.

6.3 Key persons working in the bush, like breaker-outs and radio oeprator, should wear distinctive coloured capes or jackets as should those on the skids.

6.4 Down-wash. The air velocity at ground level from a Lama in hover is approximately 37 miles per hour. This can be hazardous to the people working in the bush and on the skids. Loose branches and other hang-ups can be blown out of standing trees. There is also, in dry conditions, a lot of dust blown up from the ground.

6.5 It is essential that lift doesn't commence until breaker-outs are clear. This is the radio operators responsibility to indicate to the pilot. The breaker-outs should always move uphill as the machine will fly either across or down slope.

6.6 Signs should be erected along roads, blocking them to unauthorised people. Also, unauthorised people should not be allowed within the confines of the operation unless under strict supervision.

CONCLUSIONS

It cannot be overstressed that using helicopters is possibly the most expensive form of extracting timber. However, if the cost of roading is placed alongside the cost of conventional logging it would look less attractive. In areas of unstable soils, where roads for establishement and silviculture operations have been formed and can be used as extraction roads for logging, then provided they are in the right place, timber can be flown out with much less soil disturbance and cost than conventional logging. Using an helicopter for extracting means that a contractor isn't faced with having to invest in a machine costing $100,000, he could employ people to cut for him for a week and then once enough timber is on the ground he could hire a helicopter to extract it. Although still in its infancy in New Zealand, helicopter logging has its role to play as an extraction unit in the future.

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