LOGGING INDUSTRY RESEARCH ASSOCIATION

TECHNICAL RELEASE

Vol. 2 No. 2 1980

NEW ZEALAND

HELICOPTER LOGGING TRIAL IN SECOND CROP KAURI FOREST

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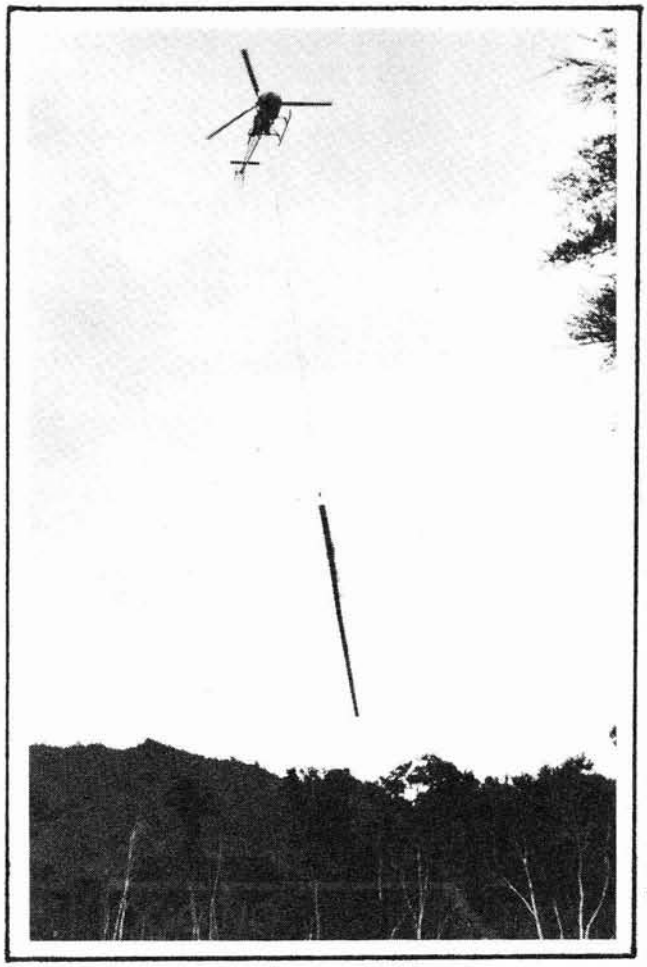

"...choppers are not utopian logging machines. They are special machines for special areas and timber types."

Anon. 1978

WOOD PRODUCTION FROM KAURI FOREST

It is intended that the utilisation of kauri forests for timber will ultimately be centred on second crop stands. This shift in wood production emphasis, from the current selection logging of old growth kauri to harvesting in younger stands, cannot be implemented until such time as the strategy for the continued management of second crop forest has been fully developed. Harvesting techniques best suited to this forest type also need to be evolved and tested, and it is in pursuit of this objective that this trial was directed.

A BRIEF HISTORY

Interest began to be expressed in the possibilities of transporting logs by helicopter in the 1950's. The first reported helicopter logging tests were conducted in Scotland in 1956. Numerous difficulties were experienced with log pickup techniques and the trials were considered an economic failure. Experimental helicopter logging projects were commenced in eastern Canada in 1957 and in the North Caucasian mountains of Russia in 1959. Other tests were conducted in Norway and North America during the early 1960's. Results from these early experiments indicated that, although the concept of helicopter logging was viable, the combination of limited load carrying capability and low product value made the operation economically impractical.

As lift capacities increased the possibility of logging with helicopters regained interest. Serious efforts were initiated in North America in the early 1970's. This renewed interest was accelerated by pressures to maintain wood supply from areas where conventional logging practices were now inhibited by requirements to reduce the environmental impact of harvesting operations.

The first timber sale offered exclusively for helicopter logging was negiotated by the United States Forest Service in April 1971. Helicopter logging is now a routine management activity in several parts of the world.

TRIAL DESIGN

Detailed studies of second crop kauri stand structures revealed that much of this forest is suited to management using a 'selection system'. It is planned to undertake silvicultural tending and timber harvesting in such a way that a continuous forest cover is maintained and regeneration of desirable species, together with growth and development of trees in a range of size classes, occurs.

Actual stand conditions were contrasted with the structure of a theoretical model. Based on this comparison it was calculated that 20% of the volume of the stands scheduled for harvesting should be removed.

EQUIPMENT

Lama Helicopter

The Lama is manufactured in France by Aerospatiale Helicopter Division. It is the only light helicopter able to lift the equivalent of its own weight. Its exceptional power is generated by a Turbomeca Artouste IIIB 858 horsepower turbine engine. It is capabale of lifting 1000 kilograms and has a maximum speed of 113 knots. (See Figure 2.)

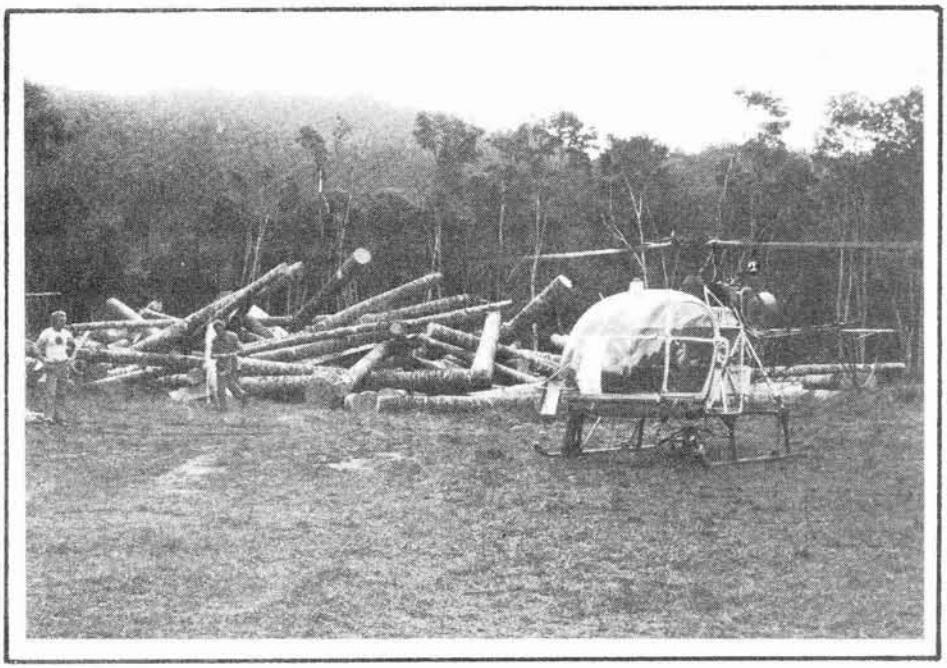

Figure 2. Lama Helicopter and Kauri Logs on Landing

Tag Line

The tag line, which had a breaking strain of 4640 kilograms, was made from 8 mm diameter, non-rotating wire rope. It was constructed in sections so that adjustments for variations in the forest canopy height could easily be made.

Electronically Activated Cargo Hook

An Eastern Rotor Craft cargo hook was attached to the end of the tag line. This hook had a load carrying capacity of 2300 kilograms and could be operated electronically by the pilot, or manually by the ground crew.

Strops

'Continuous band' strops with a breaking load of 2030 kilograms were used. They were manufactured from low stretch synthetic 12 mm diameter "Proplon" (polypropylene rope) and were 4.5 metres long.

WORK METHOD

Felling

Trees marked for removal were directionally felled. Care was taken during felling to avoid damage to residual trees and kauri regeneration.

Log Preparation

Log size was regulated by helicopter lift capacity. Logs were cut to length using a specially prepared diameter/length/weight table. Some logs had to be cut to specific lengths to meet particular end use requirements and this caused some under utilisation of helicopter lift capacity.

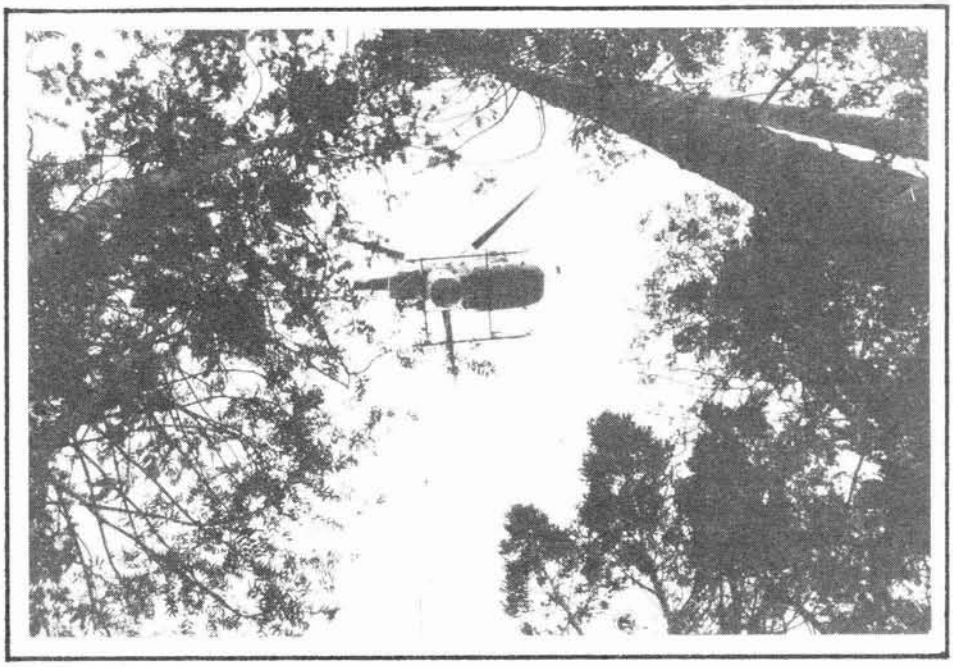

Figure 3. Helicopter positioned above each log with the aid of V.H.F. radio

Pre-stropping
Strops were attached close to the butt end of each log. 30 strops were used and this permitted sufficient logs to be pre-stropped so that delays during log extraction were minimised.

Log Extraction
Four men were employed in the logging setting during log extraction. Their roles were:

(a) One man scouting ahead for logs and attaching strops.

(b) Two men formed the breaking-out team and hooked logs to the helicopter tag line.

(c) The fourth man acted as controller. He was in continuous radio contact with the helicopter pilot and directed the movement of the aircraft over the logging setting (See Figure 3.).

Log Dump Activity
A man was positioned on the log dump to retrieve and bundle strops. They were attached to the helicopter tag line and returned to the breaking-out team as required.

At the completion of log extraction logs were sorted into categories, loaded on to trucks and despatched to the various processing plants.

In addition to the normal safety equipment all logging personnel wore scarlet 'Day-glo' vests. The breaking-out team also wore distinctively coloured safety helmets to aid identification from the air. (See Figure 4.)

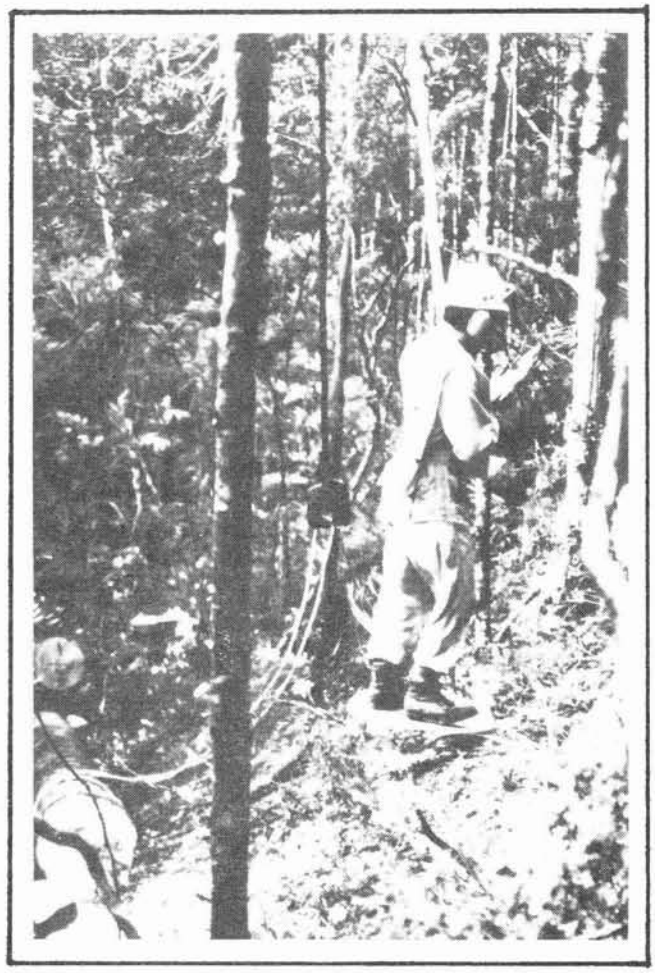

Figure 4. Breaker-out moves away after attaching the strop to the tag line

TRIAL RESULTS

1) The most crucial aspect of the operation, from an economical point of view, was the performance of the helicopter. Over a flight distance of approximately 1 kilometre its average cycle time was 2.37 minutes. Each cycle was composed of four activities and the percentage of the total time expended on each activity is shown in Table 1.

Activity	Portion of Cycle Time
Fly out	26%
Position, attach log and extract from stand	35%
Fly in	28%
Unhook	11%
Average Cycle Time	2.37 minutes.

Table 1. Analysis of Cycle Time for Extracting Logs Over a Distance of 1 Kilometre

2) Careful log preparation was important. Where possible every endeavour was made to break trees down into logs so that log quality and helicopter lift capacity were maximised. 82% utilisation of helicopter lift capacity was achieved during the trial.

3) Helicopter log extraction charges dominate logging costs. However, labour costs and other outgoings accounted for 33% of the overall harvesting cost of $27.96 per cubic metre on truck. A cost review is shown in Table 2.

Activity	Cost $/m^3
Felling and log preparation	5.97
Breaking-out	1.33
Helicopter extraction*	18.76
Log sorting and loading	1.90
	$27.96

*Helicopter ferrying charges are not included

Table 2. Analysis of Helicopter Logging Costs

DISCUSSION

The operational feasibility of helicopter logging within second crop kauri forests can now never be seriously challenged. However, while per unit costs could be reduced with improvements in techniques and experience, there is no question that this log harvesting system is expensive when viewed in narrow financial terms. Justification for its use needs to include recognition of the importance of non-timber values.

The use of helicopters for logging offers some major management and environmental advantages over conventional logging methods. Because of the steep broken nature of the terrain upon which most of the second crop kauri is situated, the impact on the soil and water, aesthetic,and other forest values caused by ground hauling logging, would be environmentally unacceptable. Helicopter logging also significantly reduces the damage inflicted upon residual trees and seedlings during log extraction. Consideration of these intangible, but very real values, in addition to current market prices, indicates that helicopter logging has a part to play in some timber harvesting operations.

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