Session 6
Paper (a)

TANGOIO HELICOPTER LOGGING

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INTRODUCTION:

Helicopter logging has been toyed with on several occasions in New Zealand since its inception here in 1977. Studies have been undertaken on several aspects of helicopter logging. These include, selective native logging (Halkett, 1980), pinus radiata thinnings (Bludell, 1979) sawn timber/log extraction (Gaskin, 1981) and clearfell pinus radiata (Kirk & Smith 1992) to name a few.

Helicopter logging in New Zealand has tended to be seen as somewhat of a novelty rather than a viable alternative harvesting system. Overseas experience has shown that helicopter harvesting systems can be effectively used in a variety of situations (Haulkett, 1982). In February 1991, New Zealand experienced it's first taste of clearfell pinus radiata logging using a heavylift helicopter.

In this paper I will attempt to explain why the choice was made to use a heavylift helicopter harvesting system over the more conventional cable hauler system and discuss the benefits, operational & environmental, of using a helicopter system for this site.

Finally, I will endeavour to outline where I consider helicopter harvesting systems are placed in todays New Zealand exotic forestry resource.

BACKGROUND:

Compartment 6 of the Tangoio Soil Conservation Reserve (Figure 1) was initially planted between 1954 and 1956 in an attempt to prevent mass movement of the hillside above State Highway 2. This road serves as the main route which connects Hawkes Bay to Northern Hawkes Bay and the East Coast, and is the only access capable of carrying both light and heavy traffic.

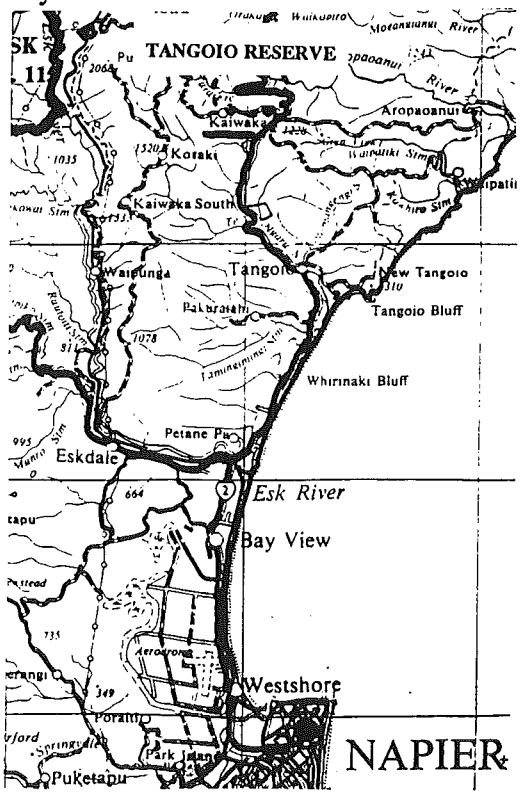

Figure 1 : Cmpt 6 Tangoio Reserve Locality Map

The 34.6 ha reserve proved successful at reducing the frequency and intensity of major land slides and their subsequent road closures. However in early 1991, with the tree age approaching 35 to 37 years, and with Transit NZ planning a re-alignment of State Highway 2, it was decided that it was an appropriate time to harvest the compartment.

The decision on which harvesting method to select had to consider several restricting features of compartment 6.

These included, extremely sensitive erosion prone soil types, steep slopes, unstable limestone boulders, bluffs, limited deflection, high voltage transmission lines dissecting the compartment and the location of State highway 2 along the compartments lower boundary.

The harvesting method had to be environmentally sensitive and technically feasible, while not impeding traffic flows or diminishing public safety on State Highway 2. Therefore, the decision on which harvesting system to use had to be thoroughly evaluated to ensure that the correct choice was made.

CABLE HAULER/TRACTOR OPTION:

Initially a partial suspension cable hauler harvesting system combined with a ground based tractor system was considered. This system would use a three drum hauler to harvest the most difficult terrain, and a 100 to 150 kW sized crawler tractor to harvest the flatter terrain near the ridge top.

While this system could harvest 97% of the compartment, with 3 ha of predominantly Pinus nigra considered unloggable, it had several operational and environmental difficulties to overcome.

Potential limestone boulder displacement as drags were being retrieved still posed a serious problem. The location of two limestone bluffs along the length of the compartment further complicated matters.

In order to gain adequate deflection for the hauler, a live skyline would have to cross State Highway 2. Every time a drag was retrieved, and the skyline placed under tension, the road would have to be closed in order to safeguard the public on State Highway 2. Road closure times using the hauler system were estimated to be 10 minutes per drag.

A hauler/tractor system would require the building of six landings and 1.6 km of access roading. This would in effect significantly increase the potential sources of erosion and sedimentation. As the soils were extremely sensitive, potential ground compaction and rutting near each landing would of only exasperated the problem further (Figure 2).

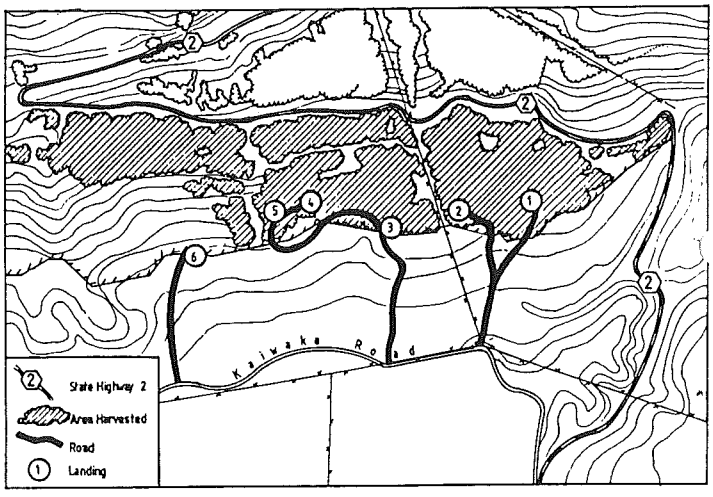

Figure 2 :Hauler/Tractor landing & roading plan

The location of the high voltage transmission lines through the compartment meant that hauler settings and felling faces had to be carefully planned and positioned.

The time frame of the hauler operation was estimated to be 12 months. This would leave some portions of the harvested area exposed to the eroding elements of wind and rain for a period of up to 12 months.

HELICOPTER OPTION:

A proposal was made to log the Reserve using a heavylift helicopter. Although the use of such a harvesting system had a high financial cost, considerable potential benefits, both operational and environmental were to be had.

The helicopters ability to provide a fully suspended payload was by far one of its strongest assets. Such a feature would be expected to dislodge less boulders and debris than the partial suspension offered by the hauler system. Ground compaction, poor deflection angles, and limestone bluff impediments would be significantly reduced if not totally negated..

The planned flight paths of the helicopter, and landing locations, would minimise the necessity to cross state highway 2 with a suspended payload. Such crossings, when they were to occur, would only require the road to be closed for approximately 3 minutes.

Landing and road requirements would be significantly reduced, requiring only 2 landings and approximately 600 metres of roading. Despite the obvious financial savings, potential sources of erosion and sedimentation would also be reduced (Figure 3).

The time frame of the helicopter operation was planned for approximately 8 weeks. This would enable the compartment to be replanted relatively quickly. This inturn would reduce the period that the cutover area was exposed the eroding elements.

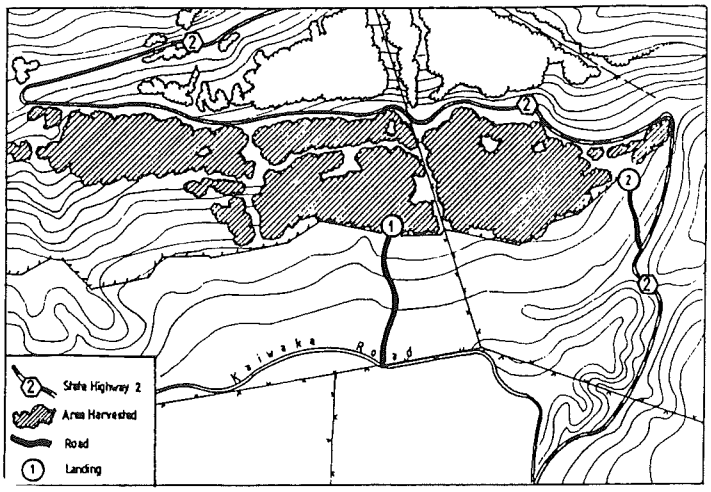

Figure 3 : Helicopter landings & roading plan.

HARVESTING STRATEGY:

With all considerations taken into account, the final decision was for the helicopter harvesting system. Due to engineering time constraints, Transit New Zealand decided that the necessity for a fast harvesting phase was paramount. The additional benefits associated with the helicopter harvesting system further facilitated the choice.

The machine used was a Bell 214 ST heavylift machine (Figure 4) with two 1625 shaft horsepower (1212kW) engines. The rated maximum external payload was 4.3 tonne. A 50 metre tagline with electronic and manual hook release plus a loadcell, for payload measurement, completed the rig.

Two pilots were needed to operate the helicopter. One flew the machine while the other monitored the instruments. The helicopter carried a maximum of 400 kg of fuel, giving 40 minutes of operating time and a 20 minute safety reserve.

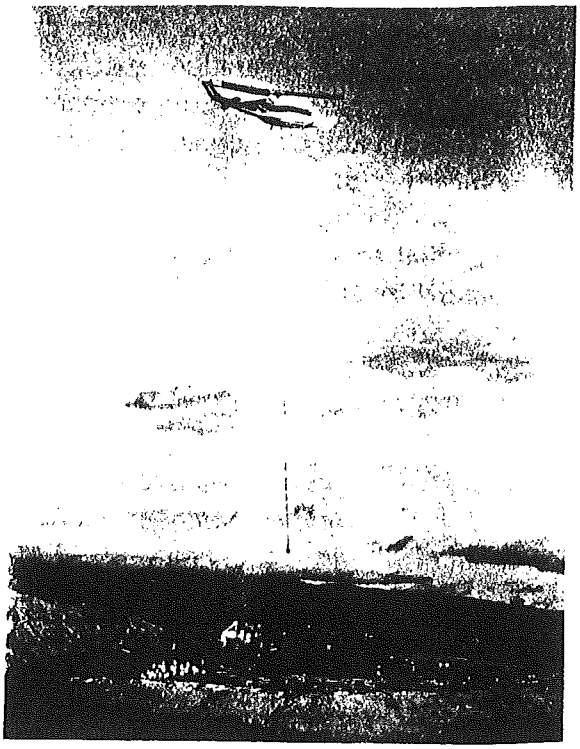

Figure 4 : Bell 214 ST Heavylift Helicopter with 50m Tag-line.

Initially a hot-deck system operated on landing 1 using a cable skidder and two loaders. This eventually evolved into a cold-deck system alternating between the two landings with the cable skidder being replaced by a third loader.

The heavylift capacity of the Bell 214 ST combined with continuous operation and short cycle times, meant that a very large amount of timber was extracted in a very short time. Congestion caused by trying to load out trucks in the hot deck situation using one of the loaders, plus woodflow problems with the cable skidder, instigated the change to the cold-deck system.

Landing one (Figure 5) was located at the highest point of the block, with landing two (Figure 6) located at mid slope level adjacent to the block.

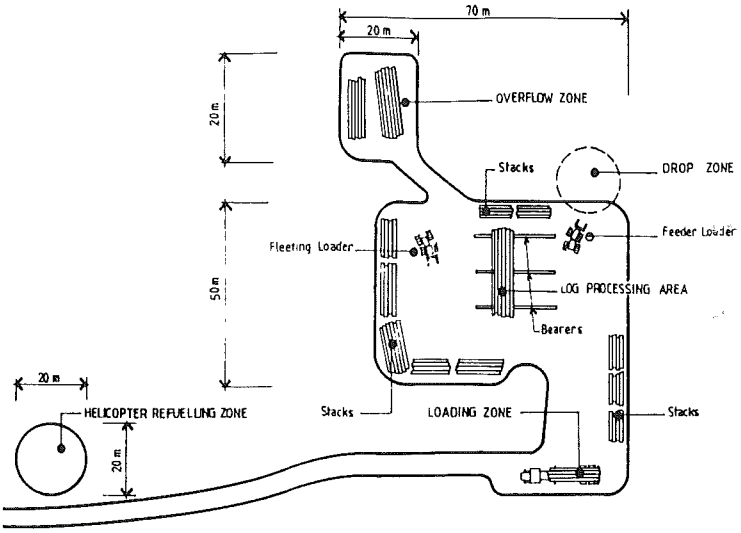

Figure 5: Landing One. (0.49 ha)

The loaders consisted of a Kawasaki KSS 80Z2 loader for clearing wood from the drop zone to the processing area, a Kobelco LK500 for fleeting and a CAT 950B for truck loading.

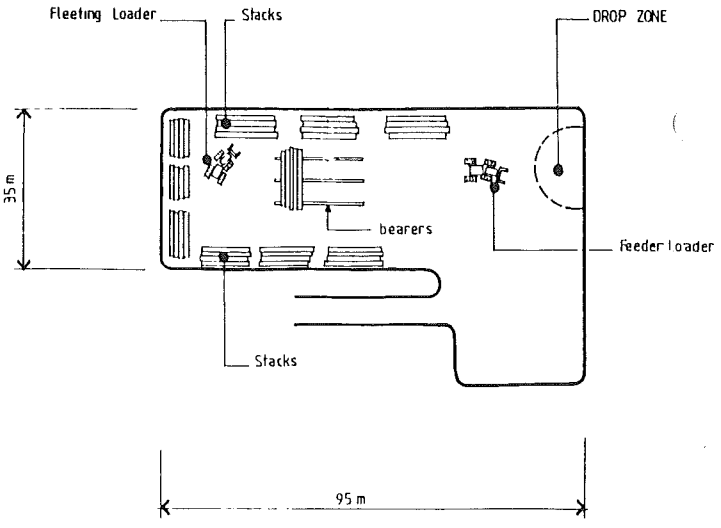

Figure 6: Landing Two (0.33 ha).

In this way a skid could function effectively using one loader to clear wood from the drop zone to the processing area, and a second loader to fleet the wood. This system would continue until the skid was completely full with fleeted timber. The helicopter would then be directed to the alternative landing and the two loaders would follow.

The third loader would then load out the full skid on his own, thereby leaving the helicopters production cycle totally unaffected.

Flight distances ranged from 200m to 1500m. The average cycle time, flying uphill over the full range of distances, was 2.05 minutes. Flying downhill, across slope and short uphill loads, had an average cycle time of 1.50 minutes. An estimated average payload of 2.5m^3 gave daily production rates between 700m^3 and 900m^3 for ten hours flying, depending on flight paths and climatic conditions.

Mean values for the period recorded

	Cycle Time Delay Free (Minutes)	Delays (Min/Cycle)	Pieces/Cycle	Refuel (Min/ Cycle)
Day 1	2.06	0.02	1.71	0.28
Day 2	2.03	0.03	1.70	0.22
Day 3	1.50	0.17	1.53	0.25

Figure 7: Helicopter Production Data.

Three fallers and five breakerouts were used and wherever possible the trees were delimbed and cut to length in the bush. To maximise payloads, the fallers carried log scale charts relating lod dimensions to weight. Fallers and breakerouts worked together to pre-strop optimum payloads ahead of the helicopter. The helicopter extracted timber alternating between three felling faces. Radio communication allowed the breakerouts and pilot to co-ordinate extraction points and times.

Landing personnel consisted of four skiddies, two full time logmakers, two strop retrievers and two machine operators. The total operation employed 26 people. The large number of people on the landing reflected the high productivity of the helicopter system.

DISCUSSION:

In this particular case, the helicopter harvesting system proved to be the most effective and successful system for overcoming both the environmental, physical and time constraints relating to compartment 6.

As overseas experience shows, especially in the USA and Canada, helicopter logging can be a viable alternative option to the more conventional harvesting systems in specific cases.

If this is so, then why is helicopter logging so scarce and uncommon in New Zealand?. Basically it can be traced to two major factors, the size and composition of New Zealands plantation forest resource, and the economic cost of operating a helicopter harvesting system.

It is fairly common knowledge that a helicopter is an expensive piece of machinery to purchase and operate due to high depreciation rates, replacement of fixed time parts, insurance etc... In order to spread these costs over a large income base, thereby reducing the average cost and charge rates, a steady continuity of work is required. If an operator knows that a machine will get 12 months steady work, then costs and charge out rates will tend to be lower than if that same machine only had 6 month work.

In New Zealand there is not the amount of areas which demand the use of a helicopter. This means that the continuity of work, that is an essential requirement in helicopter harvesting operations, cannot be obtained. Therefore any work done in New Zealand with a helicopter tends to be a "one- off" type operation. Consequently the operators costs are borne within that one operation resulting in a frightening hourly operating cost. For the Bell 214ST used in the Tangoio operation, the operating cost was $5000.00/hour.

Since the Tangoio operation, the helicopter operator has moved off-shore stating that there simply was not the work available in New Zealand to keep his machine here. Since his departure there have been no new operators fill the gap. So consequently there are no heavylift machines available in New Zealand with experience in forest harvesting operations.

The question has to be asked, "do we really require such a machine for our forest operations in New Zealand"?.

A recent investigation into enquiries from organisations considering the use of a helicopter system, showed that the most common reasons that such an alternative was considered was either due to high roading costs or selective native logging of private blocks. Environmental considerations did not seem to be a major restraint.

You would consider that as the environmental front gains more momentum within New Zealand, and legislation such as the Resource Management Act begin to take effect, the use of helicopter systems must surely gain more serious attention from forest planners and alike?, not necessarily !.

The Tangoio Soil Conservation Reserve is a prime example of an extremely environmentally sensitive site. When it came to the final decision on which harvesting system to use, it was not primarily the environmental factors that swayed the decision, but the time constraint.

It is fairly evident then that for New Zealands situation, cable haulers can effectively harvest 99% of our difficult and environmentally sensitive terrain, if time is not a severe constraint.

The harvesting of Compartment 6 of the Tangoio Reserve showed that commercial radiata pine clearfall operations can be successfully carried out by heavylift helicopters such as the Bell 214ST. The financial gain based on current economic returns alone remains debatable. Therefore helicopter operations are unlikely to replace conventional logging methods in New Zealand at this time.

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