Session 6
Paper (c)

A Potential Skyline System for New Zealand

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INTRODUCTION

The role of the harvest planner is to ensure that wood from his forest can be got from the stump to the market. The constraints within which every harvest planner must work include ensuring the operation is:

- physically feasible
- economically viable
- environmentally acceptable.

Although well known these contraints still hold true and continue to conflict with one another from time to time.

One constraint which is requiring increasing effort when planning the harvesting of steep and difficult terrain is the environmental impact of the plan, most particularly on water movement and sedimentation. This constraint has direct impact on access to the wood, both from the point of view of getting it from the stump to the hauler, and from the hauler to the main transport network.

Easily the majority of haulers working in New Zealand are capable of wood extraction by some form of skyline system. The advantage of skyline systems over highlead is their ability to fully suspend a load for transportation. The free suspension of loads minimises immediate site impact and may serve to reduce long term environmental damage. The main factors influencing full suspension include:

1. Deflection: The deflection, or sag in a skyline, has a direct influence on possible free suspended payload. The more the deflection, the better the payload (Fig 1).

2. Span Length: The longer the reach of a skyline the better, since this can reduce overall roading cost. However the longer the reach, the more deflection is required for the skyline to support both its own weight and that of a freely suspended load.

3. Chordslope: Chordslope is the least significant of the three factors, it gains in significance as it becomes large. The chordslope determines the distribution of the load between the skyline and the line controlling extraction.

The actual terrain dictates these factors and there are a number of skyline systems available for different types of terrain. The purpose of this paper is to introduce a

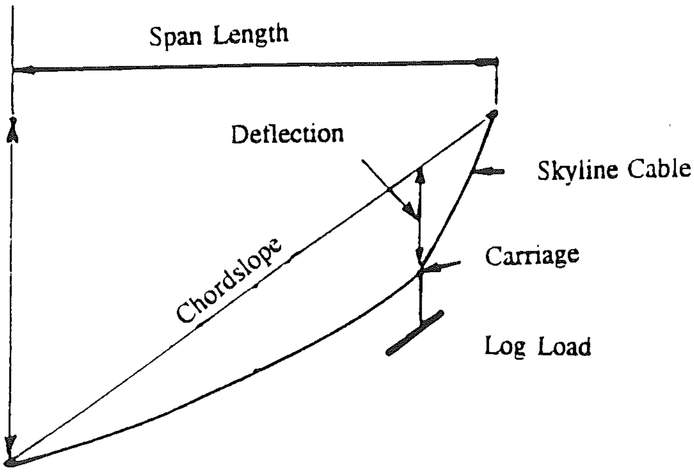

Figure 1 Factors influencing full suspension.

recent development in skyline systems for accessing timber where environmental and cost constraints are limiting.

SIDEBLOCKING

Sideblocking is the name given to an American system whereby the skyline is pulled laterally to one side. To do this a Dutchman block is placed on the skyline and attached to the tailrope. Sideblocking in the USA is carried out when shotgunning, and the tailrope is used to pull the skyline to one side before the carriage is returned to the bush. The difficulty of operating the hauler to spot the carriage over the next drag usually limits sideblocking to an extended lateral reach of only 30 metres.

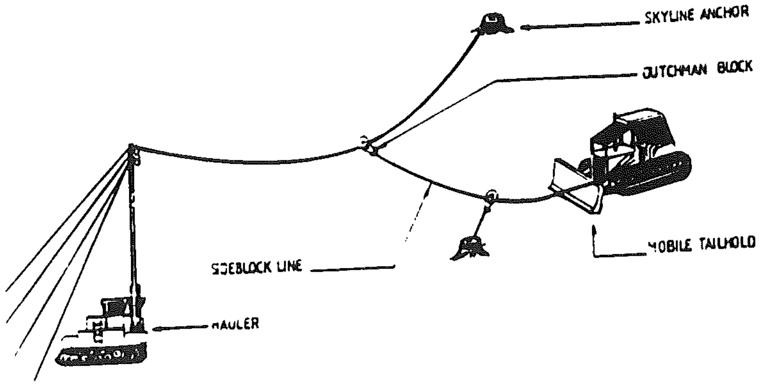

Figure 2 Skyline layout for Sideblocking.

During the past year sideblocking has been undertaken in New Zealand by one or two contractors. The basic system has been modified to enable the hauler to extract wood using a conventional Northbend system. Instead of using the tailrope to deflect the skyline, an extension is attached to the Dutchman block, passed through a block at an anchor and tied off to a mobile tailhold (Figure 2). The skyline remains permanently deflected for each skyline road. Road changes are made by pulling the sideblock line in with the mobile tailhold.

In a recent study by LIRO, sideblocking at Tairua forest was investigated in order to document the system as a niche application for maintaining deflection and facilitating lateral reach. A further objective was to demonstrate the use of the remote tension monitoring equipment for observing changes in skyline and sideblock line tensions as each new road was logged. The objective of this presentation is to introduce the side blocking system and some of the results from the study.

The area to be logged was the tail end of a spur dividing two streams (centre of Fig 3). The trees were to be extracted from right to left across the spur, as viewed in Figure 3. The stream over which they were to be extracted was bounded by an area of native hardwood interspersed with redwood trees. The timber company decided that protection of the stream and banks was necessary, and full suspension of payloads across the creek became a constraint to the logging of the setting.

The issue of sideblocking arose due to a large basin behind the spur giving no suitable tailholds for a span with enough deflection to suspend an adequate payload (Fig 4). The alternatives were to either form another road and pad, or, sideblock the skyline using high points on either side of the basin as sites for anchoring the skyline and sideblock line. The two trees in the background of Figure 4 mark the anchor points.

Planning for the system required careful analysis of the maximum offset angle to be imposed on the skyline by the sideblock line, to ensure tensions in the sideblock line would not be exceeded. The system

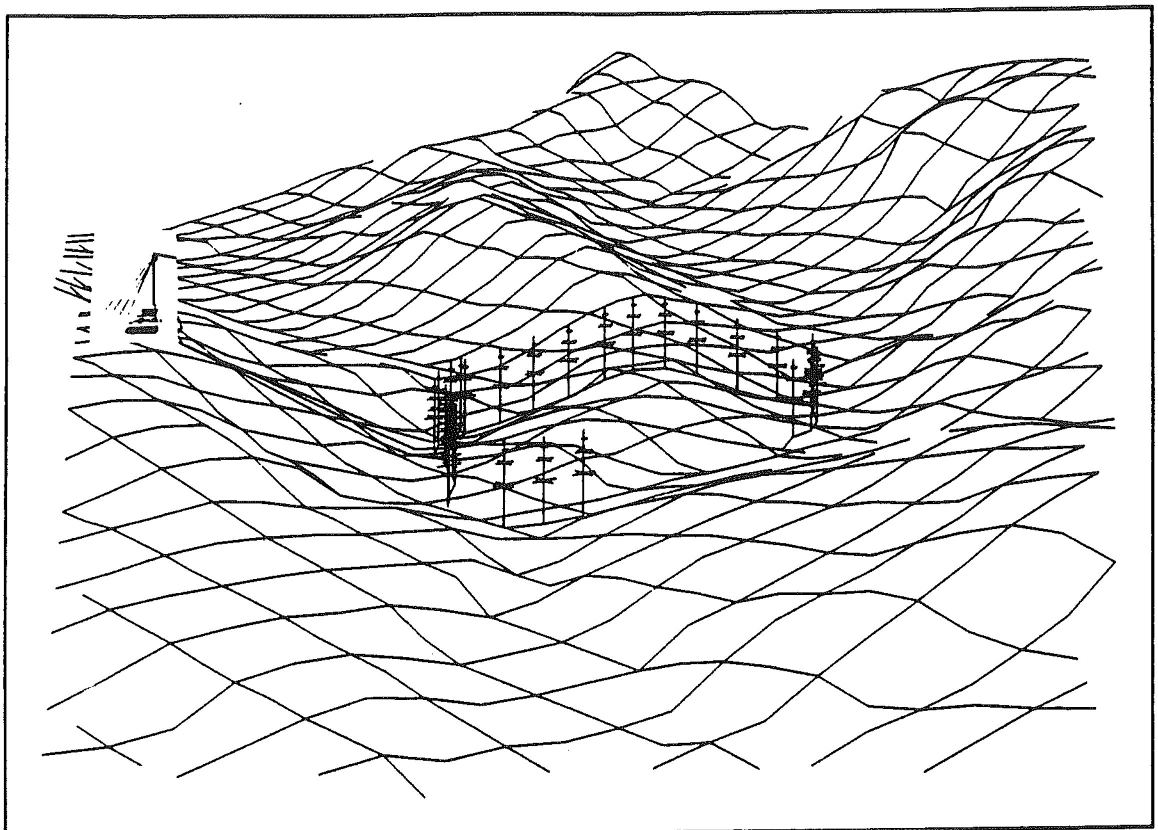

Figure 3 A view of the spur, and the setting to be logged.

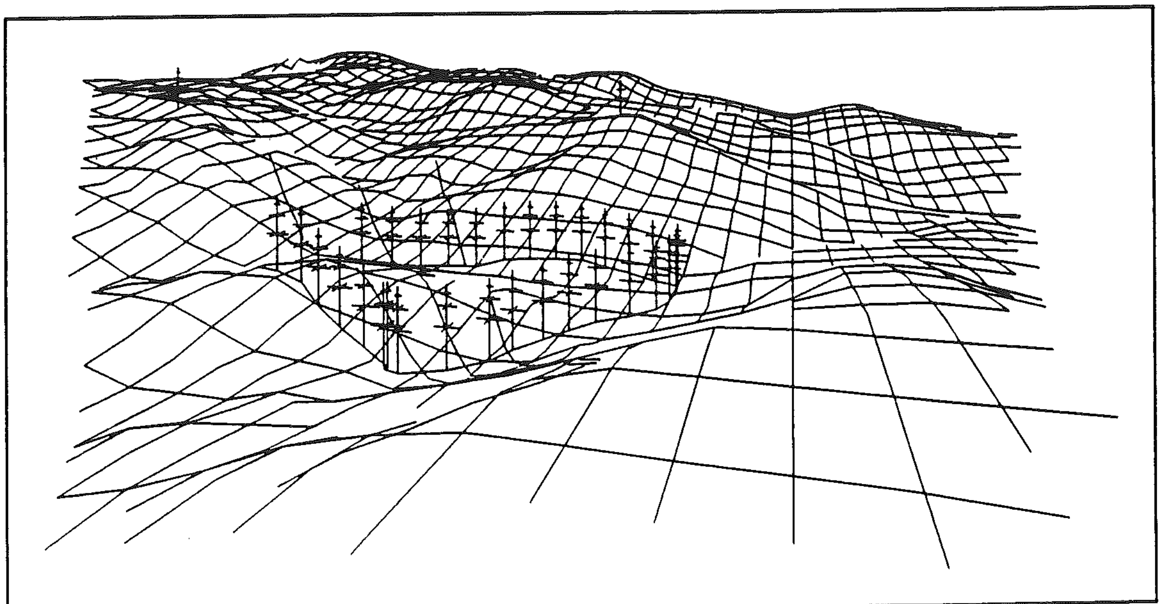

Figure 4 A view of the setting from the hauler pad (foreground).

was then checked to ensure suspended payloads of a reasonable size were feasible.

A Madill 171 hauler with 600m of swaged 32mm skyline was to be used for logging the setting. The horizontal span from the hauler pad to the skyline tailhold was 650m. A 200m skyline extention was added and a further 500m extra rope of skyline strength was also needed for the sideblock line.

A block with a sheave diameter of 61cm was used for the Dutchman block. The sideblock line was attached to the Dutchman block and passed through another block at a deadman anchor before being tied off to a Komatsu D65 mobile tailhold. Skyline shifts were facilitated by using the mobile tailhold to pull the skyline to each new position.

The felling of the stand was done in a manner to minimise impact on the stream. Trees were directionally felled away from the stream where it was safe and possible to do so. Other requirements for felling included:

- no heading off within 40m of the stream
- trees which had to be felled across the stream were not to be limbed or headed off.

During the extraction of the setting three different skyline roads were logged (these are the three radial lines extending from the hauler pad in the foreground of Fig 4). LIRO collected tension data from both the skyline and sideblock line for each extraction road. Every tree and piece from each drag was scaled to quantify the drag volume and estimate the payload.

When the system was rigged the sideblock line used was 28mm diameter rope. As a result, the sideblock line with safe working load of 17 400kg's, became the limiting line in the system. Using the LIRO remote tension monitoring equipment enabled payloads to be monitored and adjusted to ensure the ropes were not overloaded significantly.

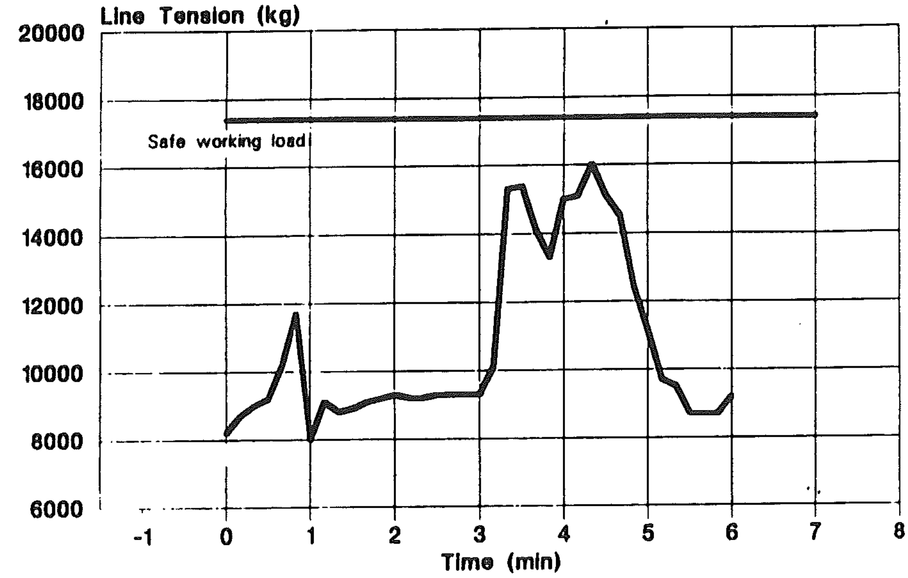

Figure 5 Sideblock line tension for a single drag.

Tension data showed a regular pattern for each extraction cycle (Fig 5). The peak during the returning of the carriage to the bush (0min - 1min) was due to the tail blocks being under the skyline. The downward pull of the tailrope during the last part of the return phase caused an increased load in the skyline. These peaks increased if the tailblocks were offset laterally to facilitate a bridle.

The two peaks occuring during the hauling in of the drag (3min - 5min) occured regularly for drags pulled from the blind side of the ridge. The first peak occurred as the trees reached the top of the ridge. At this point the operator would raise the skyline to get the butts of the trees clear of the ridge. The following reduction in tension occurred as the trees slid down off the ridge. Tensions then increased as the drag was lifted to full suspension.

During the planning of the setting, it was realised that as the skyline was pulled further away from its natural path the sideblock line would share an increasing proportion of the load. The tensions shared by the two lines would equalise when the angle imposed on the skyline equalled the angle between the skyline and the sideblock line. At this point the effective safe working load of the system would be that of the sideblock line, being the weaker of the two lines.

At the point where the angle between the ropes equalised, the possible suspended payload was estimated as 3.9 tonne for a slackline system (Logger PC Payload Analysis Package). The third skyline logged was at the equalising point of the system. One payload extracted was 3.4m^3 which exceeded the safe working load of the system (Fig 6).

It is expected that the different method of rigging the Northbend system contributed to the smaller than predicted permissable payloads.

Sideblocking appears to be a feasible system with a niche application for difficult terrain. The issues of productivity and cost still need to be worked through, however, as a system sideblocking has potential where difficult terrain negates the feasibility of other systems.

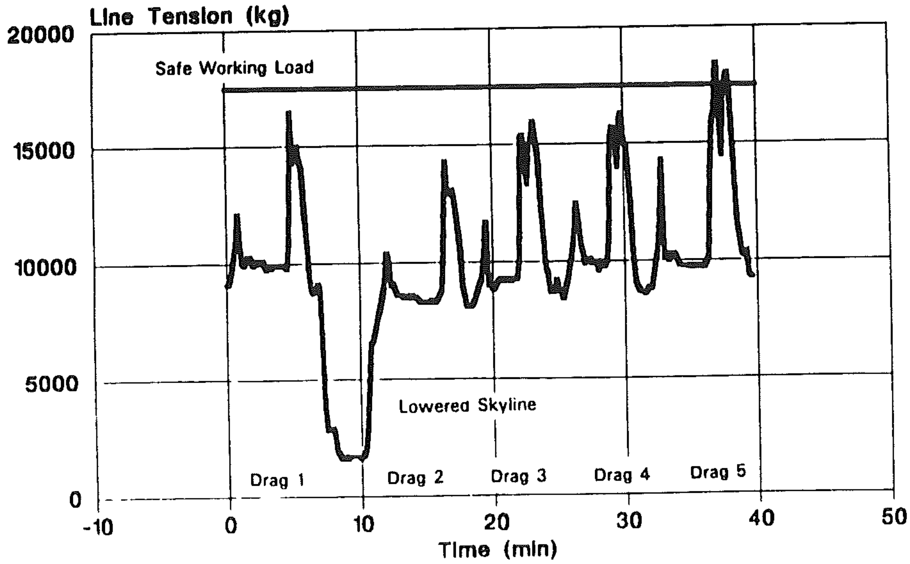

Figure 6 Sideblock tensions from study extraction road 2.

SUMMARY

The use of sideblocking has arisen from the combined skills of contactors and planners. Good communication between these groups prepares the way toward becoming technologically better. The right attitude from both parties will stimulate innovative ideas which need to be carefully engineered and planned.

For a new system such as sideblocking to be picked up and used by industry a process of development is vital. The developmental process requires nurturing from all parties involved. It is during this time that the implications of the system, it's benefits and costs can be fully quantified. When this has been done, the system can be fully descibed to industry.