Session 5
Paper (d)

M U L T I S P A N S K Y L I N E S

A Paper For N Z LOGGING RESEARCH ASSOCIATION

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INTRODUCTION

Multispan skyline systems have been used in N Z in cable thinning and more recently in clearfell operations on a very limited scale. With a large increase in cable logging forecast over areas where roading predominantly is a considerable expense, the use of multispan systems will be considered by many planners and operators as a potential harvesting tool.

While there are a number of research papers available on multispan logging, there is very little hard operation data or local experience to drawn from. This paper details N Z Timberlands East Coast's findings and perception of the multispan system following implementation of N Z's first medium size clearfell multispan unit.

WHY MULTISPAN

The multispan is used to skyline logs over terrain that will not otherwise allow deflection for sufficient payload. (See Fig. 1).

Where there is a blindspot multispans will save the use of building more road to reposition the yarder. (See Fig. 2). When skyline payloads are restricted because of the landing versus logging-slope angle, multispans are capable of raising the system productivity. (See Fig. 3). In the case of convex slopes the use of multispans will provide higher payloads and less roading for an otherwise less efficient yarding operation.

In most multispan operations a slackpulling system is used to carry out lateral yarding. The fixing of the skyline in the multispan jack allows for an improved vertical lead angle. This reduces break out force and improves the skidding restriction to the skyline road. (See Fig. 4).

Fig. 1 Multispan over even or convex slope

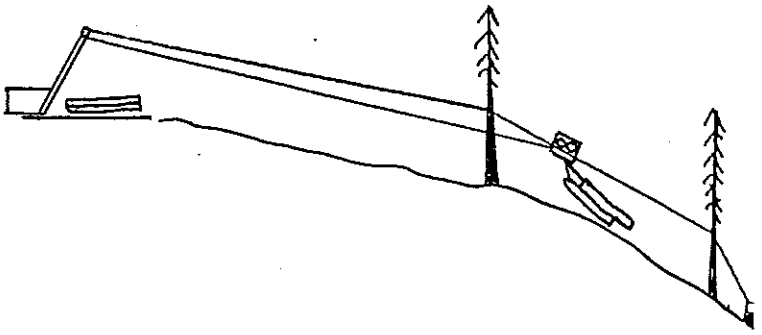


Fig. 2 Multispanning a blindspot

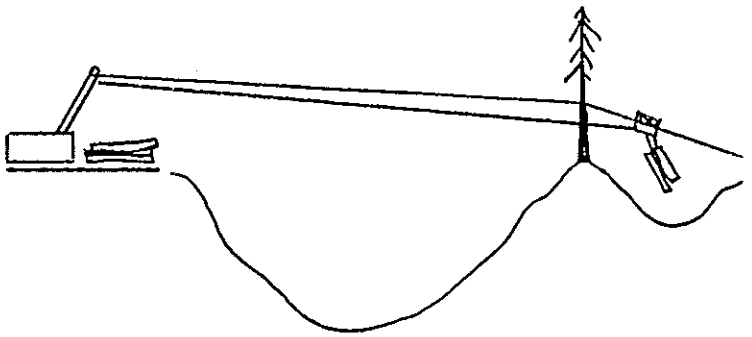


Fig. 3 Multispanning onto the landing

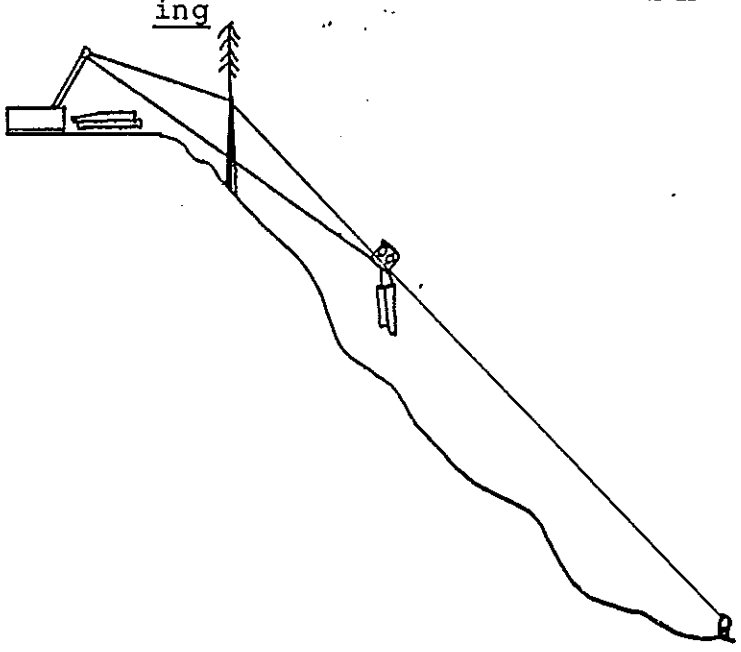
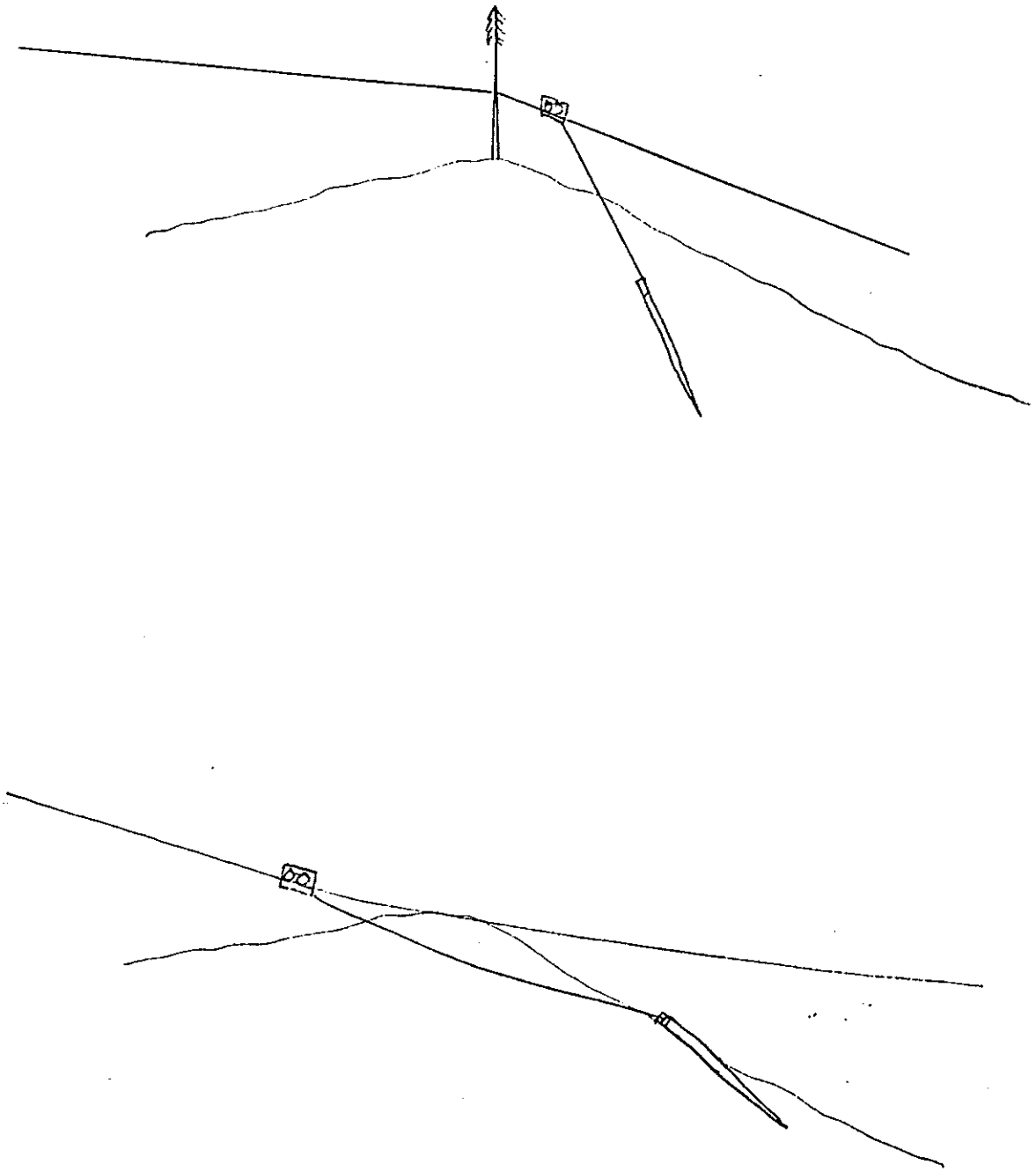


Fig. 4. Breakout lead angle Multispan versus Skyline.



USING A MULTISPAN SYSTEM

Common ingredients of all multispan logging systems is a skyline support and an open sided carriage that will ride over the support. The support is often termed the tree jack and the open sided carriage is either purpose built, such as the Koller carriage or modified using a multispan truck. When going to the trouble of rigging a multispan it is normal to have a static skyline logging system with a slackpulling carriage to facilitate lateral yarding.

The tree jack can be rigged in either of three ways.

Fig. 5 Double tree support rigging

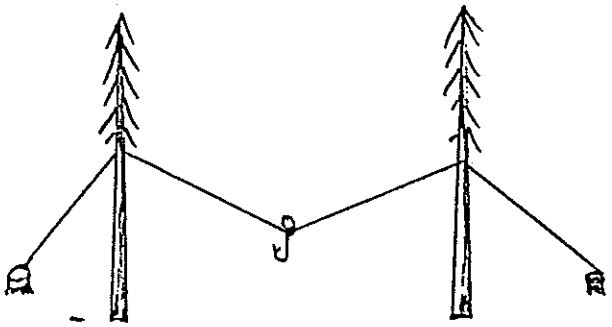


Fig. 6 Leaning tree support rigging

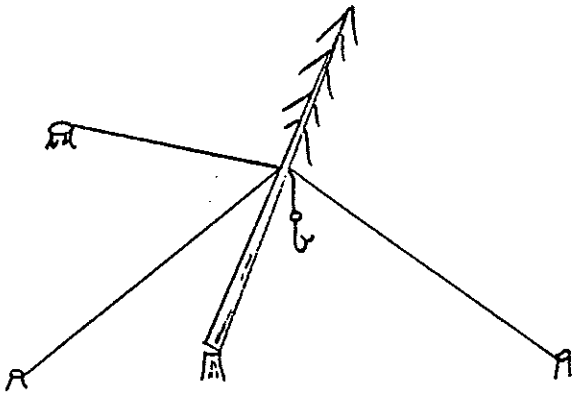
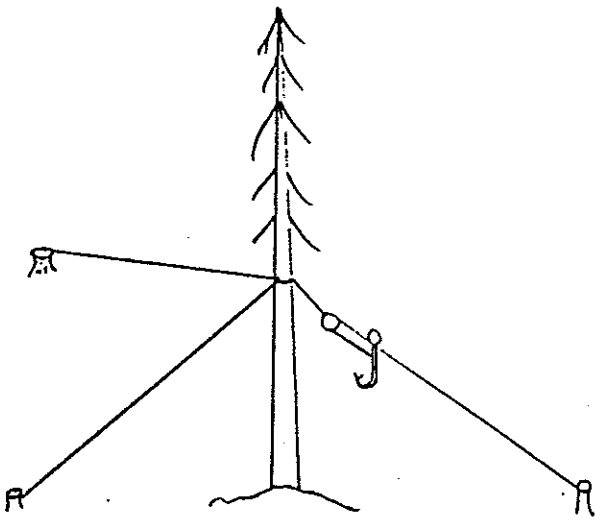
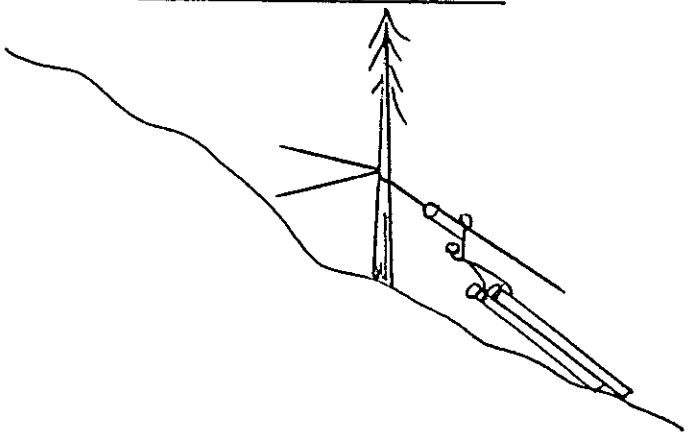


Fig. 7 Single tree support rigging



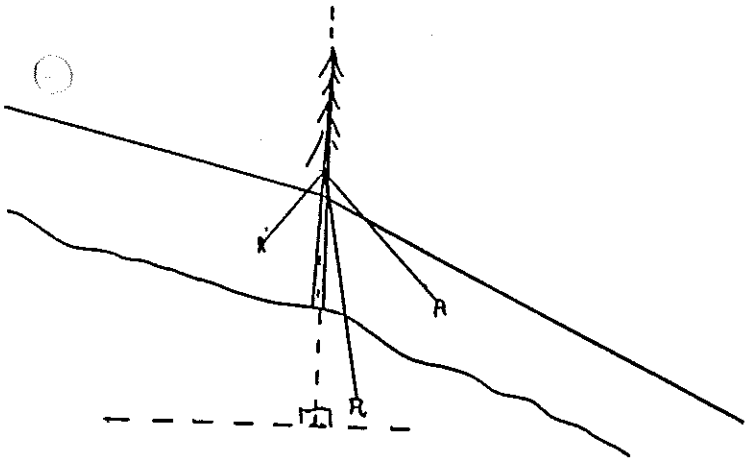
The double tree support is common in thinning operations where the skyline is retrieved at the end of each corridors production. We have used the single tree support in our clearfelling operations so that when moving the skyline to the multispan road you can, in at least half the cases, just move tailhold and winch over the line. Complications arise when you are moving the skyline tailhold downward on a sideslope pulling face. In such cases the skyline is best rigged on the downhill side of the support tree so that incoming logs swing away from the tree. (See Fig. 8). If rigged to the uphill side, the logs drag up to and turn around the support tree resulting in unbalanced force moments on the truck. The truck will tend to derail from the skyline and fall off or may bend from the forces acting upon it.

Fig. 8 Rigging to the downslope side of the support



The positioning of guyline stumps around the support tree requires careful attention. The desired resultant force on the support tree is vertically down the tree trunk. The change in the angle of the skyline running into the jack compared to that running out of the jack, the angle of the upright tree to the skyline and the required skyline tension will also effect the placement of guylines.

Fig. 9 Guyline Positioning for Single Tree Support



The height and diameter of the support tree at the rigging point will depend upon the skyline size, the profile being logged over and the truck/carriage sizes being used.

Two points to aim for are:

1) the change in skyline angle to be no greater than about 10° (tensioned, unloaded) and

2) the distance between the carriage-choker attachment point and the ground to be no less than 3 metres.

The selection of a support tree is often made for you in that you choose the best tree available at the spot you need it. To support the skyline, the payload and the forces exerted during inhaul the support tree should:

1) have a straight sound trunk

2) be free of oversize limb whorls likely to weaken the trunk strength

3) be soundly rooted

4) be of no lesser diameter at rigging height than that acceptable for a tailspar.

Multispans are used with skylines up to 1⅛" diameter. Over that the rigging gets to be heavy work and the trees may often be too small to safely support load forces. The Interstate, Danebo Drumlock, Danebo MSP, Koller, etc, mechanical slackpulling carriages are ideal for the multispan system. An adaption (truck) for all but the Koller and Wysseen carriages is manufactured by Danebo (Ross Equipment Ltd) in Oregon. The MSP carriages are shackled to the bottom of the truck which rides on the skyline and crosses over the support jack.

Multispans will not work as effectively with North or South Bend skyline systems.

THE COST TO SET UP FOR MULTISPANNING

Multispan jacks and carriage attachments for thinning yarders have been bought and made up over the years with varying degrees of cost and success.

Timberlands East Coast purchased in 1987 a Danebo multispan unit which included two tree jacks and a truck suitable for use on an 071 Madill with 1 inch skyline.

This unit cost NZ$8,000 landed in Gisborne. The unit arrived in N Z with damaged bearings and incorrect sheave and jack channel diameters. Subsequent backup from the supplier was in our estimation very poor. We rebuilt the unit to handle 1" skyline and modified the jacks to use on a single tree support. (The standard Danebo jack is only suited to double tree supports). We have also had to straighten and strengthen the truck unit. I was warned by operators in the Pacific North West that their Danebo trucks were bending (after we'd bought it!) but since strengthening they appear to hold up okay. Timberlands East Coast have been through a considerable learning curve at some expense, with the result that we now have a unit we are confident in.

For anyone interested in multispanning in N Z, I would suggest that local engineers could build a modified Danebo type unit along the lines of Timberlands East Coast's one, for a portion of the cost of importing and modifying overseas models. One Australian operator who regularly multispans from his Lotus yarder has built his own truck, etc, and reports low cost with minimum operational failures. This Australian model incorporates sections of pipe over the rope running through the jack as a means of stopping the skyline bouncing free. The truck rides over these pipe sections with minimum sheave/rope wear. On the East Coast/Danebo model the skyline sits free in the jack channel and will at times pop out.

Rigging is required to rig the jack into the support tree. For the single tree support the following ropes and shackles are required.

Item	Diameter	Length	Other	Cost
Headstrop	1"	2m	Choker/ ferrule/ eye	$160
Support Line	7/8"	35		$300
Guyline 1	3/4"	30		$250
Guyline 2	3/4"	30		$250
Block	10"		For support line	$600
Shackles 4	1"		For guys etc	$250
Rope clamps 12			For guys	$100
				$1,910

Two sets of rigging are required so that consequentive lines may be prerigged. Assuming a N Z built truck and two jacks could be sourced for $4,000 the total cost to set up, including two sets of rigging ropes, etc, would be around $8,000. Climbing gear is not costed into this exercise as it is normally a standard cable logging item.

IS THERE NAY SPECIAL PLANNING REQUIRED FOR A MULTISPAN

Skyline logging is a science that produces best results following the best preplanning and analysis. Multispanning complicates the basic functions involved in skyline logging. Some overseas operators are very pro multispanning, whereas there are others who say "I'll multispan if theres no other way of doing the job". Our own experience on the East Coast has highlighted the need to analyse profiles, guyline placement, etc, well before the job is due. Without the most precise preplanning there is a high probability of delays or failure during the operation.

Common delays occur as a result of the skyline jumping off the support jack, the multispan truck becoming derailed or falling of the skyline and from the jack being rigged too close to the tree. When the skyline jumps of the jack the support rigging has be to lowered and reraised with the skyline in place.

This can cost ½ to 1 hour. If the truck falls off the skyline its normally close to the support jack. Being on a prominent point amid two spans its normally too hard to pull enough skyline slack down to re-thread the truck. Hence again the easiest solution is often lower the support jack and reraise with the truck back in place. An alternative if the contour's not too steep, is to drag the truck and or carriage forward with the mainline to a position where the skyline can be refitted after slacking it down.

If the jack is rigged too close to the support tree logs will become caught on the opposite side and jam, or the support will not hang vertically, causing derailment of the truck and possible damage to equipment. Taking account of the effects of load, tensioning, log lead and position under the jack is the key to avoiding these delays.

By far the greatest effort in achieving successful multispanning is in the logging planning phase. If a need for multispan is recognised then the practicality of multispanning that line or lines needs to be checked in advance, i.e. support tree availability, tailhold position on compass bearing from spar through support (jack position), change in angle of skyline, required rigging height of tree, support tie back locations relative to support and relative to the lead.

Timberlands East Coast have used their intermediate support on six occasions now, each time in an area where map definition was poor, (we are using 5 chain to the inch). To be sure of the contour we field measured the profiles. "Logger P.C.", the cable logging computer package supplied and updated by Oregon State University forms the basis of the production analysis.

Logger P.C. will draw the profile on screen from which you can alter the position and height of the intermediate support. This will provide a more accurate assessment of where you should position the support and what theoretical payload will result for production.

With the preplanning complete and the planner satisfied that no easier method exists to harvest the area, it is then necessary to return to the field and spray mark the required support trees and tie back stumps. Fallers will then take care to leave high stumps where required, leave the support trees standing undamaged and to fall around the support area in a fashion allowing uncomplicated breakout.

The other pre-use task involved in multispanning is the equipment check. Items like shackles, blocks and rope clamps are general equipment which tend to be used elsewhere. Ideally, your multispan kit should be in its own box, to be checked for contents prior to the moment you want to rig the multispan.

HOW LONG TO RIG MULTISPANS

The total time required to set up a multispan is ½ day. Items are as follows:

- carry in gear	1/2 hr
- climb and trim tree (includes rig lifting block)	1/4 hr
- lift and fix headstrop block and 3 guys to tree	3/4 hr
- notch three stumps	1/2 hr
- pull down and clamp 2 guys (3-4 men is best)	1/2 hr
- move skyline to support line tailhold and wire into jack (3-4 men)	3/4 hr
- raise 3rd guy/support line and clamp (use strawline or winch)	1/2 hr
- fit multispan truck/carriage at landing done during course of moving skyline	0
Total Time Required	3 3/4 hrs

of which 2½ hours is prerigging and 1¼ hours is yarder delay. To achieve these times the gear must be on hand, the riggers proficient and the support be rigged on the side of the tree that the skyline is working on (otherwise it will have to be yarded in and placed back out on the other side of the tree). Two men easily perform the prerigging while the last 1¼ hours requires the whole crew to perform line change, carriage set up, raise last guyline, etc.

To derig the multispan the 3rd guy is dropped, 1st and 2nd guys dropped, tree felled and skyline moved to its new position. Equipment retrieval is about 1 hour for two men.

WHAT EFFECT ON PRODUCTIVITY

To effectively use multispans the majority of the rigging should be prerigged. The delay to the yarding unit is then 1¼ hours, about twice the average skyline shift time.

During operation the multispan is perhaps marginally slower than single span yarding. It is normal for the operator to reduce inhaul speed on approaching the jack but the delay as compared to single span is but a few seconds.

If delays occur as itemised in the "Special Planning Required" section then productivity could reduce to around 50%.

On the positive side, the use of multispans will normally increase payload ability (as much as double), reduce roading and reduce damage to the butt rigging during otherwise blind-leading operations.

Multispans are not designed to increase yarding distance. They are designed to increase the productivity over difficult settings and to provide access to timber which for reasons of environment, economics or tower height would otherwise be unloggable.

SUMMARY

Multispan Skylines have not had extensive use in N Z as yet. The expansion in cable logging now occuring in N Z will provide opportunities where multispanning can reduce costs and access timber otherwise difficult to harvest.

N Z operators would be best to engineer their own multispan equipment rather than purchase the unknown at excessive cost from overseas. Timberlands East Coast in conjunction with L.I.R.A. have pioneered a system and equipment suitable for clearfelling second crop using mid range yarders such as the Madill 071.

There is a degree of expertise required in correct planning for multispans. Without planning and field survey of sufficient quality multispans become troublesome and will cause excessive operational delays.

Without correct planning suitable equipment and proficient field use, multispans will increase productivity. Because there is a cost in labour and yarder delays to set up a multispan, their use should not be contemplated unless there's sufficient timber on the line to adequately compensate for costs.

Multispans are designed for slack pulling skyline systems. The object of the multispan is to increase the deflection and thereby the payload over resultant shorter spans. Multispans are not efficient in extending yarding beyond the normal productive distance.