

INTERMEDIATE SUPPORTS

(A REPORT BY DENNIS NEILSON, TASMAN PULP & PAPER CO. LTD.)

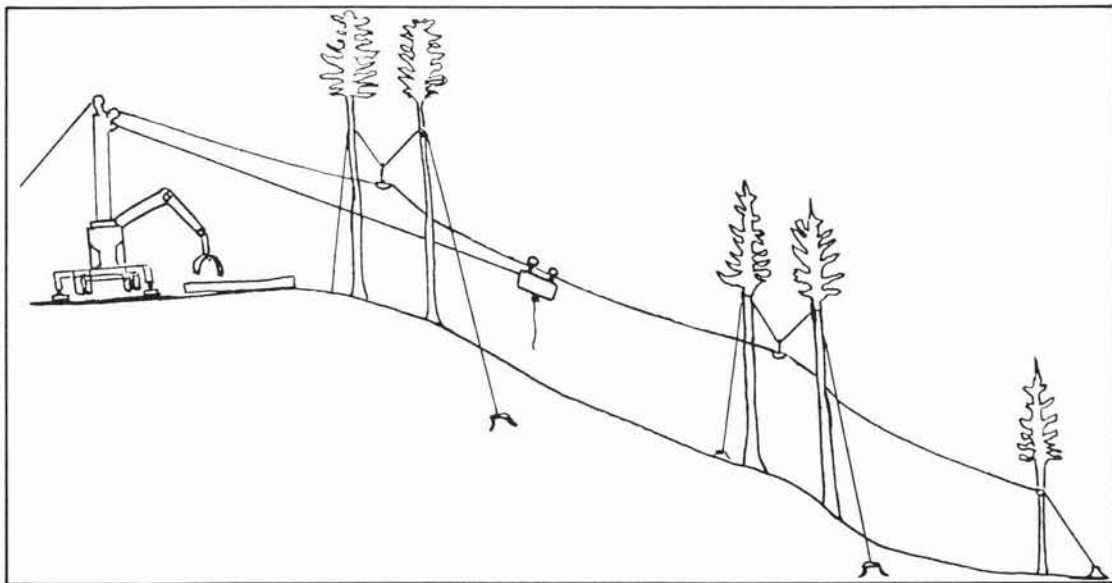
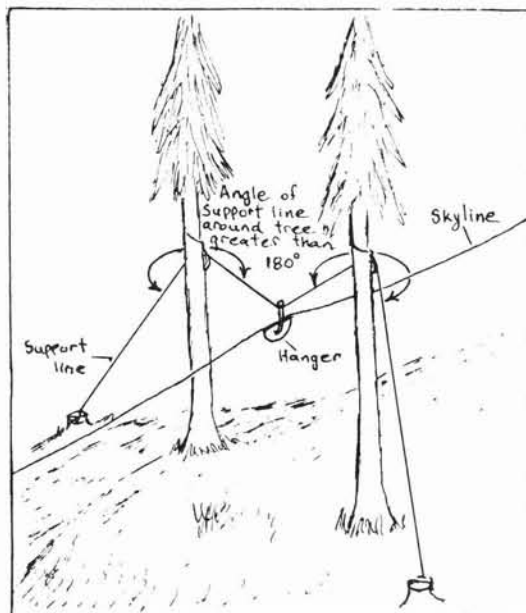


Figure 1. Intermediate Support System

ACKNOWLEDGEMENT

LIRA is grateful to Dennis Neilson of Tasman Pulp & Paper Company Limited for his contribution in writing this report.

This report is the fourth in a series describing cable logging systems that aim at encouraging wider use of methods suited to specific N.Z. conditions.



The use of intermediate support systems to extend skyline yarding distances on constant slopes or convex terrain has been a relatively common practice in Europe for many years, and on occasional downhill yarding sites in the United States since the early 1950's. However, there has been a lack of widespread acceptance of supports as used by Europeans because of the time required to rig the support systems at each skyline road change.

Recent developments in the United States and here in N.Z. have significantly reduced rigging time and so have reduced one of the principle objections to the use of intermediate supports.

Figure 2. Hanger Support Line Layout

WHAT IS AN INTERMEDIATE SUPPORT ?

If the deflection on a single span skyline is inadequate to carry an economic payload, or if adequate clearance cannot be obtained, it may be possible to raise the skyline at a critical point to improve deflection or to obtain the necessary clearance. The device used to raise the skyline is called an intermediate support. Also, an intermediate support rigged close to a landing enables a small hauler with a short tower height, to operate effectively where lift over the edge of the landing is a problem.

The support system consists of a line hung from one or more trees with a jack or hanger* on which the skyline rests. The skyline is not secured to the hanger but is free to slide through it. A variety of support designs have been used but one of the most simple and practical for N.Z. conditions is the use of two support trees with a support line attached to each and the hanger suspended between. (See *Figure 2*). Any number of intermediate supports may be used on a skyline road - the only limiting factors are the hauler's rope capacity and power.

EQUIPMENT FOR INTERMEDIATE SUPPORT SYSTEMS:



The type and size of support equipment required in any situation will depend on the hauler, rope sizes, and the weight of logs to be extracted in each haul. However, it is important to minimise the weight of gear used for multi-span yarding subject to safety standards being met. Moving the hanger and the support line and raising the support line is normally carried out manually and the lighter the gear, the less effort and associated lost time required to rig the support.

Figure 3. Photograph of Hanger and Open Sheaved Carriage

SKYLINE HANGER AND SUPPORT LINE:

The hanger consists of an offset coupling bar suspended from the support line and an attached plate on which the skyline is supported. The skyline must be held in the plate groove to prevent it jumping off and this can be done by attaching brackets along both sides of the plate groove. The support line is generally the same size or smaller than the skyline rope being used.

* The words 'hanger' and 'jack' are synonymous in this report.

SKYLINE CARRIAGE:

To pass over the hanger, the multi-span skyline carriage requires open-sided sheaves and must have an offset coupling arm between these sheaves and the mainrope blocks below the carriage. (See Fig 3.)

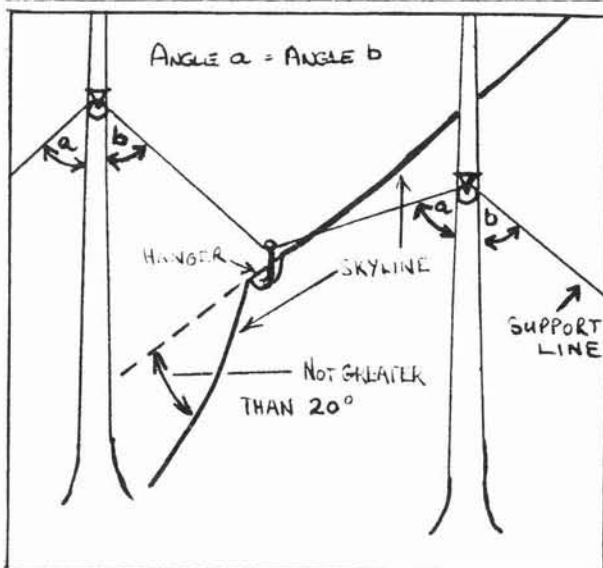
Multi-span open-sided carriages are currently being used in pulpwood thinning operations at N.Z. Forest Products Limited. Haul volumes up to 1.5 m³ are being extracted with open-sided carriages weighing 25-30 kg compared with a conventional single-span carriage which may weigh only 15-20 kg. A disadvantage of this extra weight is that the carriage tends to move off downhill while the breaker-out is trying to pull slack unless a stop is clamped on the skyline or the carriage is held by some other means. (The Wilhaul skyline uses the straw-line to hold the carriage in place.) A recent United States adaption of attaching a locking carriage (Christy) to an open-sided traveller had given the ability to use a gravity return system with multi-span yarding. Although this method requires good chord slope over the total skyline length, it has the potential to increase production through increased control over the incoming logs.

Typical intermediate support equipment (including hanger, carriage, blocks, and ropes) designed for harvesting 15-20 year old Radiata thinnings would cost \$500-\$600 compared with a simple carriage adequate for single-span operations costing approximately \$100

RIGGING METHOD:

The support line should be attached to a stump or tree, pass through a block in the first support tree, through the hanger, through a block in the second support tree and attached back to a second stump or tree. A suitable lightweight ladder, or some other means of climbing trees, will be required to hang the support blocks. The support is best pre-rigged, with final positioning completed after the skyline has been fitted into the hanger groove. Pre-rigging reduces skyline shifting time which, in some current thinning operations, takes up to an hour per day. The rigging time should not exceed 40-60 minutes with experienced personnel.

PLANNING AND DESIGN REQUIREMENTS:



It is important to ensure that the size of the support rope and the support trees are adequate to accept the stresses imposed by the planned skyline haul volumes. The angles of the support line into and out of the support tree blocks should be equalised if possible so that the vertical forces are directed straight down the tree and no additional guylines are needed. (See Figure 4.) The support line should be anchored to a stump or tree so that it makes a slight angle at the support block. (See Figure 2.)

Figure 4. Critical Angles for Rigging Hanger*

This will also help ensure that the vertical force is straight down the tree and will help prevent the tree bending. Overseas experiments have shown that the tension placed in the support line for a typical configuration is significantly less than the tension in the skyline. (See Figure 5.)

In order for the carriage to pass the hanger, the grade change in the skyline at the support cannot be too great. For uphill hauling this break should be no more than 20 degrees. (See Figure 4.) This problem is not so critical with downhill extraction.

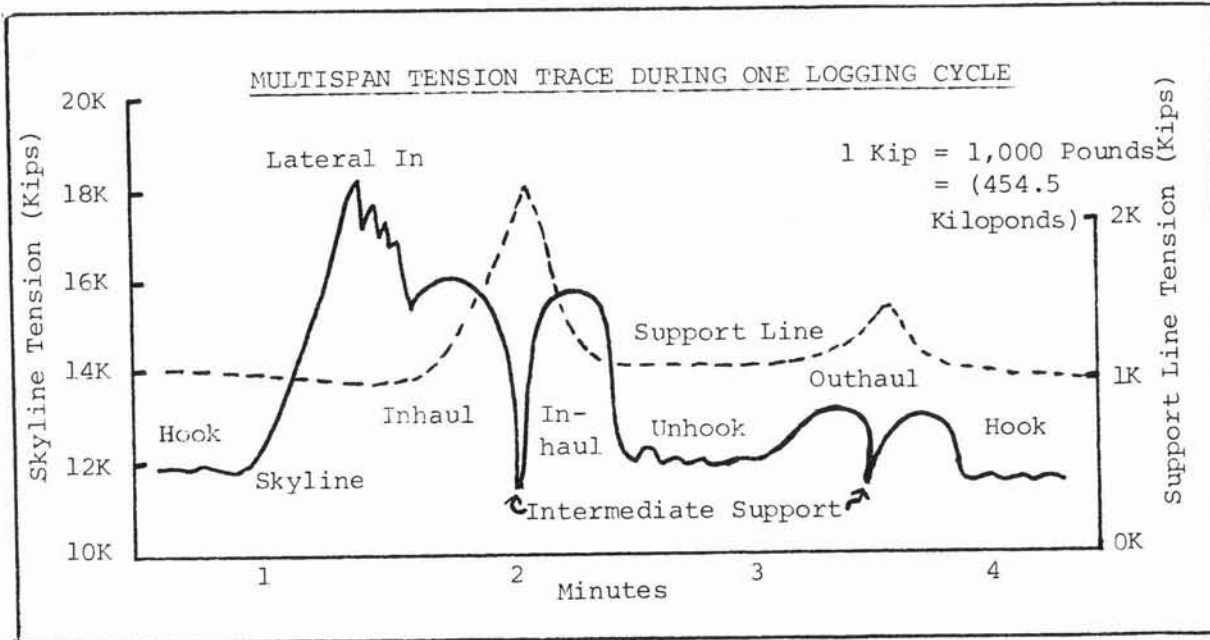


Figure 5. Tensions Recorded in a Typical Cycle

SUMMARY

The use of intermediate support systems in N.Z. is a relatively new field although they were used with the Wyssen haulers operated by the N.Z. Forest Service in the early 1960's. Major advantages can be obtained by their use at little extra cost.

Intermediate support systems operate most effectively on uphill hauling where convex slopes do not allow sufficient clearance beneath a single-span skyline. In current skyline thinning operations for pulpwood at N.Z. Forest Products Limited, the increase in the amount of country available through using intermediate supports has been substantial, both for uphill and downhill extraction. The contractors on these thinning operations use the supports only on extraction tracks with critical skyline clearance.

The amount of roading required to harvest an area could be reduced by the use of intermediate supports. Extending yarding distances on adverse slopes and enabling small machines with limited lift to operate are other advantages. These are important especially where stand volumes are low, road costs very high or in environmentally sensitive areas.

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