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Evaluation of the Model 9 Micro Master Yarder

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PREFACE

This Technical Note is part of FERIC's continuing series of evaluations of small cable yarders designed for interior and coastal British Columbia smallwood. Fifteen previous small yarding machine evaluations were covered in FERIC reports TR-8, TN-19, TN-31, TN-40 and in Interim Report #378-1.

FERIC is grateful to Joe Morrison and Dennis Ozero of Micro Logging Systems, Parksville, B.C. for their cooperation and assistance in conducting the study. Appreciation is also extended to Pat Phillips, Divisional Forester and John Peyton, Forestry Wood Supervisor of MacMillan Bloedel Limited's Northwest Bay Division and to the Micro Master yarding crew.

All quantitative data are presented in SI units, with Imperial units shown in parentheses.

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SUMMARY

This Technical Note is one of a continuing series of evaluations of small cable yarders suitable for yarding in clearcuts or in thinnings of interior and coastal British Columbia second-growth timber. This study examines the Model 9 Micro Master yarder, a skidder-mounted yarder fabricated by Micro Logging Systems in Parksville, B.C.

The Micro Master features a 9-metre (29-ft) tower with a four-drum winch set, mounted on a Model 404 Timberjack rubber-tired skidder. The cost of the complete, fully-rigged yarder mounted on a reconditioned carrier is $94,000.

The yarder was studied in the fall of 1981 while working in a small second-growth clearcut on Vancouver Island. As a result of natural lean, felled timber was often out-of-lead with the yarder. This caused both cable and wood breakage. The contractor and crew have occasionally reached yarding distances of 300 metres (1,000 feet) and have suggested a distance of 260 metres (850 feet) as optimum for smallwood thinning. In this clearcut trial, setting design restricted yarding distance to a maximum of 140 metres (450 feet). The manufacturer has plans for an intermediate support system to reach distances up to 600 metres (2,000 feet).

During the detailed time study, the two-man crew (engineer/chaser and rigging slinger/chokerman) averaged 3.2 pieces per turn at an average total turn time of 5.96 minutes. This included pro-rated road changes and minor delays. For the full clearcut study, average daily production was 246 pieces, or 112.5 m^3 (39.7 cunits).

The Micro Master experienced some minor problems during the 16-day study. A rubbing mainline clutch pad in concert with lightweight chokers slowed or prevented choker descent from the carriage. Also, during the study there were ten occurrences of broken lines; five for the mainline, three for the haulback and two for the skyline.

The Micro Master compared favourably with other small pipe-tower yarders, including the Rosedale Machine Shop Ecologger I, the Madill Mini-Spar and the Steyr KSK-16. The Micro Master exhibited the highest observed piece count per

man-day and the fastest observed average line speeds. The winch set provided adequate yarding forces. Crew size was one-half that required by the other yarders and the purchase price of the Micro Master was the least of the four yarders.

Readily-available Timberjack parts and the uncomplicated design of the Micro Master amount to an efficient, user-serviceable yarder.

SOMMAIRE

La présente fiche technique fait partie d'une série continue d'évaluations de petits téléphériques forestiers convenant aux coupes rases et aux éclaircies dans les peuplements de seconde génération de la Colombie-Britannique intérieure et côtière. L'étude porte sur le téléphérique Micro Master, modèle 9, monté sur débardeur et fabriqué par Micro Logging Systems, à Parksville, B.C.

Le Micro Master se caractérise par une tour de 9 mètres (29 pieds) avec un treuil à quatre tambours, montée sur un débardeur à roues Timberjack, modèle 404. Le coût de ce téléphérique forestier, avec tout l'équipment requis et bâti à partir d'un transporteur reconditionné, est de $94,000.

Le téléphérique forestier fut étudié à l'automme 1981 sur l'île de Vancouver lors de coupes rases dans un peuplement de petits bois de seconde génération. Due à une inclinaison naturelle, les arbres abattus furent souvent hors de la direction d'entraînement du téléphérique forestier. Ceci fut la cause de bris de cables et de grumes. Le contracteur et son équipe ont à l'occasion atteint des distances de téléphérage de 300 mètres (1000 pi) et ont suggéré une distance de 260 mètres (850 pi) comme optimum pour les coupes d'éclaircie de petits bois. Lors de ces essais de coupes rases, la planification de la coupe limitait la distance de téléphérage à un maximum de 140 mètres (450 pi). Le manufacturier prévoit doter son téléphérique forestier d'un système à support intermédiaire afin de pouvoir atteindre des distances allant jusqu'à 600 mètres (2000 pi).

Au cours de l'étude chronométrique, une équipe de deux hommes (ingénieur/décrocheur et élingueur/accrocheur) débusquait en moyenne 3.2 grumes par rotation, une rotation complète prenant en moyenne 5.96 minutes. Ces chiffres tiennent compte proportionnellement des changements de travée et des temps morts peu importants. Pour l'ensemble de l'étude sur les coupes rases, la production journalière atteignait en moyenne 246 grumes, soit 112.5 cunits).

Le Micro Master a connu quelques problèmes mineurs au cours de l'étude de seize jours. Joint à l'emploi de chokers très légers, le frottement d'une butée d'embrayage du câble principal ralentissait ou empêchait le choker de descendre du chariot. De plus, au cours de l'étude, les câbles se brisèrent à dix reprises; cinq fois le câble tracteur principal, trois fois le câble de retour et deux fois le câble porteur.

Le Micro Master se comparait favorablement à d'autres petits téléphériques à tour, y compris l'Ecologger I fabriqué par Rosedale Machine Shop, le Mini-Spar de Madill et le Steyr KSK-16. Il montrait le nombre de grumes par homme-jour observé le plus élévé et les vitesses de câble moyennes observées les plus rapides. L'ensemble de treuils produisait des forces de câblage suffisantes. La taille de l'équipe n'était que la moitié de celle qu'exigent les autres téléphériques et le prix l'achat était le plus faible des quatre.

La disponibilité immédiate des pièces de Timberjack et le design simple du Micro Master en font un téléphérique forestier efficace, très pratique à l'utilisateur.

INTRODUCTION

The Model 9 Micro Master yarder (Figure A) is evaluated in this technical note. This report is part of FERIC's continuing series of evaluations of small cable yarders. The Micro Master is a 9-metre pipe-tower yarder designed and built by J. Morrison, D. Ozero and G. Ozero of Micro Logging Systems Limited, Parksville, B.C.

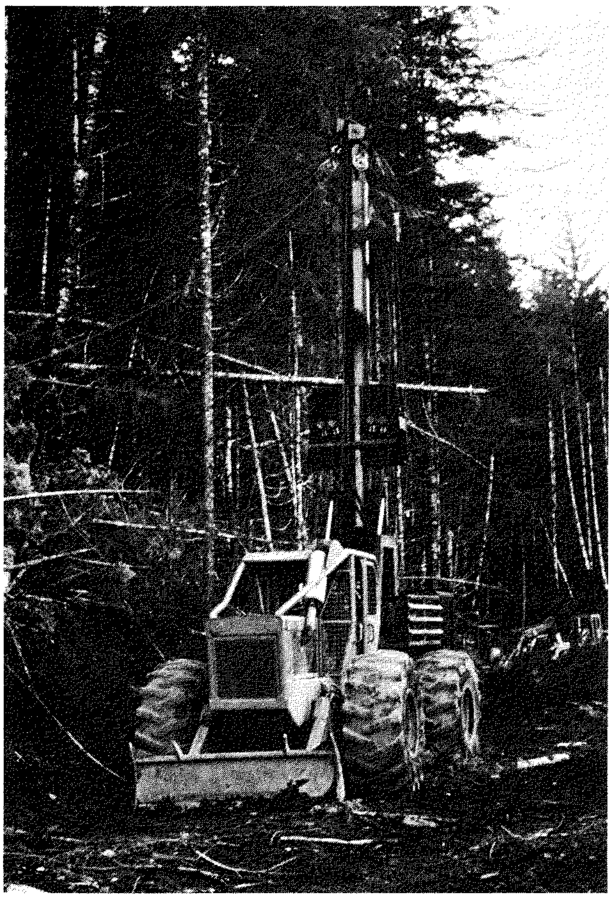

FIGURE A. Model 9 Micro Master Yarder.

The prototype machine was originally designed for cable thinning on coastal British Columbia. However, a pre-production model was used to yard in a clearcut of coastal second-growth timber in the fall of 1981. It is in this application that FERIC evaluated the machine.

The evaluation began in mid-October, 1981 when a model DSR Servis Recorder was mounted on the yarder. Servis Recorder charts and operator shift-report forms were completed daily and forwarded to FERIC for analysis.

During the week of October 19, 1981, FERIC personnel conducted detailed time studies of the Micro Master. Turn element durations were recorded and an average piece size determined by hand-scaling yarder production at the landing.

Machine Description

The Model 9 Micro Master can function as both a thinning and a clearcut yarding machine. Main components of the yarder include a carrier, a 9-metre (29-foot) pipe tower, a four-drum winch set and a R.O.P.S. cab.

The carrier used during FERIC's evaluation was a reconditioned Timberjack model 404 rubber-tired skidder. In addition to transporting and supporting the tower, the skidder furnishes power to the winch set through a power take-off. Four hydraulic guyline winches are driven by the skidder's hydraulic system which generates a flow of 105 litres per minute (23 gallons/minute).

The tower is constructed of standard 30-cm (12-inch) pipe and is positioned directly above the skidder's rear axle. The tower base is hinged, permitting it to lie horizontally over the skidder cab in the "tower-down" mode. Twin hydraulic rams raise and lower the tower.

The winch set is located on the rear deck of the skidder beneath the tower and consists of the mainline, haulback, skyline and strawline/slackpuller drums. Each drum is mechanically coupled by a hydraulically-activated clutch to a chain-driven shaft meshed to the power take-off. The four drums are independently braked by hydraulic disc brakes. Clutches and brakes are controlled by hand- and foot-actuated master cylinders in the operator's cab. Hence the clutch and brake circuits are divorced from the skidder's hydraulic system.

The operator's cab is shown in Figure B. It is semi-enclosed by wire mesh and plexiglass. Hand levers control the skyline, guyline, haulback and mainline winches while foot levers control the strawline and throttle. A remote-start and stop is mounted in the cab.

The contractor and crew have yarded up to 300 metres (1,000 feet) and have suggested a maximum external yarding distance, for smallwood thinnings, of approximately 260 metres (850 feet). The manufacturer has plans for an intermediate support system to reach distances up to 600 metres (2,000 feet).

Manufacturer's specifications for the Micro Master are shown in Appendix I.

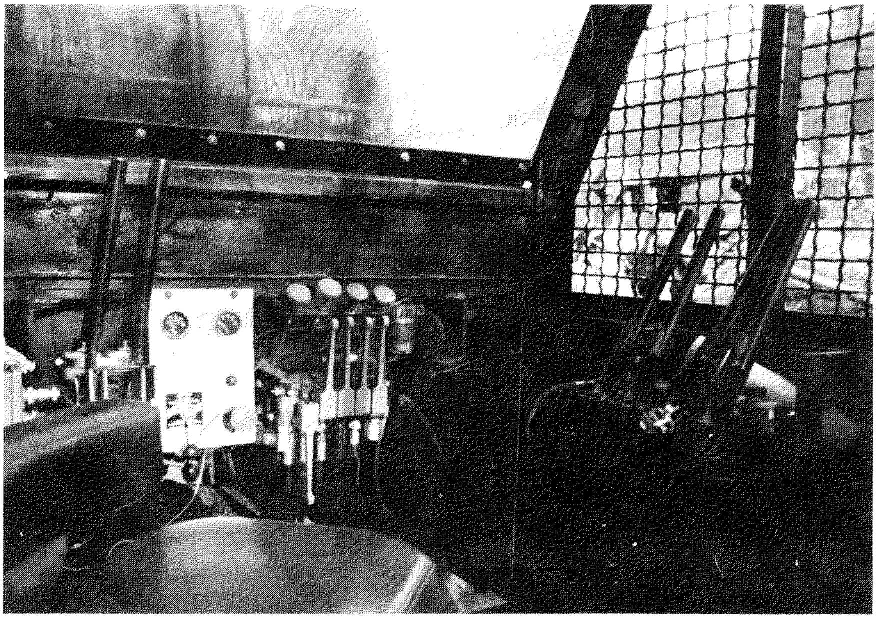

FIGURE B. Operator's Cab.

Operation Description

The yarder was on contract to MacMillan Bloedel Limited's Northwest Bay Division and was located near Qualicum Bay on the east coast of Vancouver Island. The contractor is part-owner of the machine and requested an evaluation of this machine's first trial in clearcut logging.

The study area had been logged approximately 45 years ago. The original access route was improved and used for Micro Master landing points. Unfortunately, natural lean of the second-growth timber resulted in felled trees that were often out-of-lead with the yarder. This led to increased cable and wood breakage.

During the trial the yarder used a modified "skidder sky-line" yarding configuration. The simplified carriage consisted of two blocks attached to each other. The skyline ran through the top block and the mainline through the lower. Figure C shows the system configuration for the clearcut trial. For yarders with higher towers and higher centres of gravity, one of the four tower guylines should be positioned on the opposite, or yarding, side of the machine. This would prevent the yarder from toppling backwards if the skyline broke. While in the configuration shown in Figure C, the skyline has parted on two occasions, but because of the low height and centre of gravity the tower was hardly affected. Appendix III shows the cable configuration when the yarder is used for thinning.

Owing to setting design, yarding distance during the trial did not exceed 140 metres (450 ft). Wood was usually yarded full-tree or tree-length, with the occasional oversize bucked to length at the felling site. The yarder was stationed at roadside and turns were brought onto the road. Stand conditions for the study block are shown in Table 1.

A grapple skidder was used in conjunction with the yarder. Its prime function was to keep the landing area clear. (As time permitted, trees felled close to roadside were skidded by this machine.) Yarder turns were forwarded up to 60 metres (200 ft) down the road where the skidder operator performed the limbing, topping and bucking functions. Logs were then piled parallel to roadside in small decks. Self-loading highway trucks delivered the wood to Northwest Bay's dryland sortyard.

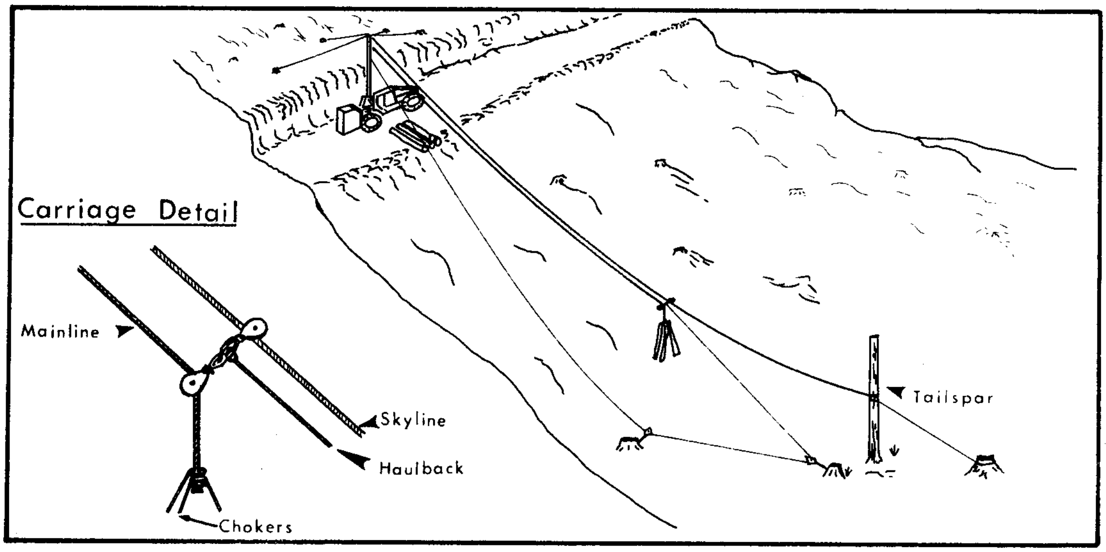

FIGURE C. Micro Master Line Configuration for Clearcut Yarding. The mainline passes through the choker slider rings and is simply knotted at the end. Most mainline "breakage" occurs when the knot unravels or breaks. The mainline is then re-threaded and re-tied. Mainline repairs are therefore not as complicated or time consuming as those for the haulback or skyline.

TABLE 1. Stand Conditions.

Area yarded	5.7 ha (14.1 acres)
Cruise volume	315 m^3/ha (45 cunits/acre)
Species distribution (% by volume)	54% Douglas-fir 43% hemlock 2% cedar 1% alder
Stand age Brush Slope Obstacles	43 years--established 1938 sparse 0% to 70%; 25% average scattered old-growth stumps

The yarding crew consisted of 2 people: an engineer/chaser and a rigging slinger/chokerman. The grapple-skidder operator assisted with some of the road changes.

STUDY RESULTS

SHIFT-LEVEL STUDY

The Micro Master and the grapple skidder completed work on the clearcut in 16 days. The total volume produced during that period was 1983.7 m^3. All wood was weigh-scaled at the sortyard. The contractor was paid on a per-tonne basis for this volume.

Both yarder and skidder piece counts were obtained for the full period and these were used to apportion the volume to each machine. Yarder production therefore totalled 1800.6 m^3 for the 16-day period.

Shift Time Summary for the 16 shifts. Table 2 contains the time distribution. Productive time (yarding time + yarding road change) accounted for 89% of the scheduled time, or 7 hours of each 8-hour shift. Yarding road changes averaged 29 minutes. Some were line changes only while others included machine moves. Those involving only line changes (38 changes) averaged 24 minutes. The remaining 7 included machine moves and these averaged 51 minutes. Total downtime for all reasons was 14.5 hours and a summary of this downtime is shown in Table 3.

Shift Production Summary period totalled 1800.6 m^3 Yarder production for the study (635.9 cunits), or 112.5 m^3 (39.7 cunits) per shift. Additional details are provided in Table 4. With the 2-man crew, production per man-day averaged 56.3 m^3 (19.9 cunits).

TABLE 2. Shift Time Summary.

	Hours	
	Study Total	Average/Shift
Productive Machine Hours (PMH)		
Yarding	92.1	5.8
Yarding Road Change	21.4	1.3
(No. of Road Changes)	(45)	(2.8)
Delays:		
Mechanical	8.2	0.5
Landing Change	0	0
Other Non-Mechanical	6.3	0.4
Total: Scheduled Machine Hours (SMH)	128.0	8.0
Mechanical Availability[1]	94%	
Machine Utilization[2]	89%	
Number of Scheduled Shifts	16	

[1]Mechanical Availability = $\frac{\text{SMH - Mechanical Delays}}{\text{SMH}} \times 100\%$

[2]Machine Utilization = $\frac{\text{PMH}}{\text{SMH}} \times 100\%$

TABLE 3. Downtime Summary.

Downtime Category	No. of Occurrences	Time (hours)
A) Mechanical - Repair		
Winches		
replace brake lining	1	4.5
adjust clutch	2	0.5
Subtotal:	3	5.0
Rigging		
mainline: splice	5	1.0
haulback: splice	3	.8
: replace	1	.5
skyline : splice (cut by haulback)	2	.5
replace skyline block (carriage)	1	.2
Subtotal:	12	3.0
Other		
repair radio	1	.2
Total Mechanical Downtime	16	8.2
B) Non-Mechanical Downtime		
coffee breaks	15	4.0
late start/early quit (study total)	-	1.3
tower-down: prepare to move yarder out	1	.5
road washed out	1	.3
pulled tailhold	1	.2
Total Non-Mechanical Downtime		6.3

TABLE 4. Production Summary.

Number of shifts worked	16
Total volume, m^3	1800.6 (635.9 cunits)
Total piece count	3935
Average piece size, m^3	0.458 (16.2 ft^3)
Volume per shift, m^3	112.5 (39.7 cunits)
Piece count per shift	245.9
Productivity:	
Volume/Productive Machine Hour, m^3	15.9 (5.60 cunits)
Volume/Scheduled Machine Hour, m^3	14.1 (4.97 cunits)

Detailed Time Study

Results of the detailed time studies are summarized in Table 5 and Figure D. A total of 201 turns were observed. Average total time per turn was almost 6 minutes at an average turn volume of 1.98 m^3 (70 ft^3). Average hourly productivity, including pro-rated road changes and minor delays, therefore averaged 10 turns and 19.8 m^3 (7.0 cunits) per Productive Machine Hour. This productivity rate is approximately 25% greater than the longer-term productivity determined from the shift-level study. The difference is accounted for almost entirely by different piece volumes between the two studies--0.62 m^3 for the detailed study and 0.46 m^3 for the longer-term study.

The lengthiest turn element was Hookup, consuming 2.27 minutes or 38% of the average turn cycle. About 9% of the 2.27 minutes were spent waiting for the chokers to drop within reach of the chokerman. (Chokers are attached to the mainline and the mainline must unspool in order to lower the chokers.) Chokers often did not drop freely, partly because of their light weight and partly because of a rubbing mainline clutch pad. A weighted spare choker was added to counter this, but it did not eliminate the problem. At times, either the skyline had to be partially lowered or the operator would assist by unspooling the mainline by hand.

Outhaul and Inhaul (both lateral and direct) accounted for 0.85 minutes, or 14% of the average turn cycle. Based on the average yarding distance, outhaul speed averaged 4.1 metres/second (803 ft/min) and inhaul averaged 2.1 metres/second (416 ft/min). Eight road changes were observed during the detailed study, averaging 26.6 minutes apiece (range: 14 to 46 minutes).

Delays accounted for 0.89 minutes/turn. About one-quarter of this was mechanical downtime and most of that consisted of clutch adjustments or line repairs. The remaining three-quarters was composed of personnel delays (primarily coffee breaks) and operational delays such as entangled chokers, skidder interference or hangups.

Turn element definitions are presented in Appendix II.

TABLE 5. Detailed Time Study Summary.

Turn Element	Average Time (min)	Range
Outhaul	0.29	0 - 0.11
Hookup: choker drop	0.20	1.03 - 4.95
hooking time	2.07	
Inhaul: lateral	0.26	0 - 1.36
direct	0.30	.07 - 1.15
Decking	0.17	.03 - 0.81
Unhook	0.72	.25 - 3.87
Subtotal: Net Cycle	4.01 (S.D. = 1.09)	1.92 - 8.20
Road changes--pro-rated	1.06	0 - 46.02
Delays--pro-rated	0.89	0 - 20.58
Total Time per Turn	5.96	2.23 - 61.02
Production		
Average turn volume	1.98 m^3	(69.9 ft^3)
Average no. pieces per turn	3.2	
Average piece volume	0.62 m^3	(22.0 ft^3)
Average yarding distance	71 m	(233 ft)
Number of turns in study	201	

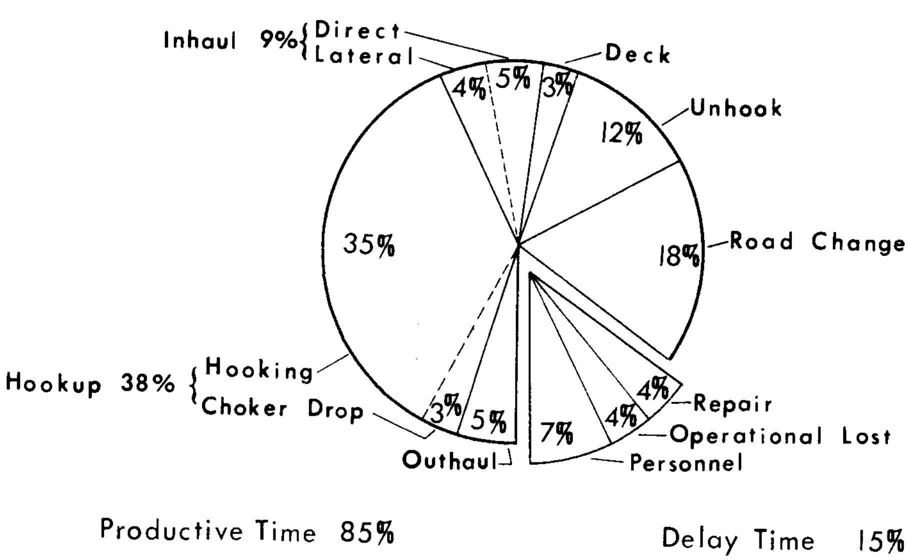

FIGURE D. Percent Time Distribution of Detailed-Study Results.

The piece-size distribution was obtained from a measure of scale at the landing. Two hundred and thirty-one pieces were scaled which represents 6% of the pieces produced during the 16-day period, and 36% of the pieces yarded during the detailed time study. The distribution is shown in Figure E. Fifty percent of the pieces are in the two smallest volume classes (piece volumes up to 0.5 m^3 (17.7 ft^3) apiece). The shaded areas show the volume percentage in the size class. At this operation, 50% of the pieces produced 24% of the total volume.

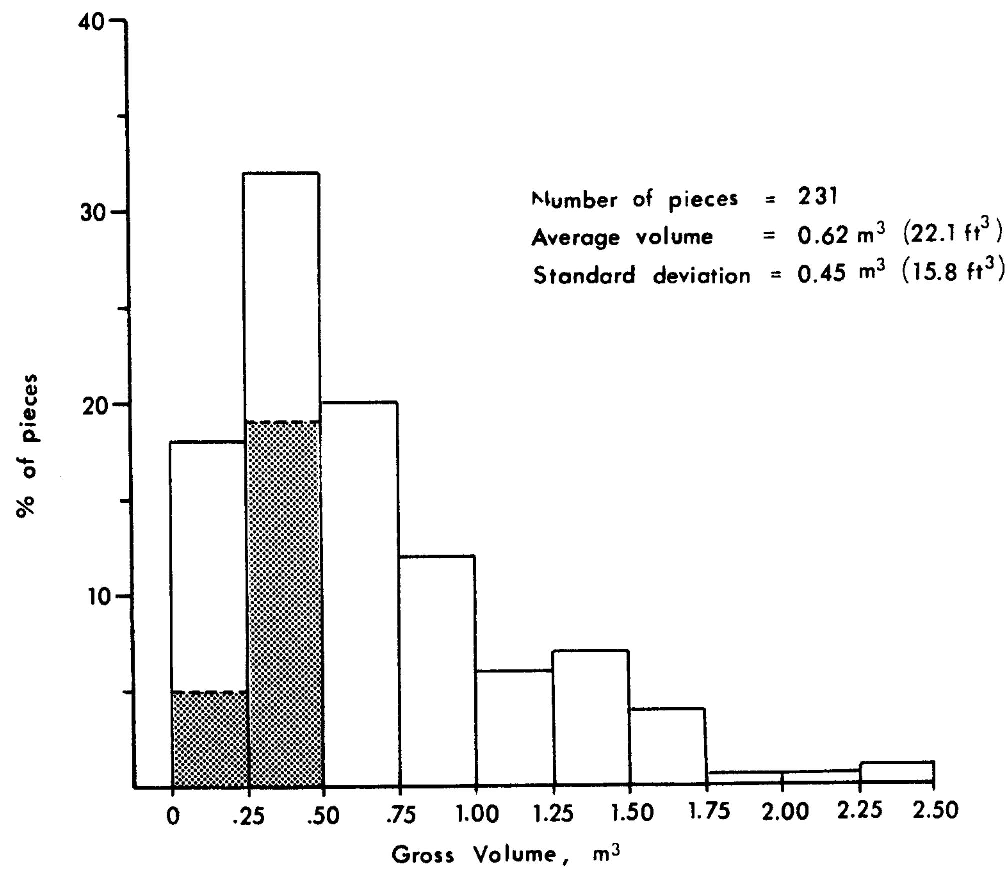

FIGURE E. Piece-Size Distribution From Detailed Time Study.

DISCUSSION

ADVANTAGES

Table 6 contains comparative information on the Micro Master and several other small yarders that FERIC has evaluated. The information is taken from two FERIC publications--Technical Report TR-8 and an interim report on the Steyr yarder. The yarders in this comparison are all pipe-tower machines with no swing capability. Although the Steyr is larger than the other units it falls within the small-yarder classification. Tower height is less than the arbitrary 21.3-metre (70-foot) height definition.

The comparison shows several factors of benefit to the Micro Master. The yarder:

- is the least expensive
- requires the least personnel
- has the fastest observed average line speeds.

The personnel requirement for the other machines could possibly be reduced to three people by having only one chokerman, as at the Micro Master operation. All of those machines, though, would still require a chaser at the landing. Otherwise, too much time is required for the engineer to descend from and re-enter the control cab after unhooking. The Micro Master's cab is at ground level, permitting the engineer to unhook each turn with very little time loss.

High motivation levels and experience of the contractor and crew influenced several other factors. The Micro Master compares favourably, or is highest, in the following categories:

- turn time
- piece count per turn
- piece count and volume per man-day.

A small experienced crew that maintains a high daily piece count can help offset the effect of a low piece volume. For example, the average piece size for the Steyr was 3.3 times as large as that for the Micro Master, but the daily volume was only 1.8 times as large. On a per-man-day basis the effect is even more pronounced. The Steyr crew averaged only 0.9 times the man-day volume productivity of the Micro Master crew.

TABLE 6. Comparative Information on FERIC-Evaluated Small Yarders.

	Micro Master	RMS* Ecologger I	Madill Mini-Spar Operation 1	Madill Mini-Spar Operation 2	Steyr KSK-16
GENERAL DESCRIPTION					
Purchase price, December 1981--including lines	$94,000	$125,000	$212,000		$285,000
Crew requirement - yarding	2	4	4	4	4
- support**	1	1	0	1	1
Tower height, metres (ft)	9 (29)	13 (42)	15 (49)		17 (57)
Carrier type	R.T. Skidder	R.T. Skidder	tank (tracked)		truck
Number of winches	4	3	5		5
Engine size, kW (hp)	97 (130)	97 (130)	164 (220)		194 (260)
DETAILED TIME STUDY RESULTS					
Average turn time, minutes	6.0	5.5	9.7	12.6	5.1***
Piece count per turn	3.2	2.2	2.5	3.1	1.7
Average piece volume, m^3 (ft^3)	0.62 (21.9)	0.62 (21.9)	0.82 (29.0)	0.91 (32.2)	1.41 (50.0)
Average turn volume, m^3 (ft^3)	1.98 (70)	1.36 (48)	2.05 (72)	2.82 (100)	2.40 (85)
Yarding direction during study	uphill	uphill+downhill	downhill	uphill	uphill
Average slope, %	25	55-80	45-60	50	35
Av. distance logs were yarded, m (ft)	71 (233)	75 (250)	57 (190)	No data	134 (440)
Maximum external distance, m (ft)	137 (450)	198 (650)	168 (550)	290 (950)	250 (820)
Av. observed outhaul speed, m/sec (ft/min)	4.1 (803)	3.5 (694)	1.5 (302)	No data	3.5 (688)
Av. observed inhaul speed, m/sec (ft/min)	2.1 (416)	2.0 (397)	1.4 (271)	No data	2.1 (411)
SHIFT-LEVEL STUDY RESULTS					
Mechanical Availability, %	94	94	96	50	No data
Machine Utilization, %	89	80	70	42	No data
Net average piece volume (decay excluded), m^3 (ft^3)	0.46 (16.2)	0.57 (20.2)	0.71 (24.9)	0.80 (28.2)	1.50 (53.0)
Piece count per shift worked	246	163	106	138	132
Volume per shift worked, m^3 (cunits)	112.5 (39.7)	92.9 (32.9)	75.3 (26.4)	110.4 (38.9)	198.0 (70.0)
Productivity per man-day					
yarding crew only - pieces	123	41	27	35	33
- volume, m^3 (cunits)	56.3 (19.9)	23.2 (8.2)	18.8 (6.6)	27.6 (9.7)	49.5 (17.5)

*Rosedale Machine Shop offers an Ecologger II model for approximately $160,000. Basic specs: 4 drums, 15-metre (49-ft) tower, 134 kW (180 hp) skidder carrier.

**Skidder or loader assigned to the yarder for clearing/forwarding.

***No road changes were observed during the short sampling period. Based on other straight-tower machines FERIC has evaluated, road change time per turn ranges from 0.4 minutes to 3.4 minutes, with most operations falling between 0.6 and 1.2 minutes.

Although Availability and Utilization values are high for the Micro Master, it should be noted that this information is based on only 16 shifts. In addition, there were no major landing (setting) changes during this period. Both Utilization and Availability could alter as a result of a longer study period.

There are several other advantages concerning the Model 9. Lines are small and light, and are easily handled by the crew. The yarder uses North American components and it has a clean, uncomplicated design. The skidder carrier is familiar and well-known in British Columbia. The result is that highly-trained specialized mechanics are not required for this machine. Most repairs can be carried out on-site by operational personnel, many of whom have adequate handyman skills.

As with other skyline machines, the Micro Master can be used in areas where environmental factors are of concern. The lateral yarding facility results in less moving time per hectare as well as reduced landing construction.

Disadvantages/Problems

The Model 9 Micro Master is a comparatively short pipe-style yarder which must be used in a skyline configuration. It has no swing capability, so logs cannot be effectively decked across a road. The short tower will usually mean that the yarder be placed close to the landing or road edge. This will require a permanently-assigned loader or skidder to keep log decks low, or to prevent yarded pieces from escaping over the bank. The Micro Master can deck logs without a clearing or forwarding machine, but the resulting higher log decks interfere with operator visibility as the cab is at ground level. Unhook time also increases with deck height. For this study, an increase of 0.5 minutes per turn would reduce the hourly piece count by 8 percent.

Several items concerning the mechanical functions of the machine were noted. The lightweight chokers sometimes did not drop to the ground, even though a weighted fourth choker was added. This may have been complicated by the problems with the mainline clutch, which required several adjustments during the trial. There was also an initial problem with a brake lining, which was rectified early during the study period.

Line breakage could prove to be a drawback with this machine. During the trial either the haulback, the mainline or the skyline broke, on average, once every one-and-a-half shifts. One-half of the line breakage occurred on the skyline or haulback lines, both of which required knowledge of wire rope splicing techniques, unlike the mainline, which usually broke at the choker "knot". Because this yarding crew was knowledgable, line repairs averaged only 12 to 15 minutes. In areas where there is a lack of trained personnel, line repair time could become a serious concern.

While the operator is fully protected in the cab, the cab itself is mostly open to the elements. The operator would require a heated, enclosed cab if the yarder were placed in winter conditions in the B.C. Interior. The operator's seat appeared slightly too far back from the control levers, although no specific measurements were taken. Positive positioning is currently not provided on the control levers (resulting in some slippage) and the manufacturer is planning suitable alterations.

CONCLUSION

The Model 9 Micro Master is a British-Columbia-designed and fabricated small cable-yarder. It was built originally as a cable-thinning machine for coastal second-growth timber, yet is has applicability to clearcut yarding of small timber in the B.C. Interior. It was in a clearcut-yarding situation that FERIC evaluated a pre-production model.

The yarder and crew performed well during the trial. Availability averaged 94% and Utilization 89% for the shift-level study. Daily production averaged 112.5 m^3 (39.7 cunits), or 246 pieces. Average turn time from detailed time studies was 6 minutes at 3.2 pieces per turn.

Compared to other small, straight-pipe yarders FERIC has evaluated, the Micro Master has a lower purchase price, requires less crew and has a high man-day productivity. It is largely user-serviceable and-maintainable. It is fabricated in British Columbia and uses North American components.

For any yarder working in smallwood conditions, road change time and turn time must be minimized, while maintaining a high piece count per turn. The Micro Master benefited from having a knowledgable and motivated crew.

Although designed for cable-thinning applications, the Model 9 Micro Master has performed well in a clearcut. It can be considered a viable alternative by Interior forest industry personnel who have operations where straight-pipe towers can be used.

REFERENCES

Cottell, P.L., McMorland, B.A. and Wellburn, G.V. Evaluation of Cable Logging Systems in Interior B.C. and Alberta. Technical Report No. TR-8. FERIC, Vancouver, B.C. 1976. 39 pp + Appendices.

Powell, L.H. Steyr KSK-16 Mobile Spar Yarder. Survey of Interior Cable Yarders. FERIC, Vancouver, B.C. Interim Report #378-1. 1981. 14 pp.

APPENDIX I

Micro Master Yarder - Machine Specifications

Carrier	Model 404 Timberjack Tractor Skidder Engine: GM, 4-53 97 kW (130 hp) @ 2300 rpm
Total weight	Carrier and tower, fully rigged: 11 780 kg (13 tons)
Hydraulic System	105 Lpm (23 Gpm)
Tower	9 metres x 0.30 m standard steel pipe (29 feet x 12 in.)

Winch Set	Drum	Wire Rope		Pull at stall bare drum	No-Load Line Speed
		capacity	size		
	Main & Haulback	700 m (2,300 ft)	9.5 mm (3/8 ")	88 964 N (20,000 lb)	Bare drum 5.1 m/sec (1000 fpm) Mid drum 7.6 m/sec (1500 fpm) Full drum 12.7 m/sec (2500 fpm)
	Skyline	580 m (1,900 ft)	19 mm Swaged (3/4" Swaged)	111 206 N (25,000 lb)	Bare drum 5.1 m/sec (1000 fpm)
	Slackpuller/ Strawline	700 m (2,300 ft)	6.4 mm (1/4 ")	- -	Mid drum 8.1 m/sec (1600 fpm)
	Guyline	38 m (125 ft)	17.5 mm (11/16")	8 896 N (2,000 lb)	Bare drum 9.1 m/sec (1800 fpm)

Specifications from Micro Logging Systems Limited.
Subject to change without notice.

APPENDIX II

Detailed Time Study - Turn Element Definitions

	Begins when	Ends when
Outhaul	Chokers are pulled free of log deck	Signal to "stop rigging" is given
Hookup	Outhaul ends (Hookup includes time for chokers to drop to ground)	"Begin yarding" signal is given
Lateral Yarding	Hookup ends	Chokers have reached carriage
Inhaul	Lateral yarding ends	Incoming logs reach back end of log deck
Decking	Inhaul ends	Logs finally come to rest on log deck
Unhook	Decking ends	Chokers are pulled free of log deck
Delay	A productive function is interrupted	The productive function begins again
Road Change	A crewman signals start of road change	Outhaul begins for first turn on new road

APPENDIX III

Micro Master Yarder - Thinning Cable-Configuration

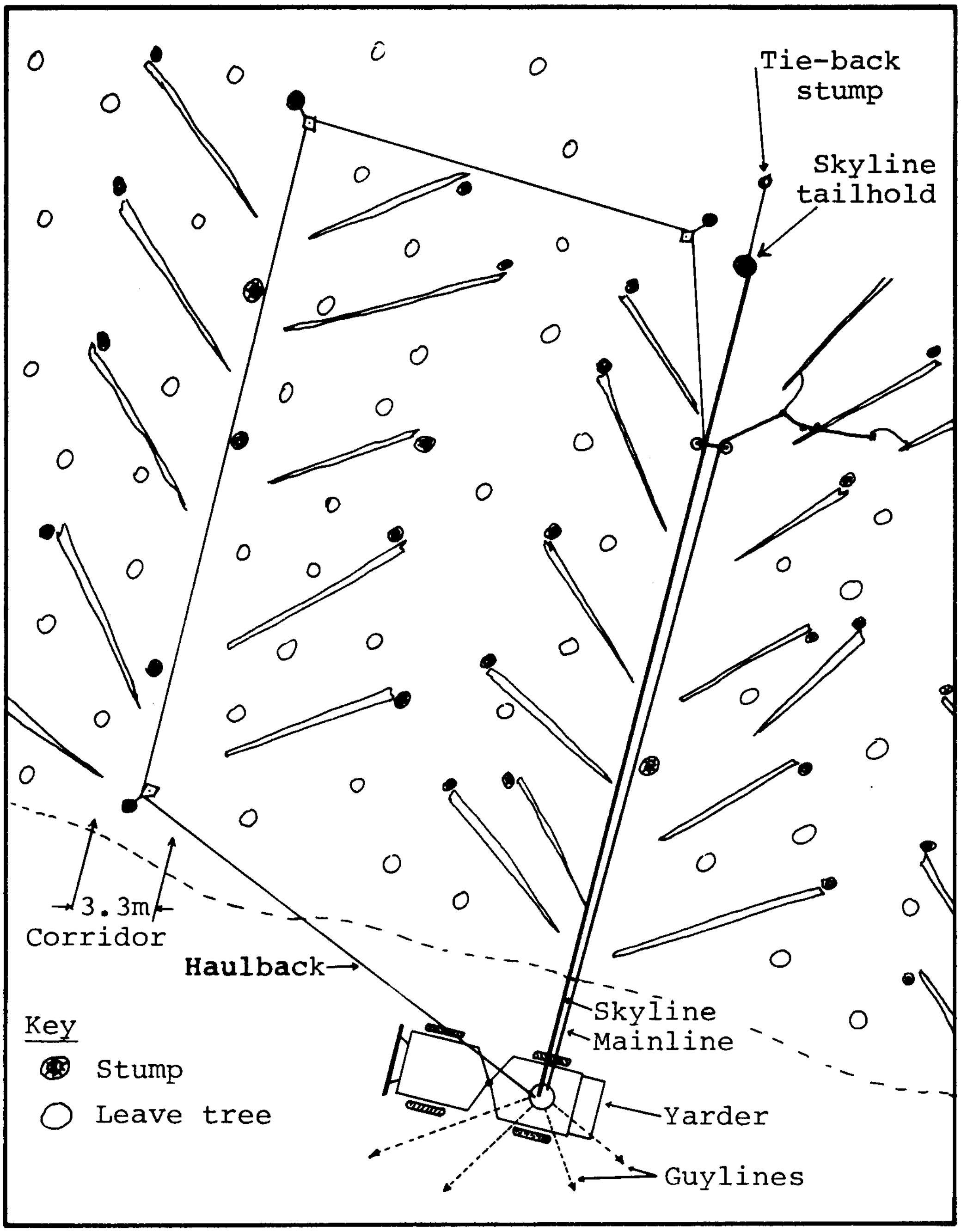

Diagram courtesy of J. Morrison, Micro Logging Systems Ltd.