LOGGING INDUSTRY RESEARCH ASSOCIATION
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REPORT

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LOG TRUCK AXLE LAYOUTS

(A Cost Comparison of 5-Axle and 6-Axle Long Log Cartage Rigs)

Where best to put those axles?

INTRODUCTION

Payload size is one important factor that influences log transport costs.

Survey work by LIRA during 1977 indicated that the New Zealand log transport industry was strongly dependent on 5-axle log truck layouts for log transport. Most of these were set up for carting long length logs (8 m - 15 m), the most common layout being a 3-axle truck with a 2-axle (2.4 m spaced) log trailer.

On N.Z. highways 5-axle layouts are restricted to lower gross weight limits than 6-axle layouts, and they thus achieve lower payload sizes. The 5-axle layouts however, generally cost less to operate than 6-axle layouts. Which axle layout then carts logs at the lowest cost?

This report summarises a LIRA economic comparison of different 5-axle and 6-axle layouts, as used for carting long length logs.

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COMPARATIVE COSTS AND PAYLOADS

A detailed analysis of operating costs and payload carrying ability was carried out using a common model, so that comparable log cartage costs could be derived. The results are shown in Tables 1 & 2 and indicate that for on-highway operation, some not so common layouts (mainly 6-axle) offer economic advantages over the present most common 5-axle layout. (See Table 1 (c)). The economic advantages are very significant where the operation is restricted to Class II road limits. For total off-highway work, however, 5-axle layouts, particularly using close-axle trailers, are best.

TABLE 1. TABULATED RESULTS - COSTS

LAY-OUT	LOGGING RIG CONFIGURATION	PURCHASE COSTS ($)		TRUCK OPERATING COSTS PER YEAR		TRAILER UNITS - OPERATING COST PER YEAR						TOTAL RIG OPERATING COST ($) PER YEAR
						STANDING COSTS ($)			RUNNING COSTS ($)			
		TRUCK UNIT	TRAILER UNITS	STANDING COSTS	RUNNING COSTS	DEPREC-IATION	INSUR. & REGISTRA.	INTEREST	REPAIRS & MAINT.	TYRES	ROAD USER CHG.	
A		85000	10925	34213	37596	1092	414	819	1785	2000	1453	79372
B		85000	11820	34213	37596	1182	441	886	1785	2000	1827	79930
C		85000	11945	34213	37596	1194	444	896	2255	2000	2719	81317
D		75000	19475	32684	32772	1947	753	1461	3031	3250	4895	80793
E		85000	15550	34213	36936	1555	552	1166	3000	3000	1653	82075
F		85000	19475	34213	35076	1947	753	1461	3031	3250	4068	83799
G		91500	11945	35209	39240	1194	444	896	2255	2000	2719	83957
H		92500	11945	35361	38488	1194	444	896	2255	2000	2719	83357

TABLE 2. TABULATED RESULTS - PAYLOADS

LAY-OUT	LOGGING RIG CONFIGURATION	GROSS WEIGHT LIMITS FOR RIG (TONNES)			TARE WEIGHTS (TONNES)		PAYLOADS (TONNES)			LOG CARTAGE COSTS (DOLLARS PER TONNE)		
		OFF-HIGHWAY	CLASS I	CLASS II	TRUCK UNIT	TRAILER UNITS	OFF-HIGHWAY	CLASS I	CLASS II	OFF-HIGHWAY	CLASS I	CLASS II
A		45.0	34.4	30.0	9.2	3.0	32.8	22.2	17.8	2.24*	3.58	4.46
B		45.0	35.4	31.0	9.2	3.2	32.6	23.0	18.6	2.26*	3.48	4.30
C		45.0	36.3	32.1	9.2	3.5	32.3	23.6	19.4	2.30*	3.45	4.19
D		45.0	38.2	34.2	7.8	5.6	31.6	24.8	20.8	2.27*	3.26	3.88
E		45.0	39.0	36.5	9.2	4.8	31.0	25.0	22.5	2.47*	3.28	3.65
F		45.0	39.0	39.0	9.2	5.6	30.2	24.2	24.2	2.58*	3.46	3.46
G		45.0	39.0	34.6	10.5	3.5	31.0	25.0	20.6	2.52*	3.36	4.08
H		45.0	39.0	37.1	10.0	3.5	31.5	25.5	23.6	2.46*	3.27	3.53

(Road User Charges removed from operating costs. All other costs assumed same)*

Some important assumptions made in the analysis included:

1. All truck units, whether 2,3, or 4 axle, are 216 kW (290 hp) size in the Leyland/Mercedes category, with 35 to 40 tonnes gross combination weight ratings.
2. Cost, weight, and other data used in the analysis, is relevant to July-August 1979, with estimates being based in surveys and updated past figures.
3. All trucks covered 80,000 km per year with the average payload haul distance being 40 km and trucks achieving 4 loads per day over 240 days per year.
4. Three-quarters of all running is on-highway and the rear trailer is piggy-backed for half the annual mileage.

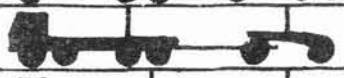
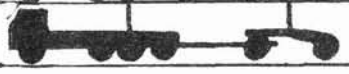
NEW LAYOUTS AND LAYOUT MODIFICATIONS

Where new log truck layouts are to be built for long log cartage, serious consideration should be given to the following configurations which offer cartage cost advantages over the present most common 5-axle layout.

For Mainly Class I Operation			
For Mainly Class II Operation			

The 6-axle layouts E (with 3-axle trailer) and H (with twin-steer 4-axle truck) seem best for operations that are restricted by either Class I or Class II road limits. The 5-axle layout D, with single drive-axle truck and dolly, should be also considered for Class I operation, but only where not required to travel on forest roads due to the difficulties a single drive-axle can cause. It would thus suit a sealed on-highway route such as from mill to export port. The 6-axle layout F with dolly, should be a first consideration for solely Class II operation.

Where thought is given to modifying the present most common 5-axle layout to 6-axle layouts, a comparison of the cartage cost savings with estimated modification costs, indicates the following:

Modifying 	Ave. Cost of Modification	Time to Pay for Modification	
		Class I	Class II
to 	$ 5,300	15 months	5 months
to 	$10,000	26 months	8 months
to 	$ 9,000	Won't pay	6 months
to 	$ 6,500	35 months	34 months

Caution must be exercised in choosing layouts based on simple economics alone, as regulations, costs,and equipment designs can change. Additional factors that need consideration are:

The suitability of twin-steer trucks to forest road conditions.
The influence of heavier 3-axle trailers on log loaders used.
The ability of 6-axle layouts to carry the shorter length long logs such as 8 m export.
The performance achievable with a single drive-axle truck.

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