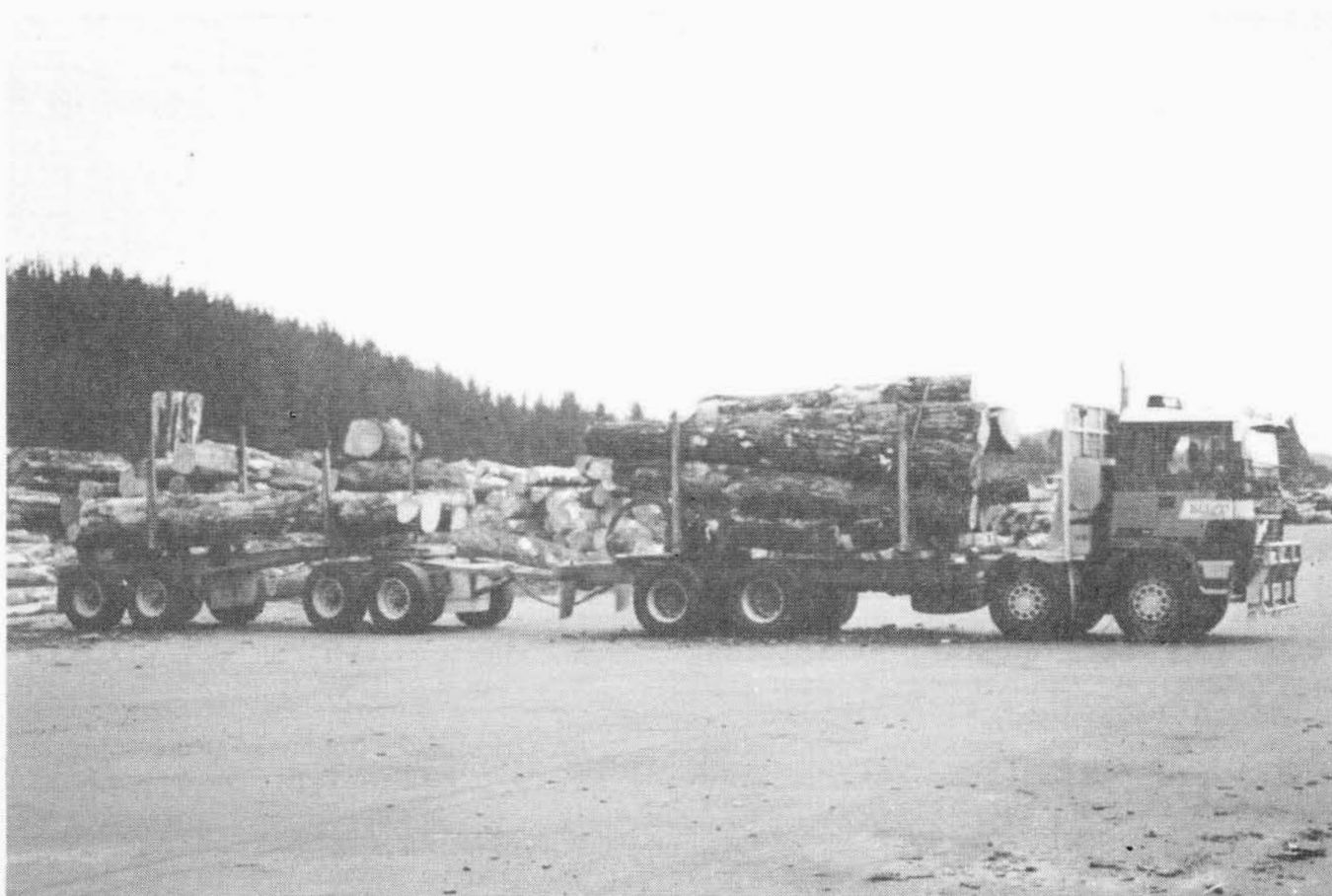


LOG TRUCK AXLE LAYOUTS — 1989

(An Economic Comparison of Layouts under the new
Weights and Dimensions Legislation)

Paul Taylor



*Figure 1 : 8 x 4 Truck with 4 Axle Trailer.
The new legislation favours 7 and 8 axle units.*

ABSTRACT

This Report compares the costs of operating the more common logging truck configurations in New Zealand under the new weights and dimensions regulations. The new regulations allow increases in productivity of up to 15% on some configurations.

The most efficient units for transporting logs on highway are those that can take full advantage of the allowable increases in GVW. These are basically 8 x 4 trucks with 3 or 4 axle trailers and B-train units.

Since 1985 the estimated costs of operating trucks have increased by

approximately 8%. While standing costs have remained largely unchanged, running costs, particularly Road User Charges, have increased significantly.

INTRODUCTION

Log transport operators in New Zealand have always used a multiplicity of different axle layouts, to suit the different log products carried and the intricacies of the highway weights and dimensions regulations and road user charges. LIRA has produced periodic reports (Gordon, 1980, Stulen, 1985) comparing the relative costs of operating the different layouts. This report follows a similar approach, but particularly examines the effects of the new Weights and Dimensions Regulations being introduced.

TRUCK COSTS

The calculations in this Report are based on a typical late model truck. The purchase and resale values have been estimated using current market values and historical data respectively.

Tables 1 (a) and 2 (a) calculate the total costs incurred annually, including both standing and operating costs, for short and long log configurations respectively. The operating costs are based on 110,000 km annual distance travelled and the standing costs are calculated using the common average annual investment method (Goldsack, 1988).

Average Annual Investment:

$$AAI = \left(\frac{C - R}{2n} \right) \times (n + 1) + R$$

where C = purchase price
R = resale value
n = life of vehicle (years)

Standing Costs consist of :

- depreciation
- registration and insurance
- interest
- overheads

Running Costs consist of :

- fuel and oil
- tyres
- wages
- repairs and maintenance
- road user charges

Accurate repairs and maintenance cost estimation is very difficult. Hence the costs used in this Report have been estimated at between 12 and 18 c/km depending on the configuration. This figure allows for the loss of production should repairs be necessary and the likely increase in repairs and maintenance due to the higher gross loadings allowable under the new weights and dimensions legislation.

WEIGHTS AND DIMENSIONS

The new regulations (which became law on February 1, 1989) make significant changes to many of the restrictions on weights and dimensions. Key changes affecting logging trucks are:

- an increase in maximum Gross Vehicle Weight (GVW), from 39 to 44 tonnes, for 8 x 4 trucks with 3 or 4 axle trailers.
- an increase in maximum GVW, from 39 to 42 tonnes, for 6 x 4 trucks with 3 or 4 axle trailers.
- an increase in maximum front axle gross weight to 6 tonne.
- changes in dimensions and axle configurations on large semi-trailers (see page 3).

Tables 1(b) and 2(b) calculate the maximum legal payload each configuration will be able to carry on highway once the new weights and dimensions legislation is made law. These payloads exclude the 2.5% tolerance currently allowed for. The total annual payload is an accumulation of each configuration doing three trips a day for 235 days a year and carrying the maximum allowable payload each trip.

RESULTS AND DISCUSSIONS

8 x 4 Trucks

The new weights and dimensions laws have given twin steer trucks and three or four axle trailers some significant productivity advantages. These advantages, coupled with lower Road User Charges, less tyre wear and potentially reduced repairs and maintenance costs make this configuration popular, particularly for short log transport. Twin steer trucks often suffer from poor gradeability due to the weight and drag of an extra steering axle. This extra steering axle also detracts from overall fuel efficiency.

Bailey Bridge Trailers (3 axle semi-trailer)

The cost of transporting logs on a Bailey Bridge configuration is high. From an operational viewpoint, the versatility of these trailers is a major asset.

Under the new weights and dimensions legislation, large semi-trailers have undergone radical change. To legally operate at 39 tonnes gross vehicle weight (GVW), a Bailey Bridge trailer must comply with the following:

- forward length of 8.5 m
- rear overhang of 3.2m
- one axle group only
- no steering axles or steering bogies

A recent innovation for transporting logs on large semi-trailers is the folding Bailey Bridge trailer. These trailers offer a ready-made solution to "in-bush" gradeability and manoeuvrability.

Another not so new development is the truck and trailer convertible unit, where the bolsters are mounted on ball-race turntables and locked into position depending on whether longs or shorts are being transported (eg Kemp, 1988). Truck and trailer convertible units are dependent on bush

loaders to lift the trailer off whereas Bailey Bridge trailers and folding Bailey Bridge trailers are not.

6 x 4 Trucks and Tag Axles

An extra axle added behind the two driving axles has become a popular option on some 6 x 4 trucks. While this modification creates a substantial saving in Road User Charges and in some cases improves gradeability when running empty, its weight reduces payload capacity by approximately one tonne. It also puts added stress on the chassis and reduces the on highway GVW from 42 to 39 tonnes when the suspension medium is not fully compensating i.e. the drive axles may be walking beam suspension and the tag axle air bag suspension.

Logging Dollies

Logging dollies are popular with larger fleet operators because they give the tractor unit the versatility to do other jobs. The logging dolly, and 2 or 3 axle jinker configuration is not so cost efficient with a 39 tonne GVW rating. The question arises whether this configuration will be competitive economically due to potentially high maintenance costs at the higher off-highway gross loadings.

In general an accurate analysis of on-highway logging trucks working off-highway is difficult. While it is easy to subtract Road User Charges and allow for extra fuel and oil consumption, it is difficult to accurately calculate the repairs and maintenance costs associated with off-highway running. A strictly theoretical approach would suggest that two axle shorts and jinker trailers are the most cost efficient way to transport large loads off-highway. Experience tells us, however, that tyre costs, vehicle repair and maintenance costs and road maintenance costs associated with this type of configuration make it a less desirable option.

		PURCHASE COST		TRUCK OPERATING COSTS PER YEAR			TRAILER OPERATING COSTS PER YEAR						TOTAL TRUCK/ TRAILER OPERATING COSTS PER YEAR \$
ITEM	LOGGING CONFIGURATION	TRUCK	TRAILER	STANDING COSTS	RUNNING COSTS	ROAD USER CHARGES	STANDING COSTS			RUNNING COSTS			ROAD USER CHGS.
							DEPRN.	INSUR & REG.	INTEREST	R & M	TYRES		
1		220000	28000	53294	97813	47492	3400	829	3560	2500	1955	19892	230735
2		220000	36500	53294	97813	35186	4432	1041	4640	3500	2683	14749	217338
3		220000	<u>22000</u> 28000	53239	96703	21961	6071	1493	6357	3500	3910	<u>16117</u> 19892	229243
4		225000	28000	54532	100669	23292	3400	829	3560	2500	1955	19892	210629
5		225000	36500	54532	100669	20533	4432	1041	4640	3500	2683	14749	206779
6		220000	52000	53239	96703	21961	6314	1528	6611	4500	4865	<u>14205</u> 7102	217028
7		230000	36500	55631	100745	20533	4432	1041	4640	3500	2683	14749	207954
8		220000	47000	53239	96703	21961	5707	1289	5975	3000	4866	25506	218246
9		220000	50000	53239	96703	21961	6071	1364	6357	3500	4866	29499	223560
10		230000	40000	55631	100745	20533	4857	1129	5428	4500	3410	10030	206263

Table 1 (a) - Operating Costs -
Short Log Configurations

ITEM	LOGGING CONFIGURATION	GROSS WEIGHT		TARE		PAYLOAD				LOG CARTAGE COSTS (\$/Tonne)	
		OFF HIGHWAY	ON HIGHWAY (CLASS I)	TRUCK	TRAILER	OFF HIGHWAY	TRUCK	TRAILER	TOTAL	OFF HIGHWAY	ON HIGHWAY (CLASS I)
1		45	38.8	10.2	3.6	31.2	12.2	12.8	25.0	5.56	13.09
2		50	42	10.2	4.7	35.1	10.8	16.3	27.1	5.07	11.37
3		50	39	8.9	$\frac{3.2}{3.6}$	34.3	8	$\frac{4.5}{10.8}$	23.3	5.31	13.95
4		50	39	11.2	3.6	35.2	11.4	12.8	24.2	5.06	12.34
5		50	39	11.2	4.4	34.4	7.8	15.6	23.4	5.30	12.53
6		50	44	8.9	$\frac{4.3}{3.7}$	33.1	9.1	$\frac{8.7}{9.3}$	27.1	5.58	11.35
7		50	44	10.6	4.4	35	10.4	18.6	29	5.24	10.17
8		50	39	8.9	6.2	34.9	9.0	14.9	23.9	5.20	12.95
9		50	37	8.9	7.6	33.5	9.0	11.5	20.5	5.46	15.46
10		50	44	10.6	5.7	33.7	10.4	17.3	27.7	5.54	10.56

Table 1 (b) - Payload Analysis and Unit Cost -
Short Log Configurations

		PURCHASE COST		TRUCK OPERATING COSTS PER YEAR			TRAILER OPERATING COSTS PER YEAR						TOTAL TRUCK/ TRAILER OPERATING COSTS PER YEAR \$
ITEM	LOGGING CONFIGURATION	TRUCK	TRAILER	STANDING COSTS	RUNNING COSTS	ROAD USER CHARGES	STANDING COSTS			RUNNING COSTS			ROAD USER CHGS.
							DEPRN.	INSUR & REG.	INTEREST	R & M	TYRES		
1		220000	24500	53130	94535	35186	2975	741	3115	1000	1955	21338	214020
2		220000	25800	53130	94535	47492	3132	774	3280	2500	1955	16111	222909
3		220000	36000	53130	94535	35186	4371	1029	4577	3500	2683	14749	213760
4		220000	39000	53176	95448	25773	4735	1218	4958	3500	2683	16117 19892	227500
5		230000	25800	55467	97467	38102	3132	774	3280	2500	1955	18084	220761
6		225000	25800	54368	97391	29874	3132	774	3280	2500	1955	16111	209385
7		230000	36000	55568	99480	26390	4371	1029	4577	3500	2683	14749	212347
8		225000	36000	54368	97391	15947	4371	1029	4577	3500	2683	14749	198615

Table 2 (a) - Operating Costs -
Long Log Configurations









ITEM	LOGGING CONFIGURATION	GROSS WEIGHT		TARE		PAYLOAD				LOG CARTAGE COSTS (\$/Tonne)	
		OFF HIGHWAY	ON HIGHWAY	TRUCK	TRAILER	OFF HIGHWAY	ON HIGHWAY	TRUCK	TRAILER	OFF HIGHWAY	ON HIGHWAY
1		45	35.5	9.8	3.3	31.9	10.7	11.7	22.4	5.25	13.55
2		45	38	9.8	3.4	31.8	12.7	12.1	24.8	5.32	12.74
3		50	42	9.8	4.6	35.6	11.2	16.4	27.6	4.89	10.98
4		50	39	8.9	$\frac{2.4}{3.4}$	35.3	8.9	$\frac{4.2}{12.1}$	24.3	4.99	13.27
5		50	41.4	10.2	3.4	36.4	14.8	13	27.8	4.80	11.26
6		50	39	10.8	3.4	35.8	12.7	12.1	24.8	4.85	11.97
7		50	44	10.2	4.6	35.2	12.8	16.4	29.2	5.17	10.31
8		50	39	10.8	4.6	34.6	7.2	16.4	23.6	5.16	11.93

Table 2 (b) - Payload Analysis and Unit Cost -
Long Log Configurations

CHANGES SINCE 1985

Since 1985 (Stulen), total truck owning and operating costs have increased by approximately 8% overall. In this time standing costs have remained largely unchanged due to the strength of the New Zealand dollar and the stability of interest rates, while running costs, in particular Road User Charges, have been responsible for the majority of this increase.

The new weights and dimensions legislation will allow certain configurations to be operated at 44 tonnes GVW. This will increase productivity for some configurations by as much as 15%. A percentage of the overall increase in operating costs will be a result of increased consumption of fuel, oil and spare parts generally.

The three most cost efficient configurations, in order of merit, for transporting short and long logs, on and off-highway, are in Tables 3(a) and 3(b).

Table 3(a) - Short Log Transport













ON HIGHWAY	
	
	
OFF HIGHWAY	
	
	

Table 3(b) - Long Log Transport

ON HIGHWAY	
	
	
OFF HIGHWAY	
	
	

CONCLUSION

The most significant change to come from the new weights and dimensions legislation is the increase in maximum gross vehicle weight from 39 to 44 tonnes. This weight increase, which applies specifically to 8 x 4 trucks with 3 or 4 axle trailers and B-train units, has made these configurations the best option for transporting logs on highway.

REFERENCES

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