Appendix 4

THE LINER TRAIN

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The description 'Liner Train' is applied to a conception of transport based upon joint use of road and rail for door-to-door transport of containerized merchandise, with special purpose, through-running, scheduled trains providing the trunk haul. It is envisaged as the future method for handling those flows of traffic, which are composed of consignments too small in themselves to make trainloads, but which aggregate heavy regular flows sufficient to support one or more trains per day.

BROAD OUTLINE OF METHOD

The advantages of the Railway are in the disciplined, safe, rapid movement of large tonnages at low cost. These advantages have generally been outweighed, firstly by the slow discharge of wagons, and secondly by the delays and damage inherent in collecting wagons in marshalling yards. The idea underlying the Liner Train is to by-pass both these obstacles to speed and economy. The expensive chassis of the wagon will no longer be marshalled, or be detained while goods are handled. Terminal delays will affect only the body.

The Liner Train then is a train of chassis which will remain continuously coupled. It will cater for the longer distance traffics and will run to a strict time-table calling for high utilisation of the stock. It will carry containers and, when fully loaded, it will have a gross load of 680 tons and a payload of 360 tons. The speed will be a maximum of 75 and an average of 50 miles an hour.

By their combination of speed, reliability in all weathers, freedom from damage or pilferage, and convenience of service, Liner Trains will surpass anything known by rail or road.

POTENTIAL TRAFFIC

The Liner Train aims primarily to capture full load traffic not on rail, and to handle remuneratively traffics which are at present carried at a loss on rail.

The traffic studies show that about 16m. tons a year of freight which is on road would be suitable for rail if the right conditions for conveyance could be created. The traffic is of the right physical nature and it moves in heavy and regular flows between a limited number of places and over sufficiently large distances. The conditions which must apply are speed, reliability, minimum handling and immunity from loss and damage, coupled with rates at a level acceptable to the customer and remunerative to the Railway.

The assessment of the potential tonnage is judged to be conservative. It includes only traffics which have been identified so far by examination of the individual flows of traffic in the 93 m. tons initially judged to be favourable to rail. A more thorough-going examination of 130 m. tons rejected as unsuitable for rail haul by traditional means may lead to some addition to the 16 m. tons identified so far.

To the tonnage which may be drawn on to rail can be added about 10 to 12 m .tons of existing wagonload rail traffic. Much of it originates at private sidings and is consigned to stations. Most of this is unremunerative at present, but will be handled more cheaply by Liner Train. In addition, there is a lesser proportion of the very uneconomical station-to-station traffic which has favourable characteristics for Liner Train movement.

There is also the probability that, arising out of the Post Office plan to concentrate the handling and distribution of postal parcels at a small number of centres, and the Railways' intention to proceed similarly with railway parcels and freight sundries, the potential of the Liner Train conception will be considerably increased. The tonnage might be in the region of 3 to 4 m.

There is a probability that there will be a growth of shipment of overseas freight in containers. Handling at the ports would be considerably facilitated thereby. With containers built to international standard, Liner Train services for ports should be especially attractive.

The type of freight traffic under consideration, being largely composed of the more sophisticated manufactured products, has been largely lost to rail or, where still carried in the traditional manner, is not remunerative. It is just thistraffic which can be expected to grow at least as fast as the economy as a whole, but the Railway cannot hope to stay in the business, and compete satisfactorily on the scale envisaged, unless a radical change is made in method of convey-ance. The answer is considered to be the Liner Train.

The overall potential for growth of Liner Train traffic over the next ten years with a growth rate of 3 per cent, per annum, is, therefore, of the following order: —

	Million tons
Potential traffic not at present on rail, at least . .	16
Existing full-load rail traffic	10/12
Parcels post, parcels, and freight sundries	3/4
Total potential at present	29/32
Increase over next ten years	10
Potential by 1973 (say)	39/42

In terms of distance carried the distribution is expected to be roughly: —

	Million tons per year
70-100 miles	7-0
101-150 miles	13-2
151-200 miles	9-5
201-300 miles	6-6
301 miles +	2-7
	39-0

comprising anything that passes by road at present provided it moves regularly and in substantial bulk over medium long distances.

THE SYSTEM OF SERVICES

The first services will be non-stop runs between selected places covering the very heaviest flows of traffic. As the scheme progresses routes with intermediate stops will be introduced. Map No. 11 shows the routes under consideration and indicates what the final pattern of services might look like, but the actual pattern will be planned to ensure that the maximum ton mileage is moved with the minimum number of trains. The greater part of the mileage will be run on the more intensively operated main lines in the country serving the areas where population and industry are dense.

The Liner Train routes will interweave in a manner designed to connect between them most terminals by through services. A broad pattern of movement over the country as a whole by groups of routes is shown below:—

	Forward direction	Return direction	Total
	'000 tons		
London-Scotland	620	710	1,330
London-Midlands-South Lancashire	4,880	7,160	12,040
London-Southampton/Portsmouth.	230	360	590
London-South Wales/Bristol-Plymouth	1,460	1,350	2,810
	1,350	2,260	3,610
South Wales/Bristol-Midlands-Yorkshire-Tyneside	2,140	3,760	5,900
South Wales/Bristol-South Lancashire-Scotland.	1,480	1,780	3,260
Other.			9,460
Total			39,000

EQUIPMENT

The project requires new types of equipment virtually throughout, except for locomotives.

As envisaged at present, the wagons will be bogie vehicles to ensure stability at high speeds, with a platform 42 ft. long at a height of 3 ft. 1 in. above the rail. They will be fitted with the pneumatic brake and be kept permanently coupled.

The length and height of the platform depend on the dimensions of the containers. The international standard 8 ft. x 8 ft. container is difficult to accommodate within British Railways' loading gauge, but by designing a wagon with an appropriate wheelbase and with a very low platform it is possible to obtain completely adequate route availability for Liner Trains.

The containers will be built to the newly recommended international standard section of 8 ft. x 8 ft. The following are the principal dimensions:—

Type	Length	Width	Height	Tonnage capacity	Cubic capacity
	ft.	*ft*	*ft*	*Tons*	*cu.ft.*
(1) Covered	10	.8	.8	5	530
(2) Covered	20	8	8	10	1,090
(3) Open. .	20	8	*	10	*
(4) Covered	27§	8	8	16	1,490
(5) Open.	27§	8	*	16	*

* According to purpose.

§ 30 ft. when road regulations permit.

In many respects, apart from the overall dimensions and the provisions for securing and lifting them, these containers will be similar to experimental containers being developed on the London Midland Region.

Containers will have the greatest possible width of opening at sides and end. This will give maximum freedom for loading them by fork lift or pallet truck.

Where the nature and volume of traffic justifies it, suitable containers to carry any commodity now carried by general purpose or specialised road vehicles, will be provided. The use of privately-owned containers, built within British Railways specifications, will be encouraged.

The maximum length of container planned at present is 27 ft. because of present regulations for road vehicles. The wagon, however, is designed to permit an increase in container length to 30 ft. or more.

DEPOTS

The task at the depot is essentially the simple one of transferring, very quickly and cheaply, containers of standard sizes between road and rail. The layout can be equally simple and depots will consist of a siding (or two), sometimes a line to release the locomotive, one or more cranes spanning the siding, a roadway, a park for road vehicles and containers, and a small building for the staff.

The depots, of which it is expected there will ultimately be about 55, fall into three principal groups. Large ones handling over 2m. tons a year, medium ones handling around 0-5 m. tons to 2 m. tons a year, and a few small ones handling under 0-5 m. tons a year. Since the operation of Liner Trains will be restricted to only a few main routes, it will be possible to serve them through a small number of depots so that the capital cost of depots will be low hi relation to their throughput and the unit costs of handling containers through them will also be low.

The depots proposed are marked on Map No. 11.

TRANSFER SYSTEMS

The transfer system must deal satisfactorily with containers of varying lengths, shapes and weights; it must be consistent with the use of standard road vehicles since the service should appeal to road hauliers and C licence holders; it must transfer to ground as well as to vehicle; and it must be so cheap and flexible as to give reasonable costs even when not in continuous use.

Many systems, both traditional and newly devised, have been studied. As a result, it is likely that the preferred methods will be the use of straddle cranes and gantry cranes, lifting automatically by means of pincer arms engaging in the base of the containers. At places of maximum and still growing intake and output, there may also be scope for application of the fork-lift principle developed to meet the special circumstances of Liner Trains.

ROAD VEHICLES

Few road vehicles owned by British Railways- are capable of carrying the new heavy containers. It is intended to co-operate with British Road Services, with C licence operators, and with road hauliers, so as to avoid an expensive duplication of road transport. As necessary, the Railway fleet will be adapted to the changing pattern which the Liner Train will initiate.

COSTS

The costs per unit of the equipment are: —

Train	£
Locomotive:	
Diesel	110,000
Electric	82,000
Wagon	3,000
Container:	
10ft.	700
20ft.	1,000
27ft.	1,200
Transfer, major depot — gantry with two cranes. .	80,000
Roadway and sidings parking (specimen)	70,000
Road vehicle and two trailers	5,000

These figures, and in particular gantry and container costs, are on the high side for production runs.

The investment to provide the first stage of two trains serving five depots will be of the order of £2.1m.

The cost to equip the country as illustrated on Map No. 11 will be of the order of £100 m.

To determine operating costs, the following pattern of operation has been assumed:—

Average train speed	50 m.p.h.
Average duration of intermediate stop. .	20 minutes
Minimum turn round at terminal	2 hours
Maximum load:	
Gross	680 tons
Nett	360 tons
Container maxima of 16 tons:	
Days in service	255 per annum
Locomotive — miles	135,000 per annum
Chassis — miles	100,000 per annum
Container — journeys	150 per annum

The direct costs of rail movement per capacity ton on this basis and at present prices will be: —

Miles	*10-ton container*		16-ton *container*	
	s.	*d.*	*s.*	*d.*
100.	*1*	3	6	*6*
200.	9	3	8	3
300..	11	0	10	3

After addition of collection and delivery costs, estimated direct costs per capacity ton are: —

Miles	*Direct rail costs per capacity ton*				*Road costs per capacity ton*		*Margin in favour of rail*			
	10-ton container		*16-ton container*		*16-ton container*		10-*ton*		*16-ton*	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
100.	20	3	15	*9*	19	0	-1	3	3	3
200.	22	3	17	*9*	32	0	9	9	14	3
300.	24	0	19	*9*	44	6	20	6	24	9

As will be seen, except for the 10-ton container moved 100 miles, Liner Train costs compare favourably with capacity ton costs for the largest road vehicles at present permitted.

Recognising that tonnage capacity cannot always be fully used and that some empty running may occur at times, both on road and rail, comparisons of75 per cent, and 50 per cent, utilisations of rail capacity with 80 per cent, and60 per cent, utilisations of road capacity, follow:—

75 per cent. Rail Utilisation v. 80 *per cent. Road Utilisation*

Miles	*Direct rail cost per ton*				*Road cost 16-ton vehicle per ton*		*Margin in favour of rail per ton*			
	10-ton container		*16-ton container*				*10-ton*		*16-ton*	
	s	*d*	*s*	*d*	*s*	*d*	*s*	*d*	*s*	*d*
100.. .	27	0	21	0	23	9	3	3	2	9
200.	29	9	23	6	40	0	10	3	16	6
300.	32	0	26	6	55	6	23	6	29	0

50 per cent. Rail Utilisation v. 60 per cent. Road Utilisation

100.	40	6	31	6	31	9	- 8	9	+	3
200.	44	6	35	6	53	6	9	0	18	0
300.	48	0	39	6	74	0	26	0	34	6

Applying these figures to the expected build up of traffic, it is estimated that the following will be the financial results: —

Year	*Tonnage*	*Receipts.*	*Direct costs.*	*Contributions to systems costs*
	m.	*£m*	*£m*	*£m.*
1965	4	7	9	-2
1966	12	21	21	..
1968	30	51	42	+9
1973	39	67	49	+18

Conclusions'

Studies have been taken to a stage where it is apparent that the Liner Trains concept is one of great promise for the Railways, and a very broad estimate of the contribution which a system of such services might make to the finances of British Railways by 1970 is £12-5 m. over direct costs. By comparison, full load general merchandise traffic at present on rail fails to cover its direct costs by£31-8m. a year.

Design studies have been taken to the point where decisions on equipment can be made very quickly. Market studies will have to be taken further before the full scope of *the* route system can be decided, but, in the meantime, attention is being concentrated on two of the most promising routes with a view to making the case for operating a one-train service over each of these by late 1964. Services which are receiving this special study are a double round trip per day between London and Liverpool, and a single round trip per day linking Sheffield with London and Birmingham.