The George Bennie Railplane System of Transport

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http://www.nas.gov.uk/about/091210.asp
The George Bennie Railplane System of Transport, continued

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The introduction of the George Bennie System of Transport is the outcome of one of the most marked characteristics of the present time. There is an insistent demand for safe and rapid transport, not only of passengers and mails, but also of newspapers, perishable goods, etc., and to meet this demand, the George Bennie System of Transport has been devised.

Rapid travel is at present confined to air transport, and is attended with much uncertainty arising from its inherent drawbacks, as safety in the air – with lighter-than-air machines – is dependent largely upon reliability of the aero engines. Apart from this, weather conditions to a considerable extent militate against comfort, if not against safety. These remarks apply in a modified degree to heavier-than-air craft, and in such machines the carrying capacity is also limited, having regard to the great bulk of the airship.

It will be conceded that for rapid transport, it is essential to separate fast traffic from slow-moving traffic, and, to achieve this, the problem must be dealt with either by aerial or subterranean means.

Aerial transport, to be perfectly safe and independent of atmospheric conditions, must be conducted along a definite line and with rigid craft. Aerial railways, as distinct from elevated railways, have so far been confined to rope railways which, while comparatively cheap in first cost, are primitive and incapable of being adapted to rapid transport. Elevated railways are,
undoubtedly, very costly to construct, but whether the lines be worked by steam or electricity, the cost of travel is comparatively low compared with existing railways.

Subterranean railways are even more costly to construct than elevated railways, and where, to reduce construction costs, the lines are very deep, the disadvantages are marked. The tube railways of London afford ample evidence of this, as many of the deep stations have had to be equipped with escalators in addition to lifts – at great cost and heavy maintenance expenses.

The cost of working either elevated or subterranean railways is high, and, even so, the service which can be given is not sufficiently rapid to meet modern requirements.

The advantages of elevated lines over subterranean lines are so manifest that they require no elaboration here.

In the George Bennie System of Transport the cars are suspended from a rigid overhead structure, at a suitable height above the ground level, and the means of propulsion is by air screws. Such a system, combining the safety of the railways with the speed of aerial craft, affords a reliable and comfortable means of rapid transport independent of atmospheric conditions, and does not in any way interfere with existing roads and railways.

At this stage it should be clearly understood that the system is not intended to offer a substitute for railways – heavy or bulky traffic could not be conveniently dealt with – nor is there necessity to
VIEW OF RAILPLANE THROUGH TOWN
compete with railways for such traffic. The utility of the system rests in the possibilities which it opens up of affording safe and rapid transport for passengers, mails, newspapers, perishable goods, etc.

Owing to the fact that the line is elevated to a convenient height above the ground, that the supports occupy only very small areas of land, and that each car is of light, rigid construction, limited to about 10 to 12 tons total weight, it follows that the cost of constructing tunnels, deep cuttings, high embankments, bridges of large and small spans, is eliminated.

Another important point in this system is that it can be constructed along or across existing roads and railways without difficulty or interruption, and lines can be carried over agricultural land without any practical interference.

It will be seen from the illustration that the cars are carried and controlled on an overhead track propelled by air screws, after the manner of airships. The cars are virtually airships, without the uncertainty of lighter-than-air craft and the bulk of heavier-than-air ships. By adopting a single rail and modern ball-bearing devices for all rotating parts, combined with airship lines in car construction, friction is reduced to a minimum. The design of the cars may be such, that at high speeds they tend to rise slightly in the air, on the principle of an aeroplane, and thus relieve to a great extent the friction due to the weight of the car on the suspending rail. This is an important point, and one of the principal features of the system.

The overhead tracks are carried on trestles or columns placed at suitable intervals, and a rigid guide rail is provided under each car, to prevent undue swaying of the car. The design of the bogies are such as to check the tendency of the
GENERAL VIEW OF MODEL, SCALE 1 INCH TO FOOT
cars to rise in the air beyond the amount required for relieving the weight of the laminated springs on the bogies.

**Means of Propulsion.** – Propellers are placed at front and rear of car, and the propellers are driven by electric motor, the current being collected from a live rail. Where electric energy is not available internal combustion engines are used. The power used greatly depends on local conditions.

By adopting the principle of two-point suspension of the cars from bogies, the bogies having a very small wheel-base, the alignment of the track is capable of following the configuration of the land, thus rendering possible the selection of a route which will reduce construction costs to a minimum, and permit of the linking up of towns, and villages which lie widely scattered. The undulations of the ground can be followed without difficulty, as the cars would be capable of ascending and descending gradients much more severe than are met with no railways.

**From the above brief outline, it will readily be realised that the system is not only capable of very high speeds, but it possesses the marked advantages of rendering possible the construction of a line following closely the contour and topography of the land. These are most important points in favour of this system, points which will appeal to those concerned in opening up new districts.**

Where aesthetic considerations render it advisable or necessary, the construction of the trestles and overhead structural work would be specially designed to meet the requirements. The structural work would be of steel, but if the considerations prevailing or economic considerations called for alternative methods of construction, reinforced concrete, timber, or a combination of the two or more of these methods could be used with
VIEW SHOWING MODEL WITH TURNTABLE AND TRACK
satisfactory results. An elevated roadway for fast motor traffic and foot pavements for pedestrians could without difficulty be provided above the tracks.

Mr. George Bennie, the Patentee, in 1922 was awarded the Gold Medal at the Industrial Exhibition in Edinburgh for merit in respect of his Transport System.

**Comparative Costs and Estimates of Railplane:**

For comparative purposes the undenoted figures are given:

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>Approximate cost of constructing a Double Line Railway of the usual type</td>
<td>£47,500 per mile</td>
<td>Assuming average conditions, excavations 5 feet deep–viaducts, no tunnels.</td>
</tr>
<tr>
<td>Approximate cost of constructing a Double line of Light Railway</td>
<td>£21,000 per mile</td>
<td>Assuming average conditions, excavations 2½ feet deep – viaducts, one per 10 miles, no tunnels.</td>
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<tr>
<td>Approximate cost of constructing a Double Line of Tube Railway</td>
<td>£800,000 per mile</td>
<td>Based on 100% increase over ascertained average cost of Tube Lines in London.</td>
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<tr>
<td>Approximate cost of constructing a Double Line of Elevated Railway</td>
<td>£135,000 per mile</td>
<td>Based on 125% increase over ascertained average cost of New York elevated lines.</td>
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<tr>
<td>Approximate cost of construction a Double Line of Tramway track in cites</td>
<td>£25,000 to £30,000 per mile</td>
<td>Based on overhead trolley wire construction.</td>
</tr>
<tr>
<td>Approximate cost of constructing a Double Line of Railway on the George Bennie Principle</td>
<td>£19,000 per mile</td>
<td>Based on heavy traffic conditions and substantial construction.</td>
</tr>
<tr>
<td>Approximate cost of constructing a Double Line of Railway (light construction), on the George Bennie Principle</td>
<td>£15,000 per mile</td>
<td>Based on conditions prevailing in urban districts.</td>
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(ACTUAL SIZE)
It will be seen from the foregoing figures that a line built on the George Bennie principle can be constructed at a cost varying from £15,000 to £19,000 per mile of double track, which compares very favourably with initial costs in respect of double line ordinary and light railways, and is very much less than would be the case for elevated or subterranean lines.

The possibility of constructing a system of aerial lines on the George Bennie principle in large cities offers marked advantages over ordinary tramways, both in respect to first costs, operating costs and public convenience. In the latter case, the tramway tracks occupy a considerable portion – in some cases the greater part – of the width of the roadways and result in the congestion of traffic which is so marked in all large cities – such as London, Glasgow, Liverpool, Manchester, Edinburgh, etc.

As an alternative to Tube Railways, the George Bennie system offers still more marked advantages. The costs of construction and operation are very much lower, the conditions of travelling are more natural, comfortable and convenient, and the speed is much greater. The question of safety is important, as with automatic signalling, and brake power, this is amply provided for in the George Bennie system.

As a means of linking up two or more important centres, and affording safe, rapid, comfortable and cheap transport, the possibilities of the system are vast. Such a line constructed, say, between Liverpool and Manchester, would supply a want which has long been felt.
HALF VIEW OF RAILPLANE CAR SHOWING SUSPENSION BOGIE
MAINTENANCE AND OPERATING COSTS

On the question of maintenance costs the George Bennie system is also much superior to all other forms of transport. Although there are great quantities of steel structural work involved, the cost of painting is comparatively low, and as the tendency is towards evolution of paints or enamels which will have lasting properties, much in advance of anything at present in use, this aspect of the question will become less important in the future.

Based on the present-day costs, the expense involved in painting the structural work of a line on the George Bennie system would be about £200 per mile per annum. Painting would be the most important item in the cost of maintenance, but if the cost of maintaining the over-head tracks, the guide rails, automatic signalling, stations, accesses etc., are included, the cost would not probably exceed £300 per mile per annum.

The operating costs will vary widely with the traffic factors on the line, but it may be easily known that, given a high proportion of average load to maximum load, the returns on the capital invested will be satisfactory. For details it would be necessary to work out a particular case, or base an estimate of revenue on a hypothetical case which is not, of course, very informative. **The operating costs will be much below those of any known method of transport.** Each car would be under the control of one attendant and as the entrance and exit gates would be automatically controlled (the Passengers entering and leaving cars will have separate doors, thus preventing congestion) – as would also all the signalling and safety devices – wages costs would be kept down to the minimum.
MODEL OF RAILPLANE TURNTABLE (OPEN)
ESTIMATE OF PERFORMANCES

Assuming that the line were level, and that by the use of ball-bearing devices for all rotating parts, the friction could be reduced to 10 lbs. per ton of load. The total friction to be overcome in moving a car would, therefore, be 50 lbs.

Assuming, in addition, that the car was ascending an incline of 1 in 35, with a minimum horse power of 84, the speed which could be attained would be 30 miles per hour, and at this speed, the horse power required to overcome wind resistance would not probably exceed about 10. With an average horse power of 84, and a maximum horse power of 200, speeds of 120 miles per hour could easily be attained on the level or down grade.
INTERIOR OF PASSENGER CAR – END VIEW
SALOON – END VIEW
THE STATION – SHOWING ROADWAY ABOVE RAILPLANE
SHOWING RAILPLANE OVER ROADWAY
RAILPLANE ENTERING AND LEAVING STATION