Allison

Sydney Live Steam Locomotive Society

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Newsletter
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'Newsletter'

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General News

Christmas Run: This will occur on the first Saturday in December (the 6th). As last year we will be hosting the ARHS BBQ Christmas lunch. Bring your scale rolling stock and interesting locos for that casual run and display. We will join them in the BBQ lunch. Proceeds will go toward the Malcolm Sergeant Cancer Fund. Following this we will have our own bring your own everything BBQ tea for family and friends. Don't put those engines away after lunch!

50th Anniversary Celebration Run: This will be held on the weekend of 21/22 March 1998 which hopefully is clear of the council drainage works. The Saturday will be the normal running day, but we will start earlier (10am) and do a bit of advertising for the day. The Sunday will be a general invitation for all clubs to come and join us. We intend to invite some special guests with speeches on the Sunday around 2.00pm. A display is proposed in the clubhouse of interesting items, on both days. The anniversary dinner will be held in July closer to our actual anniversary date of 13 July 1998.

Works Report

Elevated Carriages: The project to fit end boards and improved drawgear (including buffers) to the elevated cars has successfully reached a functionally complete stage. No less than 16 members have worked on this project which was done within 2 months of members agreeing to proceed at the August meeting. By all accounts this was a true joint effort and one which has not only improved safety, but has given all our elevated carriages a family likeness. Work is now progressing in the varnishing of the seat timber and the painting and lettering. When fully complete they will certainly present a pretty and professional picture.

Elevated Ground Frame: Work has recommenced with the focus being on connecting the crossover to the frame. The various cranks and compensators have been cleaned, painted and reassembled and slow but steady progress is being made to satisfy our lever pullers. Some thought should be given to the form of the home signal at the platform. This will become necessary once the crossover is working!

Painting: Brian Hurst has been steadily progressing with the painting of our fixed steel parts, (the non fixed bits are destined to be galvanised).

Compressor Room: Pete Shiels has transformed this dark, wet hole into a pleasant abode too good for a compressor! A new concrete floor, piped blow down, and white washed walls and now being followed up with new steel plating over the various pits at the end of the carriage shed.

Ground Level Cars: John Hurst has shown himself to be the brave man he is and has commenced a task that mere mortal men have shunned! This is the replacing of the brake diaphragms in the green and blue ground level cars. Mike Tyson has fitted a single wooden buffer to the ends of all these cars which will ensure that in the event of a collapsed coupling the endboards will not close up and jam fingers.

Protection Arrangements on the Ground Level Track: Four new red flags and steel flag stands have been provided to be carried by the four ground level guards vans. In the event of an incident and it is necessary to protect the rear of the train, the guard should walk back a train length and place a flag stand adjacent to the track, in good view of approaching trains. The flag should be positioned so that it is held over the track. It's probably not a good idea to put the flag stand on the track! This arrangement will permit the guard the maximum opportunity to assist & deal with the incident without the following train creeping up unawares. P.S. Use a RED flag!

Running Days.
The August running day was just about as good as a late winter day could be, bright sunshine with a light north west breeze. The crowd was very good, we managed about 3000 rides with some spectacular locomotive combinations in operation. The outer ground level was catered for with Peter Shiels C3901 and Ray Lee "S" class each on a train. Big power combinations on the inner ground level with Henry Spencer, TGR "R" class, leading Warwick Allison, WAGR "V" on one train and the second a triple header with Max Gay, " Bitza", Geoff Sorensen, C3142, and Barry Tulloch D5902 as train engine.
The elevated was serviced by Ken with his "Simplex" , Paul and his "Hunslet", Ron and Stuart , C35 class and the Mulholland Clan with "Pansy"
Early in the day ,visitor Jack Grierson, had a run on the elevated with his 3 1/2" gauge C38 class.

September. Spring time. The forecast storm arrived just on lighting up time but cleared to give a fine afternoon. This probably kept the crowd down but the afternoon was enjoyed by those who came along. A shortage of staff saw only two trains hauling passengers on the elevated. Ken and Paul with "Simplex" and the "Hunslet" ran one train while a first time combination of John Tulloch , "H" class and Ron's C 35 , the old and the new of steam express locomotives, ran the second train.
Many of the elevated cars had their first run with the new end boards and standardised draw gear , they looked very good..

October. The day turned out cool but fine and we entertained a reasonable crowd. A feature of the afternoon's running was the spectacle of double headed Fowlers, "Tonya" , Ross Bishop-Wear and "Pamela", Ray Bannerman on one train on the inner ground level track. Joe Huntley made the trip from Newcastle to see this train and it was good to hear "Allllbury-alllll change!" as the trains pulled in to the platform.

Running Day Comment. As well as locomotives and drivers we do need a good number of membe available to assist with the running of our railway. We need to have sufficient members so that there is the possibility of providing relief during the afternoon from some of the tasks.

CAKES.. Please remember that the ladies of the canteen need a good supply of cakes and other goodies for the afternoon teas.....

Full Size Train Riding. Early in September . The NSW Rail Transport Museum organised a trip around the metropolitan area.. Members John and Brian Hurst and James Grey were passengers on this trip as well as member Graeme Kirkby, on the foot plate from about 3.00pm. The STN indicated that the train departed Sydney Terminal and visited Rhodes, Flemington Goods Junction, Sandown, Sefton Park Junctions, Enfield Yard, Chullora Industrial Sidings, Enfield Yard, Botany, Rozelle, Meeks Road Junction and back to Sydney Terminal. John reported that Graeme did a fine job on the foot plate.

Locomotive For Sale. 5" gauge C30 T , 3075. Engine , tender and driving truck all in good running order. Boiler certificate N.A. 77. 88, current to 11.99.
Phone Maurie Haynes, 9525 7285.

New Member: We welcome Jack Grierson as a provisional member. Jack is a regular visitor at the running days, and some months ago tried out our track with his 3½ inch gauge 38 class.

Mr. & Mrs. Peter Lyons: The bells of St.Marys Cathedral rang out over Sydney on Saturday 11th. of October to celebrate the wedding of Peter and Sharlene. After a week on Lord Howe Island they returned to reality in their new home at Stanhope Park, Parklea,
The Lyons family would like to thank the SLSLS friends who ventured to the Cathedral to be part of the ceremony.

Narooma School Visit: Once again this was the highlight of the visit to Sydney by the students of this south coast school . 6th of November saw two bus loads of students spend about 1 1/2 hours at the grounds. A very busy time followed, Peter Shiels ran the ground level service while Jim Leishman ran on the elevated. Bryce, George, Alans, C. and Mac. provided assistance. I believe the kids were very reluctant to get back on the busses when it was time for them to move on.

Jim Leishman: Jim's recent bypass didn't keep him down for long. The perfect medical result ensured Jim's absence was extremely brief. Some people didn't even notice he missed a couple of Saturdays! Well done Jim. Some recuperation was done cleaning and painting some bits for the ground frame and soon the elevated anti tip rail will be on the move again following general acceptance of the design.

Wanted!!: We have some nice speakers in the clubhouse which we would like to connect to the VCR. To do so we need a stereo amplifier with connections for an auxiliary input and capable of driving real speakers. If anyone has such a unit surplus to requirements, it may improve the choofs & chuffs during video playing!

Duty Roster.

Dec. '97. J.Hurst, A.Cottrell, J.B.Hurst, J.Lyons, P.Lyons, B.Peake, M.Yule.
Jan. '98. B.Hurst, J.Davies, T.Eyre, G.Kirkby, K.McMahon, D.Mulholland, B.Rawlinson, B.Tulloch, J.Tulloch.
Feb. '98. B.Richards, R.Larkin, S.Larkin, R.Lee, M.Lee, J.Lieschman, J.Ranford, M.Tyson.
Mar. '98. W.Allison, R.Barlow, H.Brammer, T.Geraghty, B.Greenfield, J.Mulholland, L.Pascoe.

Gate Roster.
December. J.Davies. January. G.Esdaile. February. T.Eyre. March. W.Fletcher.

Diary Dates:

Weekend 29/30 November	SSME Luddenham Anniversary Weekend
Tuesday 2 December	Members meeting 8.00pm.
Saturday 6 December	ARHS lunch & Club Christmas Tea in the evening
Saturday 20 December	Running Day
Tuesday 6 January	Director's Meeting
Saturday 17 January	Running Day
Tuesday 3 February	Member's Meeting 8.00pm
Saturday 21 February	Running Day & next newsletter!

Editorial.
I would like to use this space to wish all SLSLS members and friends a very happy Christmas season and a safe and enjoyable New Year. Thankyou to those members who have contributed to the Newsletter this year, especially Warwick. Our President is determined to improve my computer skills, but, it is great to actually do some editing.
Keep the Christmas Run Day in mind, this is usually a great day.
1998 sees the 50th. year of the Society. This will be something to celebrate despite the major disruption that the proposed drainage works will cause. John Lyons.

Henry Spencer. At the time of completing this Newsletter Henry is in the Royal North Shore hospital suffering from a bout of pneumonia, all the best Henry for a speedy recovery.

The Development of the Steam Locomotive on the N.S.W. Railways.
by Mr. C.A.Cardew. Continued.

Suburban locomotives. " It was at about the time of expansion of the lines beyond the coastal areas that made such a change in the demands of the main line locomotive power that Sydney first began to face a rapid growth in suburban rail travel, first by the development which the railway itself brought about of the western suburbs, and later to both the north and south of the city. In the earlier years, with the traffic concentrated, as it was mainly between Sydney and Homebush, though extending somewhat later to Parramatta, but with the easy grades and curves involved, and the stations in use being widely separated so that a high rate of acceleration was not important, there was no great demand made on the power of the locomotive. Indeed , the assignment of some of the older and less powerful locomotives, to which it was not desirable to allot main line duties, to these local workings was found for some years to meet the requirements. However , when the northern line from Strathfield was opened, and residences were built on the northern heights, the outward bound traffic was faced with steep 1 in 40 rising grades while, on the Illawarra line to Hurstville, there was 1 in 60, and further on a 1 in 40 incline, and next, with the construction of the North Shore line, there came the long climb from the Harbour foreshores at 1 in 50 which had to be surmounted, while at the same time between stations distances were continually being shortened by the opening of new suburban platforms.
These were the circumstances that, with the increasing density of traffic entirely changed the suburban railway scene, and drastically affected the problem of providing locomotive power adequate for handling the increasingly heaving and frequent suburban trains.
N67. This was the first class that was specifically built for suburban train working in N.S.W. These locomotives first entered service in 1875 , there were eight in number. They were 0-6-0 tank locomotives and were actually an enlarged version of a design which was then giving very good results on London, Brighton and South Coast Railway, in England. They were built by Mort's Dock, and by Messrs. Vale and Lacy, in Sydney rather interestingly under licence from the Locomotive Engineer of the English railway Company mentioned.
F 351 Class. This is the next example worth recording. A 2-4-0 tank engine , eighteen in the class, introduced in 1885 . There was provided by this class an increase in tractive effort on that of the previously locomotive of some 40%, while having much larger driving wheels , 5' 0", in diameter, the type was capable of higher maximum speeds, well over 50 mph. being commonly reached. There are two of the: locomotives preserved.
M40 Class. This 4-4-2 tank engine design was introduced in 1891. There were fifteen in this class and were built by Messrs. Beyer, Peacock and Company. Like the last class mentioned they had quite large 5' 0" diameter driving wheels, but with a tractive effort of 15,800 lbs. showed an increase of about 70%.
All there locomotives for suburban train working were inside cylinder locomotives, probably because at the time having regard to the outside disposition of weight due to the location of the tanks, this cylinder position was favourably regarded for tank type locomotives for safe and smooth riding conditions, to which the location of the tanks and surge of water in them was thought to be detrimental. Continued.

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Web Page Address: *http://www.pnc.com.au/~wallison/index.html*
Public Running Day is the THIRD Saturday in each month from 1.30pm. Entry is $2 adults, $1 children. Rides are 50c each

SYDNEY LIVE STEAM LOCOMOTIVE SOCIETY CO-OP LTD

TRACK & TRAIN DYNAMICS on a 5 inch gauge Railway

1. History

For many years SLS has been refining the track and rolling stock on the ground level 5 inch gauge railway. We established track standards very early on in the days of 5 inch on the ground. The standard drawing is dated 1966 and there was obviously considerable thought that went into it prior to this being published. You can see the development of carriage design from the early club trucks that were relegated to ballast trains through to the improved bogie designs employed by Bill Richards on the set of ground level trucks now with Brian Kilgour. These in turn developed with the Ray Lee designed trucks in 1981 that now form the basis of our rolling stock. These trucks incorporated vacuum brakes, toe guards and bolster bearings. Development outside the Society saw the introduction of end boards and the availability of Warrick Sandberg's excellent bogies complete with vacuum brake and including the sealed ball race for carriage support. Eric Holme's carriages now in the possession of the Society are good examples of these features.

Considerable experience gained with these bogies has fine tuned the location of the bolster ball races, the subject of considerable discussion!

We have now fitted full end boards and ballast weights to our fleet and they would now be as up to date as any in the miniature railway business except possibly for non padded seating.

There is still continuing thoughts on how to improve them. We need to address two distinct areas in carriage performance but with overlapping technical considerations. The first is carriage performance on the track to avoid derailments, and the second is to contain passengers on the carriage and minimise any tendency for tipping, a not insignificant problem on a 5 inch gauge railway. If we understand what is happening with the basic physics then maybe we can appreciate the situation more. The following is largely based on our SLSLS bottom curve which is 9 m radius.

2. Track Performance Needs

2.1. General

To keep a vehicle on the track is not too hard if the track is tangent and straight. But what railway is? It is the variation from tangent and straight that gives us the problems. Clearly the vehicle design needs to accommodate the changes and the degree of changes within the track need to be kept to within limits that the vehicle can accommodate. The difficulty is in setting and measuring these parameters and knowing how they interact. The reason we vary the line of track is to go round curves, & provide superelevation. There are 3 aspects of this worth looking at. These are 1. Vehicle overturning speed; 2. The amount of superelevation; and 3. The optimum speed for the curve.

2.2 Overturning Speed

The overturning speed for a vehicle is dependent principally on the vehicles centre of gravity and the radius of the curve. It doesn't vary greatly with superelevation. As our centre of gravity is relatively high in comparison with the gauge of the railway (and there is not too much we can do about it) the critical speed is relatively low. Hence it would be a major factor in passenger comfort on sharp curves and for this reason, a good margin should be kept between the operating speed and the critical speed. This factor is of lesser importance as the curve radius increases, as the critical speed extends well beyond our operating speeds.

Curve Radius (m)	9	20	30	50
Overturning Speed (m/s)	3.35	4.99	6.11	7.89

Note: Calculations are based on a 5 inch gauge loaded vehicle with a centre of gravity 500mm above rail level and zero superelevation. 1m/s is 3.6 km/h.

2.3 Superelevation

As a vehicle traverses a curve there is a weight transfer to the outer rail. By raising the outer rail it is possible to transfer weight back to the inner rail. Of course the outer wheel/rail is very critical in this situation in the prevention of derailments. Reducing the load on it can also increase the tendency to derail by reducing the forces preventing it from lifting from flange forces. As raising the outer rail has only a marginal effect on the critical speed, and as our welded track structure is quite strong, the amount of superelevation is really only to provide a degree of passenger comfort helping to alleviate the feeling of falling outwards. To achieve this the speed should be no more than the speed needed to achieve equilibrium speed. This is the speed at which the wheel weights become equal. Again, as the problem is predominantly more important on the sharper curves, large radius curves really don't need any superelevation.

For a 9m curve:

Superelevation (mm)	0	1.44	3.24	5.75	12.95
Equilibrium Speed (m/s)	0	1	1.5	2	3

As an indication of the effect of superelevation on the critical (overturning) speed for a 9m curve:

Superelevation (mm)	0	1	2	3	4
Critical Speed (m/s)	3.35	3.45	3.55	3.65	3.74

2.4. Optimum Speed & Super for the Curve

For the 9m curve we are looking at, we have 2 criteria to determine an appropriate speed to go round it. Firstly it needs to be significantly less than the critical or overturning speed. Secondly, it should be related to the equilibrium speed. Exceeding the equilibrium speed still keeps the higher weight on the outside rail. If we go under the equilibrium speed we need to be careful we don't unduly unload the outer wheel. This though is probably only a real problem if we use high amounts of superelevation, and it is clear from the figures that we don't want to do this because things approach the critical speed. Practice would indicate that speeds of the order or 1 to 1.5 m/s would be possible. As the equilibrium superelevation is only of the order of 3mm, this would seem to be the maximum we would ever need.

3. Track Parameters

The attainment of any amount of superelevation involves a transition from an equal rail level to one where one rail is higher than the other. This imposes a twist in the track. In full size track twists are limited to a rate of 1 in 400 (or 0.25%). To complement this vehicles are tested to be able to accommodate a twist of 1 in 250 (or 0.4%). In between is the factor of safety. On a 5 inch gauge railway our all welded track is relatively stronger than full size. This means that very short sharp changes do not often occur and dips which affect both rails equally should present little difficulty as long as self compensating bogies are used. (A dip which is unequal on each rail is a twist). However we need to establish any super over a distance that the vehicle can cope with. Similarly this needs to be consistent with no local twist. A figure of 1 in 400 represents 7mm (9/32 inch) of twist over a 3m (10 ft) track length. As the maximum superelevation would be 3mm, this represents returning to zero super over a length of about 1.5m.

4. Carriage Parameters

4.1. Twist Capability

We have 2 lengths of carriage 5ft and 6ft cars. The longer the distance between the bogie centres on a car the more susceptible the car is to twist. The carriage needs to cope with twist due to superelevation and also due to normal track deficiencies due to soft formation etc. While full size is 1 in 250 (or 0.4%) if we can achieve better we should. Some sample cars were tested. This was done by placing packing under the wheels on one side of one bogie. The twist tolerated before all wheels were no longer on the track is as follows:

Carriage	Twist Limit
5 ft car	1.4%
6 ft car (old)	0.82%
6 ft car (new)	0.47%

There is clearly a big difference here. As the track twists the frame of the carriage is progressively supported on a single bolster ball race. As the race is fitted within the gauge, the full weight of the carriage (and passengers) is presented to all wheels, although the pressure is less on certain wheels. However when the twist is such that the bogie and frame lock together then wheel lift occurs. This point of locking is the cause of the variation in the previous table. In the new 6 ft cars it was due to inadequate length of the bogie centre pin. The bogie tilt was limited by the retaining split pin. On the old 6 ft cars, the pin jammed in the hole. This had less clearance than the 5 ft cars which permitted much greater tolerance to a twist. The symptom becomes particularly evident on the track when travelling over the last part of the curve, approaching tangent track. This is where the super elevation is decreasing. The rear bogie (outside wheels) are elevated higher than the front outside wheels due to the effect of the decreasing superelevation. This removes weight from the front outer wheels. In some cases the flange forces cause the wheel to lift and hence a derailment occurs. In extreme case the frame locking will lift the wheels directly.

As the 1.4% twist tolerance is feasible then it would be an appropriate standard to require of new rolling stock. This can be achieved by using a 15mm (5/8 inch) packing piece under the wheels. At this twist level the wheels on the other bogie would be just beginning to lift.

4.2 Bolster Support

The common method of bolster bearings for carriages involves 2 ball races mounted on angles on the bogie bolster. Experience has shown that it is important for these bearings to be within the gauge. This is because when the bogie twists due to the effects of super, one bearing is unloaded. The remaining bearing, if it were outboard of the gauge would cause the bogie to lift the other wheels, a clearly undesirable outcome. As these 2 bearings give support to the carriage frame, they play an important part in the feeling of security of passengers. The further inboard they are, the easier it is to tip and the less stable is the carriage. A compromise needs to be reached in order to optimise both aspects of the carriage performance.
Placing the bearing over the flange has been proven to be inadequate. This is because when rounding a curve, the wheelset on the outer rail rides well up in the radius of the flange. The lateral distance from the wheel contact point and the centre of the bearing is so small as to provide an inadequate weight on the opposite wheel, particularly when the carriage is unloaded. In this situation, the weight of the carriage and the distribution of forces is such as to totally unload the opposite wheel and make it susceptible to riding up on an outer rail due to flange/rail effects.
It would be reasonable to place these bearings at 4 inch spacing measured across the outside of the bearings. (Any pivoting of the body on these bearings occurs on the outside edge of these bearings and hence this is the datum.) This would be a compromise between passenger stability and the need to ensure adequate loading is retained on all wheels, especially if unloaded.

4.3 Bogie Design

Bogies should be of the self compensating type. The use of springs in the compensation (of the 3 piece design) is useful, but they should not be considered as part of the suspension of the weight due to the gross differences between the unloaded and loaded condition. This would vary from possibly 40kg unloaded to over 300kg loaded. Full size this would be from 40 tonnes to over 300 tonnes! This is a tall order for any simple springing system. Nor should they be considered as providing for track twist. At best any advantage gained by the springing should be considered a bonus or as an attempt to reduce the impact force at track discontinuities such as rail joints.
Fixed frame bogies can only be used with secondary suspension, but for the foregoing reasons are not recommended.
Bogies should be tested by lifting one corner. It should be able to raise one wheel quite freely by 12mm (1/2 inch) or so without lifting the other wheels off the track.

4.4 Carriage Stability

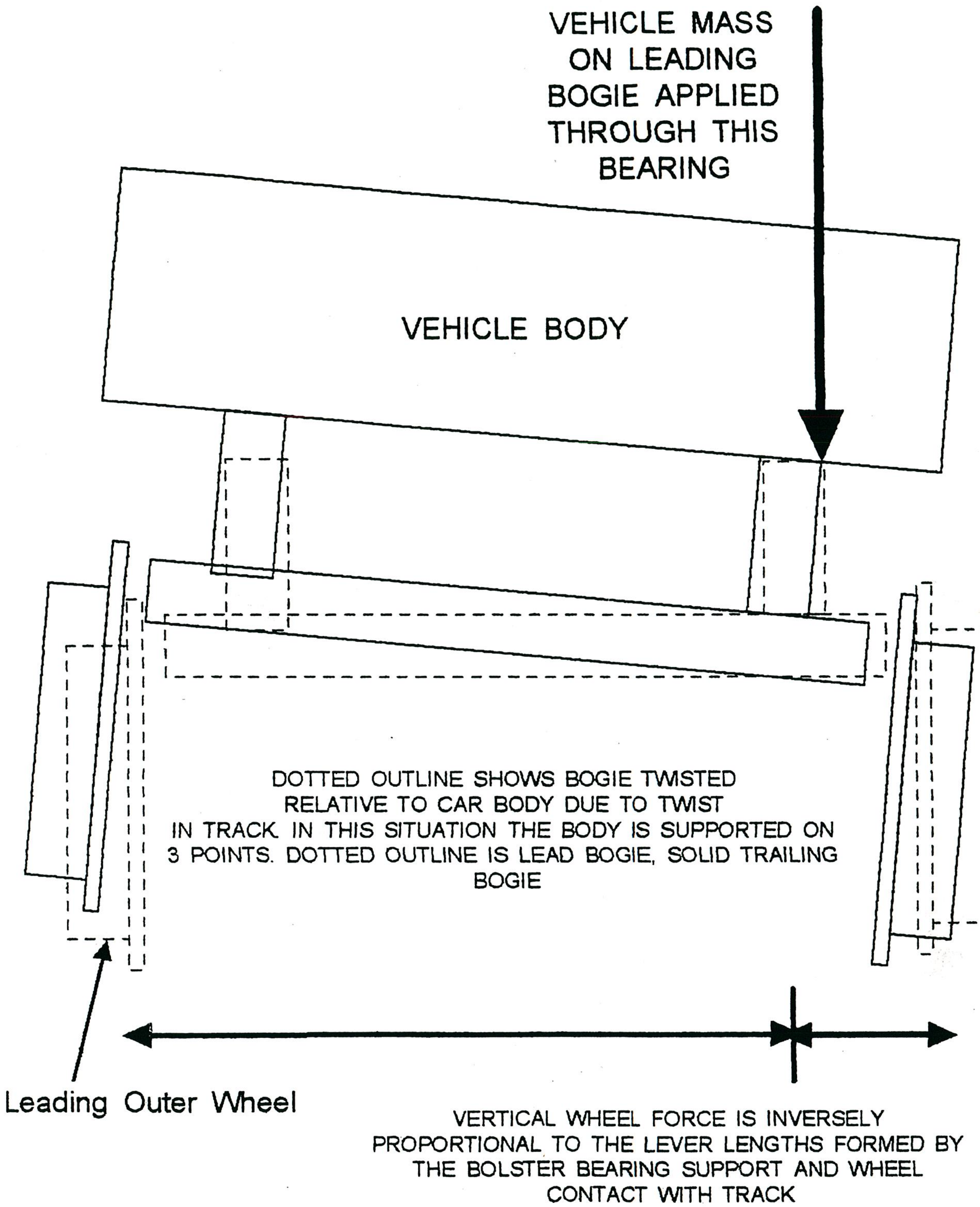
Stability is a difficult thing to assess. At some time a passenger will feel that he is unbalanced. This could be due to many reasons, most not related to the carriage at all. If the passenger feels he is 'going over' they are likely to try to restrain themselves. As they are wholly on the carriage this then takes the full effect of any out of balance. It is clearly a case of centre of gravity, and what level the overturning force is. To counter this we need to consider where the carriage tips. Initially, it will tip on the bolster bearings in the same way as the vehicle acts when accommodating a track twist. Hence there is the turning moment above this pivot being counteracted by the weight of the vehicle below the pivot. Ballasting the vehicle at the lowest point will add important weight to help counter this overturning force. Longer carriages can also resist this due to the extra vehicle weight inherent in the extra length and the extra non-misbehaving passenger load.
If the overturning force actually uses up what ever twist tolerance is available in the carriage it will then start to lift a wheel. At this point the carriage body would be at such an angle that passengers are likely to slide off whether a derailment actually occurs or not. Low level ballast would be the best way to counter this and control the tilt at the early stages. This can only be a matter of degree.
It may be possible to better control this by designing the tilt point as high as possible, such as just beneath the passenger seat. This reduces the overturning moment above the pivot and makes any ballast below the pivot (including the bulk of the car) more effective.

5. The Future Carriage

With the evolution of carriage design it is clearer what the secrets are. The Sandberg type self compensating bogie or its equivalent are quite satisfactory. Springs should never be used for supporting the load. Clearly stability would improve if the full weight of the car whether loaded or not, is always bearing on all bolster bearings. If this were to occur then there would be no objection to these bearings being placed at gauge width. The vehicle body would need to be able to twist to accommodate track irregularity. This is the tall order.
Perhaps a carriage with a central spine displaying plenty of vertical strength but capable of twisting is the ideal, but the practicalities of attaching footboards and the seat usually stiffens the frame to an undesirable degree. Still If we can achieve this goal, it would provide a significant advance in addressing the issue of vehicle stability and roadholding on the 5 inch gauge.

FOOTNOTE. I can supply an Excel spreadsheet with all the formulas for anyone interested in working out the figures for other parameters.

Warwick Allison. 29th. June 1997.



Note that with the bolster bearing located directly over the wheel, there is no weight transfer to the outer leading wheel. This can then rise due to flange forces.

DIAGRAM SHOWING DERAILMENT TENDENCY DUE TO LEAVING A CURVE WITH SUPERELEVATION DECREASING