Weedon 1951

A difference of about 20 thousandths of an inch in the clearances between axleboxes and the guides in which they worked could make for a safe journey or disaster. At Weedon in 1951, it was the lack of that clearance that led to an axlebox jamming, and 15 people being killed.

The 8.20am express from Liverpool Lime Street to Euston on 21 September 1951 was running well, after passing through Rugby. However, it was running 16 minutes late, following signal checks between Liverpool and its first stop at Crewe and further checks between there and Rugby. It was a heavy train of 15 coaches, typical of West Coast main line trains at that time. Like most of the Liverpool – London services it was hauled by one of the Stanier Pacifics. On that morning the engine was Princess class No 46207 Princess Arthur of Connaught.

After reaching the summit of rising gradients from Nuneaton, at the London end of Kilnsby Tunnel, five miles south of Rugby, the line fell for seven miles through Welton to Weedon on fairly gentle gradients, no steeper than 1 in 350. Robert Stephenson’s London & Birmingham line, built in 1837-38, which now forms part of the West Coast route, was well laid out with few gradients steeper than 1 in 330 after the initial climb from Euston to Camden. Nor were there many sharp curves to slow trains, especially steam trains, down.

Approaching Weedon was a left-hand curve, followed by a right-handed curve beyond the station, and then another left-hand curve leading to a straight length for more than a mile. On the straight section is the 492yd (450m) Stowe Hill Tunnel.

Flat-bottomed rail was used in many parts of Europe and widely in other parts of the world. It was only just coming into experimental use in Great Britain. The LMS had laid a section of very heavy flat-bottomed rail weighing 131lb to the yard on the last of the Weedon curves leading to the straight section and ending almost at Stowe Hill Tunnel. Beyond it was almost half a mile of what became standard flat bottom rail weighing 109lb per yd through the tunnel and there then followed conventional 95lb per yd bullhead rail in chairs.

No 46207 entered the curves at Weedon at about 65mph. It was riding well with the regulator just open to give a breath of steam on the falling gradient. It continued like that on to the straight and passed through Stowe Hill Tunnel.

An aerial view of the wrecked train. Although in a state of shock, the fireman of the train carried out protection duties. Fortunately, however, the signalman at Heyford signalbox had seen and heard the crash and put all his signals to danger. He was just in time to halt the Royal Scot which was approaching fast on its way from Euston to Glasgow.
Suddenly, the driver felt the engine shaking at the front end. He called across to his fireman that he thought something was wrong with the front bogie and shut the regulator and applied the brake straight away. It was too late. Almost immediately the whole engine was derailed and swerved to the left down a 128' embankment to come to rest with the tender on its side.

The abrupt derailment of the locomotive, which was brought to a stop from more than 60mph in less than 100yd (91m), caused mayhem to the coaches. The leading coach, a brake third, was still coupled to the tender, but ended up on its side down the bank, while the second was thrown into an adjoining field upside down. The third and fourth were completely wrecked and ended up as a heap across both tracks.

The fifth passed over them and finished up on the bank above the locomotive and was not too badly damaged. The sixth overturned on top of the first and second, the seventh, a kitchen car, was demolished and finished up on top of the third and fourth, while the eighth stopped diagonally across the tracks, but upright. The ninth was partly thrown down the bank and was leaning; and having been crushed at the front. Behind it the rest of the train had only minor damage, although all but the last two coaches were derailed.

Inevitably there were casualties. The coaches were typical LMS vehicles of the 1930s, with steel panels on timber body framing carried on steel underframes. They did not stand a chance of resisting the forces as the train came to a rapid stop and one coach piled into another. The timber body frames broke up, and the steel panels were ripped apart. In some cases the steel underframes were badly distorted.

Seven passengers and one of the dining car staff were killed in the crash and seven more passengers died later in hospital. A further 26 passengers and nine dining car staff were injured and needed hospital treatment.

Lucky escapes
The driver and fireman had lucky escapes. The driver on the left side was buried in coal, but was not seriously hurt, while his fireman clung on to the right of the cab as the engine overturned to the left and was miraculously uninjured.

Despite suffering severe shock, the fireman carried out protection
The coach in the foreground is an example of 'porthole' stock. These carriages got their nickname from the circular toilet windows and were some of the most modern in use in 1951. Nevertheless they had many old fashioned features, such as screw couplings, and stood up poorly in collisions.

The force of the derailment is graphically shown by the way that the 158ton 3cw locomotive has been half buried by the momentum of the train as it derailed and fell down a 12ft embankment. Of the 13 carriages in the train, 13 were derailed, killing 15 and injuring 35 people. Another 25 people suffered minor injuries.

The coaches, duties and partly running and partly walking got got Heyford signalbox half a mile ahead to warn the signalman who stopped the Royal Scot train. Rescuers were quickly on the scene. A passing Metropolitan Police car crew had seen the accident and summoned the local police, fire and ambulance services. Army medical services also helped and voluntary organizations provided emergency canteens. Some of the passengers from the wrecked train who did not need medical treatment were taken on board the halted Royal Scot train. It then reversed back to Blishworth to take the branch to Northampton where it stopped to let the London-bound passengers off before continuing on the Northampton – Rugby line. This route also carried passenger trains normally routed on the main line while the wreckage was cleared.

The investigators soon got to work to find out what had happened. Normally in a derailment of this sort, if vandalism can be ruled out, it is likely to be caused by a defect on either the track or the train, or possibly a combination of both. A close examination was made of the track and it was found that there were marks of a wheel flange riding on top of the right-hand railhead 1597yd (1460m) before the final derailment.

This initial derailment mark stretched for about 37ft (11m) on top of the rail and ran parallel with the edge for about half that distance. There was no groove on the rail suggesting that there was little weight on the wheel, nor were there any marks suggesting severe side thrust.

The mark was just towards the end of the final left-hand curve. This was on the transition towards the straight length on the 1311b rail, as the cant dropped from the average 5/8in through the curve to nothing on the straight over a distance of 110yd (100m).

From the driver's evidence, it was clear that the first thing to derail was the leading bogie, but it was obvious that it derailed while still on the curve and had run for about 1200yd (1100m) off the rails before the driver felt the front end shaking as it reached the bullhead rail. There were marks on the rail fastenings on the flat bottom rail sections, and the track with the 1311b rail had been moved out of line by as much as 7in, although this had not been noticed by the driver.

Witnesses in the train had felt rough riding as the train approached Stowe Hill Tunnel, but not through the tunnel itself. The track gauge and alignment were checked on the curve and so too was the cant. Generally speaking the track was found to be in good condition. The right-hand rail was worn which produced gauge widening of around ¼in. On the transition from the curve to the final straight the cross levels, particularly at places with wet soft spots under the sleepers, were found to vary from the designed cant by ¼in to places as much as ¼in in 5yd about 10yd before the point of initial derailment. While these variations needed attention, they were not dangerous in themselves and any train with the springing and A jammed axlebox

Locomotive No 46207 was on its first trip out after its bogie wheels were swapped round. This was done because the flange on the leading bogie wheels would wear more quickly than those of the trailing wheels. The axleboxes which the front bogie axles ran in moved vertically between the horn slides. When the axles had been swapped round, the fitter at Edge Hill shed had checked the gap but he had no idea his calipers had been swapped round. He believed there was enough clearance when there was really too little.

As the locomotive travelled at speed over the super-elevated curves near Weddon, the right hand leading axlebox jammed in the horn guides. This derailed the bogie, and then the whole train, as the bogie struck the ground between flat-bottomed and bullhead track.
Fortunately a police car was passing when the derailment occurred and was able to summon the emergency services straight away by radio. Soldiers from Weedon barracks nearby were also able to help. The carriages were mostly timber framed, and were smashed as one pile into another.

**Transition curves**

Although curved track is designed to have an even radius for the location so that speed limits, if needed, can apply right through a curve, the entry and exit to and from a curve is not sudden and the track should leave the straight and enter into the curve with a smooth curve and avoid any sudden changes in radius. This provides a smooth transition between the straight run, the radius decreasing until the circular run is reached. At the exit from the curve, the radius increases and the curve becomes more gentle into the straight beyond. This gives a smooth transition between the straight run and the curve and prevents a sudden movement which is related to the line speed through the curve.

The engine had run more than 9,000 miles since it was built in 1935 and over 81,000 of these wheels had been reprofited in May 1950. But during a regular examination in September 1951 it was found that the left-hand front bogie wheel flange was wearing to a sharp edge near the top of the flange. During a visit to Liverpool Edge Hill shed on 19 September it was decided to exchange the front and back sets of bogie wheels. This was regular practice since it evened out the wear on wheel flanges and kept the engine in traffic for longer periods between wheel turning.

After the wheel sets were removed it was customary for the fitter to check the distance between the horn slides and compare them with the outside measurements of the axlebox to ensure that they had freedom of movement.

The fitter told the inquiry inspecting officer, Lt Col G R S Wilson, that he had done this. He thought he had clearance in all four horn slides of about 1/64in (16 thousandths). But at one point he said that he had clearance between the inside calipers measuring the horn faces, and the outside calipers measuring the axlebox slides. This meant that he had reversed the measurements and, rather than having clearance, the axlebox was larger than the distance between the horn slides. Even so, the bogie frame and horns dropped down on to the axleboxes which seemed to have freedom of movement when the bogie was reassembled. But they did not have that vital clearance. After the accident it was found that the left-hand front axlebox was 13 thousandths tight and the right-hand front axlebox was 17 thousandths tight.

The back axleboxes in contrast were very slack with the right-hand axles less than 105 thousandths of an inch (2/400in) clear.

Lt Col Wilson was in no doubt about what had happened. As the engine rode round the left-hand curve, the leading right-hand axlebox had at some point risen in the horns and jammed. As the right-hand rail dropped when the cant decreased on the transition to the straight, the wheelset remained raised. Therefore it could not follow the rail and rode over it, possibly affected by the variations in cant.

Having detailed, the wheels dropped and started to damage the track and broke up the chairs when the bullhead rail was reached, and the general derailment took place. The disaster had been caused by a mere 17 thousandths of an inch too little clearance.

**Recommendations**

Although placing some blame on the fitter at Edge Hill shed, Lt Col Wilson felt that supervision should have been better in carrying out such precise work in dark and dingy steam running sheds. He also recommended that better methods of measuring axlebox and horn dimensions should be evolved to prevent similar mistakes, with such disastrous consequences occurring in the future.