



Research Note 132 | 26 September 2013

HS2 will not solve capacity issues on Britain's railways

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Introduction

The Conservatives originally announced plans for a high speed rail network as an alternative to expanding capacity at Heathrow. That argument has now been abandoned and the Government has attempted to find new questions to which the answer is a high speed rail line to Birmingham and then Manchester and Leeds. They currently seem unwilling to abandon the project itself.

The Government is currently planning to press ahead, despite a massive increase in the projected capital cost of HS2; senior politicians and business organisations turning against the scheme; and emerging evidence that a key premise for the Government's plans – ever increasing rail demand – is implausible.

Earlier TaxPayers' Alliance (TPA) research – starting with the report *High Speed Rail*¹ – found that there were a number of problems with the Government's plans and concluded that it did not represent value for money. Since then new information and revisions to the plans have undermined the case for HS2 further.

¹ TaxPayers' Alliance, *High Speed Rail* <http://www.taxpayersalliance.com/highspeedrail.pdf>

HS2 does not address pressing needs for greater rail capacity

Research by three Danish academics² has found that passenger forecasts are overestimated in nine out of ten major rail projects and, on average, demand is less than half the level expected. It seems very likely that HS2 will follow the same pattern.

The Department for Transport (DfT) has now finally adopted the updated version of the Passenger Demand Forecasting Handbook – the standard rail industry method for forecasting rail demand – but has yet to apply it to the business case for HS2. The update significantly reduces forecasts for long distance demand, inevitably weakening the case for HS2.

In the initial case for HS2, the projections for passenger demand were clearly overly optimistic. The business case for the line assumed a 267 per cent increase in demand. HS2 Ltd – the company set up to promote HS2 – projected an increase in overall demand for long distance rail travel of 133 per cent, whereas other estimates ranged from 35 per cent to 73 per cent. In *High Speed Rail*, we argued that “there will be significant growth in rail demand, but if it is half the level forecast by HS2 – still more than double present levels – the business case for HS2 would collapse, as the scale of the benefits delivered directly relates to passenger volumes.”

More recent forecasts for passenger demand for HS2 are slightly more reasonable in their projections for passenger growth in the immediate future but have also been extended further into the future, which introduces another kind of optimism.

The DfT's rail demand model assumes that for every 1 per cent of additional income, people will spend an additional 2.8 per cent on trips to London. People will clearly not keep spending an ever larger proportion of their earnings on trips to London, so the original projections stopped such escalations at 2026. In his review of transport priorities, Sir Rod Eddington expressed concern about using the same model for making forecasts over 10 years into the future. But in the business case for HS2, it is now used to make forecasts all the way to 2043.

The West Coast Main Line is not the route under the most pressure

Future demand is not just important for the revenue projections for HS2. It is also critical for the constantly repeated argument that the West Coast Main Line will be “full” by the mid-2020s. In fact, the West Coast Main Line is the least crowded long distance route to London, according to Network Rail's own figures.³

² Flyvberg, B., Holm, M.K.S. & Buhl, S.L. *Inaccuracy in traffic forecasts*. Department of Development of Planning, Aalborg University

³ London and South East Route Utilisation Strategy July 2011 (page 55)

<http://www.networkrail.co.uk/browse%20documents/rus%20documents/route%20utilisation%20strategies/rus%20generation%202/london%20and%20south%20east/london%20and%20south%20east%20route%20utilisation%20strategy.pdf>

Service group, long distance services into London	Total demand/total capacity	
	3 hour weekday morning peak	Busiest 1 hour in morning peak
Paddington (Main line and other fast trains)	99%	109%
Waterloo (South West Main Line)	91%	110%
St. Pancras (Midland Main Line Long Distance)	80%	79%
Liverpool Street (Great Eastern Main Line)	78%	87%
Victoria (fast trains via East Croydon)	72%	85%
Kings Cross (ECML long distance)	65%	74%
Euston (long distance)	60%	64%
St. Pancras (HS1 domestic)	41%	44%

After strong growth following the completion of the upgrade in December 2008, growth has virtually ceased on the route:⁴

Year	Passenger mile growth
2009-10	20.4%
2010-11	9.3%
2011-12	4.6%
2012-13	0.9%

There is lots of other evidence that West Coast Main Line services are normally nowhere near full. The average loading – or how many seats on an average train are occupied – of Virgin Trains services in 2012-13 was 164,⁵ and the majority of trains on the route now have 589 seats, giving a “load factor” of 28 per cent. By contrast, airline load factors are typically 80 to 90 per cent. Important routes such as the main lines into Waterloo, Victoria and Liverpool Street and key commuter routes into cities such as Birmingham, Manchester and Leeds are full now, but in many cases the Government has no long term plans to provide extra capacity.

The DfT has repeatedly refused to provide data on passenger loadings for individual trains on the extraordinary grounds of “commercial confidentiality”, even though rail franchises are major government contracts, and there is an obvious public interest in knowing what is being delivered for the taxpayer.

However, some data was eventually released to the High Court as part of a Judicial Review case in December 2012. This showed that evening peak intercity departures from Euston for 2011 carried on average just 229, a load factor of only 52.2 per cent. Furthermore, the 2011 counts were carried out before the programme to lengthen 35 out of 56 Pendolinos from 9 to 11 cars was implemented. This project provided a further 150 standard class seats in each lengthened set.

⁴ Data from Stagecoach Annual Reports - Stagecoach own 50% of Virgin Trains

⁵ Derived from Office of Rail Regulation statistics <http://dataportal.orr.gov.uk/browsereports/9>

Assuming 20 out of the 29 Pendolinos leaving Euston in the evening peak are now 11 car sets, the standard class load factor drops to just 45.8 per cent. A small number of individual trains, for example the 19:00 from Euston to Manchester, are full, but these are trains immediately after the peak price period, and the best response is more flexible pricing in order to distribute the passenger load more evenly, not spending £50 billion on a new line.

Large numbers of passengers will see a worse service

It remains the case that – under the Government’s current plans – many towns and cities would receive a worse service than they do now. The impacts were previously set out in the earlier TPA publication *HS2 Capacity Analysis*⁶ and are updated here to reflect the latest information buried on the DfT website⁷.

Phase 1 – 2026

Station	Impacts
Coventry	InterCity frequency reduced from 3 to 1 trains an hour. Longer journey times as a result of more stops.
Wolverhampton, Sandwell and Dudley	Longer journey times as a result of more stops.
Stoke on Trent	Frequency reduced from 2 to 1 trains an hour, with the loss of its hourly non-stop service, resulting in longer journey times.
Stockport	Frequency reduced from 3 to 1 trains an hour. Longer journey times as a result of more stops.
Wilmslow	No through London services.
Euston commuter route (stations to Northampton)	Major disruption during reconstruction of Euston. There will also almost certainly be a permanent reduction in peak services as a result of a reduction in the number of platforms and approach tracks.
West Midlands suburban network via Birmingham New Street	Worse London connections for the West Midlands suburban network. InterCity frequency from Birmingham reduced from 3 to 1 trains an hour, with 10 minute longer journey times.
Shrewsbury, Wrexham and Mid Wales	Worse London connections. InterCity frequency from Birmingham reduced from 3 to 1 trains an hour, with 10 minute longer journey time.
All Thames Valley, South Wales and West of England destinations	All journeys to and from Paddington extended by around 5 minutes as a result of stopping at Old Oak Common (the disbenefit of longer journey times outweighing the interchange benefits).

Phase 2 – 2032-33

Station	Impacts
Lancaster, Oxenholme, Penrith and Carlisle	No London high speed services. Much longer journey times as a result of more stops and diversion of through London trains via Manchester.
Leicester	Service reduced from 4 to 3 trains an hour, with only 1 non-stop (2 at present).
Sheffield, Nottingham,	Longer journey times and frequency reduced from 2 to 1 trains an

⁶ Stokes, C, *HS2 Capacity Analysis* <http://www.taxpayersalliance.com/highspeedrailcapacity.pdf>

⁷ [Updated economic case for HS2 phase two \(August 2012\) explanation of the service patterns](https://www.gov.uk/government/publications/updated-economic-case-for-hs2-august-2012-explanation-of-the-service-patterns)
<https://www.gov.uk/government/publications/updated-economic-case-for-hs2-august-2012-explanation-of-the-service-patterns>

Derby	hour. HS2 Parkway stations are an alternative, but not convenient for city centres and not well connected to local transport.
Chesterfield	Longer journey times and frequency reduced from 2 to 1 trains an hour.
Doncaster	Longer journey times as a result of more stops.
Wakefield	Longer journey times and frequency reduced from 2 to 1 trains an hour.
Durham, Berwick upon Tweed	No London High Speed services. Longer journey times as a result of more stops.
Edinburgh	No High Speed trains to Edinburgh via Newcastle.
Aberdeen, Inverness and Dundee	No through London services shown (currently Aberdeen has 3 daily and Inverness 1 daily) from Phase 2.

There are better ways to improve capacity on the route

Even if rail passenger demand growth does continue, there are much cheaper and quicker ways of increasing long distance capacity on the West Coast Main Line. The alternative developed by 51m,⁸ the group of local authorities opposed to HS2, achieves a major increase in capacity through a number of incremental improvements, including:

- Changing one first class vehicle to standard, which would still leave three first class coaches in each train
- Lengthening trains from the present 9 or 11 cars to 12 cars, except for Liverpool trains which would stay at 11 cars because of physical constraints at Liverpool Lime Street

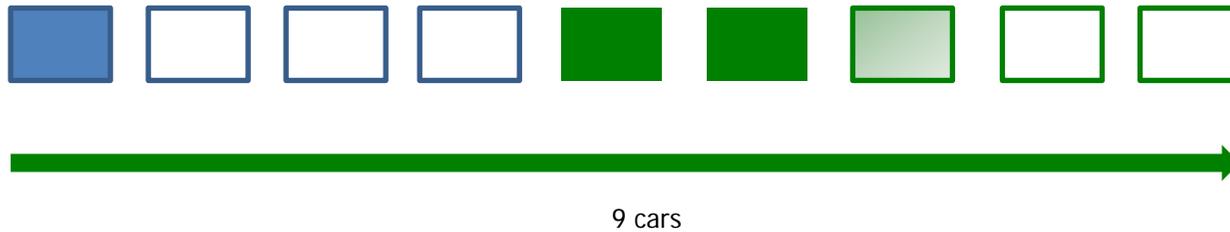
This approach gives 693 seats on most trains – more than three times the average evening peak loading today.

An example of this approach is shown in the diagram on page six.

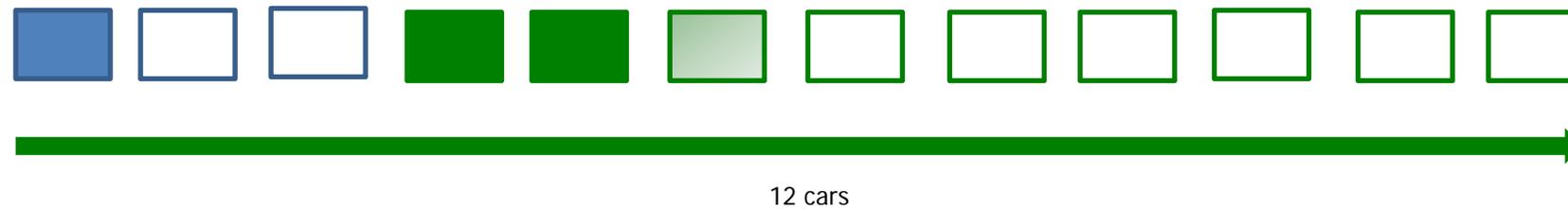
It is true that there is a major crowding problem today on the fast evening commuter trains to Milton Keynes and Northampton. According to the DfT, one of the ten most overcrowded trains in the country last year was on this route. However, this could be solved immediately and at no cost by allowing Milton Keynes commuters to use the eight Virgin trains which stop at Milton Keynes in the evening peak period, but only to pick up. These trains have an average load factor of just 43 per cent, with 1,992 empty seats. In the medium/longer term, the 51m alternative would double the fast peak commuter capacity on the route by building a new flyover south of Milton Keynes and introducing faster rolling stock, and this could be done in five years. HS2 would provide no additional capacity until 2026 at the earliest.

⁸ Optimised Alternative to HS2: the scope for growth on the existing network, <http://51m.co.uk/sites/default/files/uploads/App%201%20-%20Optimised%20Alternative%20to%20HS2.pdf>

Standard train at current demand



With incremental modifications



-  First class cars, full
-  First class cars, half full
-  First class empty
-  Standard cars, full
-  Standard cars, half full
-  Standard cars, empty

With a load factor of around 50 per cent in standard class, and 25 per cent in first class:

- Change one first class vehicle to standard, which would still leave three first class coaches in each train
- Lengthen trains from 9 to 12 cars
- **This leaves plenty of room for growth**

HS2 will cost much more than the official £1,800 for every family in Britain.

At the launch of the TPA programme of research scrutinising HS2, we noted that the scheme was projected to cost £32 billion. That was equivalent to well over £1,000 for every family in Britain. Even the official estimate of the cost has since risen significantly. The latest forecast for the total cost is around £50 billion – including the rolling stock – or **over £1,800 for every family in Britain.**

But there are still additional expenditures that could either be added to that budget or necessitated by the project but never admitted as part of the official cost of HS2. They could add tens of billions to the overall cost to taxpayers and create further pressure on other transport projects.

*The Hidden Costs of HS2*⁹ – published by the TPA in 2011 – set out how the costs of the project were likely to rise, particularly if ministers wanted to make a reality of their ambitious promises for the new line. That report estimated that capital costs could be £13 billion higher than expected; operating costs £5.4 billion higher; and revenues £10 billion lower. That would result in the total net cost to taxpayers increasing from £17.1 billion to £45.5 billion.

Since then the Institute of Economic Affairs has released a new study – *The High Speed Gravy Train* – which argues that additional transport projects linking city centres to HS2 could easily cost more “than £30 billion, equivalent to around £1,000 per household.”¹⁰

Those costs result from the fact that many of the proposed stations for HS2 are not located in city centres like the current routes. In the East Midlands, for example, a tram link is proposed to link the East Midlands hub to Derby and Nottingham. Projects like those are often very expensive and prone to overruns themselves but might never be acknowledged as a part of the real cost of HS2.

On the Government’s own numbers, using the latest published business case (August 2012), there has already been a dramatic deterioration in the HS2 business case:

⁹ Stokes, C, The Hidden Costs of HS2 <http://www.taxpayersalliance.com/hs2hiddencosts.pdf>

¹⁰ Wellings, R, *The High Speed Gravy Train*, Institute of Economic Affairs
<http://www.iea.org.uk/sites/default/files/publications/files/The%20High%20Speed%20Gravy%20Train.pdf>

Published Business Case (Net Present value £ billions)	February 2011 ¹¹	August 2012 ¹²	Improvement (B) / Deterioration (W) in the business case
Transport user benefits	39.6 ¹³	51.0	B11.4
Other quantifiable benefits	0.4	1.0	B0.6
Loss to Government of indirect taxes	2.7	3.8	W1.7
Net Transport Benefits	37.3	48.2	B10.9
Wider economic impacts (WEIs)	6.3	15.4	B9.1
Net benefits including WEIs	43.7	63.6	B19.9
Capital costs	30.4	36.4	W6.0
Operating costs	17.0	22.3	W5.3
Total costs	44.3	58.7	W14.4
Revenues	27.2	32.9	B5.7
Net costs to Government	17.1	25.7	W8.6
Benefit cost ratio without WEIs	2.2	1.9	
Benefit cost ratio with WEIs	2.6	2.5	

This shows the cost to the taxpayer – shown as the “cost to Government” – rising by £8.6 billion to £25.7 Billion. That is despite the dubious rise in the projection for revenues and benefits.

The DfT has persisted in using an extremely high value of time for business passengers, based on an assumption that time spent on trains is entirely unproductive, even though they know that this is totally discredited, particularly given advances in information technology. These time-saving benefits make up over half of the total economic benefits claimed for the project.

Those estimates also do not reflect the recent increase in capital costs from £33 billion to £42.6 billion. Taking into account the increase in capital costs already declared and a number of additional costs discussed in the rest of this section of our report, we expect that there could be a substantial rise in the cost of the project.

¹¹ Economic Case February 2011 <http://highspeedrail.dft.gov.uk/sites/highspeedrail.dft.gov.uk/files/hs2-economic-case.pdf>

¹² August 2012 Economic Case update
<http://www.hs2.org.uk/sites/default/files/inserts/Updated%20economic%20case%20for%20HS2.pdf>

¹³ Includes £1.3 bn “estimate of additional released capacity benefits”

	Cost increase/revenue reduction (£bn)	Cost to the taxpayer (£bn)
Government's August 2012 Business Case		25.7
Capital cost increases		
Additional capital costs already declared	9.6	
Crossrail 2	10.0	
Transport links to other HS2 stations	2.0	
Further mitigation of route impacts	2.0	
Total capital cost increase		23.6
Avoiding service cuts on the existing network		5.4
Lower revenue as a result of price competition		10.0
Total net cost to the taxpayer		64.7

The Government is expected to produce an updated business case shortly, but many of these costs will not be included in the headline HS2 budget.

In reality, the costs of this project now exceed the benefits. HS2 Action Alliance estimates that using a more up-to-date forecasting model and dropping the assumption that time on trains is wasted would reduce the benefit to cost ratio to 0.78 for the full project, excluding dubious wider economic impacts. Further adjustments would reduce the benefit to cost ratio to 0.36, or 0.88 even if wider economic impacts are included.¹⁴

Even if the official estimate of the benefit to cost ratio was reliable, it is still unimpressive. In November 2011, the RAC Foundation identified a backlog of 96 road projects and many of them had reported benefit to cost ratios several times higher. The latest RAC Foundation survey – in June 2013 – found that only 33 of those schemes had since been approved.¹⁵ There are many other potential infrastructure investments that offer better value for money.

KPMG has also produced a report – commissioned by HS2 Ltd – which assesses the benefits of the scheme in a different way and claims that HS2 will have a positive economic benefit of £15 billion a year when it is eventually completed.¹⁶ But the report was widely criticised. Henry Overman of the London School of Economics said the methodology was “technically wrong and possibly out by orders of magnitude. I can imagine why the government has rushed this report out, but it would appear to add very little, if anything, to the debate.”¹⁷

The report is also premised on substantial improvements to existing services as a result of HS2 freeing up capacity, but the project's budget includes a provision for substantial cuts to existing services, discussed later in this report.

¹⁴ HS2 Action Alliance *Why the business case is flawed and HS2 is not in the national interest*,

<http://www.hs2actionalliance.org/wp-content/uploads/2013/05/130123-Business-Case-Flaws-Summary.pdf>

¹⁵ RAC Foundation *Ministers fill in £11 billion funding black hole as road scheme backlog starts to clear*, 24 June 2013

¹⁶ KPMG, HS2: The Regional Economic Impact, September 2013 <http://spatial-economics.blogspot.co.uk/2013/09/hs2-regional-economic-impact-garbage-in.html>

¹⁷ Prof Henry G. Overman, HS2 Regional Economic Impact: Garbage in ...?, London School of Economics, September 2013 <http://spatial-economics.blogspot.co.uk/2013/09/hs2-regional-economic-impact-garbage-in.html>

If the Government want to adopt a new appraisal method for major transport projects then – even if it was more reliable than the report from KPMG – they should not just apply it to a single project. The purpose of any appraisal method is to inform a choice between different ways to use scarce resources and the same method should be applied to examine different strategic alternatives. Until that is done, the KPMG report is best understood as another attempt to use taxpayers' money to distort the debate over HS2, rather than a serious attempt by the Department to understand the options it is faced with.

Avoiding service cuts on the existing network

Ministers have promised to maintain existing services or introduce new ones on a number of occasions, in order to try and defuse criticism from towns and cities that will see a worse service under the current HS2 plans.

In a Westminster Hall debate on 31 March 2011, the then Transport Minister Theresa Villiers effectively promised that there would be no service cuts on the existing network once HS2 is built. In response to a speech by Dan Byles MP, in which he said Coventry would see its fast trains to London cut from three to one an hour, she responded:

“This is simply not true. There are some indicative forecasts in the HS2 analysis about how services might be configured in the future. The reality is that Coventry is going to enjoy frequent fast services.”

Indeed, there is strong pressure to increase services on existing routes. For example Centro, the West Midlands Passenger Transport Authority, is arguing that numerous additional services are needed to maximise the benefits of HS2¹⁸, including two Walsall – Euston trains every hour (there are none at present) and an additional Wolverhampton – Euston service every hour. These services would require significant subsidy, particularly given that Birmingham – London passengers are assumed to transfer to HS2.

But the documentation is clear. The HS2 business case was based on an assumption that Coventry will only have one train an hour, which would be slower because of additional stops. If all the Birmingham passengers travel on HS2, it would be extraordinary if the present 20 minute frequency continued just for Coventry passengers.

The HS2 business case includes a total saving of £5.4 billion for reductions to existing services. If those services are not reduced, the cost of the scheme to taxpayers will rise.

Competition with the existing network

The business case ignores the potential impact to the revenue of HS2 services as a result of competition from operators on the existing network. But this is already happening today – there are three operators between Birmingham and London, offering eight trains an hour between them. Virgin is fastest but the other two (Chiltern and London Midland) offer much

¹⁸ How the HS2 Y Network Will Transform the West Midlands
<http://www.centro.org.uk/corporateinformation/publications.aspx>

cheaper fares and are capturing an increasing share of the market. This is good news for passengers, but bad news for Virgin, which is losing passengers and having to keep its fares lower. The same will happen with HS2, though of course it will not be apparent until it opens.

We estimate a reduction in revenues of at least £10 billion over the life of the project.

Crossrail 2

It is clear from Transport for London documents that the existing Underground lines from Euston will be totally overwhelmed by the additional passenger numbers forecast as a result of the full HS2 scheme: this is best illustrated by an extract from a letter from Daniel Moylan, the Deputy Chairman of TfL, to Sir Brian Briscoe, the Chairman of HS2 Ltd on 30 September 2011, obtained as a result of a Freedom of Information request:

"...we estimate that the full phase of HS2 will add an extra 4,000 people to the southbound Victoria Line in the AM peak period in 2033 compared to a 2033 base demand figure of around 4,350 and 3,400 today. Without further capacity, our analysis has suggested that waiting times for Victoria Line trains in this scenario could be in excess of 30 minutes for some passengers. There is simply no space for this volume of additional passengers without having to close Euston Underground station on a daily basis, completely undermining the time saving benefits of HS2. The impacts on the southbound Northern City Line branch are similar..."

Building a new line – Crossrail 2 – to address this demand is likely to cost at least £10 billion.

In addition to the position in London, it is quite clear that major infrastructure expenditure will be needed to provide access to other HS2 stations such as Birmingham Curzon Street, Birmingham Interchange, Toton Parkway, Meadowhall and Manchester Airport. Costs for these projects are not included in DfT's estimates.

Those schemes are likely to cost at least another £2 billion.

Mitigating impact on the route

The strong demands for work to mitigate the environmental impact of the route have already created additional costs, as the earlier TPA research predicted. Since 2011, the Government has added extra tunnels in West London and East Birmingham, and the route to Manchester published in January this year is far from direct, avoiding sensitive areas of George Osborne's constituency for example.

Our 2011 report made a conservative assumption that this would cost an additional £3 billion. In fact, the capital costs of the scheme have already risen from £33 billion in 2011 to £42.6 billion this year. And it is highly likely that the Parliamentary Committee considering the Hybrid Bill will recommend further changes. For example, the tunnel into



the airport for Heathrow Express is much longer than originally planned, even though the line didn't go through any obviously sensitive areas, as a result of changes required by the Lords Committee.

Further mitigation is likely to cost at least an additional £2 billion.

Conclusions

HS2 is very expensive. Our new research finds that the cost to the taxpayer alone is likely to be more than £60 billion. That figure does not even include the costs of associated projects identified by the Institute of Economic Affairs.¹⁹

The Government may try to claim that it is sticking within the new budget by not acknowledging many of the costs of the project, treating additional investment needed to make HS2 work as separate projects, but in reality the already inflated cost will rise further.

That will make the already tenuous business case for the line even weaker. HS2 is an enormous project that represents very poor value for taxpayers' money. Better options are available that would deliver improved capacity without the long wait and high cost. Instead spending such an enormous amount of money on a route that is already well-served by a fast and frequent service, the Government should focus resources where the demand is already most pressing and the solutions can be delivered most effectively.

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¹⁹ Wellings, R, *The High Speed Gravy Train*, Institute of Economic Affairs

<http://www.iea.org.uk/sites/default/files/publications/files/The%20High%20Speed%20Gravy%20Train.pdf>