HIGH SPEED RAIL - FASTER SERVICES FOR SOME OR BETTER SERVICES FOR ALL?

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1. INTRODUCTION

1.1 Investment in Rail Is Important

I would start this paper by stressing the author believes we should be investing more in railways in the UK. However, the author does believe that certain preconceived notions of what is "best" do need to be questioned, especially where investment requires a very long period to deliver a "pay back". Further, as we move into the 21st century, an era likely to be dominated by the impact of climate change and fossil fuel depletion combined with the continuing evolution of our service based economy and the ever expanding potential of digital communication, we need to ask if we are identifying the correct problem and appraising projects appropriately.

1.2 The High Speed Rail Case

At first glance, a high speed rail scheme does appear to have many advantages. Reports by WS Atkins, Booz Allen Hamilton and Greengauge 21 all suggest it should result in a shift to public transport and spark regeneration in lagging towns and regions along the route.

There is also the background of rising rail use in the UK. Passenger numbers soared by 40% in the past decade, with 1.13 billion journeys made in 2007, the most since 1946, when the network was twice its present size. Rail freight has increased even more, with tonnage up 60% since 1997. Long-distance rail travel grew by one-fifth in three years and passenger numbers on the West Coast Mainline alone are forecast to double between 2006 and 2026.

Of course, the recent economic turmoil has "dented" this growth in demand, but if demand did continue to rise at recent rates once the economy re-stabilises, Network Rail say many lines in the UK will be full to capacity by around 2025.

But before we all get carried away by the prospect of new high speed lines, it might be better to pause and consider whether it really will give us the "economic and environmental return" that is being suggested and if this is really the solution to transport system for the 21st century.

Further, is such an investment appropriate given the relatively small scale of impact on rail users as a whole? In the Atkins High Speed Rail report of 2003 it says that in 2016 the "full network" (i.e. London to Scotland with routes on both the east coast and west coast) would carry 33 million trips a year that had previously used "traditional" rail services. This can be contrasted with an estimate of around 1.32 billion rail trips across the whole rail network in that year. So, even the full network would only carry around 2.5% of all rail passengers.

1.3 High Speed Means High Costs

The cost of a new high speed rail link would be huge, both as a consequence of the substantial physical construction of the route, plus the cost of all the necessary equipment, both lineside and rolling stock. The most commonly quoted "cost" seems to be £39 billion (although most commentators feel the final figure is likely to be even higher as this value assumed the line would be built using a combination of upgraded and new lines while the government seems to be talking about entirely new lines). Of course, this does not address the issue of operating costs. UK rail passengers are currently only meeting half the £10 billion annual cost of running Britain's railways.

Then there is the planning process. Heathrow's Terminal Five took eight years from first application to government approval and the inquiry alone took 524 days to hear 700 witnesses and go through 100,000 pages of transcripts. That inquiry cost £80 million and it could prove to have been a simpler proposition than agreeing a new high speed rail route running the length of Britain.

There are also environmental costs to consider. Rail supporters highlight the benefits of road and air traffic reduction and improved air quality. Even if this is correct (and there is an increasing number of people questioning this and pointing out that the only truly non polluting and sustainable travel is that powered by a human being – i.e. walking) then this still leaves the acknowledged problems of noise and landscape degradation.

Britain is a crowded island and a new route would be bound to have adverse effects on people, buildings and landscapes. A line with only limited stops means many of those affected will not directly experience any of the proposed benefits. Inescapably, there will be winners and losers, and there could well be more of the latter. While a precise route has not been defined, it is generally acknowledged that a London to Glasgow high speed line would pass through around five environmentally or historically sensitive areas, including one World Heritage site.

Ratcheting up costs further is the fact that the "easy wins" in rail alignment have already been taken in the UK. Unlike the SNCF's TGV projects in France, where space for development is cheaper and more easily available, the UK is crowded and land is expensive. France has a population density of only 110 people per sq km while the UK has 246 people per sq km.

A new high speed rail line would have to run through the Home Counties and suburbs into new terminal capacity in London itself. New infrastructure would be needed in the centre of London and the other "station" cities along the route to entrain and disperse passengers and possibly freight as well. The Channel Tunnel link showed clearly how high the costs can go when you have to build tunnels in city centre locations.

1.4 Are We Asking the Right Questions?

High speed rail supporters claim a new rail line will offer economic benefits greater than costs largely due to time saved and will reduce crowding on the rail system by increasing total rail capacity. But even if these prove true to some extent, there are still two key questions that need answering.

- Is speed really so important?
- Is a high speed line the best answer to the capacity problem?

2. IS HIGH SPEED REALLY SO IMPORTANT?

2.1 What the Passenger Thinks

One thing is clear, rail users do not actually rate speed as a significant priority. If we look at the quantitative research outlined in the 2007 Report entitled "Passengers' Priorities for Improvements in Rail Services" we see the top 5 rail service attributes that rail users felt were priorities for improvement were:

1) Price of train tickets.
2) Sufficient train services.
3) At least 19 out of 20 trains arrive on time.
4) Getting a seat.
5) Passenger information on trains that are delayed.

The attribute "your journey time is reduced by 5 minutes" was at number 13 and the attribute "the train travels at a fast speed throughout the journey" was at number 16. Interestingly, this attribute had been listed in a similar survey in 2005 and been ranked 12, suggesting speed is not only a low priority but is dropping down passengers priority list.

The April 2007 report "Priorities for Rail Improvements – Research Report" had a specific section on "Reactions to High-Speed Lines" which said:

- *"Although the innovation and vision of a new high-speed rail network is broadly welcomed, most are sceptical of the cost implications for passengers, thus would prefer investment to be made in improving existing network".*

- *"Moreover, with the exception of Scotland, it is felt that journey times are already fairly acceptable and there is widespread recognition that journey times have been shortened over recent years"*

This is not surprising when you consider that one of rail's key advantages over car and air travel is that the time spent travelling can be put to effective use. Provided the train is on time and not too crowded, the journey is an opportunity to work, relax, eat and drink. Mobile technology such as Wi-Fi brings even more such opportunities for rail travellers.

Interestingly, these time-use advantages are not taken into account by conventional economic appraisals. Indeed, this comes to the crux of the benefit argument for High Speed Rail, namely, whether the time saved on a journey has significant economic value.

Let us look at what rail passengers say. The same April 2007 Research Report provides interesting insight, containing the following comment:

- *"In addition, many business and leisure passengers alike express the view that they do not always mind slightly longer journeys, as it represents a welcome chance to either work or relax."*

This doesn't seem to support the argument that the time that might be saved by a high speed rail service would have much value and appears to show that in train time can be productive for most rail users.

2.2 Why in Train Time is Now Productive Time

So just how productive can in train time be and why might this situation be changing over time?

Let us start of by considering how many people might be able to work from a train. In 1970 the service sector represented 54% of employment in the UK. By 2007 this had risen to 77%. What ever we may think, it seems likely this will increase, and, as much of what we do today revolves around a computer, it seems reasonable to assume most people travelling on business could be productive on a train if they had a laptop AND the train provided appropriate supporting facilities (which at its simplest might be a seat and a table and for longer trips might include a power point and an internet connection). Indeed, all of this is already provided in some form on some trains.

Having the correct technology is important to making in train time productive (for either work or social travel). So, what do we know about the UK and its take up of technology?

- In 2008, 16 million households in Great Britain (65%) had internet access. This is an increase of 5 million households since 2002. Italy, for example, has only around 40% of households with internet access.
- In the UK more than 75 per cent of adults use a mobile phone, with this rising to 90% of people between the ages of 15 and 34. How soon before these are "exchanged" for a "Blackberry", "I-Phone" or similar?

Clearly, we have a society that is well placed to take advantage of in train time and we can be confident this ability is only going to increase over time.

2.3 The Theory of Time Savings

Given the above, let us look at the “conceptual” basis for valuing time savings.

In the economics appraisal of transport projects the **value of time** is the opportunity cost of the time that a traveller spends on their journey. This is interpreted as the amount that a traveller would be willing to pay in order to save time, or the amount they would accept as compensation for lost time. The main justification for most transport projects is the amount of time that people save. Using a set of values of time, the benefits of a project can be estimated in order to compare them to the costs. Values of time are used to calculate the non-monetary costs incurred as part of a journey.

Despite the fact that value of time varies considerably from person to person and depends upon the trip purpose, duration and nature of the trip, in the evaluation of transport projects we traditionally simply sub divide the value of time into work time and non work time. This division is a product of the fact we derive these two values by different methods.

It is argued that as work time is subject to the operation of the labour market it can be valued in a relatively straightforward manner. The value of worki time is simply the opportunity cost of that time to the employer (in effect equivalent to the wage cost of the worker).

For example, if a worker on a salary of £40 per hour travels to a meeting, the value of time in that case is £40 per hour, because that is the amount the employer would be willing to pay to reduce travel time (as travel time can be considered to be "wasted", i.e. not spent working). However, as discussed above, under the right conditions, this argument does not hold for rail, as the journey time can be productive time. Under such circumstances the value of the time saved is close to zero and the arguments for the massive additional investment for high speed rail evaporate away.

Non work time is all other time (leisure, personel business and journey to work). In reality, this represents most of the time we include within our assessment of transport projects. Since this time is not valued in a market, it can only be estimated. Classically, this is estimated from analysis techniques, where a real or hypothetical choice of travellers between faster, more expensive modes and slower, cheaper modes can be examined.

For example, if a traveller has a choice between a coach which takes six hours and costs £20, or a train which takes four hours and costs £80, we can deduce that if the traveller chooses the train, their value of time is £30 per hour or more (because they are willing to spend *at least* £60 to save two hours). Setting aside all the technical problems in deriving such values (inevitably most value of time work is done on hypothetical not real choices) how do we interpret this in the light of the findings of the 2007 rail passenger research that they “*do not always mind longer journeys*” referenced above? Does this mean a negative value of time?

Perhaps the fundamental problem is we are applying 20th century concepts of work, leisure and travel to a new and different century. After all, in 2002, life expectancy at birth in the UK was 81 years for females and 76 years for males. This contrasts with 49 and 45 years respectively at the turn of the last century in 1901.

With life expectancy generally predicted to continue increasing perhaps we now need to re-apply the axiom **"**It is better to travel hopefully than to arrive" to 21st century project evaluation.

2.4 The Importance of Journey Time Reliability Over Time Savings

Next, let us look at a recent real world example of a successful transport scheme that did not deliver crude time savings.

Active Traffic Management (ATM) has been introduced by the Highways Agency on the M42 between J3A and J7. The key aspects of ATM are:

- the use of variable mandatory speed limits
- the dynamic use of the hard shoulder during periods of congestion or incidents,
- the provision of dedicated Emergency Refuge Areas for use when vehicles break down,
- the installation of gantries with signals and Variable Message Signs (VMS).

Construction of the scheme started in March 2003. Following a phased introduction, the full operation of 4-Lane Variable Mandatory Speed Limits commenced in September 2006.

The findings of a major research project into ATM showed that it has resulted in smoother, more consistent traffic conditions. The Highways Agency reported:

- *Variability of weekday journey times has reduced by 27% when compared to the before case, making journeys more reliable – one of the Agency's key aims and critical to the business community.*

They also stated

- *The overall consensus of road users is that they feel better informed and nearly two thirds would like to see ATM used elsewhere on the network*

Indeed, the scheme has been perceived to be so successful that it is now being introduced over a wider area of the Birmingham Motorway Box.

However, it was also found that Journey times increased by an average of 9% as a consequence of the introduction of the ATM system (i.e. variable speed limits and hard shoulder running).

The introduction of variable (lower than 70 mph) speed limits combined with high compliance of the 70 mph speed limit (when the lower variable limits were not active) were found to be the major cause of this slightly intuitive result. No one is suggesting this is a bad thing, however, one wonders what a cost benefit appraisal might have looked like if it had been based simply on crude time savings.

Do we need to re-think how we appraise rail schemes from a cost-benefit perspective, moving away from overly simplistic concepts like total time saved and putting greater emphasis on journey time reliability?

2.5 What Can We Learn From Aviation?

It is perhaps worth at this point briefly considering the development of the aviation sector over the last 30 years. Do we see an industry that has striven for faster and faster journeys?

In 1967 the Boeing 737 (100) had a cruising speed of around 850 km/hour. A new Boeing 737 (500) today has a cruising speed of around 800 km/hour. No evidence of an industry searching for faster times there.

The fastest ever commercial jet was the Tupolev 144, which went at 1553 mph, but it stopped commercial service in 1978 and was not replaced by a similar high speed plane (and there is no need recount again the history of Concorde here).

Growth in the demand to fly has been astronomical over the last 20 years and yet flight times between most major cities have actually increased over this period. What we have seen, however, is a dramatic change in the nature of flying as an experience, and, in particular, the conversion of “in flight” time (both on the ground and in the air) from unproductive to productive time.

2.6 Access and Egress Time

In addition, a real assessment also has to consider that the in-vehicle time for a train journey is only one component of a passenger’s overall trip. Most inter-urban rail journeys will include at least an extra hour travelling to and from the main station and waiting for the train. Higher speed on the main journey, therefore, must be seen in the context of the time required for the whole trip.

If we look at the 2003 Report prepared by WS Atkins on High Speed Rail in the UK we see the following statement:

- ***Interchange*** *has been assessed by considering the population that would have easy access to an HSL station. This ranges from 3.4 million people for the shorter options, to a maximum of 5.6 million people for the large two-branched options.*

The population of Great Britain is around 60 million people. The High Speed Rail Line, even at its largest conceived network, fails to be easily accessible for even 10% of the countries population.

Given the inherent need to have widely spaced stations on a high speed rail line, are we confident that, in terms of door to door journey time, that a high speed rail line will save that much time for most people?

3. CREATING EXTRA CAPACITY

3.1 The Eddington Report

The author believes the question of improving capacity and in train environment is more important than that of increasing train speed. The recent Eddington Report of December 2006 drew the following conclusions (paraphrased by the author) on the role of transport on economic growth and development:

- Transport matters for the economic performance.
- In mature economies like the UK evidence suggests there is considerably less scope for transport improvements to deliver the periods of rapid growth seen historically.
- Instead, the debate should be focused on the performance of the existing network, particularly where capacity is stretched, as demonstrated, for instance, through congestion or unreliability.
- Studies are suggesting that the efficiency with which existing transport networks are used is just as important as the underlying investment.
- The relationship between transport and the economy in a developed economy is therefore likely to be an incremental one.
- Economic success can generate higher transport demand and lack of adequate capacity can constrain that success.
- Transport is not always the answer and there are times when countries have enjoyed economic success without significant improvements to transport
- Transport does not always deliver expected economic benefits.

The author believes that the Eddington Report directs us as follows:

- We need to address capacity not speed.
- We need to address increased efficiency of the existing network not build new networks.
- We need to be very critical of claims that significant investment in new transport infrastructure will automatically bring equivalently scaled economic benefit.

With these thoughts in mind one must ask the question – can we increase the capacity of the existing rail network and get it to operate more efficiently in a more timely, cost effective AND equitable manner and are such benefits likely to be sufficient in the long term?

3.2 Improving Rail Network Capacity More Quickly and More Equitably

There are many practical alternatives to a dedicated high speed line that can provide much additional capacity at considerably lower cost. Targeting capacity where it is needed and focusing on bite-sized chunks of the network would probably be more affordable and manageable than concentrating on a new high speed line.

For example, a recent talk by Professor Felix Schmidt (Birmingham University) entitled 'Investing Wisely for Rail Capacity Provision' presented the argument that the most cost effective to invest in staff and training, timetable solutions, fares, rolling stock (in that order) and that only then should one come to the most expensive solution of investing in extra infrastructure. Are we really confident we have exhausted these other more cost effective solutions? There are certainly plenty of schemes that can help in this respect.

For example in Scotland:

- Between Perth (where the routes from Edinburgh and Glasgow meet) and Inverness most of the route is single track. This lack of capacity means that even an hourly service is difficult to achieve. There is also an impact on reliability as there is little scope for delayed trains to recover time as they have to pass services in the opposite direction in passing loops, which may in turn be delayed by the original late running service. The recent Strategic Transport Projects Review (STPR), published by Transport Scotland late last year recommends an initial series of improvements costed at £50m to £100m to allow for an hourly service between Perth and Inverness.
- On the east coast of Scotland, the line between Dundee (where the routes from Edinburgh and Glasgow to Aberdeen meet) and Aberdeen (Scotland's third largest city, gateway for North Sea oil/gas support and the northern limit of East Coast Mainline operation) is largely double track. However, there are a number of capacity constraints that limit the number of paths to three trains per hour in each direction. The STPR recognises the need to link Aberdeen more effectively to the central belt of Scotland and proposes the provision of express and stopping services with associated loops and line speed improvements. This would cost £100m to £250m. A second phase, costing a similar level, would remove the last single track section and allows more effective use of the whole line.

While in England, examples include:

- Another project, costing around £420 million, would remove capacity constraints on much of the East Coast Mainline by speeding up timetables, increasing train numbers and improving freight access between Finsbury Park, Peterborough and York.
- A capacity improvement of 20% on the London-Dartford route, for example, could be made by spending around £60 million on longer platforms and increased power supply enabling 12-carriage trains.

More generally, across all existing inter-urban routes, capacity could be greatly improved by using longer trains (12-13 car rather than 4-car Voyagers) and optimising timetables (more trains per hour). Providing more seat capacity would increase the likelihood that in train time switches from non productive to productive time, delivering significant economic benefits.

Track utilisation on inter-urban lines can also be maximised nearer the level of commuter routes. Bottlenecks such as those at Milton Keynes and Reading can be helped by enabling parallel-platform working.

Even where construction of a new line might be the appropriate solution, one still has to ask the question, are the benefits of a high speed line worth the significant additional cost over constructional as a more traditional rail line?

Above all, the author believes these alternatives mean focusing expenditure where it will bring the most benefits and ensuring that we deliver a quality rail system for everyone, both in terms of geography and income, not just a tiny and "select" proportion of the rail network and rail users.

As Ross Clarke said in the Times in April of this year with regard to the plans for a high speed rail system:

- *Using taxpayers' money to subsidise the railway system can only ever be justified if it is in order to provide a genuine public service. Yet increasingly, trains are becoming social inclusion-free zones, the poor driven off to make room for the rich……..It is hard to see how a new £29 billion high-speed line is going to rectify this injustice. More likely, services will be franchised to a rail operator that will shamelessly target the upper end of the market.*

3.3 Addressing the Real Capacity Problem

The main capacity issues occur not on the lengths of plain track connecting cities, but on the approaches to them and at their main stations. The infrastructure in these locations has to be shared with many other local services and this is particularly the case in London. It should be remembered that more than two-thirds of all UK rail journeys originate and end in London. Regional transport authorities such as TfL are all keen to enhance the frequencies of their local services, thereby exacerbating the capacity squeeze on inter-urban routes.

Urban capacity problems are best solved by local schemes focused on the inner approaches to cities. Such schemes target the extra capacity where it is needed and can provide additional longer distance services on the existing network. They do not need to be propped up by city-centre distribution measures, since they are actually providing this function themselves. This strategy may not improve train speeds, but it does help reduce the station access component of passengers' journeys.

Perhaps most important of all, new urban rail routes provide more capacity than high speed lines, with hourly services of up to 30 trains (each with 1,000 passengers), compared with 12 high speed trains (each carrying 500).

Numerous examples exist of urban schemes that target capacity increases at terminal stations and their approaches. There are heavy rail schemes such as Thameslink, conversion schemes like Manchester's Metrolink that change routes from rail to tram and, thirdly, intermediate schemes including the Tyne & Wear Metro and Merseyrail. Alternative light rail schemes using "tram-trains" have especial advantages by allowing trains to leave the heavy rail network before the terminus approach and use street running to either access the city centre or pass through to rail routes on the other side.

3.4 We Should Travel Less not More

One simple way of solving capacity problems (and a solution that seems to fit more logically with a world trying to deal with the twin impacts of global climate and a shortage of fossil fuels) is to encourage less travel not more. This raises one further major concern with a new high speed rail line. The 2003 WS Atkins Report on High Speed Rail identifies in 2016 that usage of the High Speed service will come from 4 key markets:

- 68% from "Classic" Rail.
- 2% from Air.
- 13% from Car.
- 17% GENERATED.

With regard to the small number of air passengers using the High Speed Rail Link the report says:

- *This in part reflects the small domestic air market, but also the relatively small amount of the domestic air market that is contestable by rail.*

So, it seems the justification for the scheme on the basis of High Speed Rails impact on the aviation sector is not strong.

In terms of the car transfer, the report says:

- *The effect of this reduction in car traffic upon highway congestion, as measured by average speeds, is minimal*

So, it looks as if the scheme won't solve highway capacity problems.

What I do find interesting is that so little reference in the report to the GENERATED demand that is predicted. In a world where we know the best way to significantly reduce our carbon emissions is to simply to travel less are we seriously suggesting we should consider a scheme where almost 1 in 6 users are generated by the schemes very existence (and as critically are generating additional trips to and from the High Speed Rail stations).

If you look at the analysis presented it is clear that the main justification for the scheme is to address problems faced by current rail users on the existing network. Is the solution to the existing rail network problems really to create a new high speed rail line that generates even more travel?

3.5 The Existing Network Is the Priority

High speed rail is an extremely long-term investment. Recent estimated costs of a full network are around £39 billion. To achieve pay back on such a massive investment (assuming it can be delivered at such a cost) requires a life time of use by many people.

As we head further into the 21st century, a digital age of Wi-Fi and the I-Phone, where more and more people work at a computer (but not necessarily at a desk in an office), are we really confident this is a good investment.

Private sector funds will be hard to attract, especially in present circumstances, and much of the burden would fall on the Treasury. It has to be concluded that there are many other rail schemes that would help solve the key problem of capacity at lower cost and can be delivered more quickly.

Schemes that improve rail access to city centres and at key nodes on the existing network are likely to prove the most suitable and manageable to implement and hence deliver benefits to the public quicker. These are schemes that address the highest priorities of passengers – price, frequency, reliability, seat capacity and information – not a low priority like greater speed.

Such schemes may be individually less substantial than a high speed line, but that new line would itself require improvements to the existing local network to allow people to access the route. The first priority has to be to improve capacity and services across the existing network.

It is understandable that high speed rail has strong supporters, many of them romantics and visionaries. But the more attention paid to these proposals, the more one has to question whether such a scheme would deliver genuine benefits during the 21st century, and whether such attention is distraction from getting to grips with the fundamental needs of the whole network.