The Station.

Yes, I remember Adelstrop
The name, because one afternoon
Of heat, the express train drew up there
Unwontedly. It was late June.

The steam hissed. Someone cleared his throat.
No one left and no one came
On the bare platform. What I saw
Was Adelstrop - only the name.

And willows, willow-herb, and grass,
And meadow sweet, and haycocks dry,
No whit less still and lonely fair
Than the high cloudlets in the sky.

And for a minute a blackbird sang
Close by, and round him, mistier,
Farther and farther, all the birds
Of Oxfordshire and Gloucestershire.

Edward Thomas

I.

A place without qualities

Throughout the railway age, the railway station had a distinctive imaginative place in the life of the community. It was a still point whose raison d'etre was movement, the movement of crowds, a quintessance of modernity, simultaneously free and empty. Only in the event of some tragedy like a train crash or a bomb exploding, was the accidental juxtaposition of people passing through frozen into the list of the dead and injured. And the shock of reading those lists, each person so real with their age, and home and family, came from the fact that normally the crowd crossing the platform was anonymous. The station was a suspender of identities.

As a place it was neutral, a blank space, a stage. In the films of the black and white era the platform became a microcosm of the Kleinian view of life, the continuing repetition of hope and separation. For Anna Karenina, and for Tolstoy himself, it was a stage of despair.

Why is that the bus station nor the airport have ever achieved the place in the cultural imagination of a St Petersburg or a Kings Cross? In contemporary films and novels, the airport plays the role of mediator in a

post modern reduction of space and juxtaposition of places. It, too, is neutral and anonymous. But these very characteristics, of a place without qualities, has not served as a metaphor for the modern decentred identity, but rather as a convenient site for exchange, for drug 'drops', and secret meetings.

It is also above all a stage of consumption. For retailers airports are a dream world, - consumers with time and money on their hands and no tax to pay, whose only exit is by aeroplane, flying like Peter Pan, laden with transitional objects, towards the pleasure principle. The airport is a place of commodities, and displacement.

Nowerdays the spirit of the airport is taking over our railways stations. The larger ones are being re-fashioned along airport principles. They are being re-designed to increase the distance between the passenger and the train in order to expand retail space. Over the past 15 years the British Rail Property Board has pursued a strategy geared solely to maximising returns from the privileged spaces inside and outside stations. Their aim has been not to improve the railway, but to realise the 'rents' of all places that are the focus of people in movement. The argument was always that this provided funds to improve rail services. With Rail Track the point will be inverted, with the railways there to improve the rents of these economically privileged spaces. No wonder that rail travellers have been officially renamed as 'customers'.

Times have changed, and taken the railway station with it, along the road to disenchantment. Our social and economic position is no longer firmly framed within clear parameters, like a railway timetable. The power of steam has been replaced by the power of flight and digital intelligence, insulating us from the materiality of geography and the classical unities. Not only this. Economics has cut, and pruned, and slimmed, and rationalised, until in some countries, notably in North America, there is hardly a railway network left at all.

This essay is about another possibility for railway stations. It is a possibility which takes the potential of the station as an economic hub, and redefines its role as a quasi city centre. Traditionally city centres were defined not just by what they offered - shops, markets, public offices - but by their position as a meeting point of communications. They were also always, as Roland Barthes reminds us, a site of play. Markets and eroticism always walked hand in hand.

The traditional role of the station was more functional - as a place of passage. Now it is becoming a decentred mall. But the nature of the contemporary transport problem and its possible solutions means that stations can take on a new role, economic, social and cultural. They have the potential to resume the key function that they had in a city's economic and cultural life before the age of the car. Along with airports they can become key sites of the 21st century.

II

The question of transport.

The debate on transport has in the past revolved round two issues: road versus rail, and public versus private. For many years the two overlapped. Rail was public, road transport was (largely) private, although the roads themselves were publicly provided. Now the government is seeking to privatise both rail and road, the track as well as the trains, the roads as well as the vehicles on the roads. But the two means of transport continue to be kept separate.

We should understand this historically. Railways developed because they were a revolutionary means of mass transport. The first train from London to Brighton cut the travel time of the fastest stage coach in half, and then by two thirds, and could take 50 times as many people. Between two points railways are still faster than a car, and can take upto 200 times as many people, or 20 times as much freight.

The problem for the railways is what happens outside the station. People have to get to the station from where they live, they have to get to where they work and at the end of the day they have to get home. This is the pattern of the commuter, and the principle applies to all travellers and to all freight. For the traveller there may be a bus to catch, or a tube. For freight it is a question of getting to and from the depot.

What is critical is not just the synchronisation of these connections, but the time it takes for the whole journey. Home - bus -tube - train - train - work: this would describe my journey from Hackney where I live to the University of Sussex, where I used to work. All who travel by public transport have some version of this chain, a chain of different modes, which needs synchronisation, and mobility between the modes.

The car cuts out the problem. The car journey takes you from point A to Z without any of the intervening steps. It may lose relative to the train over the measured miles between stations, but it gains multifold in relation to the interruptions and inconveniences in the stages of the train based journey. And if this is so for passengers, it is doubly true for freight.

Freight cannot walk between modes. Because able bodied people take walking for granted, they forget its critical role in transport. My journey from Hackney to Brighton could not have been done without walking. I should more accurately have shown the sage of my journey thus:

home-walk-bus-walk-tube-walk-train-walk-train-walk-work.

For those who have a walking disability, even the changing of trains can be a nightmare, or getting from the train to a taxi, or from the metro to central station in a town like Newcastle. Inanimate freight cannot move by itself at all. This is why 95% of freight in this country is shipped by road, why twenty 40 ton trucks travel up the M6 parallel to and half the speed of the train that runs alongside them. It is why these trucks come in to the centre of cities, even in to the middle of residential areas to pick up or deposit their loads. Because in spite of the handicaps, their advantage of flexibility outweighs all else.

In the United States the early appearance of the cheap car led to a pre-emption of public transport. The new auto interests - oil companies, car assemblers and type manufacturers - often bought up public transit systems to close them down. In Western Europe, the cheap car only took widespread hold in the 1950's and 1960's. Public transit which had been established in the nineteenth century, grew in the twentieth, but with little connection to road. In Britain this is reflected organisationally, in the separation of British Rail from the bus companies and the road interests, and in the organisation of the Ministry of Transport. With British Rail as a separate corporation, the Ministry is predominantly concerned with roads, with fewer than 70 people in a Ministry of 8,000 working on rail in the mid 1980's.

What has now happened is that the spread of the car and the consequent squeezing of collective transport has led to a sharp rise in pollution, and to congestion both in the cities and on the long distance motorways. The US was the first country to encounter this problem, and redesigned their cities accordingly around far flung suburbs connected by multilane free ways to the commercial cores downtown or in satellite centres. This destroyed the towns,and eroded the countryside. Nor did it solve the transport problem. Traffic engineers found themselves caught in the grip of the law of congestion, namely that highway expansion increases the supply of cars, and this cuts back average speeds to what they were before the expansion.

In Europe some cities have destroyed their urban structures in this way - Birmingham for example with its inner ring road and hollow centre. But there has been resistance. Indeed much urban politics (for example in London or Toronto) has revolved round opposition to plans for free ways through the heartlands of the city. The strongest resistance has been from historic cities, notably those of the Italian renaissance. They were the first to ban cars from the city centre, and what Florence did in the 1970's many other cities are gearing up to do in the early years of the millennium. It is striking that Volvo in its corporate plan for the year 2020 envisages the drastic restriction of the car and the lorry in the majority of European city centres, and the consequent need for another mode of urban transportation.

The age of road which, in the UK at least, has replaced the age of rail, has itself now reached its limits, environmentally, economically, and in terms

of urban design. Richard Rogers, in his 1995 Reith Lectures, showed the extent of the diseconomy by the following example. When asked to design a section of Shanghai as a new financial district to compete on the world market, he found that if the area was planned as specialised financial work space, the extent of land that would have to be given over to cars and related spaces - in terms of roads, on site and road-side parking, petrol stations and so on - would mean that only 32% of the land could be used for buildings, whereas a design based on his model of a compact city, with homes mixed with workspace and planned mass transit, would raise the proportion of usable land to 66%. He wrote this at a time when the Shanghai authorities were felling trees along the outstanding river front in order to make way for a two story car park.

In the language of the times, the age of the car which gave us unparalled journey speed and travelling flexibility, is no longer sustainable in its current form. This is now no longer in dispute. The question is, what is to replace it?

III

From the mode to the journey

The strategic alternatives.

In considering an alternative to car dominated transport, there have been three predominant approaches:

- to increase the productivity of existing road space by traffic management, and improve the cars themselves, by lowering their pollution and energy using levels (electric vehicles for example) and by making them smaller.

- to substitute cars by equally flexible means of transport, such as bicycles, scooters, walking, and, given the right climate, skating and roller blading.

- to shift journeys to mass transit of various kinds, rail, metros, trams, and buses.

What is common to all of these, if taken alone, is that they remain locked in to a mode. They are unsynchronised with each other. The binary oppositions are still there - individual vehicle/mass transit , road/rail, public/private, bicycle/car. Around the edges are attempts to stretch each one of the categories, car sharing , collective taxis, minibuses, the road-rail bus.transit. Each of these is reaching towards a more general solution from a particular modal starting point.

The journey.

There is, however, another starting point, the journey. It has never been absent from transport discussions, and in Britain can be seen in the design of many of the new towns, in some of the GLC's transport policies in the mid 1980's, and in the growing emphasis on access as the core concept of transport planning by local authorities in the early 1990's. But as an approach it has been dwarfed by the interests of the dominant modes.

If one starts from the journey the point of focus becomes not the modes themselves but changes within and between modes. It is the problem of changing trains, waiting for a connection, or standing by the bus stop. In the language of the telephone system, it is the problem of switching.

The journey of freight.

The planning of freight has faced these issues most acutely because of the problems of switching inanimate loads. The first revolution was the container and the pallet, standardised units which could then be loaded, unloaded and switched in an identical way. The principle of the

standardisation of parts, which was so central to the development of mass production in the 19th and early 20th century, did not get applied to the freight industry until the 1960's. Along with this went the re-organisation of the interchange, with roll-on-roll-off ferries, mobile handling systems in computerised depots, as well as the cheapening of the necessary equipment (like cranes) because of the standardisation of the process.

The incentive to change was sharpest in sea transport, principally because, lorries - which have the flexibility at the pick up and delivery end of a freight journey - cannot travel across water. There had to be interchanges at the docks, and with increased Europeanisation of trade, where dock handling rose as a percent of total freight costs, the pressure to increase the flow process in port intensified.

But the same pressure did not apply to inland freight interchange, whether between road and rail, or between different sizes of lorry. Here there was an alternative to the problems of interchange, namely keeping the loads on large lorries from first pick up to final drop off. Some delivery firms organised their own depots, for long distance/short distance interchange.

As for links with railways, there was a shrinking proportion of goods that, even after containerisation, made even part of their journey by rail. Rail freight was largely confined to those products going from large volume producers to large volume users (notably coal between coal fields and power stations, and aggregate from quarries to construction company interchange depots on the edge of cities). In effect coal could make its entire journey through a mass transit trunk route.

Since road transport developed its own distribution systems independently of rail, it was the railways which suffered from the disincentives caused by poor switching systems. Rail freight fell by 18% in absolute tonnages between 1977 and 1987 and from 10% to 7% of all UK freight movements. British Rail's Freightliner was one attempt to deal with the road-rail problem, but because British Rail were restricted from running road services, and because of British Rail's pricing policy, the service made a loss and was finally privatised.

Another ambitious attempt to address road-rail freight interchange was made by the GLC during the early 1980's. They sought to set up terminals for the interchange between road and rail, as well as for interchange between large, long distance lorries and smaller city based ones. They encouraged the development of various sizes of container, and challenged British Rail pricing policy which militated against split loads. They also introduced a ban on large lorries in the centre of London, to ensure that road freight was forced to confront the problem of interchange. The GLC's abolition suspended all these initiatives, and reinforced the dominance of road and large lorries for freight movements into and out of London.**

The human journey

The transport of people differs from freight for four reasons:

* the majority of people can move themselves from one mode of transport to another.

* people can plan their own journeys

* most human journeys do not fall directly within the sway of the balance sheet, but are rather included in personal economies of time.

* few if any human journeys are the same, whereas freight has a degree of batch movement. In other words, human journeys have a more diverse set of origins and destinations than does freight (personal letters excepted).

What this means is first that:

- modal and inter-modal flexibility is even more of an issue for people than for freight

- the fact that difficulties and delays at interchanges involve personal rather than paid time means that pressures for change are more weakly transmitted than where the costs are reflected on balance sheets.

- that human mobility has allowed those operating modes to give low priority to improving the process of switching.

In the late 20th century, however, the problem of switching in human transport can no longer be ignored. This is because, like transporters of freight, more and more people have turned to the option of the road to provide them with flexibility for bespoke journeys. The Hackney to Brighton journey for example, which by inter modal transport takes 3 hours, by car would normally take 80 minutes.

The advantage is even more marked for those for whom inter modal mobility is difficult - the non able bodied, unaccompanied children, those with heavy luggage and the elderly. As a result the pressure to make the journey by car is such that car ownership and car journeys have risen to the point that at different times of the day the demand for road space greatly exceeds its supply. Thus at peak times it is quicker to travel inter-modally than by car alone.

Transport crises appear as problem within modes and the balance between them. Road are congested. Trains are overcrowded. Buses are irregular. Tubes run late. The argument of this paper is that at the root of the crisis is the problem of interchange, and that the growth in mobility of people and freight has meant the organisation of interchange needs at last to be confronted.

IV

From mass production to flexible specialisation.

The issue can be put in a more general way, which echoes the innovations that have been taking place in the industrial sector.

Before the industrial revolution travel was restricted to a small minority of the population: merchants, the landed class, a standing army. Most people travelled within a narrow radius of their home and farm, and where longer distances were from time to time made, they were largely done on foot.

The destruction of agricultural employment, the growth of cities and of capitalism's need for a mobile labour force, increased the requirements of travel from the upper and upper middle classes to an ever expanding professional and working class. It also enormously expanded the quantity of freight to be shipped. We can speak of the growth of demand for mass transit, both of people and goods. Neither could be economically accommodated by horses and canals. They could by trains and later buses and trams.

The problem with all forms of mass production is that they are inflexible. They find it difficult to accommodate difference. In the case of transport this means the difference in journeys. Locations, as the determinants of journeys, had to accommodate to the mass transit. In Canada for example, towns grew around the railways stations. In urban Britain it was the railway stations which determined the siting and form of the suburbs.

These forms of mass transit were achieved with expensive capital stock which could only be produced in batches, and was based on craft skills.

The automobile revolution, on the other hand, produced its vehicles by mass production. The resultant economy allowed the spread of the lorry and car to provide a bespoke means of transport. The owner of a car is not dependent on the railway timetable. He or she can design their own route, take their unique journey with a flexibility that no mass system can match. In place then of the batch production of engines and coaches to permit mass transit, Henry Ford's revolution offered mass produced equipment for millions of bespoke and autonomously determined journeys. This was the underlying economy of the two dominant modes.

The car had another economic advantage. It was driven for the most part by unpaid labour, on an infrastructure funded by taxes and free to users, with machinery whose running costs were considerably less than the prices of its rivals. On the other hand, as a means of transport it has economic drawbacks. There is substantial over capacity - the average car is

used only for 3% of the time. When it is in use, the average number of passengers is 1.4, not only increasing financial cost but adding to the environmental resource cost per passenger mile travelled. Finally the space taken up by a car means that as a means of mass transport, there is congestion on major routes and junctions, leading to time costs or large investment requirements in order to accommodate demand.

The full cost of the car, including environmental and congestion costs as well as direct out of pocket expenditure, is increasing. What this means is that as car usage has increased motor transport can no longer be treated as so many individual bespoke journeys, since the aggregate of these journeys is increasingly uneconomic and unsustainable.

We need to pose the problem then in terms of the limitations of mass transit on the one hand (too inflexible) and of bespoke transit on the other (high environmental, time and financial costs).

Other industries have faced similar problems, either as custom producers faced with cost competition from the volume producers, or as mass producers faced with the demand for variety which their lines are too inflexible to deliver. How do they gain the economies of volume production while being able to deliver a non standard product? As Michael Best has put it, the challenge is one of moving from single flow to multi flow production. In that transition is summarised the current revolution in late 20th century production.

We could take almost any consumer industry and trace the drama of this challenge. Taking furniture as an example, there emerged two distinct markets during the twentieth century: high cost customised craft production (for example in reproduction furniture with highly skilled workers such as carvers and polishers) and mass production in large factories with semi skilled labour.

The past twenty years has seen the emergence of a new type of furniture production which have succeeded in marrying economies of scale with the differentiation of products. The areas which have been successful at this have been regions of small and medium firms (in Jutland in western Denmark for example or the region between Milan and Como in Italy), where designs have become modular, using common parts, and where firms have specialised in the production of some of these modules to give them economies of scale.

Modern technology and production organisation has allowed tools to be rapidly reset, so that the switch from one model is almost instantaneous, while prompt feedback of market information allows firms to produce in response to actual market demand and avoid the costs of stocks and overproduction characteristic of the more cumbersome mass producers.

This system has been called flexible specialisation. It has appeared in many branches of industrial activity from clothing to food, and from footwear to engineering. It is also present in services, such as catering, or banking. One of its features is that it treats the whole chain of production as a single system, and considers the flow of the product from its initial raw material production right through to the final point of consumer purchase. Retailing is married to assembly, assembly with component production, components with raw materials, and so on. The principle of Just in Time is one way of describing this synthesis. It demands close co-operation between each stage of production, in product design as well as production process. It requires decentralisation to the immediate producers to ensure the most efficient routing and processing of the elements in this highly tuned system. It requires new forms of information flow to permit the synthesis to take place and to monitor its progress. And it requires the means for rapid conversion of this chain when the product changes.

The question is whether a similar innovation could be introduced to systems of transport. Put more concretely, how can the flexibility of the automobile or bicycle be married with the environmental and production economies of mass transit ?

V

Post Fordist transport: the outline

Transport is an element of all systems of production, in that it moves things from one place to another. Henry Ford's production line revolutionised transportation within the production process, by moving the product past the tool, rather than moving the tool to the product. This was one of the cornerstones of Ford's revolution, replacing nodal assembly with product flow. The assembly line was a way of synchronising the processes together. For many products, for example small batch engineering of components, the pattern of movements cannot be predicted, since it is constantly changing. Here there are a number of work stations and the team of operators determine the flow of the part according to balance of use, mostly manually.

When the transport takes place geographically, outside the plant, we enter the field of logistics, the optimum way of moving round things originating and destined for multiple nodes in the system. The growth of internationalisation and the integration of production over ever widening geographical space has meant that the issue of logistics has become a key element of modern management.

One example would be airlines, which have moved to hub and spoke systems, the trunk routes operating between the hubs, with the spokes acting as feeders. Another would be overnight delivery services, where lorries travel daily from scattered cities to a central point in the Midlands, and exchange their parcels for those destined for their local node, and then return by morning. In this case there are no trunk routes, but a series of radial routes from the local nodes, which are themselves served by lightweight delivery vehicles for the delivery and pick up. The local delivery services are the flexible elements of the system, and the radial routes the inflexible ones.

When the things are people, the principles of logistics equally apply with the proviso that people generally require even greater economies of time. If someone wants to go between Southampton and Cardiff, they do not want to travel over night via a national exchange bus station near the intersection of the M1 and the M6. The pressure is for direct services, minimum changes, and prompt connections at the local nodes.

The logistic system that has evolved is a dense network of scheduled services, international, national and local - the equivalent of the fixed, inflexible production line - and more flexible provisions locally in the form of taxis or self driven feeder cars. The problems of such a system are:

- the difficulty of synchronising the schedules, to minimise the scheduled gaps between modes.

- the need for prompt time keeping to ensure the links in the schedule can be made
- the problem of optimum route planning
- the physical difficulties of switching within and between modes
- the high cost of the flexible feeder transport (two taxi fares for a few miles may equal the day return fare for a round trip train journey of one hundred miles)
- surplus capacity on the scheduled services (equivalent to low capacity utilisation in an assembly plant) which often leads to service cuts or less frequent schedules.

In terms of the principles of flexible specialisation, the strategic points of concern would be:

i) organising the physical lay out of activities between which people or things have to be transported in such a way as to minimise the need for transport.

ii) increasing the flexibility of the fixed element of the process, in this case the scheduled services.

iii) reducing the cost of the flexible modes in the chain, either by the fuller utilisation of capacity, by self driving, or by the substitution of cheaper flexible forms of carriage.

iv) reducing changeover times.

v) providing adequate information to the route planners (in the transport of people this means the passengers) allowing them to plan their optimum routes.

We will discuss each in turn.

VI

Post Fordist transport: the principles

First principle: optimising access.

By taking the journey as a starting point, the aim of the system can be recast not as maximising transport but optimising access. What people want to know is how far they are from key facilities - work, schools, hospital, shops - and how long it will take them to get there.

Planners taking on this perspective have begin to generate access contour maps, which shows the areas 5,10 and 15 minutes from a particular facility. They can then interrogate the impact on these contour lines of a change in one part of the transport system - for example bus services running every 5 rather than every 10 minutes, the opening of a new train station, the introduction of a bus lane and so on. Hammersmith and Fulham Council have been one of the first to pioneer this approach of access contouring, although many local authorities have adopted the general principles of optimiing access as a guide to transport policy.

One of the points to immediately follow from such a perspective is that physical planning may be the most important tool of transport policy, rather than the operating of particular modes. It is equivalent to the industrial pre-occupation with plant lay out, or the locational structures of a national distribution system.

Planners have long argued this point, that transport strategy should start not from transport itself but from planning the land uses from which journeys originate and to which they are destined. But until now they have not been successful in challenging the transport professionals way of looking at the issue as a narrow matter of transport provision.

The new towns were a partly exception to this. They provided work near to homes, homes to near to work, and shops near to homes. But the growth of unemployment, the ruralisation of industry, the development of new retailing systems and the geographical concentration of many types of jobs have meant that there has been an increase both in the journeys to work and journeys to shop.

The same is true of other types of journey: journeys to school, journeys to hospital, journeys to the town hall. In each of these public services there has been a tendency for geographical concentration of the service, involving longer service journeys. What hospitals save by concentration, appears as a cost on the transport side of the geographical balance sheet.

What is more serious is that as locations form around road networks, along motorways or the edge of towns, they reinforce single mode, high cost bespoke transport and weaken the geographical areas linked to mass transit.

Among recent attempt to reverse this pattern, one of the most interesting is that undertaken in Holland. They have announced a target of reducing car use from 70% - 30%. To this end they taken measures to encourage home working, and have introduced a zonal system for planning designed to maximise the use of mass transport. Places are categorised into 3 zones, A,B and C. A indicates that it is within walking distance of a national rail or bus network station, B that it is within walking distance of a regional rail or bus network, and C that it is primarily serviced by roads. For institutional and commercial buildings, higher densities are allowed in zone A locations, and tend to be refused in zone C locations. In general large employers are discouraged from locating on greenfield sites based on the road grid, and recently major investment by Toshiba was turned down for these reasons. In addition the Dutch authorities require every company to produce commuter management plans, and impose hefty fines on those who fail to do so, in order to heighten employers' awareness of the need to minimise commuting and to schedule it where possible to avoid peak travelling times.

Second principle: increased flexibility of fixed services.

The more flexible the system, the more it can be geared to different transport needs. There are four types of flexibility to consider:

a) flexibility of time.

How can scheduled services respond to fluctuations in demand? The industrial principle would be to supply in response to demand. Hence the Electronic Point of Sales systems in shops have enabled Just in Time supply systems to develop, what the Italian clothing industry calls 'Pronto Modo'. Sales data is processed, items are re-ordered, and new supplies made and delivered into shops in between 3-7 days of the retail sales which are being replaced. In transport at its simplest, it is the equivalent of calling a taxi. But could it work with mass transit?

There are, of course, football specials, and relief trains at peak periods. The Singapore metro has a central control room which allows it to measure traffic and dispatch trains in response to the build up of demand. For long distance trains, the response time is slower, as is the integration into the running programme for the day. One possibility is interactive planning, with rail or bus networks bringing in more regular services in response to build ups in demand. Prospective passengers could check the day's train times through CEFAX. This process would be aided by passengers being given incentives to pre-book, thus providing early indications of demand.

These bookings could include through ticketing to other scheduled modes like buses, so that local bus systems were linked into a similar responsiveness.

The scheduled services would then have a two tier structure: the basic schedules, and supplementary schedules introduced according to demand.

The general principle that has developed in the industrial field is that surplus capacity is not the prime thing to be minimised, but rather response times. An engineering firm may hold excess machinery so that it can respond rapidly in this way. Similarly in transport, transit providers would hold spare coaches to be brought into play according to demand. The cost of so doing is reduced if the vehicles themselves are mass produced, and can be switched between different types of journey (short and long distance).

b) flexibility of capacity.

The above discussion also bears on the ability to respond to fluctuations in demand for fixed time services. At the moment the main flexibility is provided by the passengers being willing to stand, but it should be possible to extend the length of trains according to demand, or to shift to a principle of shorter trains, supplemented by relief trains.

As with the ability to be flexible in time, the issue with relief trains is how far the rail network itself can accommodate new trains into its daily schedules. Computerised rail network management has allowed a more intensive use of a given rail system, and shortened the booking time needed to introduce a new train. In the bus system there is no such constraint. What is at issue here is the availability of drivers and coach capacity to respond in the way required.

c) flexibility in space.

There are two types of flexibility here. First, the capacity of a train to stop at intermediate stations on demand, making country stations into request stops. For many country stations on through routes this would increase train availability four to six fold. British Rail has been reluctant to do this because of its impact on schedules, but these schedules themselves should allow for this, by allowing five minutes leeway for interconnections. A small element of leeway into the schedules could drastically improve the level of service.

Second, instead of a train being seen as a single dedicated unit travelling from A to M, its components could be specialised and be uncoupled at intermediate points to provide through routes to points N to Z. Trains would be reconceptualised as convoys, with carriages separating from one and joining others to realise economies of mass transit.

d) inter-modal flexibility.

In the 1970's the Shop Stewards Combine at Lucas Aerospace designed a bus that would also travel on rails. The idea had been developed in Africa in the 1930's, where a railway could be easily laid on the plains, but a road was cheaper for hills. The Lucas Combine's road-rail bus had a set of rail wheels which let down or was raised according to the mode of transit, allowing it to drive away from a railway station, or turn left at a level crossing.

The bus was never taken up, but versions of the idea have begun to be used with rail carriages which can divert on to tram lines for inner city transit.

The general idea behind increasing the flexibility of fixed equipment is to avoid large scale inflexible plant, go for smaller scale units, which can be used for many purposes, which may nevertheless have a measure of specialisation, possess a built in extra capacity, and be able to linked in to other modular units for larger scale requirements.

The current tendency in stock planning is to have relatively inflexible equipment, inflexible schedules, and to match the equipment capacity to the schedules. British Rail (more than bus services which have smaller units and are therefore more flexible) have been creative in encouraging travellers to use trains in periods of surplus capacity. But the tendency has been to reduce service frequency, and thus the flow capacity in the system. The trade off has been between smaller trains and less frequent services, with the choice (based on serial balance sheet criteria) being mainly towards the latter. What is required are methods of assessment (internal prices) which reflect journey system as well as service costs and benefits.

Third principle: cutting the cost of flexible means of transport.

Flexible forms of transport include cars, taxis, bicycles, and walking. The first two are currently expensive and unsustainable as a means of generalised transport. Bicycles and walking are suitable modes for some people, but are not suitable for freight, and are currently afforded low priority in urban transport planning.

They are a range of measures which have been undertaken to make car-based options cheaper. Car pooling is one way. Shared taxis another. Dial a cab has been spreading as a system, and the same principles can be applied to small minibuses. In Paris there is a new scheme of publicly owned electric cars, which can be rented for small sums and after completing their journey are left at a neighbourhood recharging centre.

The most successful cycling schemes have been those which provide dedicated road space, as well as safe places for depositing bicycles at the

point of switching modes, or arrangements for the carriage of the bicycle on bus or train.

Fourth principle: reducing the changeover times.

For each mode of travel there will be limits to flexibility. There will be a measure of specialisation for each mode, with larger carriers on the trunk routes, and ever smaller carriers for the increasingly bespoke elements of the journey. In as much as both economy and environment encourage all journeys other than walking to be inter-modal, the major questions becomes how to reduce the time and costs of switching. In the industrial field this is the problem known as reducing changeover times.

The issue can be broken down into three components:

a) space: people

The modes need to be close together, to minimise the distance people have to walk during the changeover. Positive examples here are train and metro stations with adjacent car parks, and central bus stations being sited immediately next to a train station. It has been a continual theme of transport planning to realise this goal, but it is astonishing how many towns still have their bus and train stations in different places, both in the major London termini, most notoriously Victoria, but also in smaller provincial towns like Oxford or Carlisle.

Similarly the space must be easy to negotiate. Even where different modes are on the same site, the links between them may be long and difficult. The distance between the main platforms at Euston and the underground, for example. not only involves 600 yards walking, but a descent of three levels, with no means of transferring luggage other than by hand. Buses are 700 yards, and taxis, too, are at a lower level. Even with new connections such as the Thames Link train at Kings Cross, no inter-level provision has been made for those with heavy luggage, and station authorities report that lifts or escalators between levels are always given low priority in investment. Irrespective of freight, stations have been designed for the standard traveller, able bodied, and strong. They are not geared to easy access for those who are not able bodied, who are elderly, or those with heavy luggage.

Interchanges need to be designed so that modes interlink within a few yards. Taxis in some stations draw up beside the platform. Buses could be similarly be arranged to stand beside a train platform, as could metro and light rail carriages.

b) Space: luggage.

This is the heart of the matter for much passenger transport. Little attention has been paid to the problem of accompanied luggage, certainly

nothing on the scale of unaccompanied freight. On some railway stations there are self wheeling trolleys, but they cannot be taken between levels (unlike at airports) nor can they be taken beyond the immediate station confines. So the design of bus and train stations to allow easy luggage interchange is one task.

The second is to introduce the automation of luggage interchange, using airline baggage handling systems for railways and buses. Passengers would be able to book their luggage through to a final destination between modes as well as within them. Any such requirement would lead to a transformation of the lay out and baggage handling system on railways and buses.

Thirdly there is a need to standardise luggage sizes, and ensure that fragile loads can be handled with safety. In freight the key development was the container, which allowed the interchange process to be standardised. This has not extended to consumer freight, or to the design of consumer vehicles - whether trains, or buses or cars for luggage, shopping and so on. The more fragile passenger luggage could be put in standardised containers similar to the food containers on airlines. This would ease automatic transfer. Alternatively the passenger could move their own containerised luggage slipping it on to a base like a supermarket trolley. Supermarkets themselves could usefully adopt a similar standard to allow shopping to be easily transported by bus or train.

c) Time

One of the problems of switching is delays in waiting for a connection. Part of the problem is the regularity of the scheduled services. Another is the synchronisation between different services (which British Rail does attempt to address) and between different modes.

At present scheduling is done within modes, and, since privatisation, even intramodal scheduling has been fragmented. Rival private bus services gear schedules to narrow competition, seeking to service a route just before a competitor. In some towns in the early days of privatisation, there were main street traffic jams of rival buses. A similar fragmentation is probable if railway networks are privatised.

This is not to say that some synchronisation is possible without joint planning. Local services can take into account the movements of national networks, though it is striking how often this does not happen.

With a shift to flexible specialisation, the synchronisation of services within and between modes becomes critical. This requires joint control of the scheduling. There are a number of ways of achieving this. Railways should be allowed to own bus feeder services. Local operators could form scheduling consortia feeding , requirements in to the national network schedulers. Airlines should be represented on rail scheduling committees.

There could be a public approval process for scheduling, with the capacity to hear representations from independent operators and consumers.

The reduction of costs of flexible carriers (see the third principle is another means of reducing switching times. One way of doing this is via 'through booking' where passengers can book a taxi or minibus along with their train or long distance bus ticket. Through booking would alert the receiving carrier of likely passengers, and would allow them to arrange groups of travellers with a similar final destination. A through booking system of this kind has been introduced in Holland. At 60 Dutch stations it is possible to book a taxi along with the train ticket for minimal extra cost. The taxi can wait for upto 10 minutes to fill up, and then departs.

The general principle here is to make flexible forms of transport ('transport on demand') as widely and economically available to passengers on bulk haul services in order to minimise the changeover times from mode to another.

Fifth principle: routing information

In systems of logistics, a key question is the control of routing. In mass production systems this was done centrally, but flexible systems, which allow for non standard circumstances, require a decentralisation of routing decisions. They also require the front line operators taking the decisions to have access to up to date information on the state of play in the various transport modes. Information flows shift in their axis from being primarily vertical to primarily horizontal.

For human transport, routing decisions rest clearly with the traveller. What has not developed is access to information which allow travellers to make informed and optimum decisions. British Rail charge for the twice yearly passenger timetables, which represent the most inflexible parts of the rail system. It is time consuming to get train times by phone. It would require extensive research to obtain the connection times of buses to trains in a distant town, let alone details of the dial a cab or dial a bus services. Yet this information is, par excellence, the kind that can be made universally accessible by digital technology.

There are two types of information which are needed. First the underlying structure of available services, for all modes, as well as computer intelligence which will advise on the optimum journey. This could be provided on CEFAX, and on the intelligent terminals which are likely to be universally available in homes within the next decade.

The second type of information is conjunctural, and refers to the state of transport at any particular type. It would include road information, details of late running, of how long it was until the next feeder route was due. It would carry details of any extra services that had been laid on, and of flexible carrier availability (for example the electric mini cars as in Paris).

A start has been made in providing conjunctural information to underground and bus travellers in London. Indicators show the time of the next trains and buses and their destination, and have helped reduce passenger anxiety. What is needed is for these to be accessible above ground and if appropriate in the home so that a person's starting out time can be adjusted.

Similarly the information on road conditions and alternative routing which is now being made commercially available through aerial surveillance of traffic, could be used productively once the car was one link in a multi modal chain, rather than its current use which is to extend congestion and the environmental impact of traffic.

VII

The station

In the post war period, the railway network was always a closed system, separated from the other modes of transport. But its nationalisation and subsequent national rationalisation did establish it as a single system each of whose parts were seen as contributing to the whole. Mr Beeching's axe in the early 1960's was the first warning of what was to come, but it was not until the 1980's that the principles of neo liberal economics were applied as the guidelines for management within British Rail, and each element of the system came to be judged on its own direct contribution to BR's financial balance sheet.

This version of economics caused the British Rail as a system to implode on itself. The trunk lines which could compete with other modes became the priority. The tributories of the network - the branch lines and branch services - were cut back. This led to further loss of customers and downward spiral of demand. When it came to individual components like stations and their adjacent land, they were increasingly judged by their value as reflected in the wider land market rather than their value for railways in a wider transport system.

Yet even in a predominantly neo liberal age, the neo liberals themselves recognise that the market cannot be trusted in cities. All advanced capitalist countries have regimes of spatial planning, because many areas of a city depend on a mixture of uses which need to be developed in tandem, even though some will earn a lower returns than others.

What then of the railway station? One view is that nothing is lost by allowing the economics of retailing to predominate over the economics of transport by turning stations into standardised shopping malls. The two functions of a station can be separated, transport on the one hand, shopping on the other. Indeed many travellers welcome the availability of shops, particularly those which involve servicing, like the processing of films, dry cleaners, or food for the journey.

In the past this may have been true. The railways were a self contained world. In their time they revolutionised distance. Stations were the receptions rooms for those entering the intricate network of the railways within the stable framework of the railway timetable. In the language of organisation theory it was a closed system, whose task was to make the trains run on time. What happened outside the railways, beyond the station, was of no concern to British Rail any more than it had been for the Great Western Railway. The station was the beginning and the end point. After that others took over.

The current policy relates stations to the outer world through via the market, particularly the market for land. Our argument is that this is a narrow view and pre-empts the potential role that stations could play as the key points of the inter-modal transport system of the future. This is because they are the meeting places of the most effective mean of mass transit - the train - and the more flexible modes for connecting travellers to their origins and destinations. They are the points of interchange.

What does this mean?

First, stations should be judged on their effectiveness in reducing changeover times. This would involve:

- re-organising station lay out to minimise the distance of changing trains

- introducing automatic luggage transfer lines

- arranging for the transfer of the physically non able bodied.

- having low cost rental facilities for bicycles (as in Dieppe station) or electric cars (as in Paris).

Second, stations should be active centres of information, with on line multi modal and inter modal transport information to assist passengers in route planning, including visual displays of the times of connecting services.

Third, the surplus property in the vicinity of stations which has not been sold off should be reserved for uses which would speed up interchanges and minimise transport requirements. Thus all towns with bus stations separate from the railway station should consider amalgamating with them. Secondly, regular high car using activities like retailing should be sited near stations, reserving positions for smaller shops which are not part of national chains, and which strengthen the local economy. Third, the UK could follow the Dutch example and permit the development of high density land usages (such as offices) over and beside the station.

Fourth, stations could come to play the role of city sub centres, with shop fronts connected to services whose centres are elsewhere - for example public libraries, the town hall, Citizen Advice Centres, banks, and the job centre.

Fifthly, stations could also increase their role as cultural sites, with exhibitions, an area for busking (which has proved so popular in Covent Garden) a range of eating places (rather than the highly standardised branch outlets which are currently the norm).

Sixth, the station in terms of urban transport could act as a hub, in the re-organisation of an effective intra city bus and tram network. For the development of high use services near the station would mean that it was seen not merely as a point of interchange but as a service node which would be used during the interchange. This further fills any delays in changing trains or switching to or from other modes, thus further cutting changeover times.

VIII

Conclusion.

The station can take its place as a focal point in what Richard Rogers has called the compact city of the 21st century. Rogers' argument is that cities spread out initially because of the dangers to public health, and then because of the suburban rail networks and the flexibility of the motor car. The first no longer exists, while the second, in the form of the car, now provokes its own dangers to public health, through pollution, stress, and accidents. He argues for a compact city, which reduces distances between home, work, and shopping, which accomodates walking and cycling, and nodes of collectivity rather than linear separation. The station, like the airport for international travel, has a particular role to play in such an urban vision.

In most towns, for historical reasons, the station is at or near the urban centre. This provides many advantages in terms of accessibility and reduced journey times. One sign of these advantages is the way in which the international rail services which connect major city centres are thriving at the expense of the out of town airports with their interchange costs.

Another contribution that can be made is using what we call 'active stations' to regenerate inner city districts that have lost industries and wealth. Just as late 19th century railways created thriving suburbs, so late 20th century railways can create thriving inner cities.

The main direction cannot be given by market forces, since 'active transport' forms markets, creating new structures of market prices. We can think of it as system led rather than market led, even though the restructuring can in the end pay for itself as the US railways paid for themselves by their capture of the increased property values resulting from rail construction.

This principle is primary. Issues of ownership come after that. Some form of social ownership of the stations sites is a necessary condition for the 'active station' but it is not a sufficient one, as we can see by the way in which Rail Track has been run over the past decade. The government's policy of privatising the sub components of the railways, and in particular the stations goes in the opposite direction to what an 'active transport' policy requires.

The appropriate organisational forms for each of these elements is the subject for another paper. The important point is that the control of the key elements of the system - the scheduling, the stations, and the common standards for the system - must necessarily remain public, subject to the discipline of social and environmental criteria.

The starting point, however, has to be in the way we think about transport. Starting from the journey rather than any one mode opens up what have tended to be 'closed systems' in the organisation of modes, and focuses first and foremost on the relation between modes. It treats the issue of movement as a system, which can be designed in a range of ways according to needs, geographical density, topography and so on. The goals of the system are to improve access rather than to maximise the number of bus miles covered, the average speed for a car in the city, or miles of new roads built. The latter goals are those of the modal maximisers. They are goals of production, whereas 'active transport' shifts the orientation of the system to the needs of users.

One of the paradoxes of the late twentieth century is that in a world of collapsing distance, the distribution of access has become more unequal. While a narrow strata of the population has never moved so far so fast, a significant part of the population, above all women and the elderly, are locked in geographical ghettoes, with declining public transport, and the growing pollution of the car. The crisis of the existing modal structure has now reached a point, locally as well as globally, when a new inter-modal system of the kind suggested here, offers not only improved mobility for the already mobile, but a correction to the 'mobility deficit' on behalf of those groups and communities which have lost out in the car driven re-organisation of geography in late twentieth century Britain.

RM 26th November 1995