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A MOTORWAY-BASED NATIONAL COACH SYSTEM.

Contents

Summary.

We face two long–term crises in road passenger transport, both created by cars. The first is global warming. Anyone seeing thousands of cars daily, in and out of traffic jams, emitting fumes and CO2 knows that climate damage is being done on a long term crisis of road congestion largely created by the expansion of car traffic. The only policy discussed at present to address this crisis is road charging which has an implementation process of fifteen years, costs billions and does not add capacity to our roads.

The constraint in the present system is road space. It is forty or fifty metres per passenger in cars moving at reasonable speeds. Coaches cut this by a factor of fifteen or more, simply by grouping people. They take up less road space per passenger at sixty mph than people in stationary cars. Each one hoovers up a mile of car lane traffic. They offer the opportunity used on a large scale to eliminate most congestion. They are also the most efficient form of powered transport, five times more fuel efficient than cars.

At present, coach transport is atrociously organized, moving a relatively small number of people at 20-30mph. Yet, coaches, properly organized, could provide a fast, comfortable, and efficient transport system which would radically cut congestion, pollution, energy use and transport costs. They just use existing capital – motorways - far more efficiently. The system needs reorganisation. The Government has focussed on rail and ignored coaches.

The key to a new system is a motorway-based transfer system which allows swift off-on movement and high frequency services, rather than the present city-centre based one surrounded by congestion. This in turn requires an orbital coach system with a necklace of transfer points round the M25, Birmingham, Manchester and other cities to allow coach movement where most people use their cars. The system is described in detail in the following document.

This way millions of car journeys can become coach and public transport accessible. Coaches expand the good speed passenger capacity of the M25 from 15,000 to a quarter of a million and can drastically address congestion. Properly organized, they could be fast. They offer cheaper travel. They increase vehicle capital efficiency (in say journeys per week) a hundredfold. They reduce fuel consumption and pollution by a factor of five or more, cut driving time by a factor of twenty, improve safety and offer a frequency of service in excess of the underground. Properly used, they are the only viable form of orbital and inter-city transport to replace the car. They could rapidly transfer traffic from cars, making more room for the remaining ones.

With good organization, some coach priority and the kind of system suggested in this paper, they could create a national transport system based on the motorways which would eat up much of our car traffic, obviate the need for road charging and provide the best ecological form of transport available. The overall capital cost of the system would be, say, a billion pounds, far less than other transport projects and the system could be running and commercial within a few years as people transferred expenditure from cars to coaches. It is possible for a quarter or more of car journeys to transfer to coach. It would be the right policy for an oil scarce age and cut greenhouse gases substantially. It is the right policy now for the era of oil scarcity.

The Main Argument.

It has been acknowledged for at least fifteen years by governments and the public that we face a problem with the car as the dominant mode of transport. In the UK cars carry us for seventeen of every twenty miles we travel; they are convenient, comfortable and reasonably fast; yet they clog cities, motorways, and trunk roads with increasing regularity and congestion costs tens of billions.

The key constraint created by cars is road-space. A car at a good speed requires 70 metres of road, and there is not enough space at certain times on many roads to accommodate the cars that want to use them. The room available per car contracts and cars slow or stop. They also consume vast amounts of fuel, create pollution and have a number of other destructive consequences. Yet we love them, and there is usually nothing better. The present Government has moved from bold words to palliative measures and there is no overall strategy for addressing this transport problem. Road pricing is merely a way of containing it.

This paper suggests a way – a mode of transport which economises on road space by a factor of fifteen or more. Used substantially it could increase the capacity of our motorways and roads multiple times and cut congestion precisely where it is greatest. The suggestion is a fast, good quality, interconnected coach service based on motorway rather than city centre transfers. A passenger in a coach travelling at 60mph uses less road-space than a person in a stationary car. Each coach at normal occupancy hoovers up a mile of cars. This is the mode of transport which economises on road space, cuts fuel consumption and pollution by a factor of five and travels fast which we are presently ignoring.

It could be argued that we have no alternative. We have no effective long distance public transport system other than rail and air which are limited in the car journeys they can replace. By contrast coaches can replace a high proportion of car journeys and an integrated system could be quickly in place. Moreover, it is *the* green form of transport, two or three times more energy efficient than trains. As oil prices and scarcity increase, here is the form of transport which will grow worldwide. At present coach transport suffers from a number of disabilities, not really the fault of the companies that run them, but arising out of a failure of public policy for this mode of transport. Few people are going to use coaches when their ambient speed is 20-30 mph and they need booking. Yet potentially they could offer a fast, comfortable, motorway-based system with easy transfers that could pick up millions of longer distance and commuting journeys. Coaches are fifteen times more efficient than cars in their use of road space simply by avoiding the space between cars and grouping journeys; they are made for the issue of congestion. Land and capital for rail and other mass transit systems is not available; coaches just use existing capital –

motorways - far more efficiently. They thus address the key transport constraint, road space, with a massive improvement in its use. They can be as fast as cars and can be comfortable and reliable as we choose to make them. They are more effective at saving road-space than any Minister can be in building roads. If a fast, regular quality coach system were created nationally, we could radically eat into the problems of congestion and make life better for car users.

At present coaches are used very inefficiently. They are centred on inner-city transfer points, surrounded by congestion. These often involve a further journey of an hour or more out to home or destination in big conurbations. Tickets usually need booking. Many journeys are not possible, and often transfers are slow. They are cheap, but often too slow or incomplete a system for most journeys. Key is a systematic redesign of the way coaches are used. This again is relatively easy in terms of infrastructure and other capital costs.

The main reform is to move the main transfer points from city centres to motorway and other main intersections. This allows rapid transfers to be made away from areas of congestion and slow moving traffic. Linked with this move is an orbital coach system round the M25, Birmingham, Manchester and other cities allowing swift movement around, in and out of these great centres of population. With these in place, a system of coach priority, and good links to bus and car transport, millions of journeys become possible with swift on-off coach transfers. Later we will look at the system in detail. Moving to high frequency, unbooked journeys cuts waiting and preparation time. Coaches can become more comfortable, have flat entry from platforms, and can be given priority to avoid congestion. Quickly a reliable national system could be established which would move people to make near identical journeys in groups, rather than in expensive, isolated, space-consuming units called cars.

These changes are economically practical. The orbital systems could be created by the establishment of transfer points, or stations, at motorway intersections at a cost which is a fraction of most transport innovations, say £150 million for the whole M25, and smaller amounts for other orbitals and motorways. An expenditure of £100 million on coaches would buy a fleet that would eat up a high proportion of the daily M25 passenger trips. For under half a billion pounds a whole public transport system could be created in the South East feeding into existing transport links and new, partly privately provided, motorway coach services. Similar developments, on a smaller scale, could happen all over England, Scotland and Wales. Compared with all other strategic changes the technical problems are small and the development time is remarkably short. A mixture of public and private investment would be readily available, and the system could grow with demand.

More than this, the need is urgent. Congestion builds and costs a rising number of billions each year. Indeed, the pay-back time for this investment in terms of savings in congestion costs could be only a few years. By comparison the alternatives are vastly more expensive and disruptive. Before motorways can be widened there are five years of road works making road-space more restricted. Road pricing research and development costs dwarf coach system costs, and cannot be produced within a decade. Oil can only get scarcer and prices are rising. This policy would raise the efficiency of our use of fuel in the most dramatic way. The 2012 Olympics need efficient outer London passenger movement. Everything indicates that this is the possibility which should have priority in government policy.

Yet, the Department of Transport has not considered this possibility properly. A quality M25 orbital coach system and a strategic authority to set it up were strongly recommended by the £3.6 million ORBIT multimodal study of the South East set up by the Secretary of State for Transport, but the advice to set up a quality coach orbital system was ignored. Alisdair Darling was asked in the 9th July 2003 Transport Debate by the Conservative spokesman "why he specifically rejected the recommendation of the M25 ORBIT multimodal study for a strategic authority to create a high quality orbital coach network?" His response was, "Given everything that the hon. Gentleman said about bureaucracy, I am astonished that his own new policy announcement is that he wants a strategic authority for coaches. I should have thought that running buses and coaches was best left to existing organisations, rather than a new quango set up to do it."[1] This was an inadequate way to respond to a serious policy issue. In June 2003 the Regional Transport Strategy Task Group of the South East scored an M25 Orbital Coach System highest and highest but one in priority of all the possible transport initiatives on a number of key indicators.[2] Then and since, neither Alisdair Darling nor the Department of Transport have shown any evidence that they have thought of the possibilities of this mode of transport in relation to the M25 and nationally.

The preferred policy is congestion-related road pricing. The long established economic justification for this is that it internalises to the motorist the externalities of using vehicles which cause congestion. While congestion did not exist throughout much of the network most of the day, this policy was not necessary. The growth of

congestion over the last few decades has made this policy seem inevitable. Yet, it has considerable weaknesses. It makes road travel difficult for the poor. It is extremely complex to set up and to use. It will not be available for ten years or more. It adds substantial road costs, but adds no capacity in heavily used areas. It could break down. By contrast, coaches can quickly be expanded as a mode of transport. They substantially cut road-space use, and therefore passenger-based congestion, by a factor of fifteen, and therefore radically free up space. Coaches should therefore be a prior policy focus, considered before road pricing. They could defer the need of road pricing for decades.

A substantial motorway-based national coach system could result in reductions of vehicle traffic of 10% to 30% or more, and higher reductions in congestion. It would result in one of the biggest conceivable drops in energy use and production of greenhouse gases. However, as yet, little has been done to develop the kind of strategy necessary to develop such a system. This study seeks to set out the kind of changes required. It is exploratory and would need further refining. Yet they are not technically difficult and could happen quickly. The UK hardly has a car industry, but the movement to strong coach design and manufacture would allow us to lead a transport model which must be replicated across the world. We are a small, well populated island with thousands of people making near identical journeys all over the Britain, driving about 1.6 people. Not to group these journeys would be a criminal mistake. This reform could make travel more efficient, pleasant, sociable and available for millions of people, radically cut our transport expenditure and address the transport contribution to global warning. It should receive urgent consideration.

Chapter One: The Present Car Empasse.

Most of us have a grasp of the present car empasse. It is present in queuing traffic all over Britain daily. But how we perceive it effects our response, and we therefore review some bits of the picture.

CARS ARE FLEXIBLE. For most people life without car transport would be difficult and even unthinkable. For every twenty miles we travel, seventeen of them are in cars. They are available, comfortable, usually offer door to door movement (though this is less so than is often assumed) and they are often cheaper than public transport. They are also relatively fast. Journey speeds across England are about 53 mph on the trunk road and motorway system.[3] No transport policy which does not take all of these and other advantages into account can work. An alternative strategic policy cannot be crudely anti-car. Rather it should be able to replace a substantial proportion of car journeys with transport that is relatively fast, cheap, comfortable and convenient. It also must address door to door movement. That is a challenge, but maybe it can be done.

CARS ARE CLOGGING THE SYSTEM. The basic facts are known to all of us. Cars dominate passenger transport mileage. Car use has grown by about 1% a year and continues to grow. Road traffic will be double its 1990 level by 2025-30, an astonishing potential growth.[4] Traffic growth is especially heavy on motorways, increasing by about 3% a year. Over the last few years we have squeezed more out of the major road system by patterns of traffic management, but the load continues to increase.[5] We know congestion is, and will be, a major transport problem for millions of us; it will increase much faster than road use, because much of the road system hovers on the edge of congestion. Even now hundreds of miles of motorways and major trunk roads are clogged for several hours a day. At the millennium, the Department of Transport estimated that motorway congestion would increase by some 250% by 2010, and we are well into that process. Road charging is vaguely signaled to address congestion, but the political will may be lacking to implement it quickly. Like council tax property re-evaluation it will not be popular and may fall to the wayside. Recent Department of Transport expenditure reviews have opted for widening motorways; the M25 is to be four lanes throughout its orbit. This process will take much of a decade, cause congestion while it takes place and the extra space will rapidly fill during peak hours with further car use already suppressed by congestion. Car drivers and transport experts know the personal and structural costs of congestion will rise year by year.

CARS PRODUCE MASSIVE ENERGY LOSS AND POLLUTION. Cars use vast amounts of energy; for the last two decades they have steadily registered about 30mpg. They weigh about a ton and move about one and a half persons. In congestion fuel use rises alarmingly. Millions of car passengers are sitting in traffic jams burning up a limited and valuable resource. Petrol can only become more scarce and expensive. The North Sea bonanza is nearly over; we have substantially used up the family silver and it will be expensive, even dangerous, to buy oil in profligate quantities. The import costs will weaken the economy. Cars are a major contributor to CO^2 emissions and other forms of pollution. Far and away the most effective way of cutting energy use and pollution is to group

people together on the roads. It prevents using vast quantities of steel to move very few people and cuts wind drag by having people in the same shell. The energy saving achieved by coaches may be close to an amazing 90% of that used in car transport.

THE ECONOMICS OF CAR TRANSPORT IS AWRY.

Cars are also a very expensive form of transport, costing privately some 45p per mile with all the costs incurred by the motorist. Though initial purchase prices have fallen somewhat, private motoring costs are now over £60 a week per household and look set to increase. These private costs reflect the fact that cars are actually a capital expensive and energy expensive form of transport. Yet in addition to the private costs, there are very substantial government and public costs which make this far less efficient a form of transport than many of us assume because we do not pay these costs. This inefficiency is reflected in the national economy and our overall standards of living, and it is possible we could all be better off with a substantial move to coaches.

The car lobby points out that motorists spend some £30billion on transport payments to government, while road building and maintenance costs are far less. Road users, they assert, are subsidizing government. This turns out to be a very untrue picture. Many costs in addition to immediate road related expenditure fall on governments. These include police costs, accident related costs in hospitals, social security payments, the costs of parking space provision, the asset value of road-space itself, court and prison costs including those arising from car theft, sickness costs generated by air pollution, noise and pollution related costs falling on government These costs amount to far more than motorists actually pay. On a conservative estimate, car users should be paying several times as much a mile for car use as they presently pay.[6] If we also included the sums we spend on protecting our oil interests in the Middle East, the figure would be astronomical. Because the full public cost of car travel is heavily subsidized, cars are heavily overused and this economic imbalance contributes to our problems. This is not to be anti-car point; it merely corrects a weak argument from the car lobby and shows how the existing structure of transport pricing is awry. In terms of sound economics, car journeys should cost more.

PRESENT POLICY HAS NO LONG-TERM STRATEGY. New Labour came to government with promises of a transport revolution, but in terms of infrastructure and modes of transport, it has not materialised. It quickly backed away from increased duty on fuel, under objections from the car/lorry lobby. There have been a number of traffic management improvements, yet the underlying problem remains: there is no obvious alternative to the car for perhaps three quarters of the car miles we drive. Outside a few intercity and suburban journeys, the car is the only possibility. We have good reasons for using cars for 85% of our passenger transport mileage, because nothing else is on offer.

Road charging is suggested for the future, beyond an election or two, but it is just a charge, ineffective for the rich and all necessary journeys, but editing some of the poor off the roads and resented by those who have to pay; it involves expenditure of billions in setting up the system *without adding any journey capacity*. It is structurally negative, a rationing system that does not change the way the transport system operates. Yet it addresses the problem of road-space which has so far been ignored.

The present Government has opted for some extra motorway building, including widening the M25, in the face of transport advisors who point out that the newly created space will quickly fill with cars and the slowdown will continue. Rail and air cannot expand much and are limited in their journey possibilities. Bike, bus and walking are good for short journeys, but there is at present no alternative to inter-city and long distance passenger travel other than by car. All the predictions signal a build-up of road congestion and traffic jams and the Secretary of State for Transport's policy is driving towards a queue of traffic without any other strategy, especially given the implementation time for road charging.

We urgently need an alternative inter-city and long distance public transport system, because at present there is none. Given a fast, comfortable alternative, such as quality coaches could provide, billions of journeys might be switched away from cars.

Chapter Two: Road Space.

The Space cars need.

The key cause of congestion is the road-space that cars require for driving. This varies with speed and the variation is set out in the Highway Code. It is as well to recall the table because it is so significant.[7] The Code sets

out the thinking and braking distances that contribute to Stopping Distances. They produce the following requirements for car space at different speeds.

Table 1 Minimum car space required at different speeds.

Speed	Stopping Distance	Car length	**Space per car**	**per passenger**
20mph	12 metres	4 metres	**16 metres**	**10 metres**
30mph	23	4	**27**	**17**
40mph	36	4	**40**	**25**
50mph	53	4	**57**	**36**
60mph	73	4	**77**	**48**
70mph	96	4	**100**	**63**

The Highway Code points out that these distances should be doubled on wet roads. These are remarkable figures , not that we do not know them by use, but because of the demands on road-space which cars create. We focus on 60 mph as a good speed. At this speed 21 cars, or 33.6 passengers at a 1.6 occupancy rate, take up a mile of roadway. Usually, of course the gaps will not be uniform and there will be fewer than this. This low density of road-space use must be probed. Let us consider an example.

An example: the M25 passenger capacity.

The M25 is 118 miles long and this means that a single lane can carry 2478 cars at this speed and a maximum of just under 20,000 cars on an *eight* lane M25 assuming there were no lorries and other vehicles. At present, with effectively two or three lanes each way available to cars it is closer to 12,000. At an occupancy rate of 1.6 people per car we have room on the M25 for fewer than 20,000 people at a decent speed. Obviously the people who need to use it far outstrip this figure for several hours most days. Below is a chart of M25 car passenger occupancy at various speeds.

Table 2. The car and passenger capacity of the present M25 at different speeds.

Speed	**Car Capacity**	**Passenger Capacity**
20mph	**55,772**	**89,235**
30	**33,050**	**52,880**
40	**22,309**	**35,694**
50	**15,655**	**25,048**
60	**11,589**	**18,542**
70	**8,924**	**14,278**

This is with the present mixture of 35% of the M25 with four lanes and the rest three lanes each way, assuming that one lane is taken up by lorries. It also assumes an occupancy rate of 1.6 per car, the national average, when rates for commuters and business travellers on the M25 are below 1.2. At the rush hour occupancy rate the passenger capacity is below 14,000.

At the occupancy levels which normally dominate in the rush hour the passenger capacity at 60mph is more realistically below 14,000. This is amazingly small for the major route round such a metropolis. In poor conditions, say when it is wet or visibility is poor, these figures decline further. The capacity defines the speed. When the figures build up the traffic slows, as it does each day. Just for the record (or is it?), there is room for 111,543 stationary cars on the biggest car park in the world, allowing 8 metres per car and assuming lorries fill the inside lane, as they usually do… The on-the-ground scarcity of road space differs under a range of factors – at junctions, with weather, at road-works, with holidays, at rush hours, with the weekend flux, and most of these can only be partially addressed. The underlying problem on the M25 and many other parts of Britain remains the extravagant use of space which cars require. It does not matter much if the roads are clear, but it is crucial in congestion. Expanding the M25 to eight, ten or twelve lanes would not create sufficient road space at rush hours, and the surrounding roads would continue to be hopelessly clogged. Years of roadworks and congestion in other areas

would result, and the ORBIT study shows this kind of expansion of road space to be completely unrealistic. We need a system which drastically economizes on road space per person. There is only one available and fortunately it is a rewarding alternative.

The key strategic conclusion: coaches solve the problem.

This problem of road-space the coach radically addresses simply by eliminating the stopping distance between passengers and having people three or four abreast. A coach at 60 mph hoovers up about a mile of car traffic. Allowing an ample hundred metres per coach and an average occupancy rate of 30, the passengers take up less road space at sixty miles an hour than car passengers do when they are stationary. They are about fifteen times more efficient in road-space use per passenger than cars. This is an extraordinary leap in efficiency, and it is this factor that allows the coach to transform our transport system, if we use it properly. This mode of transport can carry nearly five hundred people in a mile of roadway, not a mere thirty, and the capacity of the M25 moves from 15-20,000 in cars to 260,000 in coaches. This kind of leap in the efficiency of road space use could radically transform our transport system. Using coaches effectively on a large scale could provide unrivalled economies in road space which could allow coach and car users to travel without serious road congestion.

Chapter Three: Apologia for the Coach.

Coaches have a number of advantages as a mode of travel for many journeys, and it is worth reflecting on some of them.

- **SPEED.** They travel fast and well on open roads and motorways. A regular cruising speed of 70mph is easily obtained in a modern coach. There is no faster, safe speed available for inter-city and orbital road travel without breaking the law. Crucial is not just the cruising speed, but the speed including stops. With motorway based transfers, average speeds of 50mph are possible on the major motorway routes up and down the country on the coaches which stop at transfer stations. Faster through coaches could easily manage an average of 60 mph, and the average orbital speeds on the M25 and elsewhere could be 30-40 mph. These are speeds which would compare well with cars and trains for many total journeys
- **USE OF ROAD SPACE.** They are vastly efficient in road space use, as we have already discussed. Used on a substantial scale they can clear congestion on our roads. At present motorway speeds of nearly 60 mph, 132 coaches travelling on the M25 would clear a lane of cars. That would require, say, 180 coaches in service each way. Clearly, a fleet of 400 could make a substantial dent in morning and evening rush hour congestion. Put in other terms, given the car low occupancy rate during the rush hours of 1.15, four full coaches per mile could double the speed of a 20mph rush hour crawl down a three lane motorway. A substantial use of coaches would make existing motorways extravagantly adequate for our needs. It is a far more effective policy than road widening. To improve road use efficiency by a factor of fifteen is a radical change.
- **CUTTING DRIVING TIME.** They economize on driving. One careful driver replaces twenty or thirty car drivers, freeing them up to do other things and reducing their experience of stress and the monotonous work they do. At present millions of drivers are duplicating quite simple work for relatively small returns in terms of passenger journeys, a grossly inefficient process. Cutting out the inefficient work of driving 1.6 people around and replacing it with the efficient process of moving thirty or forty people with one driver cannot but be good, especially for commuters, many of whom could now work online on their way to the workplace.
- **COMFORT.** Coaches can be comfortable as we want them to be. Some already are. Tables, good seats, work stations, media centres and a range of other features can make sure that time spent this way, without the encumbrance of driving, is pleasant and useful. In other words these vehicles can be an elite form of road travel, moving fast and getting a lot of people where they want to be in comfort. At present we are stuck with the idea of cars as luxury and coaches as cramped and unpleasant transport; that need not be so. Because of the high levels of use, it is possible to build levels of comfort in coaches which equal the highest quality in cars and have efficient utilization. Coaches, in principle, are another form of stretch-limousine.
- **LOW INFRASTRUCTURE COSTS.** Infrastructure costs are extremely low, or rather, they have already largely been met in the development of a motorway system. There are development costs, like the coach stations, system maintenance and information technology, but they are likely to be far less than the £850 million needed to widen part of the M25 by one lane. The costs we examine later, but a high proportion of the

costs are located in the operating capital - the coaches – rather than in the infrastructure necessary to make them viable. This is any investor's dream. In an era when major transport infrastructure expenditure (like Crossrail) seems difficult, this is a development where the major emphasis is on using existing resources fifteen times more efficiently.

- **EFFICIENT USE OF CAPITAL.** Capital investment in coaches is far more productive in a fundamental economic sense than our present use of cars, because they are used so much more intensively. One piece of equipment costing, say, £150,000 can carry people on nearly 100,000 substantial person/journeys a year, while a car costing £15,000 would be likely not to clock up 1,000 such journeys. This is a ten-fold increase in the efficiency of capital use. Much of the time we buy cars to keep in the drive or garage. The ten-fold increase in capital utilization issues in people not having to buy cars, or second cars, and in lower capital running costs per journey than with cars. A 25% transfer to coach travel nationwide would cut cars, garaging, parking, insurance and other costs throughout the nation, and many people would be richer in their weekly budgeting.
- **THE INTERMODAL LINK.** Coaches complete a road based public transport system. Bus use is often disappointing, because their use tails off in the suburbs. They cater for city centre journeys, but do not take people out of town, except to some lonely terminus near a housing estate. If people could also use buses to get onto a national coach network, we would suddenly have a full system of road-based public transport and buses would be more fully utilized. The same would be true of the outer reaches of the underground. Here is a system which would make the bus system and the underground more efficient with almost no expenditure and the likelihood of filling many empty seats. People on the Piccadilly line would be travelling out to Cockfosters in the morning and back in the evening to link up with the M25 orbital and national coach system, against the commuting flow.
- **ORBITAL TRAVEL.** Coaches can address orbital travel. Much of our present rail, underground and coach system is still based on the central transfer model, ignoring the fact that most people live and travel in outer cities and suburbs. The lack of orbital public transport in outer London is well known and explains the congestion on the M25 and associated roads. The same problem exists in other cities. Manchester and Birmingham are aware of the problem, but outer conurbation movements are also relational and national transport issues. Something like 43% of the journeys on the M25 start and finish outside its orbit.[8] Birmingham, Manchester and other cities are linked with other towns and cities which use their routes. Here a solution can be put where the problem is, on the congested orbits.
- **DEMAND LED DEVELOPMENT.** The development addresses existing demand. This emerging coach network can be focussed at the point where existing traffic flows are at their greatest. When you have a couple of people a second using a section of motorway, there is a good possibility of picking up custom. Origin to destination coaches often do not fit the national flows of human traffic; this system goes with the flows already established by car transport and road widening and upgrading patterns. We know the demand for the M25 or M62. It is merely a question of seeing how much of that demand can be translated from car to coach.
- **FREQUENCY OF SERVICE.** The unit size promotes high frequency and short transfer times. Tube and intercity trains have capacities of several hundred and are therefore relatively infrequent. Coaches with a capacity of 50 would be more frequent with reasonable demand and the waiting times would be cut, say, below that of the underground. With 200 coaches on the M25 there would be a coach within a mile of a stop most of the time in both directions, and the waiting time would be some two or three minutes. The Oxford-London coaches are able to offer a ten minute service at present simply by providing an unbooked on-off service, despite congestion and the need to go in to Victoria Coach station. With an effective network many of the inter-city motorway journeys could have a waiting time of five minutes or less. Once people could use this system with confidence in its regularity, demand would surge. Then high occupancy coaches could emerge.
- **JOURNEY FLEXIBILITY.** Coaches are more flexible than trains in the routes they are able to access. For example, at Junction 24 of the M25 it is easy to get to Potters Bar, Southgate, Enfield and the Piccadilly Line at Cockfosters by coach or bus links. New routes can be fed into the basic system from local points without large capital expenditure. The system can penetrate into the areas where most people live. Nearly 60% of London's population live in the outer boroughs, and it is the same in most conurbations. We are developing more effective feeder systems to transport loci which include bikes, minibuses, cars and buses, and so this is a system that can work right through to the journey's beginning or end. We shall discuss these multi-modal implications later.

- **ERADICATING PARKING.** Operational coaches do not need parking. The costs of parking are considerable in domestic garages and at the other end of the journey. Bradbury and Nulty suggest that as well as the parking costs to motorists of £1.25 billion, there is a public estimated cost of between £6.7-15 billion. Many cars park free, especially outside their own houses. There are also costs in terms of the way on-road parked cars restrict traffic, contribute to accidents and disfigure areas. However, the personal costs to the driver are also considerable. Many drivers crawl to find open parking spaces; it contributes a considerable amount to the traffic in many areas. Often drivers have to park a long way from their destination. Being able to leave a vehicle without retaining responsibility for it is often liberation. This the coach offers.
- **FAST TRANSFER.** Coach transfers can be quick and easy for passengers, although they are not so at present. It is relatively easy to step off one coach and onto another on the flat via a platform system. They can have multiple doors. Waiting times can be far lower than for trains, taxis or underground. Coach reliability can contradict the reputation that many bus services have developed over the years of three arriving at once. This requires that coach services are moved out of the congestion lottery that makes bus arrivals often so uneven. This seems easier to organize on motorways than in the congested and complex urban areas which buses inhabit. The location, design and conception of transfer stations we examine below, but they must create transfer ease and comfort.
- **ECOLOGICALLY THE BEST.** Coaches are very energy efficient. Sir John Houghton's Royal Commission shows the following levels of energy use.

Table 3: Energy Consumption in megajoules per passenger km (Houghton 199)

	Typical occupancy	Full
Express coach	0.3	0.2
125 train	0.8	0.4
Suburban train	1.7	0.4
Small car	1.4	0.5
Big car	2.8	1.0
Air	3.5	2.3

Here, therefore, we are tapping into the most energy efficient inter-city form of transport available. **Every car journey transferred to coach normally cuts energy consumption to a fifth or less of its previous level. Because occupancy levels are lower around the M25 and in other areas, the savings will be more than this. Because coaches cut congestion and also allow cars to move more efficiently, the likely fuel saving could push up towards 90%.** This is a massive saving, both to the economy overall, and for the consumer.

- **SAFETY.** Coaches tend also to be about three times safer than cars. They are large units with a stable wheel base, high driving position and good visibility. Drivers are probably less distracted by passengers. With seat belts and a careful set of driving rules, it should be possible to push down accident levels on coaches further.

CONCLUSION.

Coaches offer a direct alternative to the car for a high proportion of middle distance and long car journeys. They also have an overwhelming number of advantages to offer, especially in terms of addressing congestion and fuel economy. Even for continuing car users they have advantages in opening up road space. Strategically, if they take up a substantial proportion of car use, road pricing may not be needed. The vast capital expenditure on a road-pricing system and the consumer irritation with its complexities could be obviated by a system that vastly expands the road-space and the journey possibilities of the traveller.

Coaches can be fast, flexible, frequent, energy efficient, clean and relaxing, though they are not at present. Moving millions of journeys over to this form of transport would save money, energy and massively cut pollution. Nor would these changes be marginal. By factors of five, ten and fifteen in the crucial area of road space, this system would radically improve present transport patterns.

Chapter Four: The problems with the existing coach network.

What we don't know.

First, we need to be aware of how little we know about coach travel. The Department of Transport has not presented separate data on coach travel over the last decade or so, and has been happy to include it with buses in many of its tables. The classic case is the *Transport Statistics for Great Britain*, 2004, Table 1:2 "Passenger Journeys on public transport vehicles 1950-2002-3". Here the figures for the number of coach journeys undertaken each year by coach are provided down to 1990-91, where the figure is 619 million, equivalent to about three-quarters of the journeys on the rail network, but suddenly the figures disappear. Why is such an important form of travel no longer documented? An examination of the available statistical material on coach travel shows a weak pattern of information and little strategic thought.

Nevertheless, there is a discernable overall pattern that helps to explain why coach transport is both relatively inefficient and is marginal in the thinking about public transport in the United Kingdom. Broadly speaking, it has become a lower class form of travel. Car transport, rail, and air have become the acceptable form of travel for those who want to move relatively quickly and in comfort, while coach is for those who are prepared to accept lower prices as a trade for comfort and speed. A lot more MPs will moan about poor rail services from direct experience than would do so about coaches. Opinion formers, and civil servants in the Department of Transport, are not going to be coach travellers or think strategically about this mode of transport. The amount of government policy time and funding that has gone into rail over the past two decades must be vastly in excess of that brought to coach travel, though the latter is perhaps half as significant. But this is not even a conspiracy. Buses are urban public transport with a long tradition of public involvement and funding. Rail retains a strong public interest, but coaches are run by private companies and although they use public roads there is no conception of them as a matter of public policy. As a result they just fall through a gap in our transport thinking.

There is also a credibility gap in this form of transport. It is associated with cramped seating, difficulties with luggage, poor timing, slow journeys, diesel fumes and lack of comfort. Actually, coaches have changed and there are some good luxury vehicles in service. But still the design and technology are cast in a certain frame. There is, for example no reason why flat level step on – step off access with platforms should not be available on transfers, yet still there is the clamber up or down narrow steep steps. Most of all there is the problem of speed. Average speeds of 20-30 mph on long journeys are not going to satisfy most passengers. Many of these problems are not the fault of the companies, but have to do with the public structure of the form of transport, which is largely unconsidered.

The present weaknesses.

At the same time there are aspects of the present coach service which destroy the possibility of high levels of demand. They include the following.

CITY CENTRE TRANSFERS DO NOT WORK. We presently talk about a rail system, although it seems to have lost some of its coherence since nationalisation. It largely has a transfer system based on city centre stations built in the 19th century. They allow movement from one line to another quite easily via platforms, subject to the waits resulting from intermittent trains. Because railway lines into city centre stations are not unduly congested, there is no slowing at transfer points, apart from the occasional wait at signals. London's inner ring of separate stations is a special problem in transfers that wastes millions of hours.

Like rail, the coach system operates through a system of city-centre coach stations with the addition of a few other strategic transfer points which operate as nodes for journey transfers. National Express, Stagecoach and other companies use these city centre coach stations as the main framework for their service. Transfers occur at these places to create a national network. The problem is that each of these city centre stations is surrounded by congestion. Let us take one journey taken at random– Manchester to Reading by National Express. Here the transfer points are Birmingham and Oxford Coach Stations or London Victoria. The journey time that results varies between 6 hours 25 minutes and 9 hours 11 minutes. The speeds corresponding to these times are 28-20 mph. Partly, these reflect congestion and waiting times in Birmingham and Oxford or the long drag into and out of London, but they are unacceptable for a national transport system.

Slow journey speeds

Although speeds vary with the time of day and the routes concerned, they are regularly below 30mph. Most of the population does not consider travelling at this speed. Other journeys where there is less congestion and most of the journey involves motorway cruising might average 30mph or more, but the overall pattern of operation of the system is unbelievably slow.

Nor is it just the coach journey times, but *full* journey times. Someone in outer Manchester or Birmingham has to travel to and from home in addition to the coach journey from the centre often adding twenty miles and one or two hours to the journey. If these passengers could go directly out to an orbital link, many overall journey times would fall by an hour or more. If I am travelling from Southgate in North London to Cambridge, then the journey to Victoria Coach Station or Stratford not only adds further miles to the overall journey, but takes another hour or more. This can slow the overall journey towards an unacceptable 15 mph.

It is these problems that the orbital transfer system proposed here addresses. The aim is to push average speeds over 40 or 50 mph for total journey times by reorganisation.

PASSENGER GATHERING BY COACHES DOES NOT WORK. Quite a lot of coaches gather passengers by calling at a number of places. This slows the journey time. The Stagecoach Oxford-Cambridge coach increased the number of stopping places en route in 2004 to pick up more passengers, and the average speed for the full journey has slowed to 22 mph, even without any transfers from one coach to another. This guarantees a small pool of demand. What is required is a fast national system where gathering and dispersion are carried out by subsidiary services that feed to and feed on the strategic network. The underlying requirement is a fast, frequent motorway based system into which people can easily plug their full journeys. This can be done. If the system is good enough, the local gathering systems will also emerge and be efficient.

BOOKING IS TIRESOME. For many people transport is a get up and go business, especially if the journey is less than a hundred miles. Catching a booked train or coach is also time wasting, because of the cost of missing that vehicle becomes prohibitive and link journeys are unpredictable. One timetabled coach departure requires passengers to turn up fifteen minutes early. Booking a fast train is tolerable, but booking a 25 mph coach is too little of a bad thing. Yet, when the departure frequency is sufficiently high and people do not need to book, the convenience of that system is far greater and demand expands. The success of the London-Oxford on-off service shows the knowledge that coaches will leave every ten minutes encourages far higher levels of demand than occur on booked routes. One of the keys to the successful performance of a national coach service is frequency levels of less than ten minutes on the major routes. This is actually relatively easy to achieve, given the size of the units.

COACH QUALITY NEEDS IMPROVING. Car manufacturers have been addressing issues of comfort for years, and many cars are very comfortable, given the awkward sitting position that their design seems to require and the limited space. Coaches by comparison have seemed uncomfortable. Yet in principle coaches should be better. The sitting position is not so low. The provision of many forms of comfort and service for 30 people should be easier and cheaper than for four. The possibility of people working on coaches has not been fully opened up. The stowaway luggage design is unsuitable for quick transfers and difficult for drivers. Multi-door models could appear. The creation and control of fumes needs more careful treatment. The multi-modal ORBIT study's insistence on a quality orbital coach service with good leg room, seat quality, work stations, food, drinks and media stations is achievable with design modifications.

It is not difficult to see why coaches presently have low levels of demand and seem to serve passengers badly. Key are levels of speed and frequency. Speeds of 20-30mph for journeys are not acceptable for most, and departures with intervals of an hour or more intervals that need booking do not make for convenience. Add in relative discomfort and the difficult journey from the terminus to home or destination, and the relatively low demand is entirely understandable. It is the end result of decades of car dominance making it a marginal service. They are not intrinsic to the mode. Indeed, the mode, given its unit size can easily provide a high frequency service. This overall situation is not the fault of the companies concerned, but results more from the residual status coaches have been given in public transport policy. It could be changed.

Chapter Five: The Basic Conception of a National Coach Network.

Reordering the Network.

There is a need to create a national coach network which functions smoothly and efficiently as a national system. It needs to be based on motorways and motorway junction transfers, that allow fast movement through the full journey. Because it would be catering for a different kind of journey from most rail journeys, there does not seem any strategic issue of undermining rail travel. The latter will tend to have many of its current advantages, in particular, fast access to city centres. The national coach system will pick up many other journeys impossible by train, or focussed on suburban movement. What competition there is with rail, could be beneficial. The priority in the coach system is on fast transfers. This is best obtained by not having coach-car interchange at any of the key motorway transfer stations. The speed and quality of the journeys should be as high as is safely possible. The elements in the plan are as follows.

1. **Motorway based transfer points.** The coach network would operate around a series of transfer points based at motorway and key trunk road intersections.
2. **Average motorway coach speeds of 50 mph or more.** This would guarantee that the bulk of most journeys would take place at speeds similar to or faster than cars. It requires an effective system of coach priority and a limited number of transfer points on motorways.
3. **Orbital coach systems round the M25, Birmingham, Manchester and other conurbations.** These and other orbital and link coach services would provide stage journeys at 40 mph or more.
4. **Integration of the national coach system with rail, bus, underground services.** Many of these provisions are potentially in place, but they would offer an integrated system of road-based public transport for the first time, and the possibility of door to door coach-based journeys.
5. **Coach priority throughout the motorway and trunk road network.** The purpose of this is to ensure coach journey reliability for these road space saving vehicles.
6. **The construction of platform based, fast entrance and exit transfer stations.** These should provide passengers with easy and pleasant movement from one coach to another.
7. **A quality of coach travel as good as or better than cars.** Quality public road transport is possible with large scale investment.
8. **Moving coach-based road journeys up to a quarter or more of all road passenger mileage.** The aim is not to see this as a marginal form of transport, but as a major competitor for the car on a wide range of journeys. It should be possible given the potential of this form of travel and it largely depends on the economic parameters travelers face.

Let us examine these elements of the system in more detail, so that the conception can be rounded out.

Motorway-based Transfer Stations.

Coach stations need to be based at motorway intersections and junctions for major cities to allow rapid transfer without congestion. The conception is of a largely self-contained platform stations alongside or within the motorway junction roundabout and feeder roads. These points allow for quick exit-board transfers and therefore open up millions of potential journeys to the coach. They are also key in allowing coaches to operate optimally in the areas of major motorway congestion. These stations speed up linked coach journeys by allowing transfer times of two or three minutes. The slowing, stopping and accelerating time should be not more than three or four minutes. There will normally be a carousel design with shelter, facilities and a shop, and designs are discussed later.

There will be stations at the major points where cities intersect with the motorways and at motorway and trunk road intersections. The aim is that most people with a simple public transport journey will have access to one such point and feed onto the national system. The location of these stations and the principles governing their location will be discussed in more detail later.

Motorway Speeds.

In order to achieve average speeds of 50 mph or more, coaches need to travel at 65 mph and have stops at intervals of ten or twenty miles. This means that stops do not necessarily occur at every motorway junction. As a

result the gathering systems to that junction become important and in many places they would also be done by coach. Coaches can operate at these speeds, given their better visibility and stability than cars, and when demand builds up, through coaches can also operate on most motorways and orbitals, increasing speeds further.

The coaches need patterns of priority that will guarantee their fast movement. These must not alienate motorists, but nevertheless, coach passengers because of their road-space saving and environmental performance ethically deserve some priority.

The M25 and other Orbital Necklaces.

In many ways these orbitals are the key to the system, both in generating millions of potential journeys and in making multi-transfer coach journeys easy and efficient. Vast populations live in the outer areas of our major cities. They need access to road-based public transport without the journey to the city centre. Thus we create an orbital coach service and a necklace of transfer points round the major conurbations. These allow rapid entry and exit to the coach network for most of the populations of these areas. For example, several hundred coaches round the M25 calling at transfer stations could pick up a substantial proportion of the motorway's car traffic and other journeys in the area. These orbitals address the main centres of congestion on the national motorway network.

It is important not to allow coach to car transfer at the orbital stations, because this would generate another level of congestion at the place where road-space is most scarce. Large numbers of current road users in these areas face congestion and show considerable dissatisfaction with their journeys. There is clearly large pent-up demand for an alternative form of transport, which coaches provide.

The orbital principle can be used round Manchester and Birmingham, but also in other great cities. In Newcastle the A1, A19, A194 and A184 create an orbit which could be linked with two transfer points on the A1 and A1(M). Liverpool has an inner and outer circuit which would serve a similar purpose. In Leeds the A6120 and A6110 serve a similar purpose. Nor do the coach circuits have to be circular; they could also be linear linking to the edge of high population areas.

The Orbital Coach services are the key to increased national demand for coaches, because they provide the means for collecting large numbers of passengers from the great conurbations. The calculation of the coaches needed in relation to demand is a complex market development calculation. The initial requirement is for a frequency of service attractive to passengers, say every three or four minutes. On the M25 with, say, 16 transfer points and an average distance between them of 7-8 miles (discussed in the next chapter) it is possible, as we have seen, to average 40 mph allowing three minutes for stops. The Manchester orbital might be slower because stops would be closer together; given the orbital is shorter this would be less significant in overall journey time.

At the transfer points there would be links with motorway coaches to other conurbations and cities, allowing people good access to their homes and points of destination. For some the old central coach or bus station might still be the best destination. The orbital systems would aid movement round the outer sections of these conurbations, journeys that can usually only be made by cars. A good proportion of these journeys would be commuting ones and could be designed for fast, reliable morning and evening flows. Some orbital coaches could be sector coaches not stopping at intermediate transfer points and therefore faster. There are many major places of employment and travel, like Heathrow, to which tens of thousands need access from North-east or South-east London. There could be custom made orbital movements of these people. Wherever a coach could regularly be filled, it could be timetabled and made operational. Because traffic is heavier in the western sector of the M25, some coaches would not go all the way round, but feed back into the area where demand is more intense. Organisations could charter coaches privately to create more flexibility and other private coaches could feed into the network. Clearly, establishing the daily timetable would be complex, a matter of meeting actual and potential demand, but because the units are fairly small, it should be possible to generate a frequent, fast, comfortable service with easy transfers.

Intergration with other modes of transport.

Later we shall look at the various ways in which links can be created with rail, underground, bus, car and bike links. Here we highlight the way in which the present bus service is left hanging. Although London and other conurbations are more complex, most cities consist of services that move between centre and outskirts. In the outer regions the bus services end with poor occupancy and desultory purposes. Yet in these areas many people are undertaking out of town journeys using cars for which the buses provide no linked inter-city services. If buses were

linked with a quality inter-city coach service through these outer areas, the rationale of the bus system would radically open up.

Coach Priority.

Good coach speeds require some coach priority to rescue this efficient form of travel from some of the congestion that cars create. The purpose is to guarantee a certain level of journey security to passengers in terms of speed and reliability in the face of serious congestion in some areas. It makes more rigorous and ethical the consumer choice of car or coach. If you choose a road-space consuming car, the car-space available might be limited. If you choose a road-space saving coach, then road space will be available to you. The aim is to move traffic to the space-saving form and substantially, but fairly, transform the market in road use. There is an ethical case for it, and since it also benefits car users, it is a case which should be acceptable to most thinking drivers.

The detailed priorities are matters for the experts, but there are a number of possibilities. 1. Coaches use the hard shoulder at 30 mph when the road is blocked. 2. Triggered traffic lights give coaches priority at intersections and roundabouts. 3. Coach lanes (when the utilisation levels are high enough). 4. Channelled lanes giving coaches priority using overhead motorway signals in slower moving traffic. The aim is to keep coaches moving at decent speeds in all conditions to give passengers security in their use. With some modification costs, option one is a feasible initial development.

Transfer Station Design.

Londoners know which underground station transfers to use. On some stations you can move sweetly from one line to another in a few yards, while elsewhere there are long tunnels and elevators. Clearly, these coach transfer stations should allow transfers which are easy and comfortable for passengers. It should be possible most of the time for them to be compact with short platform transfers, because the unit size of coaches creates high frequency. Important is the comfort of people already on board. For them the interruption to their journey should be as slight as possible, though transfer stations also provide an available way of breaking journeys for those who need a stop or a newspaper.

Later we shall discuss a range of possible transfer station locations and designs.

They need to be safe. It seems obvious that they should have a platform structure both for safety reasons and ease of on-off movement. They would have areas under cover and indoors from the rain, toilets, a kiosk or shop, seats, luggage trolleys and children's facilities. They would need safety design not only for effective segregation from the traffic, but also to cope with any emergency conditions, say a local overload of coaches. Because over time millions of people would pass through them, it would be good if they were pleasant buildings of some distinction and comfort and not just functional constructs.

A Quality Coach System.

If the coach market is to be relocated, then it needs to provide the kind of travel experience which would suit those used to more luxury in cars. This can be done. It is just a matter of specification and stronger consumer research. The ORBIT recommendations were quite clear. They wanted "high quality vehicles with tables and power-points for on vehicle working, adequate leg room and lateral space, drinks and other refreshments, radio headsets, newspapers and satellite television." They also "emphasized fast and reliable operations through priority measures and making use of major roads and not diverting in order to pick up local traffic."[9]

The coach luggage system needs to be rethought and automated to allow quick retrieval. Other matters need attending to, like switching the engine off at stations and keeping fumes away from passengers. There is probably also a need for multiple doors on orbital coaches to allow easy entry and exit. We have already mentioned flat entry design. At the same time there needs to be thought about the requirements of different journeys. Short quick transfers need a more mobile layout than long journey coaches. These are practical matters of vehicle design and depend largely on the quality of the build. Because coaches can be used for as many as a hundred thousand passenger trips a year, their standards should be especially high. Costs are defrayed across so many journeys, that luxury is possible on a very economical form of transport.

The Market Reach.

The idea of this form of transport taking over perhaps a quarter of car passenger mileage is a radical and almost unprecedented growth in a mode of transport since the post-war emergence of the car, but it is not a casual hope. The level of potential demand for journeys on these routes is already laid down by the cars that map out 85% of the weight of our journeys. Coaches can follow the heavy densities exactly.

Given the present average private cost of car travel and the lower prices that a proper alternative coach system would offer, and given the advantages of coach travel, like not having to drive and no parking, it is likely that a full coach system could generate substantially higher levels of usage. Clearly, there is a need for market research where the interviewees understood fully the change that was proposed.

Yet, probably the levels of demand that are envisaged here require a thorough revision of the economics of our public and private transport system, including a major revision in the price of fuel, or road charging, though the former seems easier. Hitherto, this has not seemed practical and understandably so, but with an alternative system in place, it could become a more acceptable political option. This we discuss more fully in the next chapter.

Chapter Six: Car and Coach.

The Average, Marginal and Public Costs of Cars.

The economics of car transport is somewhat disordered and conceptually confused. Households spend 87% of their travel related expenditure on cars, some £60 a week.[10] This is a substantial part of weekly income, roughly equivalent to much of a day's work each week, and many households watch their expenditure on cars closely. Yet how accounting is done in this area is complex and involves different systems of pricing which often seem contradictory. There are capital costs, private average cost of use, private marginal cost of use, opportunity cost, public average costs and marginal costs. The variations between these are important and explain much of the underutilization of coaches and the overuse of cars. We consider these areas in turn.

Private Car Ownership and Capital Cost.

First, we consider the ownership of vehicles. At present we own about 25 million cars in the UK. The number of households (29%) with two or more cars now exceeds those without, and so we own more than one car per household and multiple ownership is quite common. People usually make careful decisions about the number of cars they need, but we do not question communally why we need so many cars. We already own more vehicles than we can physically get on the main road network, and most vehicles remain parked for 95% of the time, not a high utilization of capital. The capital cost of a car is something like a third or a quarter of its current value made up of depreciation and the yearly value of the capital locked up in the vehicle. Another cost is garaging which may be worth £15,000 a car, obviously discounted over many years. Costs charged for urban road parking run up to about £110 per annum, obviously far less than the space is worth. Alongside privately owned cars are company cars, about 1.35 million of them (Nov. 2003); they tend to boost the level of car availability. Many people could manage with fewer cars if there were viable and convenient alternatives, and if car ownership fell by a couple of million, through choice, many people would be better off and we would save an area the size of Coventry from being engulfed by parked cars. Owning fewer cars would be great if we could do it, and that means providing alternatives. Most car owners see no practical alternative to having the number of cars they do. Yet London is full of cars which are used rarely during the week, but sit there for the weekend out of London trip. Thousands then sit in jams created by the weekend pulse doing near identical journeys. There could be a better way. There are burdens to car ownership. The cost alone of depreciation and interest on the capital sunk in a car is a thousand pounds a year for most people. There are other ways to spend the money and we may not need all of these cars.

There is a weakness in the economics of the private costs of cars. The fixed costs are relatively high, perhaps £2,000 a year or £40 per week. The ownership of a car, insurance, tax, MOT, garage servicing and repairs have to be paid however far the car is driven, and these are a high proportion of the overall cost of running a car. The cost of the fuel and some maintenance are variable with the miles driven, but these are relatively low costs and do not deter many drivers from substantial use of their cars. The attempts of the New Labour Government to change this by increasing fuel duty after 1997 were weakly abandoned under pressure from the car and haulage

lobby, and the price of fuel in relation to other car transport costs has fallen in recent years. As a result there has been no strong cost constraint on the mileage undertaken by car drivers in recent years. Car owners are pre-committed in a certain sense to use them. This has implications for the elasticities of car use, important for road charging, which we consider later.

However, the overall private cost of cars brings together fixed and variable costs and this is normally measured by average private costs, to which we now turn.

The Average Private Cost of Car Use.

Here we are concerned with the average cost per mile, or yearly costs divided by mileage to the car owner. It includes tax, insurance, maintenance, depreciation, MOT., garage and parking costs and they amount to between 30-60p per mile, usually depending mainly on the price and age of the car. Probably the average is about 47p a mile. The more a car is used the lower the cost per mile. MPs get 57p a mile car expenses and other organizations give between 25p and £1 or more. Average costs reflect the fact that a complex and highly engineered ton of steel is used to move one and a half people about most of the time. Cars, although convenient, are not an efficient mode of transport. If there were a real alternative that offered the possibility of reducing car ownership and use, a substantial proportion of people might be willing to take it up. A good potential market is families with, at present, two or three cars. Other urban dwellers and those who are both young and old, might also find a coach system attractive. Clearly, families with substantial amounts of luggage, might be more resistant to change in some of their car use. We note that if a substantial proportion of this vast car budget of some £75 billion did move over to coach transport, albeit at reduced prices, the emergent national coach system would have billions of revenue to work with.

The low marginal cost of car use.

The marginal use cost, i.e. the cost of travelling extra miles, is much lower and consists largely of the use of petrol. On average it is about 11p per mile, though, of course those who drive very fast or sit in traffic jams pay 15p or more. The inland revenue advisory rates for company cars are: 1400cc or less 10p, 1401-2000cc 12 and over 2000cc 14p. Even if oil and parking are added, the marginal cost does not rise much. Marginal use cost is thus something like a quarter or a third of average costs. This low marginal cost encourages some who get job related mileage of average costs to drive more to transfer some of their private average costs. Because people already have a car, the marginal cost tends to be the one they use in deciding whether to go on a journey, or commute by car. Usually, it compares quite favourably with other potential costs and boosts car mileage.

The public cost of car ownership.

The public cost of car *ownership* is very little indeed. When they are not used, cars normally sit in garages or drives doing nobody much harm, although perhaps disfiguring out living areas more than we acknowledge. One area of public cost is the cars that park in the road and on verges outside urban houses which are usually built in the pre-car era and have no possibility of parking on their own land. Systems of residents' parking have become established, but they encroach on public space, create some traffic dangers and disfigure many pleasant roads. Given this point, the irony is that with a low public cost of ownership, the Government collects car tax on ownership at a substantial level, skewing the public response to car use. Most commentators have pointed out that this tax should be transferred to another form. At least the duty is now related to engine size. Thus, not the public cost of ownership, but the public cost of car use crucial to our situation. It is vastly under-costed in our private and public finances. To this we now turn.

The average public cost of car use.

The public costs of car *use* are vast. Car lobby campaigners who rail at the private cost of cars or road haulage have their heads in the sand. Many public costs are paid by government, but not all. Accidents are partly met by government through police, hospitals and social security payments but also by insurance and members of the public waiting in jams behind a blocked road. So there are three perspectives on these figures: the actual public costs, the proportion that Government presently pays and the question of who should pay these public costs. Arguably car users should pay to a considerably greater extent. Private costs should move towards these public costs, especially in relation to the costs of congestion. This is the argument which road charging addresses. In setting these costs the Government should act to create fairness. As the polluter pays, so should the driver who

contributes to all these costs carried in the public system generally. Normally we expect government to act in relation to them as guardians of fair prices. By taxing pollution, we discourage the polluter from harming others. This is a widely accepted principle, but its full implications are often not worked through.

There are a variety of estimations of the public cost of car use. They are becoming more precise, but are scarcely part of public consciousness. So, for example, an understanding that the public cost of accidents amounts to something like 40p per litre does not occur to the person grumbling at the pumps, yet it should. Below are a set of the public costs that are the result of car use.

Table 4 : Estimated Public Costs of Car Use. [11]

1. Government Expenditure on Roads. This is running at something like £5-7 billion a year, partly depending on when big motorway projects kick in. Say **£6 billion**

Parking. The costs of car parking on roads and in municipal car parks over and above any parking charges paid by car users. The Bradbury and Nulty estimate is **£6.7 billion**

Cost of accidents and breakdowns. This includes police, accident and emergency cover, hospital treatment, work lost. The UK calculation by DETR for 2002 was £17.8 billion which we will call **£18 billion**.[12]

Police, Court and Prison Costs. Apart from the driving related policing and court costs, there are also the costs associated with car theft. Say **£3 billion**.

Annual return of the asset value of roads Bradbury and Nulty argue that because rail is expected to generate an 8% return on the asset value of the rail network, so should road users. That produces a figure of £32 billion, because obviously this is a very expensive asset. Normally we regard it as a free or public good, provided by previous generations, but clearly it is an asset enjoyed by road users. As a compromise divide the B/N figure by four to give **£8 billion**.

Environmental Costs. This includes the recognition that several million properties near motorways and trunk roads have their values reduced by a substantial proportion. Vehicle noise requires double glazing and other noise reduction strategies. Noise pollution costs alone are estimated at £3-10 billion. Land by roads is degraded. Exhaust pollution cost and its contribution to global warming, reflected in the costs associated with extreme weather events, is considerable. Conservative estimate **£25 billion**.

Health costs of pollution. There are health costs of getting fat and accident costs, but there are also breathing difficulties and chest complaints associated with road pollution and particulates. There are five million asthma sufferers and 1,400 deaths a year. There are links between air pollution and asthma but we are not sure what they are. There is no satisfactory estimate of this cost but say **£2 billion.**

Congestion costs. This is the cost generated by cars on the road slowing other cars. All of us have been held up in traffic jams. Many are just wasting private time and others work time paid at their normal rate. Many, not just lorry and taxi drivers would find their output climb dramatically were it not for other vehicles crowding the road. Expensive vehicles are immobilized and fuel consumption rises, perhaps by £2 billion. Total cost **£20 billion.**[13]

Historic costs. One of the biggest costs of car use will emerge in the future as oil prices rise, let us say to double the present level. Then, it will emerge that we have used us our resources at a profligate rate and we have extracted and marketed North Sea Oil at the historic period when prices have been lowest. The cost of this short-termism could quite *minimally* be seen at 5p a litre, which would cost **£2.2 billion**

Defence Costs. The oil guzzling west requires a policy of control of the Middle East in order to prevent monopolistic control of the market. This will be even more acute in the coming decades as the concentration of reserves in the area becomes even more acute. As President Carter pointed out two decades back, this policy of high consumption oil dependence will both generate high defence costs and lead to war. The two Gulf wars have partly been about oil, and it would not be unreasonable. A conservative estimate would see 10% of the defence budget of £37 billion as related to oil, **say 3.7 billion**.

It is a complex debate about what these external costs are, and they are difficult to assess,[14] but that does not mean they are not real. Whether it is double glazing to keep the noise out, trying to keep a person alive in hospital after an accident or a consultant who charges £100 an hour for his time sitting in a traffic jam, these are real costs. The estimate constructed here comes out at £97.6 billion or something like 25p for each mile travelled throughout the UK. This pushes the true cost of motoring up to something like 72p per mile. As a tax on a litre of petrol (at the average number of 7 miles per litre) this would come to £1.75p a litre without paying for the petrol. The figure should be more, for these estimates are quite conservative. The proper cost of petrol, without road pricing should therefore be something like £2 per litre, about twice what we currently pay.

The Opportunity Cost of Car Use.

Opportunity cost is what you forgo in using this mode of transport. In most people's mind there are no such costs, though it is emerging that the pattern is more complex. We forgo exercise, social contact, some personal safety, street safety, a less stressful existence, clean air while we are travelling, good eating patterns and a number of other things. Safety is an important element, because about 1600 people a year are killed in cars and 18,000 seriously injured. This is despite intense focus on car safety design. It is a figure that would not be acceptable in a war. By comparison, we note that coaches had a zero level for fatalities per billion passenger kilometers throughout the decade 88-97 and a level of serious injuries at one third the level of cars.[15] The opportunity cost of not travelling by coach is serious in terms of safety. Because cars are probably responsible for a high proportion of the pedestrian and cyclist deaths, and congestion leads to accidents, the relative safety of coaches should be a matter of public policy. Generally, however, people are slow to calculate the opportunity cost of car transport against instant convenience.

The opportunity costs of coaches historically involve slow journeys, waiting for transfers, booking, difficulties with luggage, experiencing hold-ups on motorways and in slow urban crawl. Many of these can be reduced or eliminated. Coaches also have opportunity benefits. There is no parking, garaging, insurance, car purchase or buying of petrol. They can be pleasantly sociable. There is less pressure than with driving a car, and the driver is free to do other things.

Marginal public costs of car use.

This is the crucial cost, especially in relation to congestion, and the key thing is that it varies. Congestion costs, for example, are close to zero when roads are empty. Accident costs are occasional for particular drivers, but quite regular for other road users. Parking costs vary. Those who don't pay for car parks, but use free space create an unpriced cost. Many of the costs are invariable and largely depend on mileage. Some of the most important variations are linked to petrol consumption. Speed generates accidents and burns up fuel. Pollution roughly corresponds to fuel consumption. It its attempts to control marginal costs the Government has declared itself in principle in favour of road charging. Later we will discuss whether this is the best form of taxation in the next generation of motoring.

What is certain is that the mindless people who rant at every fuel price rise cannot see the real costs that emerge from car driving, or recognize the fact that good economics requires a realistic price for fuel, say at least a doubling. The conclusion is simple. If the price for fuel was increased to £2.50 a litre, buying, on average, 7 miles of car movement, and establishing a full cost reflecting the public cost of 25p a mile all kinds of transport calculations would radically change and coaches would become overwhelmingly popular overnight. It is time to address this basic distortion in transport economics.

The Road Taxation system.

The public taxation principle is that if market prices are to be fair in a community where what we do affects our neighbours, then they have to reflect not just our own price choice, but what those choices do to our neighbours. It is a move away from narrow individualism to recognize the impact our consumption choices have on others. We have been forced to this recognition by falling traffic speeds and the obvious inefficiencies resulting from the way we each impact on the other's movement. Clearly, the cost of car use is greater than the cost of car ownership and the preceding analysis would suggest a change of policy is required.

Historically, the present Labour Government backed away from fuel duty increases under pressure from the road lobby. Since then there has been a slow espousal of road charging, but there remains something like a decade of implementation time. This is a high technology system and companies are already working at it, with strong vested interests in its implementation, but the suggestion here is that it is an unsatisfactory policy, for the following reasons. It would not add to travelling capacity. It would cost the motorist, say £50-100 per annum in equipment and administration merely to be regulated. It is complex to administer and understand, since its purpose will be to charge and therefore ration scarce road-space at different times and in different places. The biggest worry with this system is that in the areas where congestion is greatest, even high charges will not deter cars from what they see as the essential part of a longer journey. Demand may be very inelastic in relation to price. A complex system will be ineffective unless prices are annoyingly high. At this stage the sheer complexity and irritation the system generates will be matched by no new road capacity and suppressed demand especially among the poor.

By contrast the expansion of coach provision, vastly expanding our journey capacity, and an increase in fuel duty, addresses the situation with straightforward economic incentives. High petrol prices curbs speed, because high speeds guzzle petrol. Big cars are penalized. In ecological terms fuel duty is better than road pricing. It reflects many of the public costs associated with car use. It is simple to administer. It moves taxation towards its cause, car use, and away from other areas where it is not generated. It is possible to have a genuine zero tax rise policy associated with such a policy. Rather than capitulate to the mindless rantings of the car and transport lobby, the Government should reform the taxation system to conserve fuel and reflect the true cost of the public use of vehicles. Yet a substantially increased fuel duty is only fair if the citizen is offered alternatives in public transport. It is this that the national coach system provides.

There are clear moves that can be made quickly. Abolition of the tax disc payment and its transfer to fuel duty would add about 14p a litre to the price of petrol. Insurance companies may be prepared to charge on last year's mileage as one of the dominant actuarial factors, but it might be too difficult. Yet it seems that unless the Government is prepared in steps to double the price of petrol while reducing vehicle excise duty, we will not get near an economically sound system of transport pricing. I The public could be persuaded towards a more selective use of the car, if good quality alternatives were available. The higher price would be understood to cover accident, injury, hospital, pollution, road use, police and traffic congestion costs. The aim would be to convince the public that a £2.50 a litre petrol price was good for them and fair across a broad band of users. This last generation has used up most of the North Sea oil reserves at probably an all-time low for oil extraction prices and has still felt disgruntled with slight price rises; they need to be persuaded that this position is unreasonable. When car users were paying something more like user cost, they would be in a position to make realistic choices about their means of transport.

This leaves problems for the haulage industry, rural dwellers and travelling workers which might need special measures, but the general case for this reform, rather than road pricing seems strong.

Comparison of Car and Coach Travel.

The previous analysis was offered, not as an inducement to travel by coach, but because it moved towards a fair representation of car user costs. In this section, it is worth offering a comparison of the relative benefits of coach and car travel as an indication of the kind of market reach this form of travel might have. Obviously, this is not direct market research but it does give a feeling of the relative appeal of the two modes.

Table 5: Relative appeal of non-urban car and coach journeys.

AREA	CAR	COACH
Ownership	Need car	Do not need car
Overheads	Garage, tax, insurance, repairs, MOT.	No overheads
Overall Speed	May be slowed by congestion 35-65 mph	Slowed by transfers 35-55 mph
Luggage	Easier door to door	Luggage transfer
Fuel Use	30 mpg especially in traffic	150 mpg per person
Driving	Driving/navigating stress	No driving stress
Ability to work	Cannot work and drive	Can do some work
Children	Contained but driving	More time for them
Private Cost	20-80p per mile. Av 47p	15p per mile
Business Cost	30-100p per mile	15p per mile
Public cost	72p per mile	12p per mile
Suggested cost	an extra 25p per mile	12p per mile
Parking	needs parking	does not need parking
Stress	Driver stress	no driver stress
Safety	High accident rate	Safer, also for others
Convenience	Very high at door	Varies. Could be high
Sociability	Alone or with chosen passengers	Meet and mix with others

The list suggests that coaches offering a good quality of ride could be competitive, even in areas like business travel where coach travel has previously been unconsidered. There is no standard calculation which would tell us how much demand would move from cars, because the change of coach service envisaged would be so great. With reform, the potential for growth in demand is immense.

Chapter Seven: The M25 and other Orbitals.

The Conception.

The development of orbital coach services is a change in conception. Presently, coaches journey from city to city. Coach transfers are usually linked to city centre Bus Stations, like Victoria Coach Station. The old conception of a coach or train journey from place to place lies behind this model, and it is a worthy one. With the growth of cities the train journey has become more attractive, especially because trains slide through the suburbs and urban congestion without any impediment. Only those who have tried to drive into Kings Cross or Victoria experience the full pleasure of those train journeys. Coaches by contrast face the problem of urban car congestion at their origins, destinations and transfer points, and it is debilitating, reducing the overall journey speed to 20-30 mph.

In addition the growth of cities, obviously London, but also a range of other conurbations, has made the journey *into* the centre and *out* to home longer and more complex than it used to be. If, by contrast, a journey round the circumference and then in is taken, often it is quicker. We can see this geometrically, for the journey in and out equates with two circumferences of a circle at the perimeter, and the orbital journey therefore forms a fat crescent of faster peripheral journeys. But this is not all. If the journey round the circumference is faster than the within-city journey, in terms of time the journey reach of the orbital route begins to close the crescent, making it the faster journey for two thirds or three quarters of the city. If the journey half way round the M25 is 59 miles which can be done in an hour and a quarter and the slow journey across London takes two hours, it is clear that the horns of the crescent well and truly meet. It is this reach of the orbital route that the coach orbital seeks to take advantage of.

In principle the M25 can offer this great strategic advantage, but it needs to be made operational, and here the key issue is the way the necklace, the system of transfer points round the orbital, is set up.

The M25 Necklace.

The Necklace allows a new pattern of coach transport. Passengers can catch M25 coaches every two to five minutes and be sure of an onward journey on bus or coach every five to ten minutes. This necklace of stops could make the M25 the most effective people mover in Britain. It takes the passenger capacity up from under 20,000 to a quarter of a million. It both creates and benefits from higher speeds and provides the link to millions of journeys. In the next chapter we show how these links can work. The change in possibilities is evident for a number of different journey types.

The system could allow a complex of journeys. Some coaches could move long distance round the M25, say from the M1 to the M4, M3 and M2. Others would involve more local transfers. Links would take people to the end of underground lines, local population centres or railway stations. Once the basic efficient system was in place, coach movement on the radial motorways would expand rapidly creating a fast efficient service feeding long-distance trips in and out of London from the periphery rather than through a journey to the centre. The orbital route is the main advantage which cars presently offer when travelling from and to London. If the same route were available by coach, many would transfer mode. This system meets what they want. It would be practical transport for countless journeys.

The necklace of transfers is crucial. They occur at the M25 intersections near the roundabouts or junctions. Their design we discuss later. Clearly, people need shelter, seats, coffee and a convenience shop, together with a good information system on the incoming coaches and options. The aim should be to cut the stopping time to three minutes or less at the M25 transfers, so that the speed of the inter-city journey, guaranteed by coach priority, would be close to, or even exceed that of cars.

Types of Orbital Journey.

There are five main kinds of orbital journey.

Table 6 : Orbital Journey Types.

1. **Within London orbital.** This is the OUT-ROUND-IN type where people use the M25 to travel round London faster than the inner journey might take. A lot of early morning commuters creating jams westward in the morning round the northern section and eastwards at night are probably doing this. Because it seeks to hop round London rather than going through we will call this the **HOP.** It loses effectiveness with distance from the M25 of origin and destination, and is relatively low overall at an average of 7.3% of journeys clockwise and 10.3% anti-clockwise. The difference is presumably because anti-clockwise journeys are on the "inside" track. The levels are above 15% in the North West where there are centres of population like Watford and Orpington close to the M25.
2. **The M25 Transit journeys.** These are the journeys which use the M25 as a transit motorway between two destinations outside its boundaries. They are more likely the more obtuse the angle of the journey and the closer origin or destination is to the orbital. Under 50 miles out and the critical angle might be 75º, but over a hundred it would be 90º. A large part of the weight for this form of journey comes because motorways centred on London are better and faster roads than those available in lateral journeys. Obviously, the Thames estuary generates these journeys in the East. They are the most important form of journey making 44% of the clockwise journeys and 39.4% of the anticlockwise journeys, again showing how the perception of being on the "outside" makes this journey seem more acceptable. We will call these the M25 **TRANSIT** journeys, because the orbital is used to go somewhere other than London. Here there is no alternative to the car at present, and the orbital coach would open up a huge market.
3. **The M25 Lateral exit.** These are journeys from London to places outside the M25 which people make by first exiting to the M25, moving laterally and then taking whatever exit road leads to their destination. Many of these are 360º in scope. Someone in Southgate choosing to go to Gatwick will drive North and then go either left or right round the M25. Again, there is a fat horseshoe facing in any direction of exit, which marks the territory from which the lateral exit route will be the best. It will be something close to two-thirds or more of the population of London who choose this route out, and back. Given the coach as an alternative a high proportion of London car users might consider and choose it.
4. **The M25 Lateral entry.** These can be return journeys, but there are also an important category of people who come from outside into London. Many of course use train, if they want to go to the centre. Others may park and ride, but there is a vast distribution of journeys which are not to the centre and where the possession of a car brings some uncertainty or at least parking costs. A typical journey will be those who drive to Heathrow. It has thirteen car parks I am told, but many of the people parking there would probably prefer not to pay £100 or more. Heathrow from Oxford or Southampton would probably be better through lateral entry by coach. The potential demand on these journeys may well be high.
5. **Orbital commuters.** Commuters will tend to be hoppers or lateral entry and exit people. Crucial for all of them is timing. They want their journey to be under an hour or whatever, and actually it is not because of congestion. Here establishing a form of transport which both solved congestion by economizing on road-space and was given priority so that it had a reliable journey time would be invaluable.

This analysis is carried out in qualitative terms, and of course, it is very crude and made on the basis of crude assessments. But it is important that we do not assume that some existing quantative study can arrive at an answer to the question of what the likely demand can be. To be presented with a totally new option unfolding as a developing market creates new patterns of demand. People give up their second car, groups share journeys, more passengers bring down the waiting times, fuel prices rise; the ambience between bus and coach begins to work.

The Necklace provides a number of transfer points which allow passengers to move to their next mode of transport. Key is maintaining the speed of movement of the orbital and inter-city coach routes, because we can see that this is where the present system is so weak. There are operational issues that affect this, like how fast coaches travel and how long stops are, but the more fundamental questions are how many transfer points should there be, how many beads on the necklace, and where should they be located.

Speed.

There are a number of things that matter significantly to travellers. They are safety, speed, comfort and cost. Crucial in a busy city like London is the speed of the journey, door to door. Trafficmaster reported recently that average traffic speeds on motorways have declined 16% in four years, and the Highways Agency has issued a booklet telling motorists to try to avoid the M25. Yet motorists cope with congestion delays as long as there is no faster overall journey time. At this stage we need an ethical principle. It is that because coach travelers economize

on road space use (and also on energy use by a factor of five) they should have priority of the road and a guaranteed speed of transit. If we are not selfish, we will all agree to this. We note this is not manipulation, but a principle which reflects the meekness of this form of travel in the resources it uses. It is better for all of us, including car users, for the more people who transfer to coaches, the better the car travellers' journeys. This principle needs to be adopted in a practical way. In the longer term, the introduction of a Coach Lane round the M25 is the obvious step. Immediately, it seems too radical, and some motorists would see it as a chronic burden. Coach lanes have just been introduced on some motorways and car drivers understandably complain about the low utilisation levels. Clearly, if there are few coaches, it is wasteful. Longer term it may be well be unproblematic on a four lane M25. Meanwhile, there is a practical alternative. It is that coaches alone be allowed to use the hard shoulder when the road is congested and to be given priority on the slip roads and at exits. This is far easier than bus lanes in cities, because there is no irregular parking. The danger is when the hard lane is needed for accident and emergency, when it would impede the emergency services. Probably in any case coach drivers should be immediately notified of accidents and this possibility needs consultation. Yet if coaches could be guaranteed movement at times of congestion at a reduced speed of 30 mph, their reliability would be considerably improved. The aim would be to maintain a clear run for coaches on the orbital and ramps, and they should also be given priority at roundabouts. Clearly, the effective movement of coaches must be guaranteed over cars for this system to operate and offer better journey times.

Given this, the question is what speed can be achieved? A simple model assumes cruising at 60 mph, half a mile each of deceleration and acceleration at 30 mph and a stop of two minutes; giving an overall time of four minutes, slightly longer than an underground train. The average journey along the M25 is five junctions or four sections of motorway (more accurately the maximum number of junctions travelled by 75% of traffic entering at each Junction)[16]. This gives varying speeds depending on the distance between stops.

Table 7 : Average speed and distance between stops.

Distance between stops	Average speed	Speed of five junction journey
4 miles	**30 mph**	**33 mph**
6	**36**	**39**
8	**40**	**43**
10	**43**	**45**

This shows the kind of trade-off depending on how frequently the coach stops, for not every junction is suitable or needed for transfers. An initial estimate is of about 16 junctions for the system, giving an average stop distance of 7-8 miles. So a journey speed of 40 mph is practical for the orbital part of the journey. Shorter waits at the beginning and end of the orbital journey increase the full journey speed.

Clearly, long sector journeys move up towards 60 mph and one possibility would be to have quarter sector journeys from M1, M4 M23 and M29 to which longer passengers can transfer.[17] These would save twenty minutes or more on longer journeys and increase average speeds on longer journeys to about 50mph. The long sector coaches would need a waiting time of say three minutes. Given their greater speed this is possible with a fleet of 45 coaches each way. This express service might not be possible immediately, but could come in as demand grew.

The waiting time at each junction largely depends on the number of junctions and coaches used. There are three definitions of waiting time, (a) the maximum time waiting for a coach departure, (b) the wait to board a coach, and (c) the average waiting time for departure which is half of (a). Here we will focus on (a). Something like a quarter of the coaches at any time will be at transfer points and the rest on the M25. With a fleet of a hundred coaches each way and reasonably easy spacing the maximum waiting time would be below three minutes and the average one and a half. It would be possible to start the service with as few as sixty coaches each way, but shorter waits would help demand considerably.

M25 Traffic Speed with Coaches.

Thus far we have been considering the impact of coaches on a theoretical capacity of the M25. The actual capacity is measured in daily vehicle flows and these vary considerably from one section to another. It is possible, by having vehicle turnarounds at different transfer points to vary the density of coaches in any section, although this would involve inconvenience to passengers who were going further and had to transfer to another coach. Nevertheless, the vehicle flow differs from about 186,000 vehicles in the West to 95,000 in the South East. We take

the worst case, namely the western section, where the maximum daily flow for one western section was 12,400 vehicles per hour during the rush hour, or 6,200 each way.[18] The proportion of these vehicles that are cars also varies. Lorries are probably a higher proportion of the flow in the North East than elsewhere because of the flow towards the Channel Tunnel. Assuming, as the Highways Authority does, that 10% of vehicles are heavy duty vehicles, we are talking about an hourly flow each way of about 7,800 passengers (assuming a generous rush-hour occupancy rate of 1.4). Because these are rush hour flows, it is justifiable to put the coach occupancy rate up to 40.

Table 8 Speed and hourly flow for three motorway lanes of car traffic.

Speed	Vehicle flow	Passenger Flow.
10 mph	4830	6762
20	6033	8447
30	5363	7508
40	4827	6757
50	4234	5928
60	3761	5266
70	1126	1577

This table shows how the two conflicting variables relating to flow pan out. Speed obviously allows more vehicles through, but the increased gaps between faster traffic slow the throughput. The outcome of these countervailing variables is that if the flow of passengers can be reduced by about 40%, speeds could move from 20mph to 60 mph. Sixty coaches an hour, on the western section, or about one a minute, during the rush hours would more or less achieve this, with phenomenal savings of time, petrol, tempers and pollution. There is no other solution which would be as good for existing motorists, providing some 40% of travellers on these roads were prepared to switch their mode of transport. Even with more modest changes it should be possible to increase flow times by 10-20 mph for several hours each day.

The Orbital Intersections.

Here we discuss a general principle of the orbital intersections. It is that as far as possible the stop complexity at the transfer points should be minimized for the orbital journey rather than the radial one. So, for example, if one of the coaches has to stop twice to allow the full transfer possibilities, it should be the radial rather than the orbital. Or if a stop has to be offset from the intersection, it should be the radial motorway rather than the orbital one from which it is offset. This is because the orbital route has more transfer stations and retaining the momentum of its journey is more difficult than the relatively slight impact of one orbital stop over a full inter-city journey.

Because there are some complex issues surrounding the Orbital transfer points, they are more fully discussed in the following chapter.

Chapter Eight: Motorway and Orbital Transfer Stations.

How many and which ones?

The location of transfer stations requires a much more detailed study than this introductory one, and the number of stations can grow with the development of the system, but evidently there are three or four kinds: - the orbital transfers, the motorway links with cities and conurbations, nodal intersections where motorways and trunk roads cross and more local stations. Generally, the more stations there are on a stretch of motorway, the greater the usefulness of the system, but the slower the ambient speed. This issue might be resolved by having through and stopping coaches, but it remains important to keep the overall speed of the system high. So, for example, at Leicester there would be one stop on the M1 rather than two, with onward distribution around the city from that one station.

The strategic factors which would be taken into account are the flows off the orbitals and motorways at each intersections, the populations which would have easy access to the transfer points, links with other transport

modes and distances from the other transfer stations. If we take the M1 as an example, a first approximation to the transfer stations might be the following.

Table 9 Possible M1 transfer stations.

Junction	Road links	Cities.
6	**M25**	**St Albans, Watford, Hemel Hempstead**
11	**A505**	**Luton, Dunstable**
14	**A509**	**Milton Keynes, Bedford**
15	**A508**	**Northampton**
19	**M6, A14**	
21	**M69, A563**	**Leicester**
25	**A52**	**Nottingham, Derby**
28	**A38**	**Mansfield, Sutton, Alfreton**
30	**A619**	**Chesterfield, Worksop**
34	**A631, A6102**	**Sheffield, Rotherham**
37	**A 628**	**Barnsley**
40	**A638**	**Ossett, Dewsbury, Wakefield**
42	**M62**	**Leeds, Manchester, Hull**

This amounts to thirteen junctions over about 160 miles which results in an average speed that drops below 50 mph. Clearly other coaches might eliminate most of the intermediate points and push back up to about 60 mph with, say, M6-M25 through coaches being very frequent. The aim is a heavy concentration of coaches making a variety of stops and allowing passengers flexibility to maximize their speed of travel.

The M25 orbital would follow a similar pattern. The dominant junctions seem to be the following, though a more thorough analysis would be needed than is given here. These are merely an indicative minimum.

Table 10. Possible M25 transfer stations.

Junction	Motorway/Road	Local towns
2	**A2**	**Dartford,Bexley, Gravesend**
3	**M20**	**Swanley, Maidstone, Channel Tunnel**
5	**M26**	**Sevenoaks, Tunbridge Wells**
7/8	**M23**	**Redhill, Crawley, Gatwick**
10	**A3**	**Guildford, Chobham**
12	**M3**	**Camberley, Staines**
14/15	**M4**	**Slough, Heathrow**
16	**M40**	**Uxbridge, Oxford**
20	**A41**	**Watford, Aylesbury**
21	**M1**	**St Albans**
23	**A1(M) Potters**	**Bar, Welwyn, Hatfield**
25	**A10**	**Enfield, Cambridge**
27	**M11**	**Woodford**
28	**M12**	**Romford, Brentford**
30	**A13**	**Grays, Basildon**

This number in intersections, given a cruising speed of 60 mph, breaking and acceleration time and stops of 2 minutes gives an overall speed of 42 mph. At each of these junctions we would expect there to be fast and frequent coach links out to the hinterland, local bus links to the centres of population, a bike park and shuttle services to train and underground stations.

Design.

The overall design of these stations needs to take account of their purpose and ambiance. They will be areas with a lot of people coming and going morning, day, evening and night. The public space should be pleasant and the construction of the buildings and public space convey that people are welcome to be here. Until recently bus stations have operated at the lower ends of comfort. Here there needs to be a sense of service and provision which adds to the pleasure of the journey. They are a new kind of public building. They need to be staffed, safe and have an aesthetic of their own.

The details of the design partly depend on the location of the site and the model of transfer station. If the carousel were used, the central buildings might be similar to Southgate tube station. If the roundabout end model were adopted it would be closer to the pattern of many Park and Ride buildings. Either way, they should provide pleasant surroundings, inside and outside, for passengers to enjoy.

The key overall design issue is where the transfer points should be in relation to the junctions and especially in relation to the M25. Because the coaches on the M25 stop more frequently than the radial coaches, it is important that their stopping time is kept to a minimum. Probably there should not be a form of transfer at a point of direct access from the M25, because that would leave passengers in a place too close to fast moving traffic in a place where total segregation would be difficult. Yet clearly, the point of transfer should be as close as possible to the motorway and minimize the disruption to the onward journey. Again, indicatively, we look at one or two possible designs, though it would be a matter of more careful reflection than it is given here.

1.The roundabout end model.

The first junction model is located at the inside of the roundabout at its radial ends. M25 coaches would only have to move up the ramp, stop and set off again.

- Is it away from the motorway and the safety hazards of fast traffic.
- Passengers could move from one to another vehicle on a single platform.
- It is the shortest meeting point at the junctions in terms of overall people and vehicle movement.

Sometimes one end of the roundabout is considerably bigger than the other, as at M25 junction 31, and a variant of this model is to have the station at only one end of the roundabout and require one set of radial coaches to go right round once. The coaches enter the D, either from the slip road or from the roundabout. The entry direct from the slip road cuts across other traffic, and probably requires triggered traffic light priority. Coaches and buses coming round the roundabout filter to the roundabout's central lane and enter right into the station area. Within the station, the movement of the vehicles is to what is effectively a long platform. The pedestrian area and facilities sit at the back of the D with a wall separating them from the traffic circulating behind. The shelter, facilities, kiosk, seating and so on are provided where the platform is at its deepest.

The strength of this model is that it is close to the motorway and involves a very simple movement, almost in a straight line, for the M25 orbital coaches. Because this movement is also often up a ramp and then down a ramp, both deceleration and acceleration are energy saving. Normally the land is of poor quality and not used for anything else. One weakness is the way people are contained within the roundabout traffic; this may create the need for a pedestrian bridge or pedestrian crossing for occasional use. The platform may have limited scope for vehicles and not cope with unusual numbers. Pedestrian movement is along the platform, slightly less efficient than the next model It does not seem possible to have a two sided platform without right hand opening doors on the coaches and a number of safety problems.

2. The offset carousel.

Because of the topology or the small size of the roundabouts it is sometimes not good to locate the transfer station within the roundabout. There may also be problems about the weight of traffic and the angles of access and egress which are difficult. Another junction model is the offset merry-go-round. This station sits in one of M25 exit slip road in the armpit created by the radial road. The station consists of a polygon across which passengers move to the coaches and buses which gather on the sides of the polygon. The central platform area contains a kiosk, shelter and other facilities to the platforms where the incoming coaches and buses park. The coaches and buses need to move from the roundabout into the merry-go-round as the radial road or motorway leaves or as the coaches come up the M25 sliproad. Coaches from the other direction on the M25 and all buses and coaches on the radial roads enter from the roundabout. This model has the advantage that people are outside the ring of road traffic at the roundabout (though coach and bus movement encircles them) and there is no immediate limit to the size of the merry-go-round provided the land is available. All the vehicles come to the passengers with a single stop. All vehicles can have left-hand opening doors.

The unlucky clover interchanges.

One of the biggest headaches in this whole scheme is the big motorway interchanges involving various forms of cloverleaf, cyclic, diamond or three level interchange with separated carriageways. Because their design priority is to keep traffic flows separated from one another, they pose a particular problem for the coach interchange system because it needs the flows to come together. This is a special problem to the system, because a number of interchanges which are likely to bear the heaviest traffic and to be most in demand for transfers have this

form. Again, though this means ignoring Spaghetti Junction, we focus only on the M25, though the same issues occur round Birmingham, Manchester, Bristol and elsewhere. Given the incredibly low infrastructure costs of this whole system construction, it would be a pity if these interchanges required major civil engineering projects which would add tens of millions to the cost of the orbital coach system.

An examination of the different forms of major interchange set out by the Highways Agency Design set or evident on the M25 map shows that there is no safe way in which a transfer point could be built into one of these interchanges. [19] There are several problems – passenger safety in heavy, quite fast traffic, problems of generating crossing lines of traffic, countervailing flows and so on. The design clash of the principle of keeping traffic flows separated and bringing them together is fairly complete. Major design modifications do not seem feasible. The question is whether there are solutions which allow transfers to occur in close proximity to these intersections. Below are some suggestions, but the civil engineers would need to work at the problem.

1. Displacing to a roundabout.

The first model for coping with these junctions is simply to displace to a roundabout which can then be used as the point to which all journeys are rerouted. It depends whether the roundabout is on the orbital or radial motorway as to which coaches will have to make the detour. Preferably, it is on the M25 so that they do not have to face the increase in journey which is twice the distance from the roundabout to the giratory system. Obviously, the closer the roundabout the less costly the solution and the transfer station can be organized in any of the ways already discussed.

2. The bridge loop transfer system.

Another model for the giratory intersections centers on a road which crosses one of the motorways, preferably the M25 and one which is already present. It must not be immediately at the intersection, but otherwise the closer the better. Here two transfer stations are provided either side of the Motorway with entrance and exit slip roads. There also needs to be the possibility of looping over/under the road and bridge to travel back to the clover leaf or giratory intersection the opposite way. With this model passengers wait where they are dropped by orbital or radial motorway coaches, while the radial coaches loop over the bridge making stops at either side when they are travelling slowly. It seems a relatively safe system with platforms set back from the motorway. Passengers do not have to walk to another station. The loop re-entry to the motorway may slightly cut across cars which are beginning to filter left, and there may be issues of how much width the bridge allows for the re-entry slip roads, but this seems quite a powerful solution, often using existing road engineering. The extra travel involved is quite limited, and the road crossing the motorway can often allow local links.

Table 11. Possible solutions to difficult Motorway Junctions on the M25

Junction	Response
3(M20)	Southern section of roundabout available for transfer station.
5 (M26)	Displace to the A25 intersection, modified as a roundabout.
7/8 (M23)	Displace to Junction 6 Godstone roundabout. Coaches out of London can transfer to the A22 rather than the A23 out of Purley.
12 (M3)	Use Lyne Lane, Green Road, Mill House Lane, Thorpe Road and Almners Road to create accesses to transfer station.
15 (M4)	Use Langley roundabout on M4 and Colnbrook bypass to access loop on bridge over M25.
16 (M40)	Use loop on the Oxford Road (A40) at Ulmer Road and Pinstone Way or displace to the Denham Roundabout.
21 (M1)	Displace half mile to Junction 21a with M1 north travelling coaches using A405 from Waterdale Junction.
23 (A1M)	Large roundabout already.
27 (M11)	Unclear, Hobbs Cross Road too close. Bridge under motorway near tube line?

These are not easy design issues, but on the whole the solutions are inexpensive in relation to the whole system. Again expert transport designers are needed to work at it, and these solutions are only indicative.

Chapter Nine: A Coach System and Multimodal issues.

Inter-city coaches.

The understanding here is that the orbitals will be the engine generating expanded coach traffic. If you like, this is direct competition with the car. Vehicles travelling on heavily used car routes offer to do the job better. By giving millions of people orbital access to fast inter-city coaches a totally different level of coach utilisation becomes feasible. This, of course, needs to be proved. Yet because it is creating a different kind of transport, one that people do not yet envisage, it cannot be done by empirical studies, and was not done in ORBIT study, where the conclusion was reached, despite the advocacy of a quality orbital coach service for the M25, that there could not be much transfer of traffic from cars to public transport. Only if what is on offer is substantially different is there likely to be a substantial change in market demand. Orbital access can create that.

The orbital transfers feed a number of links, which we keep discrete merely to identify them. The first are "inter-city" coaches, or rather coaches travelling fast on the motorways and major trunk roads to the motorway junction where major cities are to be found. These would feed out travelling on the radial roads. Thus the M4 coach would stop at one junction for Reading, Swindon, Bath, Bristol, Weston super Mare, Bridgewater, Tiverton to the destination at Exeter. Seven stops between the M25 and Exeter at four minutes a stop, given a cruising speed of 65 mph over 175 miles would give an overall average to the journey of over 55 mph. That is competitive with cars, provided the end of journey links are frequent and convenient. Sometimes the transfer points would be at junctions rather than population centres. For example, the interchanges of the A14 and the A17 with the A1 would be strategic for a lot of East Anglian journeys. Building the system requires the work of a number of planners, but it is not too difficult to work out the journeys with immediate and long-term potential demand. They are already signalled by cars and existing coaches.

Although this account tends to be London-centred, there is nothing inherently metropolis-based about it. All over Britain locating the transfer points at motorway and major road intersections would free coaches from intermediate time-wasting transfers and create a fast network. It is not too fanciful to think of motorway cruisers carrying several hundred people at higher speeds, with multiple exits and automatic outside lane priority coming into service.

The supposition is that the popularity of these inter-city services would increase rapidly given the collecting power of the orbitals and other links to the motorway transfer points. This we now discuss. We do not know the extent of this collecting power, because present data do not give us any grasp of it. There need to be strategic changes to the other modes of transport. Some say that people just will not leave their cars. At present there is no alternative to the car. But with the ambient speed of coaches lifted from 20-30 mph to 40-55 mph, demand could change. Clearly a lot depends on the links to home and destination. If these were good, they could easily become the preferred mode, given the advantages sketched above. The aim, with increasing frequent, comfortable, fast coach provision, is for a quarter or more of motorway traffic to be transferred to coaches in the longer term. This can, and should be, an ambitious plan. We therefore consider the link systems.

Bus links.

Within conurbations and cities buses are the obvious present medium for the more local journeys to home and destination. Their use is interesting. In areas of the North they are heavily used by a high proportion of the population and are therefore frequent enough to be a convenient service. In London and other areas there has been a lot of investment in buses and use is edging up, but still thee critical level of use and regularity has not been reached, nor have bus lanes fully defeated the congestion. Coaches and buses are clearly in a symbiotic relationship, each encouraging the use of the other. This we now consider. One task of buses within this model is to link as many people as possible to the orbital transfer point both from within and outside the orbital road. I concentrate on the M25 because it is the road I know best and not from overt southern bias. By map examination, Manchester and Birmingham seem to need to collect more people from outside the orbitals than is the case in London. Nevertheless, in London perhaps a million or more people living outside the M25 would use it as a local resource for journeys from home.

Buses collect people at stops and deposit them at different stops as destination. Usually, certain stops at shopping centres, underground stations, or bus stations are key and other stops feed into residential areas. This model tends to create another focal destination at the transfer points with the M25. This should even out passenger

loads. Such a change should not make a lot of extra demands on existing services and routes. At Junction 24 of the M25 buses already travel to Potters Bar, Southgate and Enfield through the Junction roundabout. Other routes may need some extensions. But the bigger question is how acceptable this bus linkage is to potential coach users?

It needs a more thorough investigation than we can give it here, but a guesstimate analysis will sketch the picture. The tolerable journey time to the orbital will vary depending on the overall journey. It might be 30 minutes or more for a journey up to Newcastle, but 20 minutes or less for a daily commute round the M25. A five mile catchment area could feasibly be reached by a 20 minute bus journey (20 mph plus stops), five minutes walk and a five minute wait, giving a thirty minute journey time. It is likely that a population of up to half a million a transfer station could be given access by this method within an acceptable journey time.

But more is possible. There is the possibility of speeding access by increasing the directness of links with the transfer point. So, for example it would be possible to have fast bus/coaches, averaging 50-60 mph, making the 10 mile journey from Twickenham out on the M3 to the M25. The fast coach principle would thus be brought into London and another tranche of people would be brought within the twenty minute journey time. Car traffic clearing would then reach quite deeply into the metropolis. Obviously the same could occur with external locations like Camberley. Thought has already been given to clearing routes in and around London for faster public transit. This policy makes it operational.

Rail links

Another mode can be activated by linking the ends of underground lines and train lines with the orbital transfers. We have noted that this increases the underground system efficiency, utilising the less used parts. The first stage is mobilising existing links and the possibility arises of creating new ones. Where these transfers can occur we now list. Most of them occur without extra civil engineering and a simple short shuttle link.

Table 12: Possible Rail/Underground transfers to M25 Orbital Coach Services.

- Junction 3 Swanley BR Station to Rochester, Sevenoaks, Tunbridge etc. shuttle to Swanley interchange. I mile.
- Junction 6 Caterham BR Terminus. Shuttle to Godstone interchange. 1.75 miles.
- Junction 7 Merstham BR station to Gatwick, Brighton. 1 mile via Rockshaw Rd.
- Junction 9 Leatherhead BR station to Horsham, S Coast. Shuttle Half mile.
- Junction 12 Virginia Water BR Shuttle 1 mile.
- Junction 15 Iver BR station to Slough, Reading, Bristol walk to created M25 stop.
- Junction 16/M40Junction 1 Uxbridge Underground (Piccadilly and Metropolitan lines) 1 mile shuttle.
- Junction 18 Rickmansworth BR to Aylesbury and Underground 1.5 mile shuttle
- Junction 20 King's Langley BR Station to Birmingham Shuttle half mile.
- Junction 23 High Barnet (Northern Line) 2.5 mile shuttle.
- Junction 24. Potters Bar BR Station to Peterborough and Edinburgh using existing bus 1 mile, and Cockfosters Piccadilly line existing bus 2.5 miles.
- Junction 25 Turkey Street BR Station. Shuttle 1 mile.
- Junction 27 Theydon Bois Underground (Central line) Two mile shuttle.
- Junction 28 A12 Brentford BR Station on the Chelmsford-Ipswich line to M25 orbital. Shuttle 2 miles
- Junction 29 Upminster Underground (District) Shuttle 2 miles.
- Junction 31 Chafford Hundred BR Station Shuttle 1 mile.

The beauty of these links is that they offer the possibility of mixed mode rail-coach journeys of different kinds. Perhaps two million Londoners are substantially better travelling via the M25 and Potters Bar by rail to Peterborough, York, Newcastle and Edinburgh than via Kings Cross. They could not make the intercept journey by car because of parking and the coach orbital makes it possible. Given a transfer time between London mainline stations of 20-30 minutes, this makes any orbital movement of less than an hour probably faster. The loss of time for the rail system as fast trains stop at the peripheral stations is matched by a potentially bigger gain of passengers routed to more convenient public transport. But there is a more strategic change. If 20-40% of London's rail passengers could be recruited or dropped at the orbital stations, it would take pressure off central stations and underground lines. Given the near impossibility of increasing train flow on the central area lines during the rush

hours this would seem to be a vital change for the central London rail and underground stations, solving a substantial problem of rail infrastructure.

Cars.

Another possibility exists of using cars as the local link. These have two possible forms. The first one is a kind of reversed park and ride. Here people take their cars to or near the orbital transfer point and park them in order to make the longer journey by coach, rather like a station car park. It seems that this would not be a good idea immediately at the coach transfer station, because it would generate heavy car traffic in precisely the area where economy of road-space is most needed. Moreover, the scale of car parking space needed would be considerable and the public cost great. Because congestion always tends to be heavy at motorway junction roundabouts, there is the need for the greatest efficiency in the use of this space. Concentrating a lot of slow moving cars in this area seems to be a recipe for disaster. Yet offset parking places with short shuttles to the transfer points would be eminently sensible, especially in more rural areas.

The second possibility is the use of cars to drop off and pick up passengers at the transfer points. It is a pattern frequently found at underground stations. Taxis and cars take passengers to or from the station forecourt or a layby. This time there is little parking space needed, though the car traffic still adds to congestion. There is also a difference between putting down, which involves no waiting and picking up which may involve waiting. Again, there has to be caution about adding car traffic at the points of highest congestion, but we consider this again in relation to the design of the transfer stations.

Bikes.

Bikes are virtuous and fairly fast for short journeys. We have all seen studies showing that they often provide a faster commuting journey into the centre of our cities than cars or public transport. They are flexible and easily parked. One car parking space takes about twenty bikes. They are not weather proof. They give exercise, and probably a generation needs to be taught to make them a habit. There are perhaps a couple of thousand bikes at Cambridge railway station and the Dutch use them for a good proportion of their journeys. They are probably safer on the journeys into residential areas than on main roads, and are undemanding on rides of two miles, or five for the more ambitious.

Two strategies follow. The first is to provide, where possible, cycle links to the orbital or intercity transfer points. Three examples will suffice. A substantial residential area at Cranham could be linked with Junction 29 of the M25 via Moor Lane without any need to cross main roads or face through traffic. The ride would be from under half a mile to a mile and a half. The same could happen at London Colney or Aveley. Effectively all that would be needed would be a cycle park and safe cycle routes.

But this may be less strategic than the idea of the three stage journey – bike, bus and coach, where the bike acts as the initial short collection medium to go on a bus shuttle to the motorway. Thus far multimodal journeys have tended to be rather awkward and disjointed. The thrust of this chapter is to suggest that the development of the motorway and especially the orbital system links up the public provision in a way that has never happened before. It strengthens rail, by addressing outer conurbation living. It opens up the weaker parts of the bus and underground systems, and also allows the penetration of coach/bus movements into car dominated areas. It is full of virtuous circles…

Chapter Ten: Development Issues.

Priority of implementation.

There are a number of arguments for priority in implementation. First, this is a proposal that addresses car generated congestion quickly, rather than charging or suppressing it. By economizing on the use of road space (by a factor of fifteen) it allows more space for other vehicles. This is an amazing advantage; coaches make cars disappear from our congested areas on a large scale. Politically, it gives the car user an alternative without penalizing or handicapping him or her. Further, M25 widening will involve road works, putting extra pressure on the need for road space. This policy is desperately needed during this process. Because the orbital coach plan economizes on road space it should be developed prior to these road-works. Third, the coach plan involves changing people’s travel strategies and marketing processes. As opposed to spending £60 a week on a car, they

might come to spend a quarter on coach transport. Substantial revenue streams make a development far easier. Market transfer takes time; it involves people's lifestyle, commuting decisions, priorities and the earlier the change, the better. It is possible that a substantial transfer of traffic from car to coach could take place. The earlier this potential for market transfer takes place the more we can all adapt.

Chiefly, the immediate concern must be with congestion. It is calculated to increase on motorways by some 250% in the decade 2000-2010. Its personal and economic costs are very high. This proposal offers the best way of addressing it directly by cutting congestion and its priority should therefore be high. But this proposal also offers the best way of moving us all around with an economy of fuel use, road building, traffic systems complexity and minimal pollution and global warming. For this deeper reason it is especially urgent.

Implementation.

This is not a marginal change, but a proposed change in the strategic structure of coach services. People must know that a *system* is in place to change their pattern of demand. Fortunately, a system can be provided at a low capital and operating cost, as is explained below, and the implementation of the system is therefore both viable and necessary, but it requires a national understanding that this change is taking place and the new conception of coach travel which it involves. Something more decisive is needed from the Government which has shown a lamentable inability to considered coach transport strategically, despite the ORBIT and other recommendations.

This document suggests a faster pattern of implementation. Nevertheless, it is one that can grow with demand and does not need to presume a pattern of over-resourcing. This proposal has relatively low levels of infrastructure capital. Largely it uses existing motorways more efficiently, and the process of implementation need not be ponderous. With commitment the London, Manchester and Birmingham orbital systems could be running effectively within five years, and coach companies could have adopted their style to motorway-based transfers. Subsequent growth would largely then be through addition coaches and staff.

The Strategic Authority and the public-private mix.

My original proposal was centred on the M25 and suggested that a Strategic Authority be set up to run this orbital coach plan. ORBIT recommended the same. The advantage of a Strategic Authority is that it allows the *system* to be developed. But the system is more than the M25 Orbital. It involves a national transformation. Private operators tend to look to the viability of particular operations, rather than taking the whole system into account. Some authority in these early stages needs to take direction of the whole system.

Fortunately, there is a fairly simple division of responsibilities which builds on existing patterns and makes sense in this development. At present private companies already operate on radial motorways, although going in to Victoria Coach Station and elsewhere, on a pattern of fairly suppressed demand. One would expect private radial coach provision to expand dramatically with the availability of the orbital passengers, dropping waiting times below five minutes. Clearly this is a matter for consultation and negotiation. With a substantially expanding market coach companies could be relied on to meet the provision of radial motorway travel. Similarly, it would not be difficult for within London transport provisions to be linked to the orbital system, since much of the thinking and planning in TfL and elsewhere is already expanding bus use. Many of the services are already in place. For example, the 298 bus from Southgate to Potters Bar already stops at Junction 24 of the M24, though that stop is infrequently used.

Strategic Authorities are required to develop and run the Orbital schemes and create the necklace of transfer points. Fortunately, because the density of traffic is so high on the M25, and this bit of the journey is essential to intercity coach travel, it is likely to be a viable business. It is possible that over a relatively short period of time revenue could be meeting running and capital costs and investment funds would be generated. The ORBIT multimodal study recommended the creation of a Strategic Authority. Although the Minister for State for Transport was unclear on his response to this proposal in the 2004 Expenditure Statement, he seemed to regard it as a matter of consultation between the Highways Authority, the Coach companies and other agencies. This needs clarification. The restructuring of coach travel outlined here requires a lead by the Department of Transport in setting up and organizing these changes. A Strategic Authority is required, even if these services are going to be provided by private coach companies, for the organization and development of the necklace of transfer stations is necessarily a public matter involving highways, public land and other strategic issues. It occurs outside the area of the Greater London Authority and they cannot take responsibility for it, even though it intimately affects London's transport.

The better policy, after consultation, evaluation, feasibility studies and the normal processes of project development is that a Strategic Authority takes responsibility for the development.

A low capital cost project.

The development and funding of this revolution in transport is inexpensive compared with any other similar investment and development project. This is because most of the existing infrastructure is already there, and it is mainly a process of using the motorways more efficiently. The main fixed capital cost would be the motorway stations. Local redeveloped bus stations cost something like a quarter of a million pounds. If we estimate two hundred stations at, say, a million pounds each, it would be a relatively small cost for a national transport system. System management and other fixed capital requirements might take the overall fixed capital cost up to a billion pounds, but it should be far cheaper than other more complex forms of transport engineering. The main capital costs are the coaches themselves, and again, at a unit cost of, say, £150,000 a large fleet, would not be too costly, shared between the Strategic Authority and coach companies. The revenue flow could quickly begin to match costs as a proportion of the £75 billion spend on cars moves over to coach transport. For a whole range of reasons this looks the most commercially viable of all the major public transport innovations the Government could undertake. All the Government has to do is to create motorway priority and enable the necessary signing and traffic control, giving coaches priority. It cannot be emphasized enough how immediately feasible this project is.

We focus on the London orbital, though similar patterns of feasibility would operate elsewhere. Sufficient coaches to generate a significant system on the London orbital could be bought for £100 million. Even allowing other development costs of £200 million, it costs only a third of the cost of widening the M25 by one lane with far greater benefits in terms of congestion reduction. The coach stops could probably be based on land that is already available. The main investment focuses on the necklace and inter-city coaches which this (national) system would generate. The necklace is a feasible and fundable system for public ownership, allowing a substantial income base for later investment in London Transport, based upon people’s transfer of their expenditure from petrol and cars. That is, people would not experience this move as additional costs or taxes, but as transferred purchasing. Operating profit for such a system would not be difficult at even quite low passenger prices, because of the exceptional density of demand on the M25, the best in Britain, and the level of operation could grow with the market. It could alternatively be privately run through franchises. When the public sector provides the roads, public enterprise gives it some return on its own capital. A vast expansion of journey provision could occur within a short time horizon. It would be possible to have the system fully operative within five years and growing rapidly thereafter, possibly on a self-funding basis. There is no practical difficulty at all in generating the resources for this reform of the traffic system. By a vast margin, this is good economics at every level.

Chapter Eleven: A National Coach System – Benefits for all.

Communal Solutions.

This change involves a different way of thinking. It asks what is best for all of us, rather than beginning from the individualism which has marked our car dominated transport system. We can try to put ourselves first, but we still hit a traffic jam, like everyone else. It is better to follow the great biblical commandment to love our neighbour as ourselves and come up with communal solutions. In this case the social dimension is more pointed because it is a public asset, road space, which is scarce and which hitherto has not been addressed properly because of the absolute claims of the car. Those absolute claims are dead. Road pricing is coming, if nothing else happens, and substantial coach transport offers us a communal increase in capacity provided we create the communal solution.

The other imperative is our stewardship of the resources of God’s earth. Oil is a precious energy resource which has taken millions of years to form. We are going through it in our generation with drunken abandon. It is irresponsible beyond belief. Our ecological horizons scarcely stretch beyond a decade. Our grandchildren will gasp at our profligacy. With substantial coach transport we can save millions of barrels of oil and drastically cut the greenhouse gas emissions for which we are responsible. As we have noticed, the savings are not just the 80% direct cut in fuel consumption, but also the fuel saved by eliminating congestion. In some circumstances the savings may be above 100%.

At present the coach companies do not have the resources or the ability to make this transition. It requires changes to highways and land use. It really requires changes to our system of transport taxation. This paper is an attempt to galvanize that coherent change.

The benefits.

The benefits of moving towards this implementation of a national coach system are enormous, and they are all matters of existing public policy.

CONGESTION: For every journey moving from car to coach congestion caused by the individual passenger is cut by 94%. By locating the coaches where congestion and traffic are heavy, the proposals here address directly the problem where it is occurring. Nationally, the change could be dramatic. In London it could be yet more marked. Millions of journeys which now go through London become more efficient going round it, and people are pulled out of the areas where there are shortages of road space. Many other people who need to go round London to other destinations and at present go in and out will find a new efficient way of making their journey. It would cut congestion *within London* as well as in inter-city journeys and on the M25.

CAR OWNERSHIP: Car ownership is costly and involves a lot of public resources, especially in city centres. A proportion of cars are seen as necessary for out of town inter-city journeys, especially in London and the other great conurbations. Efficient inter-city coach transport would offer many the opportunity of managing without a car or a second car. The availability of a national coach system could cut car ownership by a million or two cars, saving vast resources, reducing street parking and opening up urban space. ENERGY Cutting energy use and pollution to at least one fifth of its previous levels involves massive savings of a scarce fuel. The secondary effects of allowing other vehicles to travel faster because of more available road space pushes the fuel saving up towards 90%.

POLLUTION. Pollution is similarly cut. This proposal takes Kyoto seriously. We are not just containing the pollution problem, but cutting out vast quantities of pollutants. We are substantially addressing global warming by the fall in CO2 and other emissions. We improve our health. We save resources. Millions of journeys could be transferred this way and make the environment of all of us more pleasant and safe.

STRESS: This move could change us from being stressed out drivers, always driving ourselves everywhere often without passengers, experiencing traffic jams, road rage (half of us) and the massive stress of arriving late. We could instead be those who are driven, who move fast and without traffic jams, who have company and can relax while travelling. We could be a friendly and companionable lot, not isolated units stuck in traffic jams glaring at one another. Those who still use cars would have lower stress levels from easier traffic.

STANDARD OF LIVING. Because this is a more efficient mode of transport than the car, it would also save people a lot of money in a variety of different ways. Cutting out *congestion* through coaches would give people more time, income, business profits. Hospital and medical costs would fall. There would be all kinds of hidden economies which could add up to a £1,000 a family or more a year on average. The increased efficiency of the London economy would be vast.

SAFETY. The level of safety with coaches is higher than with cars, and would be higher still with required seat-belts. Drivers are professional and passengers are not so immediately susceptible to damage because of their larger dimensions. The level of deaths per passenger/driver mile is about one tenth on buses and coaches, and probably three or four times on coaches alone. Serious injuries are two or three times lower per passenger. Transfers to this mode of travel would lead to lower within vehicle deaths and serious injuries, but by clearing congestion, it would cut one of the other major external causes, for accidents are strongly bunched at rush hours.

For these reasons this transport policy seems both right and practical, and this paper commends it for urgent but rigorous consideration and adoption nationally.

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[1] Hansard 9th July 2003 Column 1180-81

[2] Regional Planning Panel 030603 Agenda item 8(a) PTS Progress Report

[3] National Statistics: Transport Statistics Bulletin *Traffic Speeds on English Trunk Roads:2003* SB (04) 24. DfT,2004

[4] DETR Developing an Integrated Transport Policy 21/01/00 p4

[5] There was an increase in overall speed of about 1mph on English motorways and trunk roads between 2001-3, mainly found in the 70+mph category. Motorway speeds have fallen about 3mph since 1995 mainly during rush hours. SB (04) 24 17-22

[6] The study by Norman Bradbury and Graham Nalty *The Great Road Transport Subsidy* (London: RDS Parliamentary Committee, 2004) http://igreens.org.uk/great_road_transport_subsidy.htm puts the cost at about £100 billion compared with actual road user payments of about £30 billion. Bradbury and Nalty estimate the true user cost of fuel at about £3 a litre.

[7] Highway Code 2004 section on Stopping Distances.
[8] ORBIT Map Percentage of trips on the M25 with both origin and destination outside the M25
[9] ORBIT Multimodal Study Final report (KBR, 2003) 191-2
[10] Social Trends 2004 (London:TSO) 183
[11] This section uses the Bradbury and Nulty study with changes to some categories and updating where possible.
[12] DETR Highways Economic Note No.1 September 1999
[13] cf. estimate of £19.1 billion in 1996. David Maddison, David Pearce et al. Blueprint 5: The True Costs of Road Transport (London: Earthscan, 1996) 140
[14] EU Calculating Transport Accident Costs http://europa.eu.int/comm/transport/infr-charging/library/crash-cost.pdf
[15] DETR Transport Statistics Great Britain: 2000 edition (London: Stationery Office, 2000) 40
[16] ORBIT map.
[17] The assumption that the best major transfer points should be the major roads might not be correct.
[18] The Highways Agency "The Role of the Highways Agency in Local Air Quality Management." Nov 2003
[19] The Highways Agency et al. The Design of Major Interchanges TD39/94 http://www.official-documents.co.uk/document/deps/ha/dmrb/vol6/section2/td3994.pdf ****