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Feature

Can guided bus systems really get close to delivering light rail performance?

Despite the success claimed by FirstGroup for its kerb-guided bus route in Leeds, there are only five such systems in the world -- and, it seems, only in Britain are many more planned. *James Dark* looks at arguments for different kinds of bus-based rapid transit, and the state of play with emerging technologies designed to make buses more like trams.

Last year's Government U-turn on supporting light rail with the target of funding 25 new light rail lines under the ten-year transport plan, has not resulted in any noticeable slow down in the development of proposals for intermediate mode projects, hitherto seen as the poor man's tramways.

These systems, which range from kerb-guided bus and dual-mode trolleybus to new technologies characterised as rubber-tyred rapid transit, aim to provide some of the benefits of light rail at a lower cost. With the widespread desire to significantly upgrade bus service provision, they are continuing to be advocated for corridors where there is not the necessary patronage base to support investment in a light rail system.

In the local transport plan settlement last December, funding was approved for intermediate mode schemes in West Sussex and Tyne and Wear, approved in principle for projects in Manchester, Kent and Cheshire, while Bedfordshire and Hull were asked to provide more information on their schemes before a funding decision is made.

In London a major study is assessing the most appropriate mode of transport for four heavily-used bus corridors, with the case for every form of transport from diesel bus to tram being considered (*see panel right*). Commercially funded projects are being progressed in Cambridge and Northampton by Rapid Transit International. Other towns and cities such as Doncaster, Rotherham and Edinburgh also have plans which could see intermediate mode systems implemented.

Most current plans for intermediate mode projects take as a starting point the idea of fitting conventional buses with kerb-guided technology. This has been in use in the UK since 1995 on the 2 km guided busway built in several sections on Scott Hall Road in Leeds, and a 200-metre section of guideway between two housing estates in Ipswich (*see panel below*). Two further guideways in Leeds and Bradford are under construction and due to open this year.

Patronage gains in Leeds are often cited by other local authorities as one of the reasons for promoting guided bus systems in their local transport plans. Rodney Dickinson, FirstGroup's business development director UK Bus, says the Scott Hall route is carrying 75% more passengers than in 1995 with a "significant number" being abstracted from car travel in the peak, although he is unable to give a figure for modal shift from car to bus. "Consistency and reliability of journey given by the segregated sections of the route, and car drivers seeing buses passing them in the peak" have been factors in the increase in passengers, claims Dickinson.

He adds that financial viability and speed of implementation also mean guided busways have much to recommend them. "Our view is that although we don't say no to light rail, from the point of view of cost effective implementation, we prefer guided bus," says Dickinson. "A

1:10 ratio is often quoted between the cost of guided bus and light rail schemes, and guideways can be built in 12 months whereas light rail can take four to five years, which means you can get modal shift from cars to buses quicker."

However, not all experts agree with this assessment. Research led by Professor Carmen Hass-Klau of Wuppertal University for the DETR last year argues that the cost picture is much more clouded. While bus-based vehicles may be cheaper construction costs for the two modes are much closer than is often assumed, Hass-Klau suggested. Her research found examples of light rail construction cost from around the world which fell within the range often quote for guided bus - between £2.4m/km and £4m/km.

In addition, operating costs for light rail are cheaper than for bus, according to Chris Cheek of consultancy the TAS Partnership.

"Where high density corridors are served, light rail is more efficient than bus because you only need one driver to transport 450 people, equivalent to ten bus loads," says Cheek. His research suggests that when peak flows reach 4,500 passengers an hour, reduced operating costs caused by lower driver requirement make light rail the cheaper system.

Even in towns where demand makes a bus-based system the most realistic financial option for local authorities to pursue, some consultants argue that kerb-guided bus technology offers few significant benefits.

Hass-Klau's research department says definitive data on the costs and benefits of guided bus systems compared to light rail are impossible to give as the characteristics of towns where they are in operation are so different. However, she is unequivocal that current guided bus routes are "terrible, terrible, terrible systems". She says guideways are unattractive to look at and that the benefits can be largely achieved with conventional bus lanes. "For what it is, it is very expensive," she says, adding: "No one else is building them except Britain."

In fact, there are only five guideways in the world with the sort of kerb-guided technology adopted in Leeds and Ipswich, and now earmarked for most of the projects being planned in the UK.

In the last few years, the focus on intermediate modes in Europe has moved on to developing systems which are designed to have far more in common with light rail than kerb-guided bus in terms of ride quality and appearance. Greater capacity is also provided by these articulated vehicles than by conventional buses. The largest, Lohr Industrie's modular Translohr vehicle, can be manufactured in lengths from 18 up to 39 metres, giving capacity of up to 6,000 passengers an hour. A study in Venice is looking at whether to install the system. Like Bombardier's TVR vehicle system, which entered service in Nancy earlier this year, Translohr is guided by a central rail, powered on track by overhead wires. Off-track TVR is powered by a diesel generator and Translohr through batteries or a gas turbine generator.

Perhaps the most innovative of these new systems is Irisbus's Civis. It needs less infrastructure, being optically guided by a camera and on-board image processing system which reads marks painted on the road. It is due to enter service this year in Rouen and Caen, in northern France, and next year in Clermont-Ferrand.

Some of the new systems have, however, been plagued with technical problems. TVR was withdrawn from service in Nancy after two crashes into power line poles caused by loss of stability when switching from guided to unguided operation.

Because none of these new generation technologies are in full passenger service, results of how they might be perceived by passengers are only available from trials of TVR on RATP's test track on the Trans-Val-de-Marne bus priority corridor in the suburbs of Paris. This showed passengers' preference to it over buses in many respects. For example, 84% thought

the braking was less violent than on a bus and 90% agreed it helped give towns a modern feel.

In the UK, Colin Brader of consultancy ITP, which is advising on the Northampton and Cambridge schemes, says, despite problems the new technologies have encountered, the relatively poor potential for modal shift that current kerb-guided bus technology offers illustrates the need to continue work on new systems. With Translohr he estimates that in Northampton modal shift of 10-20% would be possible.

Brader acknowledges that in towns with a patronage base the size of Northampton, kerb-guided bus is a much cheaper option than Translohr, which may work out "not much cheaper than light rail", but he insists: "The marginal car user demands much more than we can deliver at the moment."

He adds that unless successful intermediate modes can be developed, towns the size of Northampton and Cambridge will be left with only conventional bus which, guided or not, he says "is not a product for modal shift *à la* ten-year plan".

Brader has written to the DTLR asking them to set up a test track so new technologies can be tried out in Britain and gain approval to enter service. Without this prior approval, financing risk in opting for new systems may be too great for the private sector to bear, he says.

In rapidly developing areas such as Northampton and Kent Thameside, planners also say the new rubber-tyred rapid transit vehicles have the important advantage over light rail of flexibility in being able to run on roads as well as fixed infrastructure, making them more adaptable to new developments.

John Turner, senior transport planner at Kent County Council, says uncertainty over how the Kent Thameside area between Gravesend and Dartford will develop, as typified by delays to the Channel Tunnel Rail Link, means a flexible system which can operate on roads and on a segregated guideway may be a better choice than light rail.

Patronage demand created by the 30,000 new houses and 50,000 new jobs expected in Kent Thameside in the next 20 years could justify light rail investment, he says. But a fixed link light rail system in such a rapidly developing area may not make sense.

Turner also points out that with incremental improvements to conventional public transport already planned in the council's Fastrack project, initially through segregated busways and bus priorities, the sort of disruption caused by subsequently converting these routes to light rail would be counter-productive. This could make Civis the best option.

In addition, he says the advantage Civis offers in being able to move off high density segregated corridors to serve housing estates makes it more attractive than a light rail / bus journey involving interchange. He does not believe the fact that Civis offers considerably less capacity than light rail is a constraining factor, so long as high frequency services can cater for demand.

Despite the suggestions that kerb-guided systems achieve little, local authorities in medium-sized towns which are opting for the technology, say it remains a valid solution.

Tony Collins, project leader for West Sussex County Council's Fastway guided bus scheme for which the Government approved £10m of public sector funding in the local transport plan settlement, says by 2008 the system will mean 2% less cars on the road in the morning peak on the 24 km route which serves Gatwick Airport and Crawley.

Collins admits this may not sound a lot in percentage terms, especially compared to the modal shift trams can produce, but points out that it adds up to a significant number of new bus passengers. In the morning peak, bus use on the route is forecast to increase by 60%, amounting to 800 extra journeys. Of these, 86% are forecast to be current car users.

Although only 3km of the system planned as guideway - where bus lane enforcement would be most difficult and at major junctions - Collins argues that the technology will have a vital role in persuading car users to switch to buses, in terms of perception of quality and reduced journey time.

Similar benefits are anticipated the proposed 15km guided bus link between Luton, Dunstable Houghton Regis. At Luton Council Translink project manager Keith Dove is currently updating the business case prior to resubmitting it to the DTLR in July. He says previous estimates suggested the project would produce a 2% modal shift to public transport.

While planners continue to try to come up with new answers for how to provide modal shift more cheaply than light rail, Carmen Hass-Klau claims there is in fact little understanding of what makes light rail systems successful themselves. She says new research to be published in September, will change current perceptions.

"As far as we know it is not what most people think. Everyone has a theory that you need a modern vehicle or whatever," she says. "What we are finding is something completely different. It will be a bit of a bombshell."

Transport modes for London corridors assessed

In the UK, some of the most comprehensive work on evaluating which mode of transport should be used for particular corridors has been done by Transport for London and its predecessor London Transport.

After examining 60 corridors, TfL has developed proposals on four which will be put out to public consultation this summer (see *below*). TfL strategic projects manager Elaine Seagriff says a crucial factor if the proposals are to achieve their full potential be the bravery of politicians in reallocating road space.

	East London Transit 53km	Greenwich Waterfront 16km	Uxbridge Transit 50km	Road	Cross River Transit 15km
	High priority bus	Trolley bus	Diesel bus		high quality bus
Annual boardings (millions)	32.9	11.7	33.8		31.5
Max. one way flow	2,200	1,800	3,800		8,200
Initial capital cost (£m)	150	71	116		173
Benefit:cost ratio	0.1:1	1.6:1	-ve		-ve
	Trolley bus	Tram	Tram		Tram
Annual boardings (millions)	39.3	15.5	42.0		71.5
Max. one way flow	3,700	3,900	5,700		12,000
Initial capital cost	266	182	195		268
Benefit:cost ratio	1.6:1	1.0:1	2.6:1		0.9:1

Limited future for short link guideways?

The first guideway to be opened in the UK in January 1995 was on a 200-metre section of SuperRoute 66 in Ipswich, providing a direct link between two housing estates.

Mike Payne, marketing director of bus operator First Eastern Counties, estimates the guideway has saved three to four minutes on the route's journey times compared to the alternative of going round three sides of a square on the roads.

However, Suffolk County Council and Eastern Counties agree better solutions are available for dedicated short link busways in future quality partnerships. For example, a segregated bus link of a similar size to the Ipswich guideway at the new Bixley Farm housing estate in Suffolk will be built on conventional road surface. Payne says that building the link so it can accommodate the width of only one vehicle is an effective segregation measure for deterring car drivers. "You don't want to meet a bus coming the other way if there's only width for one vehicle," he says.

For Eastern Counties, this solution avoids the expense of having to invest in wheel guides and to train drivers to operate guided buses. For local authorities, it involves a lower capital spend.

Payne says development of short link guideways may now be limited to areas where land is restricted as guided bus systems require less land width than roads. "They might still have a role to play in certain specific local circumstances", he says.

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