

Urban Freight And Rail

The State Of The Art

by Mark Robinson and Phil Mortimer

The role of rail in providing freight transport to, from and through urban areas has come under increasing scrutiny and there appears to be a continuing interest in the subject. This paper sets out to demonstrate the state of the art in urban rail freight distribution on the basis of some relevant European examples.



DB CargoSprinter

Rail has, in many areas, been displaced in whole, or in part, from a dominant position as road transport services have grown and developed in capability and levels of sophistication that have not, regrettably, been matched by rail service providers. Rail's generic weaknesses, particularly in door-to-door capability, cost – compared to road transport alternatives, which largely exclude consideration of external costs – and service availability have been the principal causes of the decline in rail's share of the urban freight market. The development of city planning, zoning and rebuilding practice has also created problems by effectively sterilising operational and commercial options that were formerly open to rail.

It was calculated (Ford, Smith and Harris 1995) that rail can readily achieve a 50% reduction in energy usage for each tonne-km compared to road-based freight systems. Despite this inherent energy efficiency rail has failed to capitalise on this advantage in a competitive commercial sense, largely on the basis of failings elsewhere in transport

operations and commercial matters. Fuel and energy costs are recognised by shippers as being only a small part of the total cargo movement transaction costs. Rail also has inherent advantages in terms of higher permissible axle weights than road transport, and modern rail vehicles can offer large cargo volume capacity for lighter weight products.

The principal generic drawbacks to the use of rail in urban freight are:

- Limited physical flexibility
- Competes with passenger services for line capacity
- Rail infrastructure and related systems' costs are perceived as being high

Rail – The Current Situation

Rail has lost markets (Mortimer 2002) in the context of urban freight by failing to meet the continuously rising expectations of shippers and receivers. Rail has not been able to match the technical, operational, commercial and product/service development initiatives that



the road transport sector has repeatedly been able to implement successfully, often at timescales rail cannot achieve. This raises the key strategic point as to whether rail can realistically reposition itself to the same level and on a competitive cost base to make it attractive to users on merit, on a sustained basis. Shippers and receivers are unlikely to surrender the benefits they have secured through the use of sophisticated road transport systems for some obscure or remote intangible benefits from using inferior rail services. Rail has effectively to compete with high-quality road services on merit if it is to secure and retain traffic on a sustained basis. Changes in relation to products, service capability, cost profile and infrastructure management were suggested (Mortimer and Robinson 1999) as fundamental requirements to convince shippers/receivers and cargo interests to re-establish the use of rail services. The role of intermodal options (Bannister 1999) including containers, swap bodies, bi-modal and piggyback trailers is a positive area of development compared to traditional direct-load rail services, but is still hampered by the cost of the intermodal transfer.

The impact of the road traffic generation aspects of rail-linked city terminals was also identified as a potential constraint on the wider acceptance and implementation of a strategy using intermodal unitised cargo options. Existing rail infrastructure in cities, where it may be surplus to present, or envisaged, operational and commercial needs should be not be lightly discarded.

Heavy rail/intermodal

Rail currently serves urban markets in ways that may not be readily perceived in terms of the movement of certain categories of commodities – oil/coal/aggregates/cement – that are usually moved in bulk to railheads and then distributed to the final urban consumption points by road vehicles. These commodities are not generally time-sensitive or intrinsically valuable and are well suited to rail's orthodox capabilities in terms of the ability to deliver large quantities of material into urban areas at relatively low unit cost. However, the increasing size of heavy freight road vehicles has eroded this competitive edge. Rail's capabilities and environmental credentials can be undermined by city planning concerns about the level of road traffic activity around a railhead or depot in an urban area if the site itself becomes a significant road traffic generator.



IRIS trials using an adapted Railtrack multi-purpose vehicle

Rail also has a less directly visible presence in terms of urban freight in the form of intermodal containers moved in urban areas to and from terminals and depots, often as the final link in lengthy and complex international supply-chains. Moving containers in and out of cities in large volumes is something rail has been relatively successful at, particularly for flows between ports and major inland conurbations. The high cost of terminal transfers can make containers a less attractive proposition to shippers of domestic traffic when compared to door-to-door road transport services that avoid this requirement in terms of additional cost and potential delay.

The use of orthodox train technologies and methods of operation is out of alignment with the needs of shippers and receivers who favour continuous methods of supply and despatch (Foyer 2001) rather than intermittent, or periodic, bulges in traffic activity. In this context, large trains do not fit in with the market's requirements, despite their attractiveness to the train service provider as a means of spreading costs over as large a train size as possible as a means of reducing unit costs.

Large intermodal terminals require a significant land area for operations, movement of trains and road vehicles. They also imply the generation of large numbers of road vehicle movements through urban and suburban areas, which can, in turn, generate environmental concerns and operational limitations to be imposed by city planning bodies; and new, large terminals usually imply a requirement for greenfield as opposed to brownfield sites, which further erodes rail's environmental credentials. The big train-big terminal model is hindered by the relatively slow rate of loading and discharge of cargo with train despatch being dictated by the last unit being placed or removed.

The Cargo Sprinter initiative in Germany – which was launched in the mid-1990s – potentially had the capability to service smaller flows of traffic into and between urban areas on a



more cost-effective basis than orthodox trains. The technology of the trains did not appear to fulfil the aspirations of its sponsors adequately and seems to have been compromised by issues of track access costs that were equated to those of larger, heavier and slower orthodox trains. The train technology deployed in Germany has been mirrored in proof of concept trials with similar equipment in the UK under an EC-sponsored project – Innovative Rail Intermodal Services (IRIS) (Mortimer 2001) and trials sponsored by the Strategic Rail Authority (SRA). The IRIS trials confirmed a number of issues in relation to this particular train technology and highlighted areas for further technical development to make this concept more competitive and capable for inter-urban and intra-urban freight operations in order to compete effectively with road transport.

The concept of small trains operating on the main national rail network then raises issues about the responsiveness of the infrastructure managers to the often volatile requirements of shippers in terms of time, location, frequency of cargo origin and destination, and the whole ability of the rail network to accommodate such movements. The use of small, self-propelled, bi-directional train technologies becomes the catalyst to manage the infrastructure in a wholly different way than under orthodox conventions if the capability of this technology is to be fully exploited and rail is to become more competitive in a range of markets.

The example of heavy rail freight use in Düsseldorf is described here as an example of active participation by the city authorities in developing an understanding of the role of rail in serving the city's changing commercial and industrial base. An analysis of freight transport (Ruesch 2001) has shown that road transport predominates in short-distance, intra-urban transport, with rail, inland waterways and road competing for the long-distance movements. The major market for rail is in bulk goods such as coal, oil, ores and metal, and there is aggressive competition from inland waterways for these commodities. In terms of intermodal traffic to and from the Dutch and Belgian ports, rail is seriously compromised by railway protocols on traction, crew changes and technical inspections, to the point that the waterborne option is a serious contender with rail in terms of transit times and cost.

Customers in Düsseldorf want the rail freight service to provide:

- Earlier delivery and later collection times
- A 'one-stop' shop for complete freight service provision and information on the operational and commercial status of their cargo
- A general reduction of costs
- Open access to increase 'rail-on-rail' freight competition
- Greater reliability, availability and security

There is a substantial public and private rail network in the Düsseldorf area, which means that rail has the potential to compete against road haulage. However, the infrastructure needs to be retained despite decreasing cargo volumes having resulted in discussions to close rail routes and shut down terminals and sidings.

To improve the competitive situation of rail, numerous bilateral initiatives have developed to combine operations, maintenance and servicing to reduce costs. The lack of usable land in Düsseldorf has put pressure on the railway infrastructure due to changes of land use from industrial to services and the relocation of newer industries into the suburbs. The freight policy in Düsseldorf is actively to support rail and intermodal transport to achieve a modal shift from road to rail. The most important decision in relation to this policy is to secure the railway infrastructure, thereby halting the decline in the number of rail-linked sites and the loss of future traffic potential. Düsseldorf has recognised the need to conserve and improve regional and urban rail freight traffic as an integral part of the city planning process.

Other towns and cities could draw much from this example.

Underground/Metro Systems

In a large number of cities it is apparent that the road infrastructure appears to be increasingly unable to cope with current levels of congestion. The growing use of cars, the finite availability of road capacity and a growing opposition to more urban road building, coupled with the increased demand for freight, means that some major cities are examining the feasibility of alternatives to road transport, such as the use of underground/metro systems (Bous 2001). The incorporation of freight into the existing metro operation requires the development of an entirely new logistics concept. »

To be successful it is necessary to determine:

- The markets that any new concepts could service
- Suitable available routes and equipment
- Private and public sector commitment
- Operational and technical feasibility
- Cost benefits compared to existing systems
- Impact on the passenger services

Such an initiative was proposed in Amsterdam by the Municipality and GVB. The initiative was co-financed by Amsterdam, Connekt and NDL. The steering committee included participants from the retail, food and logistics sectors, with the executive consultant being DHV.

The situation was that clear commitment was needed for the pilot project to develop independent/innovative thinking outside of the usual 'private' logistics systems arena. The first step required significant investment from the local authorities and sufficient appropriate underground rolling stock for the experiment. The metro concept was believed to be feasible with the necessary support and, initially, the full system would require substantial investment with limited return. The main question remained: did the market want or need it?

Work undertaken by the city authorities suggested that this initiative could have attracted a substantial market share of the freight flow into the city achieved at a saving of 30% on current road transport prices with freight restricted to off-peak and night-time operations. The real benefit of this proposal appeared to be met when most of the metro network was able to operate with a freight component giving comprehensive system coverage. Since development of the concept began, the metro train operating company has scaled down its support and interest in the concept, largely as a result of concerns over operational and track maintenance matters.

Tram and light rail

The goal of urban freight trams and light rail systems is to use relatively modern vehicles on existing available infrastructure – rail networks and terminals in, or close to, the centre of cities. The advantages are that costs are low, there is a minimal implied increase in congestion – especially for dedicated routes – and there is an environmental advantage in the move from road to rail. Tramways also lend themselves to mixed systems – passenger and city freight – when capacity permits.

The push towards freight trams has usually required an external measure such as the fuel/energy crises that occurred in the 1980s.



Dresden CarGo Tram

At this time there was a resurgence of interest in the use of tram systems for freight, particularly in various cities in Germany – Berlin, Leipzig, Magdeburg and Dresden. Dresden has successfully deployed modern cargo trams (Wortmann 2001) in an innovative but prescribed logistics application shuttling between two automotive plants in the city.

The Infrastructure

The future role of rail for passenger and freight relies on the intelligent actions of transport and city planners to recognise the need and potential of existing rail infrastructure in cities; and not to take short-term measures that effectively delete, or neutralise, the future use of existing railway alignments. Once an industrial, commercial or residential development cuts across, or deletes, vital parts of a disused railway route then it is either impossible or very difficult to restore without excessive costs being incurred.

Throughout Europe the privatised railway infrastructure companies have the objective, for themselves and investors, to provide a strong economic platform for the business. The newly entrepreneurial rail infrastructure owners are naturally examining their asset



base for potential income opportunities through rental or sale. Within their internal decision-making, the importance of defunct lines is recognised and these are effectively placed into a strategic reserve. For urban freight, the value of some lines, which may not now be linked to the main national system, but that may have valuable future potential for rail-based urban freight and related distribution, may not be so recognised. It is this category of route in particular that requires the influence and intervention of city planning authorities to ensure lines are not lost or compromised.

One example of the pressures on rail's infrastructure is provided by Nuremburg (Eisele 2001) where there is a circular rail route within the city that was used by heavy industry in the past. When these industries declined due to changing commercial pressures, the level of rail freight traffic declined also and now requires significant investment to maintain the infrastructure. Some bridges are in a poor condition that implies that private investment cannot be attracted to reactivate the line. DB Netz has now further weakened the potential of the Nuremburg circle by removing running lines in the north-east section of the city.

This situation is unfortunate as the largest freight hub in Nuremburg is situated within a residential area, and now it is no longer possible to disperse goods from this terminal by rail. Access by road now implies:

- Danger to pedestrians in the access roads
- Noise and other intrusion
- Daily traffic congestion due to the layout of the residential streets
- Rerouting and more urban road freight congestion

The consequence of these factors is that the freight hub must now be relocated, costing much more than any innovative redevelopment and modernisation of existing rail infrastructure.

Similarly, in France (Ebrardt 2001) there are still many rail freight stations in large cities, such as: Paris, Lyon, Marseille, Strasbourg, Lille, Bordeaux and Toulouse. These stations are usually very well located in the heart of the city, which means that they are potentially well placed for collection and final delivery in the core areas of the city. They are also very well connected to the national railway system and some offer added value services such as warehousing and links to other transport modes. However, the needs of freight shippers are moving closer to a Just-in-Time philosophy

and this has resulted in road transport adapting and providing this type of service more effectively than rail.

The potential consequences for urban freight railway stations in France are drastic. There is less rail traffic and many of the stations are not suitable in their present state to adapt to the demands of the new urban freight shipper/receiver. In addition, the existing road access can be poor and was not designed for large road traffic volumes or to be used by large vehicles. As a result of this, many local authorities are pressing SNCF to change the use of the sites to respond to the increasing city centre demand for land for housing, commercial and public services.

To try and preserve its stations and reverse the trend of declining use, SNCF Fret has been working on a series of new projects for the last three years. French public authorities have created a national research programme for goods transport in towns that will also address the law on air quality for towns of 100,000 inhabitants or more. These towns must establish a PDU (Plan de Déplacements Urbains), which is, in effect, an Urban Movements Plan. For each of these towns the PDU may include new proposals for the rail mode and the preservation of rail freight stations. It is an enlightened initiative that could serve as a model for other cities – and nations – to adopt.

State Of The Art – Conclusions

Rail has declined significantly as a provider of transport services between and within urban areas across Europe, although the decline is more marked in some countries, notably the UK and the Netherlands. The growth of road transport, endowed with almost total flexibility and lower cost, effectively ejected rail from traffic and commodity flows. As a consequence, rail has retreated into serving large flows of low-value commodities such as aggregates, cement and fuels and effectively given up on the higher-value, time-sensitive traffic flows. Intermodal traffic is largely limited to the movement of international container traffic between ports and the inland cities with the pre/end haulage undertaken by road.

Rail's steady decline has been accompanied by profound changes in city planning that has acted against the use of rail as a medium for the movement of goods between and within cities. As industry has moved physically and generically away from the heavy industrial concentrations of the late 19th and early/mid-20th Centuries, the need for rail to service intrinsically lighter but more valuable traffic became less attractive.



The adoption of concepts such as Just-in-Time manufacturing and retailing raised the requirements for transport operators in terms of routinely reliable precision, availability and security, all of which proved to be largely beyond rail's generic competence. There are arguments that suggest road transport has effectively secured its dominance at the cost of huge environmental impact and subsidies in the form of other externalities that are not reflected in the transport pricing mechanism.

The pressures to release rail infrastructure for other uses further compounds the problem. Once rail infrastructure is effectively neutralised by planning measures or destroyed, the likelihood of rebuilding is very low. There is a real conundrum here as the city planning authorities may, in effect, take out beneficial potential city logistics capability and capacity to fulfil other pressures and priorities without a real understanding of the implications of their actions.

In Conclusion

There is no doubt that rail no longer commands a prominent place in urban freight activities. There are some grounds for believing that rail can rebuild market presence, but this will need to be done with a much greater recognition of the market's needs and requirements and how these continue to evolve.

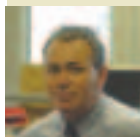
Shippers are now accustomed to slick, sophisticated, road-based logistics services and are very unlikely to be prepared to sacrifice these for a less capable and more costly alternative.



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