Advocacy for Conventional Light Rail

TOM PARKINSON

Although no one mode of transit can serve as the best alternative for every corridor, light rail has significant advantages in many applications. Usually, light rail can be planned and built in less time, with lower costs, and with less environmental impact or construction disruption than other types of rapid transit. It also fosters investment and redevelopment in the areas that it serves and stimulates tourism as well, while drawing additional revenue from off-peak tourist passengers who favor light rail over other transit modes. Most urban corridors in North America with transit demand in the mid- to high-intermediate capacity range already have automated rapid transit, heavy rapid transit, or light rail. With the exception of some new growth corridors and the expansion of existing systems, most new opportunities for intermediate-capacity transit modes will be on the lower end of the scale. At lower passenger volumes, light rail can compete effectively against bus alternatives when it is built with economy in mind. Existing rights-of-way, surface alignment, barrier-free self-service fare systems, practical station design, and light overhead all play a part in making light rail the transit mode of choice in a number of cities.

URBAN CORRIDORS COME IN many shapes, sizes, and passenger levels. One mode cannot be right for all. Good transit is integrated transit with each mode effectively and economically used and effectively coordinated and with fares and schedules that maximize convenience to the people transit is built and run for—the passengers. Buses will remain the most important and dominant transit mode in North America, and the possibility of a fixed-guideway system is little excuse for not planning, maintaining, and operating them well, whether they are feeders to that system, on truck routes, or providing the line haul over busways, high-occupancy-vehicle (HOV) lanes, or dedicated traffic lanes.

TPTC Ltd., 111-1141 W. Seventh Avenue, Vancouver, B.C. V6H 1B5, Canada.

Light rail can be defined too narrowly. Light rail now has fully grade-separated systems (Manila), automated driverless operation (London Docklands), and hybrid automated operation (Düsseldorf). Several lines operate three- to five-car trains on close headways, offering capacities to and beyond those of any rapid transit line in North America outside Toronto and New York. Yet it is still light rail. The vehicles possess typical characteristics, including geometric flexibility, even when the power collection is by the third rail.

Automated light rail can match all the advantages of automated-guideway transit (AGT) at lower cost with less risk. Further, hybrid light rail can run automated on segregated right-of-way, then take on a driver to operate over less expensive alignments. This provides more miles of service per dollar and also gives more passengers a one-vehicle ride.

In making a case for light rail, tabulated cost comparisons are unnecessary. Rather this paper presents the advantages of light rail, many miles of which have been built in the $10 million/mi to $20 million/mi range. Certainly some lines have cost a great deal more. Many of these higher costs were unavoidable; some were not. This paper points out how to avoid unnecessary costs. There are few urban corridors left in North America where fixed-guideway transit can be supported. These corridors generally have modest transit demand. For light rail to continue to proliferate, it must be built leanly and cost-effectively.

CONVENTIONAL LIGHT RAIL ADVANTAGES

Light rail transit (LRT) spans a wide range of technical and application options. One of light rail's major attributes is its street running capability. Light rail cars are designed with the ability to accelerate and brake rapidly and to traverse sharp curves and steep grades. Cars are narrower than those in heavy rapid transit and fit within the maximum allowable highway width. This enables tunnel or underpass sections, where unavoidable, to be correspondingly narrower and less expensive than with most other fixed-guideway modes. Single-track sections are possible where space is tight and the ensuing capacity limitations are acceptable.

Light rail can usually be planned and built in less time and with lower costs and fewer environmental impacts or construction disruptions than other types of rapid transit. For example, where no exclusive right-of-way is available, light rail can run on a street or make a sharp curve around a historic or expensive building, avoiding property take and destruction.

Even when segregated on-street trackage cannot be provided and the light rail vehicle (LRV) must run in mixed traffic, there are advantages. The LRV does not have to pull to the side of the road at stops. The wide multiple doors provide faster loading and unloading. Both of these features result in higher schedule speeds that attract patronage, reduce operating costs, and reduce interference with other road traffic. In this mode LRVs are streetcars whose clearly visible tracks discourage motorists more than an unmarked bus route. Track paving can be raised or use a rough surface, discouraging automobiles although not impeding use by emergency vehicles. These conventional streetcar advantages are often played down, but a look at Toronto shows how streetcars can dominate certain streets that local drivers then avoid. When buses temporarily replaced streetcars on a major Toronto street, both transit and traffic speeds decreased. The streetcar can, in fact, act like an enforcer, keeping traffic in lanes and setting a travel speed.

Other light rail advantages are less tangible and more difficult to deal with. The fixed tracks of streetcars or light rail provide an indication of support, commitment, and continuity to the community and neighborhoods served. This is a catalyst that can trigger renovation, redevelopment, investment, employment, and even recovery for economically depressed areas. Light rail also has tourist potential. This provides extra revenue and good publicity, and encourages tourism and tourist-oriented development and jobs, as San Diego so ably demonstrates.

Light rail's contribution to reducing air pollution in most metropolitan areas is modest, although there can be significant localized improvements where a downtown street is converted from congested traffic to a transit-pedestrian mall. But it is not always that the amount of pollutants is reduced; rather it is that an agency demonstrates its intent on using the least polluting mode, and sets a positive example for others.

Similarly the use of nonpetroleum fuels is of minor concern now, particularly given that electricity in many areas is partially generated from oil. It was very different following the oil shortage of 1973 when many transit projects that reduced oil dependence were favored. The fact that the current Middle East problems could bring another oil crisis tomorrow is worth taking into consideration when evaluating light rail over a diesel bus alternative.

In addition to the low or zero use of petroleum resources and the freedom from any local pollution, light rail has the inherent environmental advantage of low impact, plus the ability to fit gracefully into the urban structure. Light rail can have very low noise levels with resiliently mounted track and resilient (elastomer-cushioned) wheels. However, for a variety of reasons recent light rail street track has not been resilient and in-street noise on most new systems is higher than need be. Calgary and Portland are exceptions. The flexibility in selecting alignments and the subsequent lower capital cost is the "light" in light rail. There is nothing light about the cars, which can weigh and cost as much or more per passenger space than a heavy rapid transit car. Stations can be also be very modest and unobtrusive.

This "lightness" of light rail—a combination of flexibility, low impact, modest cost, and environmental softness—is ephemeral. It must be carefully guarded. Ignorance or ineptitude during the planning, design, specification writing, engineering, or construction phases of a project can lose the "lightness." Light rail's advantages can be diminished or even destroyed with overdesigned overhead; ugly, noisy, or difficult-to-maintain cars; poorly conceived alignments; or simply uneconomic applications. This is why certain systems provide better examples of light rail's "lightness." Calgary, Portland, and San Diego in North America and Nantes and Grenoble, France, in Europe are exceptional among many fine, recently built systems.

APPLICATION AND ALIGNMENTS

Light rail systems can be built to handle from 15,000 to 200,000 passengers per day, equivalent to 3,000 to 20,000 passengers per peak hour direction. This range is often termed "intermediate capacity." The lower end of this range is well within the economic capability of a bus route, particularly if articulated buses with traffic management measures such as reserved lanes and traffic signal preference are used. To be competitive light rail must be built at low cost and may have to incorporate many design compromises. The San Diego, Calgary, and Sacramento light rail lines are good examples—all built within the range of $10 million/mi, inclusive of vehicles, yards, and project overhead.

San Diego bought an operating freight line, retained long single-track sections, reused much of the existing rail and ties, and retained rail freight operation on a time-separated basis. Sacramento made several cost-saving compromises with much single track, carving out rights-of-way at the side of highways, and squeezing the line onto existing underpasses and overpasses.

The upper capacity range of light rail requires long trains of LRVs at close headways that preclude some of the light rail advantages. Single-track sections, downtown surface operation, and grade crossings of any streets with significant traffic flows become difficult or even impractical. It is at these volumes, where light rail requires advanced signaling and a wholly or predominantly grade-separated right-of-way, that a case can be made for automation, and where light rail overlaps and competes with heavy rapid transit and the AGT systems.

When there is a case for automation there is every likelihood that it can be provided with conventional light rail cars equipped for automatic or driverless operation at less cost than the proprietary intermediate capacity rapid transit systems referred to as AGT. An example of driverless light rail is the Docklands Light Railway in London. The 10-km line was built inexpensively and equipped with classic light rail vehicles without a driving cab that uses third-rail power collection. Problems with the automatic train control relate to the all too common error of designing a new system rather than using or adapting an existing, proven system. The "not invented here" complex continues to bedevil various transit modes in many countries. It is unfortunate that it has now migrated to the light rail mode.

A hybrid of light rail also has potential that cannot be matched by the proprietary AGT systems. Light rail can run on totally segregated track in automatic mode, then proceed onto in-street or partially segregated right-of-way under driver control. If needed, the power collection can also be hybrid, third rail on the segregated section, overhead elsewhere. Düsseldorf will shortly be opening a section of its light rail system with automatic driving, using the same SEL technology as the Vancouver proprietary AGT system.

Most urban corridors in North America with potential transit patronage at the middle to high end of this intermediate capacity range already have automated rapid transit, heavy rapid transit, or light rail. With the exception of some new growth corridors, predominantly in the Southwest sunbelt and expansions of existing rail systems, the great predominance of opportunities for new intermediate-capacity transit modes will be in the lower patronage range. It is in this range that light rail and prioritized buses, with or without busways, compete. Light rail vehicles are three to four times the first cost of the equivalent capacity of diesel buses. Although this cost premium usually can be recovered from longer vehicle life and lower operating costs, particularly operating labor, the selection of light rail in many applications will depend on keeping infrastructure costs down. This means going back to basics, making compromises, and persuading authorities to give up street space or adjust standards. It means avoiding monumental stations and other gold-plating and staying on the surface whenever possible.

DOWNTOWN AREAS

Much of the economy of LRT comes from its ability to use existing rights-of-way, including those of railroads, power lines, and the medians of streets and freeways. When no such rights-of-way exist, particularly in the city center, a dilemma is presented: to run on the surface, mixed or partially mixed with traffic at lower speeds; to build a transit mall; to build an elevated (aerial) guideway at typically three to five times the cost of a surface alignment; or to go underground, typically an order of magnitude more expensive.

Elevated sections sound attractive, but unless the street is very wide (in which case a surface right-of-way should be used) or the adjacent land use is industrial, public concerns are hard to overcome. Even the most carefully designed elevated structure is large and intrusive and the relatively quiet LRVs can add noise to a community when the cars are raised in the air. Many proposals for elevated light rail sections have failed to get approval, particularly in downtown areas. This leaves a seemingly obvious choice between surface and subway alignments. With slow speeds on congested streets at the highest patronage section of the light rail, surely the costs to go underground, possibly for a relatively short distance, can be justified.

The cost of a short underground section may be justified relative to the overall economies of light rail, but a downtown surface alignment, even at slow speeds, and especially if traffic signal preemption or a light rail mall can be built, can be advantageous, and can in fact provide faster overall travel times provided passenger volumes are at or below the medium level of LRT capability.

Underground sections require longer station spacing with longer walks and access time. This access time will often fully offset the slower travel times of LRVs on the street. In addition to easier access, the light rail is highly visible and can share a street with buses, minimizing the impedance of a bus/rail transfer. This light rail presence should not be underestimated. It is a major marketing tool for the light rail, for retailing, and for other existing and future developments along the line. It enhances the tourist ridership, and adds to light rail's already good record of attracting more ridership than comparable non-rail-based transit improvements, particularly at off-peak times.

The then-general manager of the San Diego light rail system put it succinctly during the planning stages 10 years ago. He said that the city did not deserve light rail if the planners and council were unwilling to forgo a very small amount of traffic capacity in the city center! After a lengthy battle San Diego got its surface running downtown and went on to build what is still the most inexpensive LRT line in North America—with high presence and high visibility.

It is not always necessary to forgo street capacity. Light rail vehicles use less green time at an intersection than the equivalent capacity of buses, typically carrying a given number of passengers through the intersection in less than half the time. Providing preemption for light rail and coordinating or sequencing traffic signals for several intersections either side of the light rail can actually increase traffic flows both across and parallel to the light rail.

FARE COLLECTION

All new North American light rail systems except that in Pittsburgh have adopted the barrier-free self-service fare system (proof-of-payment). In Edmonton this was introduced after an expensive period when a manned-barrier fare system was used. The self-service system is sometimes disparagingly referred to as an honor system, but it is far from this. The thorough percentage checks of passengers have resulted in accurate evasion statistics, which range from below 1 percent to less than 3 percent in the nine North American applications. This is lower than typical evasion levels with conventional bus driver or turnstile fare collection. Although self-service failed in Portland when it was introduced systemwide on the buses, it is successful on the light rail line. Pittsburgh and San Francisco are now examining conversion to self-service.

The ticket inspectors or checkers play a much wider role than their title suggests. They are front-line information officers. They handle lost children, ill and confused passengers, and normal operational problems. But above all they provide a high level of security, appropriate for most North American cities. Perceived passenger safety on all new light rail lines is exceptionally high.

At typical light rail volumes, a self-service fare system has capital costs as low as one-tenth those of a barrier system. Operating costs, after taking security into account, are comparable to or lower than those for conventional systems. If these advantages are not enough, self-service provides the greatest flexibility in station and vehicle design, minimizes station stop time through use of all doors, and avoids the impedance turnstiles present to handicapped passengers.

The misgivings associated with the self-service system have almost disappeared thanks to the pioneering efforts in Vancouver and San Diego. Hybrid self-service fare collection with barriers only at central area stations is being introduced on Toronto's GO Transit, on the London Underground, and in the New York and Philadelphia areas. Fear of self-service is no longer an excuse to lose the light rail advantages of low station capital and operating costs, fast multiple-door loading and only a single "driver" per train.

THE STATIONS

Light rail provides astounding flexibility in station location and design. Stations can be as short as one car (80 ft or 25 m). With care they can be located on curves. They can be as minimal as a transit stop sign on a light rail mall or a full-featured, multilevel underground station with escalators, elevators, retailing, and direct connections into adjacent buildings.

The basic station needs only a simple shelter with room for a bench, ticket vending machines, pay telephone, newspaper boxes, and information signs. With a self-service fare system, access can be multidirectional, but care is required to ensure that passengers cross the tracks at safe, marked locations. This simplicity aids the provision of a low-cost, low-maintenance, vandal-proof facility. It can help to think of a basic station as just a large bus shelter. It is possible, as with many bus shelters, to pay in whole or in part for the station and its maintenance through advertising contracts. Alternatively, a local developer, retailer, or major employer may contribute to or even provide and maintain a station, whether minimal or more elaborate.

One difficult decision is whether to provide high or intermediate-height platforms. High-platform and street-level loading can be mixed by using vehicles with moving (high-low) steps or by designating specific vehicle doors for high loading, others for low loading. San Francisco is an example of the former, Pittsburgh the latter. Both add costs and complexity.

High platforms speed loading and provide optimal arrangements for handicapped passengers, including those with wheelchairs. Where high platforms cannot be economically provided, wheelchairs can be accommodated three ways: lifts on the cars (San Diego), lifts at stations (Portland), or station ramps (Sacramento). Wheelchair users prefer high platforms. The station ramps are the next best alternative, as they avoid mechanisms on the car or on the street that require maintenance and whose failure precludes wheelchair access. But ramps at stations are not elegant and can be difficult to fit into the available space. Sacramento has some commendable designs that are worth examining.

On the horizon is the possibility of a light rail car with a low floor in all or part of the car. Alternative designs are now entering service in Geneva and Grenoble. Other car manufacturers have designs on the drawing board. A very low floor design (12 to 16 in. or 300 to 400 mm) brings high-platform advantages to street-level loading, particularly with an intermediate-height platform. Intermediate-height platforms are used in Europe, but somewhat inexplicably, have not made it to North America except in Portland. They are no higher than a street curb, avoiding the first step into the vehicle, just as a bus does when it pulls to the side of the road. Combined with the low-floor cars now becoming available, they provide the same speedy, wheelchair-accessible loading as high platforms, at lower cost.

Although light rail stations can be simple and inexpensive, they also can be more substantial when appropriate, for example as part of a new development. Stations reflect the flexibility and low-cost potential of basic light rail.

LIGHT RAIL VEHICLES

LRVs are relatively heavy and expensive, all the more so with the recent fall of the dollar against the mark, yen, lira, and franc. This problem is accentuated by the small quantities in typical procurements. The West German VoV is sponsoring research into lighter designs with single-axle trucks. A new generation of cars could be available in 5 years. Currently there are several other designs of lower-floor cars under trial or in production. There are no manufacturers in the United States, although facilities to build in the required

U.S. content have almost created several U.S. light rail car builders. Bombardier's Vermont plant is an example.

In the mid-1970s the UMTA-sponsored U.S. Standard Light Rail Vehicle was intended to obtain the benefits of President's Conference Committee (PCC) car-style universality and continuity of batch, if not mass, production. These aims were thwarted by the relatively poor performance and high maintenance of the Boeing-Vertol car. Designing a car from the tracks up obviously presents some risks, making the common practice of developing an extensive and expensive customized specification questionable.

The alternatives are negotiated procurement, adding on to an existing order, or restricting selection to a car that has been or is expected to be in production for some time. These present institutional difficulties but are both possible and practical. San Diego and Calgary have negotiated additional orders with prices comparable to current competitive bids.

Operating two different vehicle designs is practical in large fleets, particularly if the couplers and multiple-unit controls are compatible. In small fleets this is undesirable. Here custom designs can be a liability, operators of "orphan" LRVs can rarely add to someone else's order, and negotiated procurement, the second time around, may be the only option.

OVERHEAD AND POWER SUPPLY

There have been many comments made about the extreme variation in overhead design on new light rail lines, both in North America and Europe. Certain systems have complex, heavy, and expensive designs. The visual pollution can be an appreciable obstacle to local and political acceptance of light rail. Given that there are several thousand miles of simple suspended trolley wire over light rail, streetcar, and trolleybus routes, the need for counterweighted (tensioned) catenary or compound catenary designs with structural supports that resemble the framework of a building merits examination.

Catenary designs have advantages at high speeds, in areas with extreme temperature variations, and where the added conductivity of the messenger wire can avoid or reduce feeder cables. Such designs are generally unnecessary on North American light rail, where speeds rarely exceed 50 mph (80 kph). They are often a result of overspecification or lack of knowledge of the simpler alternatives.

A system starting out operating single articulated cars may specify overhead for long trains and require the capability for a dead train to be pushed by an equivalent-length operating train. Similarly, requirements that the overhead remain intact through earthquake, flood, and 100-year winds is admirable but questionable. Overhead that survives an earthquake is of little advantage when it is unlikely that the roadbed can be cleared of debris for several days. Even on the lightest systems fallen overhead is rare and injuries are even rarer. Power is automatically disconnected when faults occur or can be turned off remotely.

The best examples of simple, unobtrusive overhead are on existing light rail, streetcar, and trolleybus systems. The two new French systems, in Nantes and Grenoble, have light, elegant designs. The latter is of particular interest as it uses Kevlar plastic span wire, avoiding the need for any insulators. In city centers, span wires can be attached to buildings, although it takes some effort for the transit agency to get legal approval. Support poles can be integrated with those for lighting, whether modern or ornamental antiques.

The basic, simple light rail line deserves basic, simple, and inexpensive overhead. Designers, engineers, and specifiers should be pointed toward the best appropriate examples elsewhere and asked to copy them.

LIGHT RAIL APPLICATIONS

The best way to determine the design of a new basic light rail line is to look elsewhere and see the cost-saving features, light elegant overhead, traffic management measures, station architecture, and other careful design features that many existing systems demonstrate.

In Europe, light rail has evolved predominantly from the post-World War II modernization and upgrading of streetcar systems, particularly in West Germany. Quite recently several all-new systems have been built. Notable for good "light" design are France's new systems in Nantes and Grenoble; the latter also has exceptionally low floors on its articulated cars.

Other good examples of light rail are in Gothenburg, Sweden; all large cities in the Netherlands, including a new system in Utrecht; Hannover, the Rhine-Ruhr district, Bonn, Frankfurt, Stuttgart, and many other locations in West Germany; Kiev, Volgograd, Lvov, Minsk, Riga, Tallinn, and elsewhere in the Soviet Union; numerous places in Switzerland; and in Italy at Milan, Turin, and Genoa (under construction). Light rail is also being planned in three British cities, with projected low costs per mile achieved by using railway and street rights-of-way.

Elsewhere in the world, the Manila system is notable for very high ridership on totally grade-separated aerial structures and for farebox recovery of all direct operating costs and most of the capital amortization. In Tuen Mun, Hong Kong, an extensive new system will soon open that is also projected to cover more than direct operating costs.

The new systems in Britain and France are of special interest, as these countries had all but given up on the streetcar and there was considerable antagonism to the reintroduction of this mode. In France "high-tech" systems have been heavily promoted and have competed technically, economically, and politically with light rail.

Table 1 summarizes both old and new light rail systems and streetcar operations in North America. It is based on data compiled by Ed Tennyson and provided by the American Public Transit Association's Light Rail Transit Committee.

TABLE 1 NORTH AMERICAN LIGHT RAIL SYSTEMS

City	Year Opened	Kilometers	Passengers per Day	No. of Cars	City Center Operation
Boston	1897	52	70,000	230	Old subway
Buffalo	1985	10	21,000	27	Mall
Calgary	1981	22	36,000	78	Mall
Cleveland	1920	22	17,500	48	Underground
Edmonton	1978	10	25,000	37	Underground
Fort Worth	1962	3	6,500	8	Underground
Los Angeles (est.)	1989	64	100,000	54	Underground
Mexico City	1900	34	47,000	50	Not central
Newark	1935	7	12,000	26	Underground
New Orleans	1893	11	21,000	35	Street
Philadelphia	1892	160	127,000	236	Old subway
Pittsburgh	1891	36	20,000	90	Underground
Portland	1986	24	21,000	26	Mall
Sacramento (est.)	1986+	29	21,000	26	Mall-street
San Diego	1981	33	23,000	30	Mall-street
San Francisco	1897	39	133,000	141	Underground
San Jose	1987	32	40,000	50	Mall-street
Toronto	1892	73	334,000	284	All street
Vancouver	1985	22	80,000	114	Old tunnel

Note: New Orleans has a historic streetcar line in street median. Toronto has a classic streetcar system, not typical light rail. Part of the Philadelphia system is also classic streetcar. Fort Worth has a short, private parking lot shuttle. Vancouver has a fully automated and driverless system that is often not classed as light rail. Tourist lines also run in Seattle and Detroit.

CONCLUDING COMMENTS

The remaining North American corridors with potential for capital-intensive transit improvements generally will have patronage in the low to middle-intermediate capacity range, that is, 15,000 to 50,000 passengers per day. To be competitive and cost-effective with buses in this range, light rail must be designed to be inexpensive. Attention is needed to retain the basics and avoid gold-plating. AGT is entirely uncompetitive in this range, and where passenger volume can justify higher expenditures, automated or hybrid light rail can do everything AGT can do with less technical risk and lower costs.

The case for busways is very corridor-specific. They have an unhappy history, with the few guided busways costing as much per mile as basic light rail. Where underground running is needed, the ventilation duo-mode bus costs are unfavorable. Busways and bus lanes have the habit of being usurped by general traffic or HOV lanes, and buses cannot compete with light rail in ride quality at the best of times. The comparison is also colored by the unfortunate trend when budget cuts must be made of reducing bus maintenance and cleaning while delaying vehicle replacement. The results can be seen on busways and bus lanes from time to time: aging buses with malfunctioning air conditioning, hazed-over windows, and smoking engines, fumes from which often infiltrate into the passenger compartment.

Much is made of the busway's advantage in avoiding transfers. Buses on the main busway can branch off and serve a suburban or downtown distribution role. This is indeed an advantage, but it is also a disadvantage that often results in long headways to specific destinations rather than frequent trunk headways with connections to less frequent feeder buses. Transfer can be regarded as an opportunity rather than an inconvenience—an opportunity to drop off dry cleaning, pick up groceries, or do the banking. Where park-and-ride is available, the advantage of avoiding any transfer is moot.

Light rail offers a quality of ride, a presence, and an influence on development that buses cannot approach. However, to compete with buses at the lower passenger volumes, light rail must be built economically. The most important phase in light rail development is the early alignment planning. Perceptive planning maximizes the use of existing rights-of-way, retaining a surface alignment wherever possible and making compromises with sections of single-track operation or on-street operation as necessary. This exploits light rail's flexibility and, with light overhead, the environmental advantages, while holding costs to a minimum.

All rail modes have a proven record of attracting more development and urban renewal than other transit improvements. Light rail also has a good record of attracting more ridership, including tourists, than comparable non-rail-based transit improvements, particularly at off-peak times. This increases revenue to the transit agency and the development adds to the municipal tax base. Light rail's positive image and extra revenue together with the environmental benefits can be the edge that puts light rail ahead of other comparably priced transit alternatives.

The final and in many regards most revealing, satisfactory, and cogent case for light rail is its widespread use. In North America during in the last decade, a majority of the new fixed-guideway transit systems built (excluding airport or distributor systems) have been light rail. These cover a wide range of applications, designs, and costs. They are popular, they work well, and they are being extended. Although every urban corridor has specific wants that may, at times and in places, justify other modes, it is clear that in a time of stretching every transit dollar light rail will continue to be the dominant intermediate-capacity, fixed-guideway mode. We can look forward to many new light rail systems built perceptively and economically and equipped in due course with new-generation vehicles—vehicles that are more cost-effective and have the low floors that provide more dignified accessibility for the handicapped.