2842

By Michael J. Ma

Brazil's busways: A "subway" that runs above the ground

An ancient Brazilian city, Curitiba, offers the rest of the world an innovative approach to mass transit by establishing a bus system similar in many respects to a metropolitan subway.

Suppose your job was to plan a public transportation system and you had three options: an underground metro system with a capital cost of $90-$100 million per kilometer; a light railway system for $20 million; or a direct route busway for $.02 million. The conventional wisdom is that cities with a population over 1 million must have a subway to avoid traffic congestion. Yet the southern Brazilian city, Curitiba, capital of the state of Parana, with 1.6 million inhabitants and a metropolitan population of 2.3 million, chose the bus system. But it did so in such a way that it gained virtually all the advantages of a subway system, with none of the disadvantages, and at a fraction of the cost.

What's notable is that Curitiba is not a new or relatively pristine city easily amenable to the tidy arrangements of an academic urban planner. It's a very old city, founded in 1693. Due to its strategic location between the Atuba and Belem Rivers, it grew, and became the state capital in 1842. The city experienced moderate economic growth from 1800 through the 1940s due to its wood, cattle, coffee, and other products. Population growth stayed relatively in line until the 1960s when it began its upward spurt. In 1950 the population was 300,000. It has since quadrupled, bringing in its wake typical urban problems of unemployment, slums, automotive gridlock, pollution, and environmental decay.

In the early 1970s, Curitiba decided to meet its problems head-on. And they did so in a manner which can provide valuable lessons not only to other third world cities, but also large cities everywhere.

Although this article will focus on the city's innovations in mass transit, the city's vision for public transp tion was inextricably bound up land use, housing, the reduction of people and automobile congestion lessening of poverty and crime heightening of education and the qu of life, and more.

"It is important to remember planners in Curitiba do not isolate t portation as an entity apart from aspects of urban life," says J Rabinovitch, senior urban develop advisor, manager, urban develop team, United Nations Develop Programme, NYC. "They do not streets only as paved surfaces b elements in a larger network and hi chy of roads. Curitiba analyzes t as a movement and exchange bet activities. Traditional city plan approaches tend to be static and or ed toward physical features. Traditi transportation planning tends t excessively data-demanding, equa based, and technocratic. Curiti planning focuses more on the rela ship between space and movemen emphasizes the dynamic feature urban activities. It considers how n should be invested where."

It wasn't always so, of course. before detailing Curitiba's present cess, it's helpful to take a quick gl at the past. Public transportation b in Curitiba with the introductio

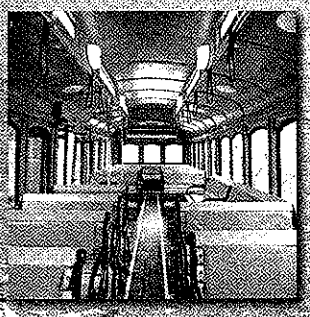
Curitiba's bus system acts much like a typical urban subway syste The conventional bus is modified so that the doors open directly o an innovative boarding tube station. The floor from bus to board tube is level.

INVEST IN LONG LASTING TRANSPORTATION

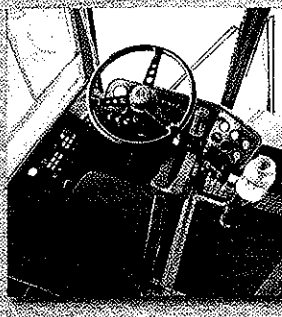
The Dupont Champlain 1608 Trolleybus is a reproduction of the original streetcars manufactured in the 1800's.

Several options availabl

The wheelchair lift system will be a Ricon F-9003.



Autocar Dupont may offer a various choice of colors for the inside of the Trolleybus.



The driver's console designed for the safety operation as well as th comfort of the drive

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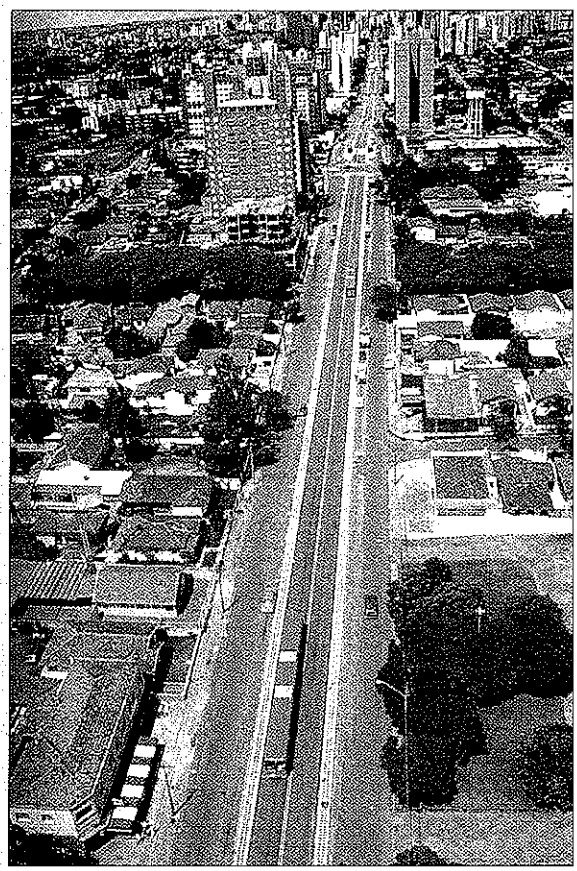
horse drawn vehicles in 1887. In 1912, electrically-powered street cars arrived, leading to conflicts between the two modes of transportation which the street cars eventually won. The first bus company emerged in 1928. The disputes now continued between the street car and the bus companies, with the buses winning. There was competition for passengers between the public and private bus fleet. There were frequent salary disputes involving drivers, unions, bus companies, and city governments, culminating in a strike in 1960 which left the city without public transportation for more than a week.

The ebb and flow of these conflicts meant that public transportation was often unreliable and inconvenient. As Rabinovitch explains it, at mid-century the city did not so much have a transportation system as a collection of mismatched concessions granted to private companies. There was no overriding system. Each bus company simply provided service in its designated area, reacting to changes rather than acting in concern with them. They operated without competition and often ignored districts with medium and smaller demographic densities. "Bus routes merely linked origin and destination pairs within the city," Rabinovitch says. "The city center was typically one element in these pairs. The confluence of routes in the central city increased central traffic congestion." He added that transfers between routes required payments of additional fares, increasing queuing and travel times.

Rather than attempt to impose some sort of ideal solution, the city began with what they had. They decided to use pre-existing roads. They already had buses, so were going to stick with those. An they had contracts with ten private bus companies, so they kept those. The city also came up with an innovative way to both relieve congestion and help the poor. Before implementing the transportation system, the city purchased and set aside for low-cost housing land near the newly formed industrial district (admitting only pollution-free businesses). The result was 40,000 dwellings for people who would not otherwise have been able to afford them, along with ready

Embarking passengers pass a turnstile and pay their fare to a co ductor in charge of the boarding tube, as in a subway station, th saving time taken to pay the fare on the buses. While passenge embark on one end, they exit on the other.

access to the some 415 companies in this area that now generate one-fifth of all the jobs in the city. The proximity of the employees to these jobs, about eight kilometers west of the city c naturally decreases the need for portation. And this was one of th ways the city decongested the mid the city from autom traffic. Instead, the cen the city is an arca shops and restaurant never close, an oas parks and pedestrian one of the few large town areas where the birds still sing.



The new public t portation system was i mented in 1974. Four key achievements c summed up under the gories of route design, ing, bus design, and payment.

ROUTE DESIGN

"Curitiba's road ne and public transport

Curitiba's road net work consists of th levels of service. T express lanes are first level which co of parallel roadwa This central road h two express bus la flanked by local ro

system are probably the most influential elements accounting for the shape of the city," Rabinovitch says. He describes the system as "trunk and branch" with three complimentary levels of service. The first is the express lanes. "Each of the five main axes along which the city has grown consists of three parallel roadways," he says. "The central road contains two express bus lanes flanked by local roads; one block away to either side run high capacity one-way streets heading into and out of the central city. Land-use legislation has encouraged high-density occupation, together with services and commerce, in the areas adjacent to each axis."

These interdistrict and conventional (feeder) buses are part of the other two levels of service which are integrated with the express buses.

The other two levels are interdistrict and conventional (feeder) buses. "One of the key concepts in the transportation system is the ease with which people can transfer from local buses to the express buses and back to other local buses," Rabinovitch says. "There is full integration between them." There are large bus terminals a end of each of the express busways w people can transfe intermunicipal or fe buses. Also, along express route, medi sized bus terminals located approxima every two kilometers are equipped with new per stands, public phones, post offices, small commercial fa ties. Passengers arri these stations on fe buses and transfer t express or interdis buses. Riders can transfer from the c coded red express buses (run through the structural axes) to ye feeder buses (circulating through outside the central city), which them to stations where they can tra to green interdistrict buses that fc

concentric routes linking outlying neighborhoods. All for one fare.

It took a bit of trial and error to coordinate the ten independent bus companies to work in an integrated fashion. But one of the main.dynamics in the solution, says Rabinovitch is that now "Bus companies are paid by the number of kilometers that they operate rather than by the number of passengers they transport, allowing a balanced distribution of bus routes and eliminating destructive competition."

Rabinovitch points out that this integrated trunk and branch system functions very much like a metropolitan subway. Passengers pay one fare to get into the system. Scheduled connections provide consistent service and convenience. Moreover, compared to under- ground systems, the capital costs of the surface bus system are low. Routes use ordinary city streets and there are no large scale excavations or tunnels to maintain. The city maintains bus speeds in the key dedicated bus lanes, and bus operators on the main routes can operate the traffic lights.

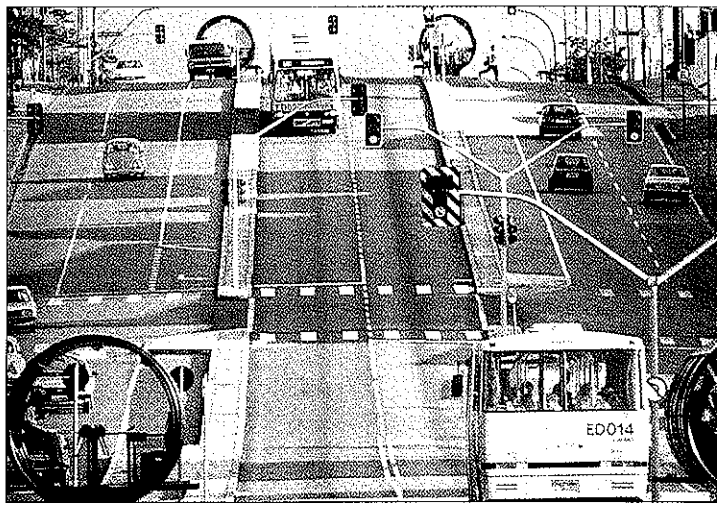
Another advantage is that the city can adapt the bus fleet profile to fit the demand volumes along different types of routes: large buses for the high volume routes and smaller ones for the lower volume, feeder routes. The system operates with minimum excess capacity, with a considerable reduction of both costs and congestion.

As a result of this system, reports Rabinovitch, "Average low-income residents of Curitba spend only about 10 percent of their income on transport, which is relatively low for Brazil. Although the city has more than 500,000 private cars (more cars per capita than any other Brazilian city except the capital, Brasilia), three quarters of all commuters — more than 1.3 million passengers a day — take the bus. Per capita fuel consumption is 2 percent lower than in comparable Brazilian cities, and Curitiba has one of the lowest rates of ambient air pollution in the country."

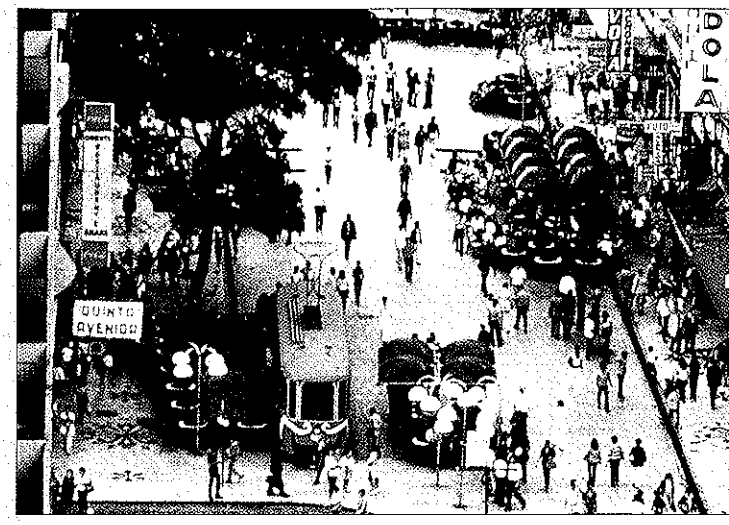
LOADING

The conventional bus is modified so that the doors open directly onto an innovative boarding tube station. The floor from bus to boarding tube is level. Without stairs to climb or having to step onto uneven pavement, passengers embark and disembark quickly. In similar fashion, the city has installed wheelchair lifts in these tubes, rather than on the buses, both easing weight restrictions and simplifying maintenance. "Buses with built-in wheelchair lifts are notoriously trouble-prone, as are those that "kneel" to put their boarding steps within reach of the elderly," Rabinovitch says. "The tube-stop lifts also speed boarding by bringing disabled passengers to the proper height before the bus arrives."

A priority busway runs through the heart of the city.



These tube stations are successfully integrated with city t fic. The pre-paid fare system allows for quicker boardin there is no obstruction to traffic.



This trolley bus in the middle of a busy district shows ho transport can be convenient while unobtrusive.

Embarking passengers pass a turnstile and pay their fare to a conductor in charge of the boarding tube, as in a subway station, thus saving the time taken to pay the fare on the buses. While passengers embark on one end, they exit on the other, reducing route times and increasing peak capacity. These stations also provide comfort and security for passengers waiting for the next bus.

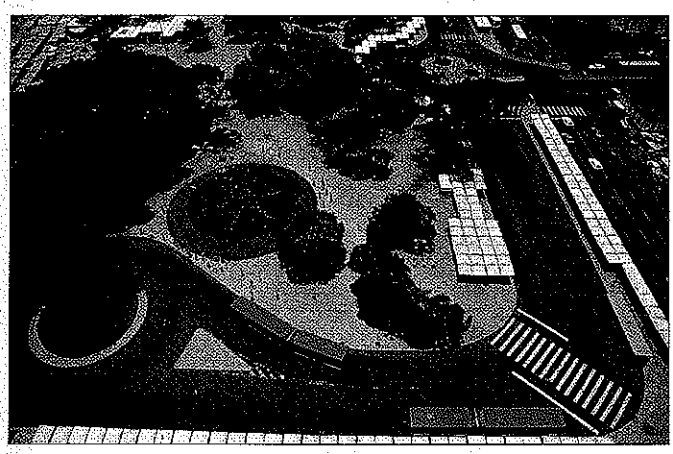
BUS DESIGN

"When Curitiba began to develop its integrated system, buses in Brazil had truck chassis," Rabinovitch says. "Assembly companies would install a standard bus body over a truck chassis and call it a bus." These buses had small doors, steep and narrow stairways, vertical exhaust pipes, and were bumpy, noisy, and uncomfortable.

Initially, bus companies wanted doors as small as possible to avoid fare evasion. They insisted on buses with only two doors. People would board from the rear, pay at the turnstile, then exist through the front. This was inconvenient, especially for high capacity vehicles. Curitiba gradually evolved toward three door buses, despite the fact that some manufacturers argued that three doors buses would not be structurally sound. Today the largest buses have five lateral doors, and there are about 33 bi-articulated buses, holding 270 passengers, among the largest buses anywhere. These operate primarily in the high demand, lower income district on the southeast periphery of the city and are able to "bend" around narrow street corners.

Passengers embark on an express bus which is co coded red.

The system allows for a full integration between the buses. People can easily transfer from local buses to the color-coded red express buses and then back to other locals.



This photo illustrates how Curitiba's urban planning is successfully integrated with mass transit.

"Now all major assembly groups operating in Brazil manufacture urban buses with turbo engines, lower floor levels, wider doors, and a convenient design for mass transit," Rabinovitch says. "As a ready buyer of improved vehicles Curitiba has helped develop the market and the standards for Brazilian mass transit buses."

Rabinovitch also adds that the cost effectiveness of system allows the city to keep its of 2,000 buses among the newe the world. The average bus is three years old. The city pays owners 1 percent of the value of a each month, then after 10 years t possession of retired vehicles and r bishes them as free park buse mobile schools.

FARE PAYMENT

A one fare payment system so simple. But, as Rabinovitch explai getting to that point was anything simple. The city knew that an inte ed system that required passenge pay a fare with every transfer woul time consuming, inconvenient, expensive for passengers. So, init Curitiba allowed unpaid transfers, l ever, after six or seven months, city discovered a major forgery of t paper transfers, so they dropped procedure.

The city then set separate fare feeder and express buses. Both op tional and social reasons brought experiment to a quick close. Fir resulted in delays as people had to and be checked twice. Secondl favored those who lived closer to structural corridors and express ro raising costs for lower income pe who used the feeder buses to com from the periphery of the city.

After l 1/2-years of the two-fare tem, the city dropped the second for the feeder buses. This had unfor consequences. A few months late driver wanted to work the feeder l

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because they had become "homes" for the homeless and mobile gathering places for the unemployed.

Officials then returned to the single fare approach. But rather than return to paper tokens, the next, solution was physical-fenced runways at transfer points between express and feeder routes separating transferring passengers from those who had not paid their fares. But these areas lacked aesthetic appeal, soon were overcrowded, and became known as "pig stalls." Convenience declined and complaints increased.

Many bikepaths supplement the busways.

In 1980, the system began to significantly improve conditions at the transfer points by constructing enclosed terminals. These follow the same basic design, working like subway stations on the surface. Flowers, trees, shops, glass walls and a pleasing architecture make them as lively and transparent as possible. Passen are free to walk i the terminals, s chat, make phone buy newspapers, change from one route to another out having to another fare. Pe who live in the n borhood pay their when they enter th minal through t stiles. These tra stations allow peop switch from one to another with as delay and inco nience as possible, make the one-fare tem workable.

Rabinovitch reports that the recent development of this highly cessful public transportation syste that it has been integrated into th municipalities surrounding Curitiba

LESSONS LEARNED FROM THE CURITIBA EXPERIENCE

By Jonas Rabinovitch

Why was the experience of Curitiba successful? I would like to highlight a few aspects which, in my opinion, contributed to the results described in this article.

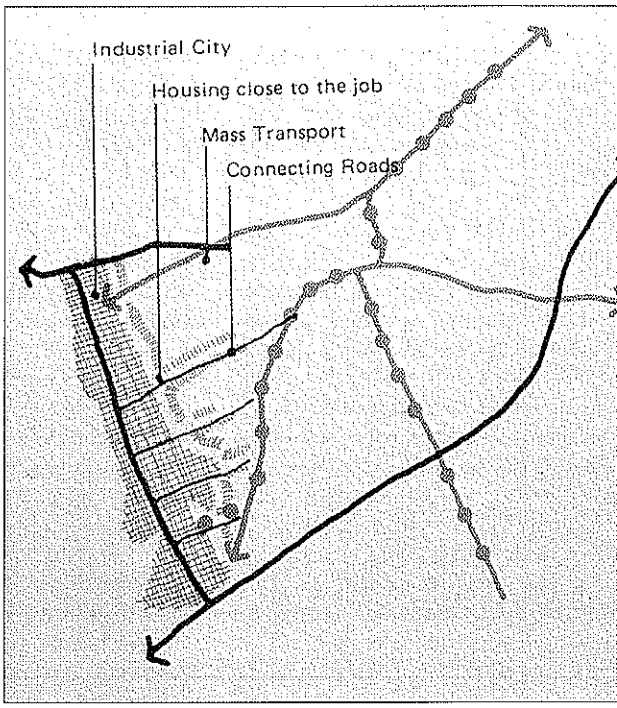
• In early 1970s, there was a "technological dogma" that cities with more than 1 million inhabitants should necessarily have a subway system. The city of Curitiba was presented with various subway options, but could not afford the high costs associated with it. Instead, the city embarked on an incremental process of small scale interventions, following a comprehensive plan which established a close relationship between mass transit, land use legislation and the urban road network. This approach provided an integrated framework to guide city development. The design and principles of the plan were widely disseminated, so that it acquired the support of the population throughout various municipal administrations. Transparency and common knowledge about the objectives of the plan also helped avoid corruption and land speculation.

• Mass transit, therefore became much more than simply a means for taking people from one place to another. It became a planning tool, an instrument to control and guide city growth.

• The vehicles, their routes, the integration points between routes and the surrounding land use became the key elements of the system. These elements altogether became more important than any specific hardware intervention.

• The system was developed in cooperation with the private sector. The city determines operations parameters and ten private companies provide buses and operate them. There has never been a financial subsidy and higher income areas within the city, allowing for a more equitable distribution of routes which is decided by the city. T resulting passenger-per-kilometer ra places Curitiba among one of the n efficient bus systems worldwide.

• The human element has always b important. The mayor who initiated plan, Mr. Jaime Lerner, exercised p tive will by giving total priority mass transit and priority for pedestr in the central area. Mr. Lerner be the establishment of a team of l committed professionals who hel develop local solutions to increas problems. Curitiba used to have highest rate of metropolitan growt Brazil during the early 1970s at 10 cent a year. This case also dem strates the importance of making correct decisions at the right ti Throughout the world, mass tra solutions are normally considered when it is already too late or too ex sive to make full use of their potenti



This map shows how the transportation system is integrated with Curitiba's urban life.

Michael J. Major is president of Major Enterprise Anacortes, WA. This article was drawn from interviews Mr. Rabinovitch and the following: Curitiba: Town Sustainable Urban Development, Jonas Rabinovitc Environment and Urbanization, Vol 4, No. 2, pages 62 October 1992; Environmental Innovations and Manage In Curitiba, Brazil, Jonas Rabinovitch with Josef Leitn United Nations Development Program, Habitat and W Bank, Urban Management Program, Working Paper Se No. 1, June 1993; A Sustainable Urban Transporta System: The "Surface Metro" in Curitiba, Brazi Rabinovitch and J. Hoehn, Environmental and Nat Resources Policy and Planning Project, Working Paper 19; May 1995 (ISSN 1072-9496); Urban Plannin Curitiba, by J. Rabinovitch and J. Leitman, Scien American, pages 46-51, March 1996; Innovative Land and Public Transport Policy, The case of Curitiba, Brazi J. Rabinovitch, Land Use Policy, Vol. 13, No. 1, pages 5 1996, Elsevier Science Ltd., printed in Great Britain.

Jonas Rabinovitch has been a planner and adviso Mayor Jaime Lerner of Curitiba since 1980. For the four years, he has been with the United Nations Develop Programme at the UN in New York. He is senior urban ronment advisor and manager of the urban develop team. Mr. Rabinovitch is currently engaged in the prep tion of sustainable mass transit strategic elements t shared with more than 130 UNDP country offices world and with other UN partners.

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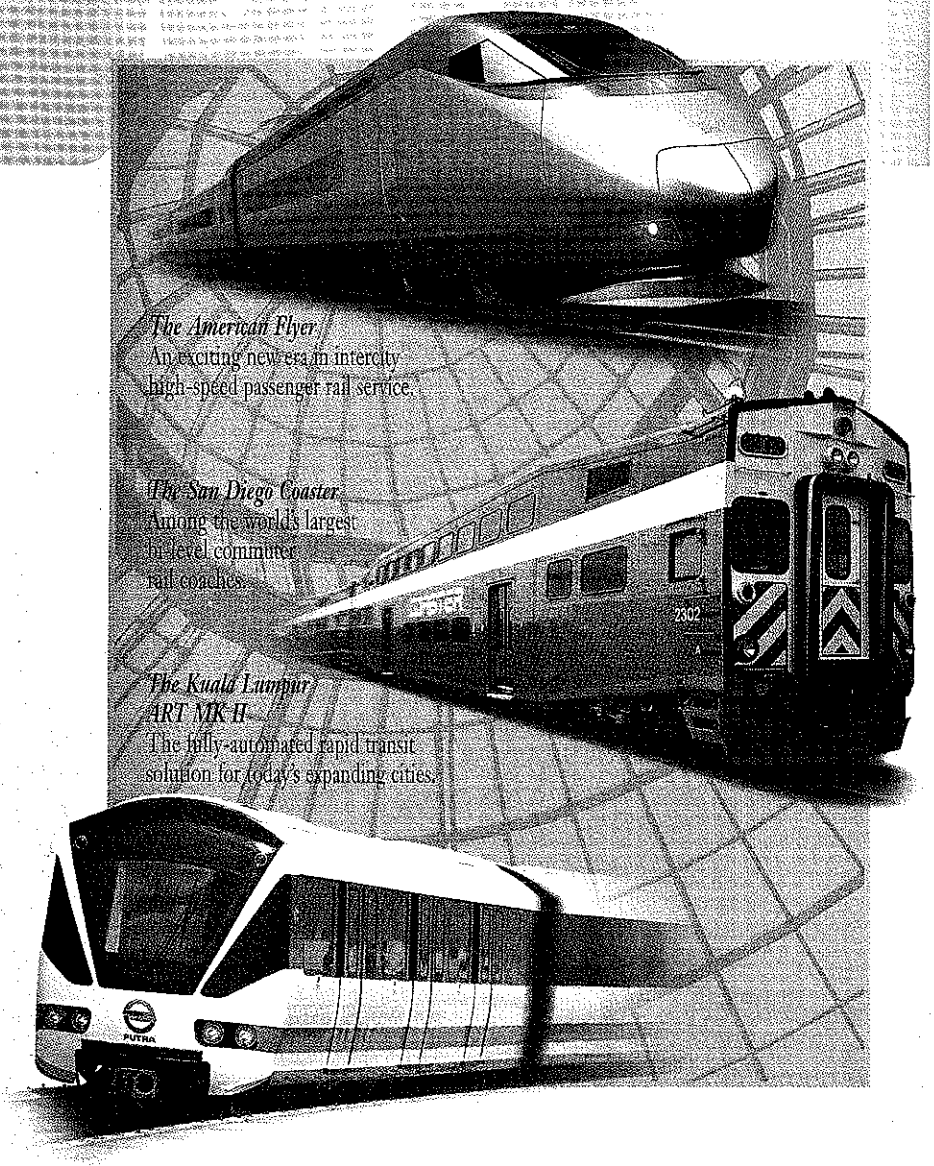

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BY LAWRENCE J. FABI

Peoplemovers lead the way in new rail automation systems

A comprehensive look at how peoplemover systems are providing new and innovatively automated mobility options for urban centers around the world.

All automated monorails are peoplemovers, bu not all peoplemovers are monorails. This one, which is both, opened at Newark Airport last year. Courtesy of Adtranz

What is the capacity of an automated peoplemover? What is the experience with those spiffy little trams that we encounter so often in airports and entertainment complexes? Are they reliable and economic? Without drivers, are they safe and secure? How many are there, and who makes them these days?

Peoplemovers come in different sizes. The bigger ones are known as automated guideway transit — or AGT. Vancouver's driverless SkyTrain now has over a decade of service under its belt. Many more operate in France and Japan. Does this experience suggest a good future for widespread use of peoplemovers? Can AGT outperform modern, communication-enhanced rail transit? Can AGT service be more attractive than our old friends — light rail, rapid transit, and electrified and diesel-powered commuter rail?

More modestly scaled peoplemovers are often called monorails, whether or not they fit the notion of vehicles straddling or hanging from single beamways. These APMs — no matter what propulsion and suspension technologies they use — definitely do not compete with conventional rail for capacity. That is because they are designed to carry only 1,000 to 5,000 passengers per hour per direction. They are lighter, with significantly smaller station and guideway dimensions.

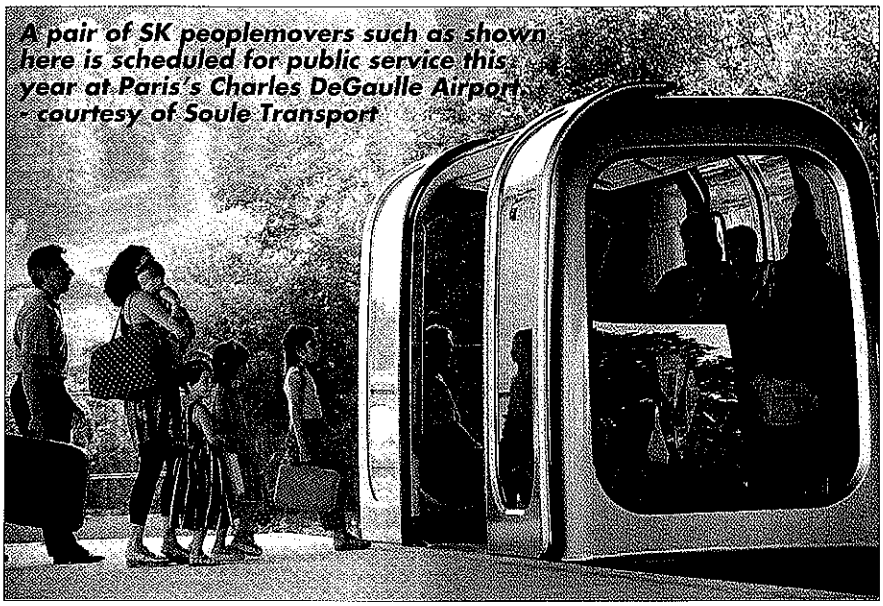
More recently, two new kinds of peoplemovers have emerged. Hectos (short for hecto-metric, for a few hundred of meters) are designed for the short-haul — simple, cheap s tles. They don't need corridors to function. Neither does — or personal rapid transit, which promises to elevate tr service into the realm of automated taxis.

HIGH CAPACITY IS NOT KEY

Before we begin to explore the experience of peoplemo and compare them to line-haul rail transit, let us po whether questions of capacity are relevant. In today's de tralized cities, is line-haul transit the most pressing prob Will marginal improvements to line-haul systems make r of difference in the overall performance of mass transit tive to the automobile.

After all, mass transit serves only about 2-3 percer urban travel. The lion's share is by car, increasingly w and between suburbs — not along corridors radiating out the CBD. Travel is more and more dispersed. Does it r sense to search out only for dense corridors where high umes can be attracted to rail transit? As the popular song few years back lamented, mass transit may be "lookin love in all the wrong places".

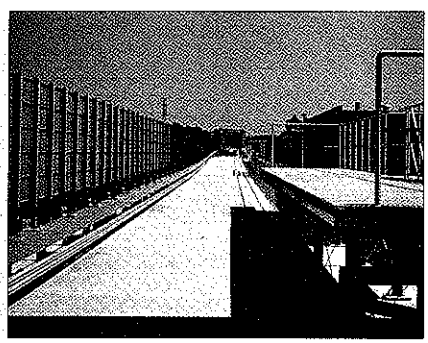
Most people, it seems, try to avoid getting packed int kinds of dense urban corridors that make rail work effecti Over the last five decades city-dwellers have been ste dispersing to areas where rail transit is just not economic.



A pair of SK peoplemovers such as shown here is scheduled for public service this year at Paris's Charles DeGaulle Airport. - courtesy of Soule Transport

in suburbs and edge cities that we need answers to brighten transit's future. The relevant questions are — how can people get to all the places they want to go, when they want to go, without driving?

APMs serve local circulation needs, which typically do not require high capacities. Hectos provide short-haul linkages that can help configure efficient activity centers. PRT functions as a network with high quality, premium service. These are the needs served by peoplemovers. They can reinforce existing rail transit. Wisely planned, they may become commonplace in tomorrow's urban landscape.



Otis is using this test track outside Tokyo for testing linear induction propulsion for its air-floated peoplemovers. Courtesy of Otis Transit

AN EXPANDING MENU

A peoplemover is a system of vehicles running over exclusive, fully segregated guideways. They have enough electronic intelligence to function without vehicle and station attendants. Operators are instead concentrated in a control center, efficiently monitoring computer and video displays of system conditions. Larger peoplemovers tend to have mobile attendants circulating through vehicles and stations.

It is within airports that peoplemovers have established themselves. Today twenty airports function with peoplemovers. Some carry very large volumes of passengers and operate throughout most of the day and night. Their record clearly shows that peoplemovers respond admirably to the critical circulation needs with dependable, reasonably priced service.

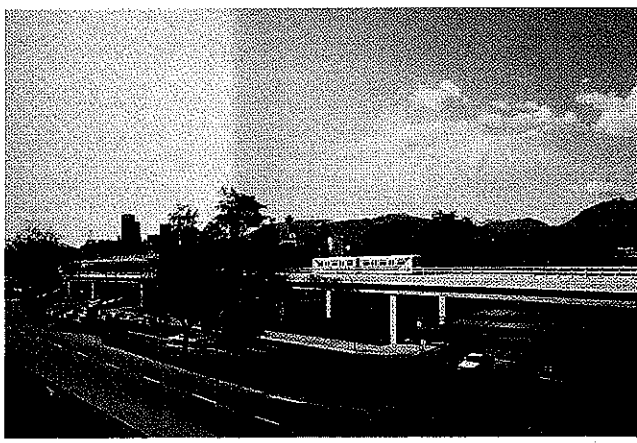
The most heavily used airport peoplemover is the Westinghouse (now ADtranz) line that forms the spine of Atlanta Hartsfield Airport. No fares are charged, so truly accurate ridership statistics are not readily available. Best available information estimates that 200,000 people use it on a typical That makes it as large as the transit tems for some fairly large cities.

About fifty more airports have ex sion plans that rely on an increas interesting menu of peoplem options. ADtranz, Bombardier, M Mitsubishi, and Otis have solid qual tions in airport projects. Their pro have satisfied the demands of airpor vice at costs of about $30 millio mile and up. Last year, intense bi on an peoplemover circulato Singapore ended with a price the eq lent of $44 million per mile for tech gy similar to most airport systems.

Airport planners are taking o next level of seriousness. People-m have reached out to remote parki Newark and Chicago O'Hare and hope to connect JFK Airport to York City's vast rail networks. schemes include peoplemover lin off-airport hotels, office parks, car facilities and intermodal stations.

There are many active peoplem projects outside the airport sect well. Driverless metro lines ove and circulators in leisure parks, ca and other small activity center underway. In total, some 80 pe movers operate around the world $6 billion in new projects can be c ed in the current peoplemover pip worldwide.

After little R&D work in the 1 investment on several fronts is ex ing the family of available pe mover technologies. For exam Otis Elevator's shuttle divisi



Vancouver's SkyTrain looks like a conventional ra line, but functions without drivers. Opened in 198 it now carries about 120,000 passengers daily. Courtesy of Bombardier/UTDC

Many urban settings are not dense enough to even consider rail transit. Courtesy of WalkBoston

working at two test tracks — one with linear induction propulsion in Japan and another for cable systems with Pomagalski in France. The Chicago RTA and Raytheon are testing personal rapid transit. The Paris Metro Authority RATP expects to establish full credibility soon for Soule's detachable, cable-drawn cars at Charles DeGaulle Airport.

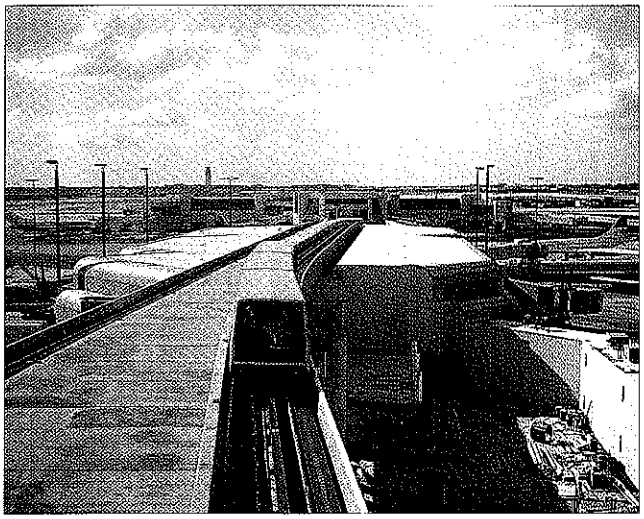
Other credible suppliers are entering the peoplemover market from other fields. Doppelmayr, Garaventa, Leitner, and Yantrak are adapting ski-lift and gondola hardware for the urban market. Schindler's elevator and rail expertise is being drawn upon in Switzerland. American Maglev and System 21 hope to expand upon their scale models and test beds. In Sweden, Uppsala's bus company is running test a track.

Many other inventors are searching for venture capital to test their ideas for the next generation of peoplemovers. Most of them will fail to gain a foothold in the peoplemover market, or stumble or fall on their first proj But it is clear that today's planners more credible peoplemover option tomorrow's projects.

AGT IN FRANCE AND JAPAN

There are now eleven highly or automated circulation systems in Ja and four driverless metros in France. Brussels-based International Pu Transport Union (UITP) has been mo ing their performance, as well as Lon Docklands Light Railway and Vancouver SkyTrain mentioned ea Their conclusions deserve our attentio

"Automated metros ... offer tre dous flexibility in adapting service to demand," proclaims a report of UI International Metropolitan Comm AGT technology "enables excepti service quality in terms of service l way and adapting services to deman well as operational savings by virtu the absence of drivers," continue June 1995 report. An update will be



This early peoplemover at Miami International Airport was supplied by Westinghouse, now part of ADtranz. Courtesy of the Boston Redevelopment Authority

sented at UITP's World Congress in Stuttgart, Germany, this June.

Much of UITP's confidence rests on the solid performance of Matra's VAL projects in France. The first line opened in Lille in 1983 and increased transit ridership beyond official expectations. It is a 13-kilometer metro, partially underground with long elevated sections as well. A second line of 12km opened in 1989. Together they have become a part of the daily pulse of life in this industrialized area near the Belgian border. They carry about 230,000 passengers per day — about 50 million annually. Work on a third line is underway.

French officials brag about VAL's, which is an acronym for "light automated vehicle". Labor productivity is more than double comparable metros. Every staffperson on Lille's two serves an average of 175,000 trip year. This is admirably high pared to an average of only 80 trips per year per employee on ten ventional metros.

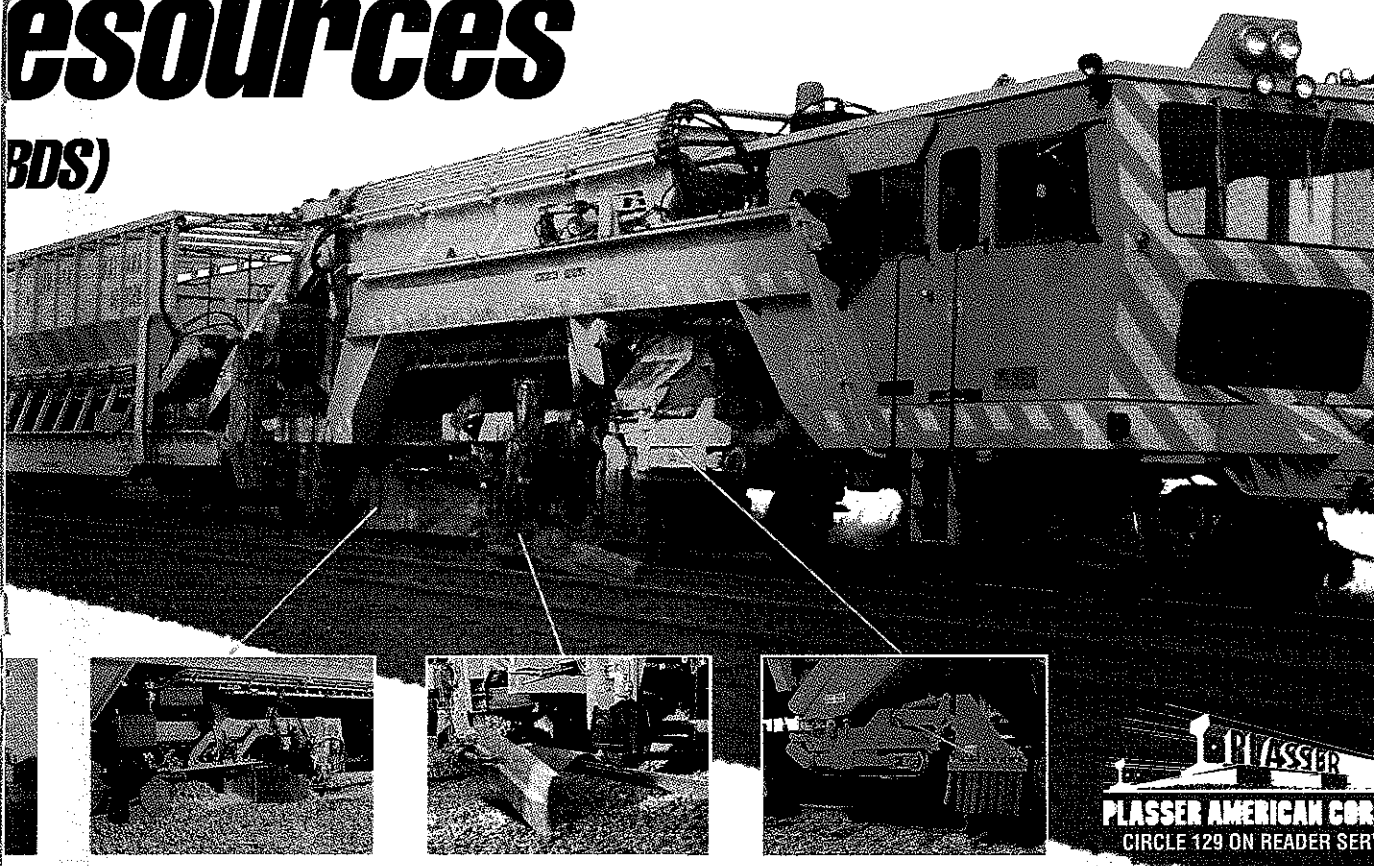
For the two VAL lines in Lill fare recover ratio is an amazing percent. This is, fares more than O&M costs. This cash inflow Lille's overall fare recovery ratio f of Lille's public transport to 68 pe In France, the national average in l cities is 55 percent.

CUTTING EDGE PRT

On the cutting edge of peoplen technology is PRT. An old co from the 1970s, it has been revive Raytheon and the Chicago Reg Transit Authority. Outside Bost test track now runs. Sophisticated promises service more akin to aut ed taxis than light rail. If deploy large fleet of four-passenger veh will serve moderately dense fl

esources

BDS)



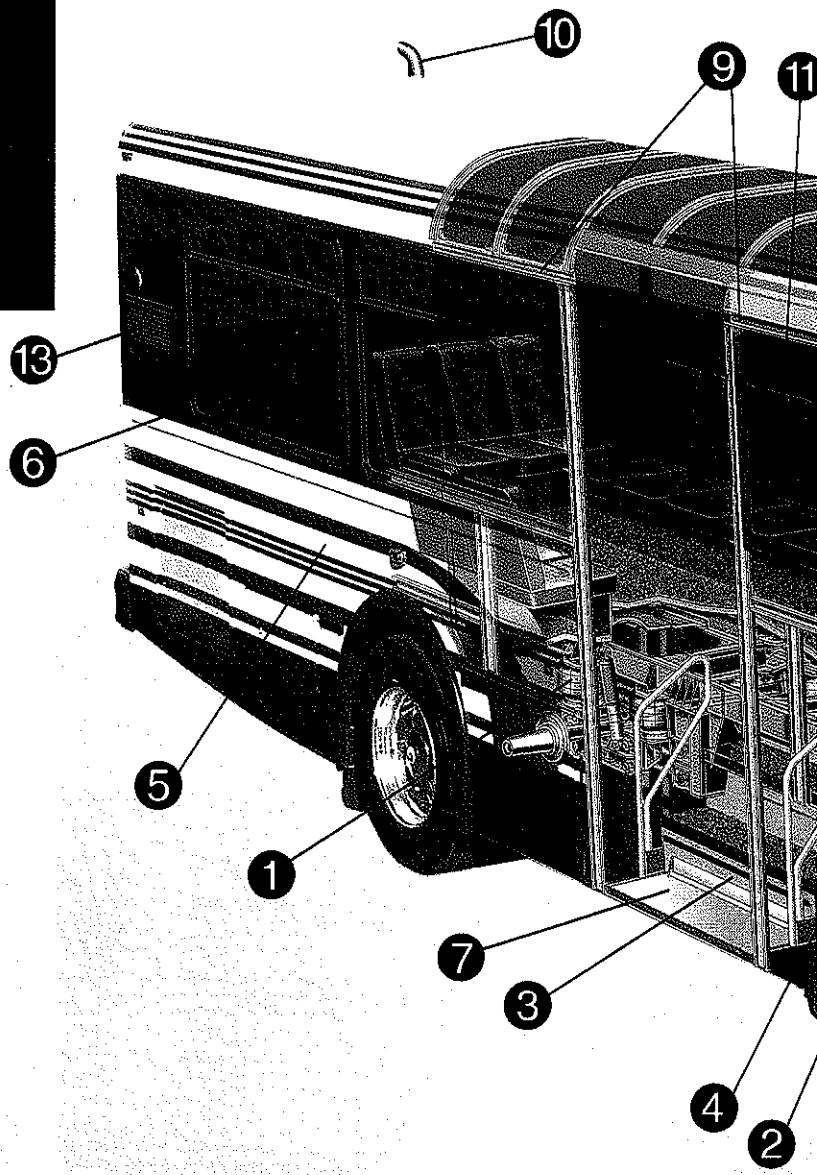
Center ballast placement plow.

Front shoulder profiling plows.

Ballast distribution conveyor units.

HOW DID OUR NEW 30' BUS ENDURE THE TORTURES OF TESTING?

LET'S JUST SAY IT TOOK GUTS.



1. Ridewell four bag per axle heavy-duty suspension, rating 13,000 lbs. front, 25,000 lbs. rear.
2. Heavy-duty 50,000 psi steel frame with 9 5/8" rails and full length liners. All permanent items attached with HUCK-SPIN fasteners.
3. "Mirage" cassette lift hidden behind first step riser for simple and quick special-needs accessibility.
4. Extra heavy-duty cross members in axle areas.
5. Smooth sides free of visible fasteners.
6. Transit-duty windows available in "T" slider, full slider, and "tip-in" transom top.
7. 41 1/2"-wide center door with stainless steel stepwell.
8. Structure to house a Luminator GTI® Mega:Max electronic sign.
9. New heavy-duty construction with continuous headers and 6"-wide boxed vertical members.
10. Roof exhaust.
11. Perimeter, forward-facing, or combination seating with flip seats at wheelchair positions.
12. Interior formica side wall and ceiling, RCA Rubber flooring, fluorescent lighting with cove advertising.
13. Rear, deck-mounted Thermo King T-2 air conditioning and heating, ducted throughout.

When Blue Bird enginee
recently completed the new 3
Q-Bus, they were pretty su
they had a winner. But it wa
until they visited the Federa
government's vehicle testing
facility in Altoona, Pennsylva
that they knew for sure.

There, this remarkable tra
& shuttle vehicle clearly show
its mettle, thanks to a new hea
duty chassis, suspension, and
body construction. But for a
its toughness, the new 30' Q
also has a softer side, thanks
its stylish interior options ar
comforts.

For more information on
this gutsy new bus, contact y
nearest Blue Bird commercia
distributor or write: Blue Bir
Commercial Division, 3920
Arkwright Road, Macon,
Georgia 31210.

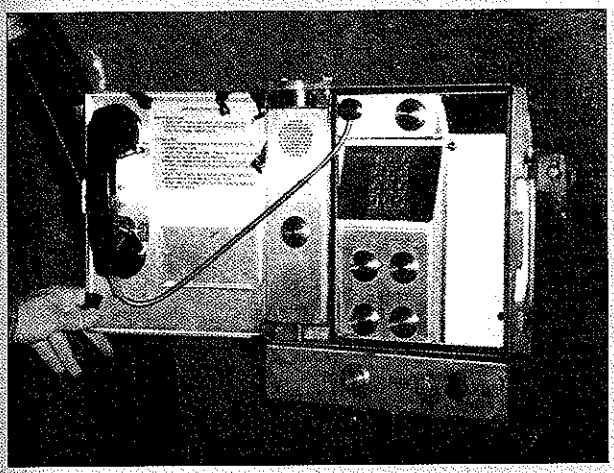
QUALITY BEGINS WITH A
THE NEW 30' Q-BUS

BLUE BIRD

RAIL PRODUCT SHOWCASE —
This month, Mass Transit features a showcase of products gear specifically towards the Rail Transportation Industry.

COMMUNICATION SAFETY STATIONS INSTALLED IN NYC RAILROAD TUNNELS

As part of the Northeast Corridor Renovation Project in the New York City tunnels by Amtrak and the Long Island Railroad (LIRR), a new Communication and Control System for the control of routine and emergency railroad operations within the New York City tunnel network and Penn Station is currently being installed. A main part of the overall system are the wayside Communication Safety Stations (CSS). Although they resemble regular public telephones, the CSS units are custom made and highly specialized communication devices that serve multiple functions.



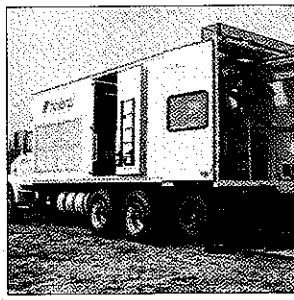
The units are made for Amtrak by Emergency Response Telephone manufacturer Vandal-Proof Products, Inc., Trenton, NJ. They are designed in cooperative effort by Amtrak/LIRR, the Architectural & Engineering firm of The Kling-Lingquist Partnership, and Vandal-Proof. The electronics are housed in a NEMA-4 rated case fabricated of heavy gauge stainless steel with all joints sealed against steel dust intrusion. The outside area features a full duplex, speakerphone which is available to the public for emergency use. Behind the door is a full function telephone and an all-metal keypad. There are four special purpose buttons that allow speed dialing to certain spacial numbers, area paging capability, connection to the power director. Visibility in tunnels is enhanced by back-lit laser pierced lettering and direct LED lighting of the keypad and all aspects of the CSS are sealed against elements commonly found in tunnel environments.

The units use microprocessor-based telephony circuitry and all the communication electronics are contained on a single circuit board accessible from the rear of the CSS. A key feature of the electronic design is the ability to remotely program and diagnose the units. The entire system of over 600 CSS units is connected to the VPP PR1150 Supervision System, which is integrated into the Communication and Control System. The PR1150 is a PC-based software/hardware system designed specifically to supervise, program, and run unattended diagnostics on an unlimited number of VPP microprocessor-based telephones and completely eliminates the need for site checks of the units and provides printed reports of diagnostic results. Direct connection for Fire Department and EMS communication equipment is provided on the front face of the bracket. The award to supply 622 CSS units was made to VPP in July of 1995. To date, over 500 CSS units have been delivered and tested. The microprocessor/firmware architecture of the T1300 CSS units allows straightforward customization to other transit applications.

Vandal-Proof, Inc.
Circle 248

IN-TRACK RAIL WELDI

The Holland Company ha the 130 Ton Welderhead rail welding, said to be capacity presently in use. head makes possible rail-g welding. This eliminates th



rail puller or any other trac and eliminates the associat The welderhead can pull strings in excess of 2,000 have more than enough res ensure a properly forged e butt weld. The servo-valve controlled and automaticall rail drag. This allows the to make rail gang closure consistency.

Holland Company
Circle 249

SOAKING UP RAIL GR

A high performance petrol designed to capture oil while reducing contamina road ties and ballast (roc

introduced by 3M. The Ra Blanket helps prevent gre fuel from contaminating ti