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Véhicules propres à faible consommation

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ULTRALIGHT MASS TRANSIT VEHICLE (UL MTV)

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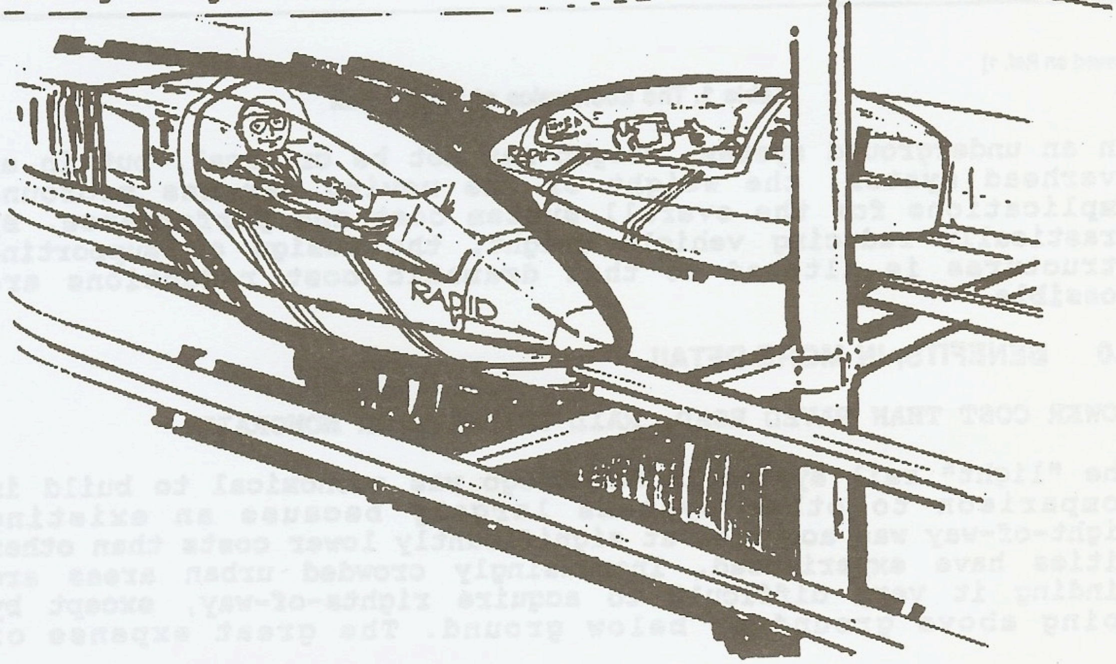
1.0 INTRODUCTION

Proposals abound for so-called "light" rail systems in major cities around the world. The term invokes the notion of light weight and low cost, but this is not the case. "Light" merely refers to light duty service, i.e., something substantially less than the 300,000 passengers per day that is the typical level for major subway routes.

The authors offer a patented Ultralight Mass Transit Vehicle (UL MTV). [Ref. 4] The UL MTV is a "Passenger Transportation System for Self-Guided Vehicles" on a fixed guiderail which weighs less than 100 kg per passenger. With an estimated top speed of 160 km per hour, the passenger's average speed is estimated to be double that of "light" rail. Superstructure costs are estimated at a small fraction of the cost of typical elevated or monorail systems. Operating costs may be as little as 1/3 that of "light" rail. With costs so low, it will be possible to build complete service grids at 1.5 km intervals (so that no one would have to walk more than 3/4 km) at less cost than single-line systems only servicing a major axis.



2.0 COMPARING THE UL MTV TO "LIGHT" RAIL

A recent survey of modern "light" rail systems in the United States reveals that these systems, with few exceptions, are very expensive and under-subscribed. (See Table 1, The Economics of "Light" Rail.)

It is estimated that the underground Metro "Red Line" in Los Angeles will cost $5.3 billion for 23 miles (37 km) of track, or $140 million per kilometer, to handle 385,000 passengers per day or $370 per passenger-km of capacity. By contrast, "light" rail systems are costing $5-53 million per km, supporting 45,000 kg "light" vehicles typically carrying 160 passengers (at 280 kg/passenger). With far lower carrying capacity, the cost per passenger-km can be significantly worse than metro systems. For example, in Los Angeles, the "Blue Line" of 35 km length, built at a cost of $877 million ($25 million/km), with ridership of 40,000, costs $625/passenger-km, twice that projected for the Metro "Red Line." [Ref. 1]

	mi	km	#Trips daily	Cost (millions)	Cost/km (millions)	Cost/trip (/rider)
Buffalo	6	10	29,900	$536	$53	$17,926
Los Angeles	22	35	40,000	877	25	21,925
Pittsburgh	23	37	32,500	539	15	16,585
San Jose	21	34	21,000	500	15	23,810
St Louis	18	30	22,000	351	12	15,955
Baltimore	23	37	13,000	364	10	28,000
Portland	15	25	24,500	214	9	8,735
Sacramento	18	30	23,400	176	6	7,521
San Diego	36	59	45,000	308	5	6,844
	181 tot	297 tot	27,922 ave	$3,865 tot	$13 ave	

[based on Ref. 1]

Table 1. The Economics of "Light" Rail

In an underground system, weight may not be critical, but in an overhead system, the weight of the moving car has profound implications for the overall system cost and performance. By drastically reducing vehicle weight, the design of supporting structures is altered so that dramatic cost reductions are possible.

3.0 BENEFITS, IN MORE DETAIL

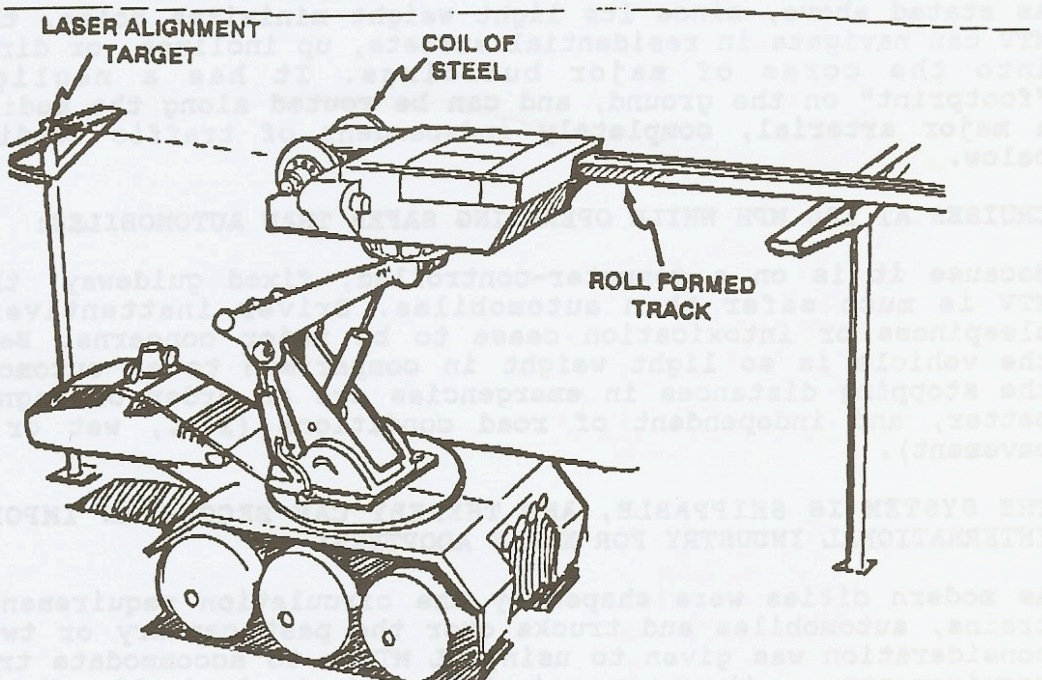
LOWER COST THAN PAVED ROAD, RAIL TRANSIT, OR MONORAIL:

The "light" rail system in San Diego was economical to build in comparison to other systems largely because an existing right-of-way was acquired at significantly lower costs than other cities have experienced. Increasingly crowded urban areas are finding it very difficult to acquire rights-of-way, except by going above ground or below ground. The great expense of underground transit is obvious, and only appropriate in dense corridors. Overhead routes might be economically attractive, but it is impossible to build anything but a massive superstructure for a "light" rail system supporting 45,000 kg "light" vehicles in the air. As stated above, because the UL MTV is actually light in weight, the superstructure can be dramatically less massive, and therefore less expensive. Furthermore, the noise level of light weight vehicles will be negligible compared to the noise level of 45,000 kg vehicles.

While the individualized vehicle will be relatively expensive for its size compared to an automobile, it will be more economical as a part of a system, because it will be used on demand many times a day, and will travel at high speed. And as pointed out above, its light weight reduces the cost of supporting infrastructure.

CAN BE ERECTED FASTER THAN ANY PAVED ROAD, RAIL TRANSIT, OR MONORAIL:

Once tubular towers are positioned, the track for the UL MTV could be continuously manufactured in place by a mobile rail forming machine. Thus a very strong and stiff "monorail" track could be produced to follow the available terrain. Alternatively, a structure of trusses or remotely fabricated beams could readily be brought into position in the field.



CAN MOVE MORE PEOPLE PER HOUR THAN ANY PAVED ROAD, RAIL TRANSIT, OR MONORAIL:

With computerized vehicle controls and on-demand departure times, the UL MTV moves people out of a station upon their arrival. There is no waiting time, so the passenger movement is seamless.

Travel speed of the rider is very much a function of the waiting time. For any transit system, a 20 km trip at 120 km/hr takes only 10 minutes. But waiting at 0 speed for 10 minutes drops the average speed to 60 km/hr. With on-demand UL MTV, there is no waiting. This increases the rider's speed, while reducing congestion at station platforms.

REQUIRES 5-10% OF THE ENERGY OF AN AUTOMOBILE TO OPERATE:

Because of its light weight, the individual passenger "pod" requires only a tiny amount of energy for propulsion. Using Magnetic Levitation (Maglev), the preferred (but by no means only) solution to propulsion, the friction and aerodynamic drag of the individualized pod are reduced to a minimum. Energy costs therefore are dramatically reduced relative to other forms of transportation, especially the automobile. The inventor claims the equivalent of 60 to nearly 200 kilometers per liter (150 to nearly 500 miles per gallon), depending upon the vehicle configuration (that is, number of passengers, reduced frontal area if passengers travel in tandem, etc.).

AS AN OVERHEAD SYSTEM, IT IS NOT CONSTRAINED BY SURFACE TRAFFIC CONGESTION:

As stated above, since its light weight minimizes noise, the UL MTV can navigate in residential streets, up inclines, or directly into the cores of major buildings. It has a negligible "footprint" on the ground, and can be routed along the median of a major arterial, completely independent of traffic conditions below.

CRUISES AT 100 MPH WHILE OPERATING SAFER THAN AUTOMOBILES:

Because it is on a computer-controlled, fixed guideway, the UL MTV is much safer than automobiles. Driver inattentiveness, sleepiness or intoxication cease to be major concerns. Because the vehicle is so light weight in comparison to an automobile, the stopping distances in emergencies are an order of magnitude better, and independent of road conditions (i.e., wet or oily pavement).

THE SYSTEM IS SHIPPABLE, AND THEREBY CAN BECOME AN IMPORTANT INTERNATIONAL INDUSTRY FOR EARLY ADOPTERS:

As modern cities were shaped by the circulation requirements of trains, automobiles and trucks over the past century or two, no consideration was given to using UL MTV's to accommodate traffic requirements -- they were simply not technologically feasible. Now, with the advent of computerized controls and ultra-light composite materials, it is not only possible, but it will ultimately be essential for humanity to develop advanced transportation systems similar to the UL MTV described here.

In many areas of the world, where vested interests and massive transportation investments are already entrenched, it will be decades before such changes will take place. However, because of its unique air quality problems and major industrial base, Mexico city is well positioned to become the first or at least one of the first cities to install an UL MTV system. Once the merits of UL MTV's become evident in the global marketplace, they will be in great demand worldwide. The country with an industry poised to supply this global marketplace will reap benefits far beyond the improvement in its own traffic conditions.

4.0 CONCLUSION

Just as the USA became the initial dominant manufacturer of automobiles because of its need for a form of transportation to get across the nation's wide-open spaces, so Mexico could become the dominant manufacturer of the UL MTV because of its health needs, thus providing employment and wealth, capitalizing on its success in addressing a severe air pollution problem which once existed.

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