Personal Rapid Transit: An Unrealistic System

by Vukan R. Vuchic

The concept of " Personal Rapid Transit ," or PRT, was conceived nearly 30 years ago. It is supposed to have an extensive network of elevated guideways--light concrete or steel beams on columns--with stations every 2-3 blocks. Small, electrically powered vehicles, with 3-5 seats, would carry passengers automatically to any station in the network.

Passengers would climb to elevated stations and call for a vehicle. Each person, or a party of 2-5 persons, would take a separate vehicle. The passenger would punch buttons to code his/her desired destination, and the vehicle would travel there without stopping. To achieve this, each station must be off-line: there must be at least one "side-track" for vehicles which are stopping, so that other vehicles can bypass them.

To a layman, this concept may appear attractive: we could finally travel through cities without the annoying problems of congestion and parking. But a systematic technical analysis shows a far less favorable picture.

Transportation systems with guideways (rail, monorail, or other technology), stations and sophisticated automation require substantial investment costs. Therefore, guided systems are economically justified only when they have spacious vehicles, such as light rail or rapid transit trains. The high capacity of these vehicles allows transportation of large passenger volumes. Small vehicles, on the other hand, are efficient for low-density travel, but very inefficient in serving large passenger volumes. Thus, private cars are ideal vehicles in sprawling residential suburbs, but inefficient in high-density central urban areas. This is seen daily on our streets and freeways, which offer the lowest level of service during peak hours, when traffic volumes approach road-way capacity.

The PRT concept is imagined to capture the advantages of personal service by private car with the high efficiency of rapid transit. Actually, the PRT concept combines two mutually incompatible elements of these two systems: very small vehicles with complicated guideways and stations. Thus, in central cities, where heavy travel volumes could justify investment in guideways, vehicles would be far too small to meet the demand. In suburbs, where small vehicles would be ideal, the extensive infrastructure would be economically unfeasible and environmentally unacceptable.

The PRT concept is thus a totally unrealistic "Buck Rogers" concept for which there are no applications where it would be operated efficiently and economically. This

design incongruence makes many other problems with PRT irrelevant. But, a few of them are worth mentioning to further illustrate the impracticability of the concept.

To provide a good service in an area, the PRT system is conceived to have an extensive guideway network and many stations. Would neighborhoods allow construction of extensive elevated guideway networks and stations with double guideways in residential streets, not to mention the legally-required lifts for the disabled?

Suppose a PRT system has a station near a large office building. At lunch time, 80 persons come from the building to travel to different points on the PRT network. To serve them, the PRT system should be capable of providing some 50 vehicles in a few minutes. That can be done only if a very large number of vehicles cruise empty--an expensive operation. (more detail on this issue).

During the 1970s, the PRT concept attracted the attention of many theoretical analysts who focused on optimizing operational algorithms without considering its fundamental unfeasibility. Having been rejected for each proposed specific deployment, the PRT concept was forgotten during the 1980s. However, several years ago, the Chicago Regional Transportation Authority energetically embarked on the planning and design of a PRT system intended to provide residents of suburban areas with a faster, more convenient access to regional rail (Metra) stations and thus reduce driving and increase ridership. Subsequently, the Raytheon Company made an investment in the technical development of this system (called PRT 2000) and several developers got interested in building a PRT system to reduce street congestion. How was this idea revived, albeit now in a different function: as a suburban feeder to rail transit rather than an extensive intracity network?

The concept was presented to the Board of Metra as a "system of the future." Several public officials from the Chicago area then visited Morgantown, West Virginia , where an AGT (automated guided transit) system has been in operation since the mid-1970s. Popularly but incorrectly called "PRT," this system provided good service between the city and university campus.

The visitors from Chicago believed that they saw that the system they are planning works very well. The problem, however, is that the Morgantown system is not a "PRT": it is fundamentally different from the system conceived for Chicago. The Morgantown line serves, and in most cases, stops at several stations along a heavily traveled corridor. Its vehicles carry up to 16 persons, similar to a minibus; the Chicago PRT is conceived to carry separately single persons or related groups, like a private car. Thus, if 15 persons want to travel, they would use AGT vehicle in Morgantown, while in Chicago they would need 10-12 PRT vehicles, involving much higher cost

and longer waiting. The claim that the PRT vehicles are so small that their guideways and stations will be cheaper than those for AGT systems is true, but the cost difference would be far from compensating for the concept's inherent inefficiencies. Actually, should the planned PRT system be heavily used, an AGT system would be much more efficient and less costly.

If the PRT attracts few customers, it would represent an expensive version of the private car. Is that what is needed, when the main cause of our congestion and waste in transportation is caused by our excessive reliance on private vehicles with low occupancy?

The PRT concept has been rejected as unrealistic during the last three decades by dozens of cities in North America, Europe, and Japan. If such a system gets built in a Chicago suburb (Rosemont), it will be useful to demonstrate the deficiencies of the concept by a real-world experiment.

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