Abstracts of Papers

ANALYSIS OF SHORT RAMPS FOR DUAL-MODE AND PRT STATIONS

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The paper is the result of continuing efforts to understand the safe-headway trade-offs for personal rapid transit (PRT) and dual-mode systems (DMS). It adds a new dimension to the traditional interactions among control complexity, safety, and acceleration constraints. The new dimension is the possibility of greatly reducing or, in some cases, eliminating the ramps leading into and out of stations. Conclusions reached for point-follower systems are as follows.

1. The acceleration ramp out of an off-line PRT or DMS station can usually be eliminated with no reduction in safety or increase in main guideway headway. Most, if not all, of the acceleration can take place on the main guideway.
2. Conclusion 1 appears to be relatively independent of system parameters and the resolution of the control and failure detection systems.
3. Appreciable portions of the deceleration ramps can be eliminated if headway is only moderately greater than that required on the main guideway, since there is a rapid initial decrease in ramp length with increasing headway.
4. The headway required for deceleration is invariably greater than that required on the main guideway. Assuming that main guideway headway must be equal to the headway required for deceleration so that successive cars can enter a station, deceleration ramps only have to be about 20 percent of the deceleration distance.
5. Conclusion 4 is valid with regard to reduced resolution in the control and failure detection systems.

At this writing, results for the vehicle-follower systems are incomplete. The following conclusions are based on preliminary results.

1. Ramp length in vehicle-follower systems, unlike that in point-follower systems, is reflected by a disturbance of through traffic. A vehicle-follower system whose follower law is safe will never be made less safe by the use of shorter ramps.
2. The degree of disturbances in a vehicle-follower system varies inversely with ramp length. In addition, the disturbance is disproportionally large when ramp length is short.
3. Shortening of deceleration ramps is more disturbing to the system than shortening of acceleration ramps.

GUIDEWAY DESIGN FOR DUAL-MODE TRANSIT SYSTEM OF GENERAL MOTORS CORPORATION

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The differences in guideway requirements of an automated dual-mode transit system (DMTS) and conventional highways are such as to require specific design effort based on those requirements. The paper discusses some of the specific requirements of the General Motors DMTS and their effects on the guideway design. Most of these requirements permit the design variables (e.g., vehicle speed, vehicle type, lateral wander) to be narrowed and offer considerable potential for cost reduction relative to conventional highways. Unique aspects of guideway geometry are discussed; and the constraints that these geometric factors impose on network configuration are examined. Important conclusions of the structural analyses are presented from the viewpoint of the transportation planner. Finally, descriptions of the preferred guideway designs are presented.

The guideway design concept discussed in the paper evolved mainly from engineering analysis and approaches; major attention is focused on compatibility with system functional requirements, system economics, and safety. However, throughout the process, guidance and review were provided by the architectural member of the DMTS team. The architectural inputs included an aesthetic evaluation of the elevated guideway design.

The approach was to start with the basic guideway, which was considered to be a relatively unlovely thing, and to upgrade it aesthetically by degrees of cost. The first stage of upgrading includes a change to the guardrail, smoothing the center slot, and consolidation of utility plumbing. These refinements add negligible cost to the basic design.

The next stage of upgrading changes the structural concept. Key features include the solid curved sidewall blending into flat panels covering the underside and a deep center girder. The lower cover panels add an estimated 10 percent to the basic guideway cost and the curvilinear geometry adds another 7 percent. Another variation of this concept replaces the curved geometry with long straight lines and planes. This variation is

estimated to add about 12 percent to the basic guideway cost.

With the certain knowledge that evaluation of a visual impact requires a picture, a series of photomontages was made. Care was taken to faithfully represent the scale of the guideway relative to the surrounding cityscape. There are some problems with the pictures; specifically, in some the columns are too closely spaced, and in others the columns are not adequately protected. However, the photomontages do provide a fair preview of the visual impact of the elevated guideway. The viewer must decide whether it is good or bad. The DMTS team recognizes that much work is left to do in this area but is not dissatisfied with these early indications.

SOCIAL AND ENVIRONMENTAL IMPACTS OF DUAL-MODE TRANSIT SYSTEMS

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The paper examines a set of attitudes of 461 urban residents toward locational and financial aspects of a dual-mode transportation system and the social and environmental impacts that might result from implementation of such a system. Perceptions of the impacts are from both neighborhood and citywide points of view. The responses are statistically described and summarized through factor analysis, and homogeneous population groups are then obtained through bivariate contingency tables examining these attitudes in relation to the socioeconomic characteristics and the geographic location of the respondents.

Ninety percent of the Detroit sample indicated that they favored building the dual-mode transportation system. Although they favored construction, 96 percent of the same sample stated that it was important that the system not increase local taxes. A combination of user fees and federal funds was the most popular method of financing the system. When asked about the possibility of displacements caused by the construction of the system, the vast majority indicated that it is important to them that displacements not occur. Concern over negative impacts is well distributed throughout the population. Possible trade-offs were indicated since the removal of rundown buildings, a positive displacement of the system, was considered important by 94 percent of the respondents. Citywide impacts were considered more important than neighborhood impacts by the majority of the sample, and providing accessibility for nonusers was positively evaluated. These positive benefits and concern for the city as a whole indicate that public acceptance of innovative systems is possible.