

## CONCLUSIONS

The promise of these kinds of systems is substantial, and it is hard to identify acceptable alternatives. The major points are

1. DRT (flexible-route) systems permit a different concept of public transit—service that is door-to-door, almost indoor, and regionwide, if major patronage can be attracted; and

2. If successful, it could be a national decongestant, provide mobility for the non-driver, contribute to energy conservation, lead to fewer multicar families, and create lots of jobs.

The desirability of fewer multicar families and labor-intensive systems lies, like beauty, in the eyes of the beholder. I suspect even the automobile makers would not take violent issue with the overall desirability of better public transportation and fewer cars downtown, even though it is probably a net decrease in vehicle investment. It will happen slowly and may well result in desirable side effects.

Labor intensiveness may not be all bad, except that it clearly makes the systems vulnerable to labor disruption. Although the trend is still embryonic, from the national view labor is increasingly becoming a fixed cost. Systems that require only moderate capital (which will continue in short supply) and provide socially desirable, important, and productive jobs may be a plus for the nation's economy.

The DRT concept was the starting point. If we can put it all together and make these regionwide systems really happen, it would be of truly significant national importance.

## REFERENCES

1. J. Ward and N. G. Paulhus, Jr. *Suburbanization and Its Implications for Urban Transportation Systems*. Office of the Secretary, U.S. Department of Transportation, April 1974.
2. D. Ward. *A Theoretical Comparison of Fixed Route Bus and Subscription Bus Feeder Service in Low Density Areas*. Applications Division, Transportation Systems Center, Cambridge, Mass., June 1974.

### *Panel Discussion*

Before the general discussion, Daniel Roos, session chairman, asked a panel to comment on several prepared questions. Panel members were Richard V. Gallagher, International Taxicab Association; Karl W. Guenther, Ann Arbor Transportation Authority; Jerry D. Ward, U.S. Department of Transportation; Nigel H. M. Wilson, Massachusetts Institute of Technology; and Eldon W. Ziegler, Urban Mass Transportation Administration.

DANIEL ROOS: What comments do you have on the evaluation process?

KARL GUENTHER: I wish I had written Jerry Ward's paper because he said some things that some of us have been trying to say for a long time. He pulled concepts together that needed to be pulled together. In our local DRT operation, our evaluation comes once a year at our annual budget time. Each year as we sit down to decide how much service we are going to give, how much it is going to cost, and what our annual deficit is going to be, we go through this evaluation process.

ELDON ZIEGLER: To evaluate the transit system, we are seeking some rough

guidelines from data on items such as the annual subsidy per capita for the area served. In general, the reaction has been that these tend to run a bit high, although we are now seeking compatible numbers on the fixed-route systems. The Washington, D.C., system, for example, is estimating an annual deficit on the order of \$55 million for a population of 2.5 million, roughly 20 cents/capita. This tends to lead one to the view that, for the same fixed number of dollars, it becomes possible to provide a much higher level of service by making adjustments in the mix of the service.

In the evaluation of demand-responsive transportation as a mode in comparison to other modes, factors are again the incremental costs of ridership productivity of one mode against another mode under the same circumstances. We have good data on the performance of the demand-responsive services, but poor data on incremental performance of conventional services. In many cases, little is known about the performance of specific lines within a transit system, what the productivities are, what riderships are on parts of the line, and how that varies by time of day.

**DANIEL ROOS:** When any new concept is introduced, particularly one that has a fair degree of innovation, it takes a long period of time before it can be properly evaluated. A concept like park-and-ride, for example, is really a simple concept, but think of the period of time that has been required to introduce the park-and-ride concept throughout this country. If an evaluation of park-and-ride in Rochester had been performed after 6 months or after 1 year according to a strict financial cost-benefit ratio, that service would have been discontinued. Now, if one looks at the experience of park-and-ride in Rochester during the second and third years, the results are dramatic in terms of what the ridership and the decrease in cost per trip are. During the 3-year period, the level of service was constantly rising, the community was learning what to do, and it was tailoring the system. If it took 3 years to find out what the full impact of park-and-ride is, one can certainly multiply that by any factor one chooses to get some idea of how long it is going to take before we fully understand what the impacts of these other systems are. Evaluating at this point is important if it is done in the proper way. One has to differentiate between a bad idea and a good idea that is implemented in a bad way. Of the 50 DRT systems that have been implemented, some are good and some are bad implementations. If one looks at the bad implementations and concludes that the concept is bad, there is a real danger.

One other point occurred to me. Demand-responsive transportation has a possible role as an incremental planning tool. A tremendous amount of money is being spent now on planning studies and engineering design studies before any facility ever gets implemented. Much of that money in many cases turns out to be money down the drain in some respects because that facility either is never implemented or is implemented but never produces the results that were proposed during the various studies. Rather than spending hundreds and thousands of dollars doing extensive planning studies for services and facilities of an order of magnitude greater than what we have today, one could take a more incremental approach and invest some of that money in various types of facilities such as demand-responsive services. That is, put the service in and see what happens. I am not implying that one should stop doing planning and technical design work, but there is a close tie between planning and implementation and there should be a close feedback between the two.

The next question is, What have we learned about demand-responsive transportation?

**RICHARD GALLAGHER:** This is my first opportunity to attend a demand-responsive transportation conference, but I have come to the conclusion that taxicabs are a demand-responsive system and that those of us in that business have a place here. We have made the move gradually during the last several years, but we also recognize that DRT is no typical taxicab operation. We have had group riding for many years. We have had shared riding, exclusive service, and jitney operations in the taxicab industry. So, from the operational and managerial viewpoint, we think we are in a position to be of service to the communities that determine the mode of transportation that they desire. In fact, I believe that the industry will invite discussions with almost every

transit authority and every community where we operate taxicabs.

We are a cost-conscious industry. We are a profit-making industry, and we intend to remain in that category. We face many problems. In a 14-month period, one of the major taxi companies had a 220 percent increase in gasoline. So, we have to adjust to the circumstances of the time.

In the taxicab industry, almost everything is measured on a vehicle-per-mile basis. Those at the conference talked about vehicle-per-hour measurements. We have to find some common unit to measure the same things.

My feeling is that our industry will remain flexible. We will do everything possible to become responsive to the needs of the community. We have some regulations that control much of what we would like to do, and many innovations must be delayed. In fact, leadership in innovations is being done in the DRT systems that have been implemented under government sponsorship. We feel that the benefits from them will eventually come down to our industry.

There are some shortcomings. The proper vehicle has not been designed for the handicapped, elderly, and school children. Nor has the proper service. Shared riding will require a variable fare structure, which may require special equipment and specially designed computers. We have not gone far enough in integrating services between taxicabs and other modes and integrating schedules among the transit industry, the airlines, the railroads, and all other modes of transportation. We feel this is one of the areas in which the greatest good could be accomplished in the shortest time if we worked together.

**KARL GUENTHER:** The 5 years of DRT conferences reflect what we have learned. In the third conference at Ann Arbor, we reached sort of a puberty level in demand-responsive systems. People began to accept DRT as a real, somewhat legitimate mode. At the fourth conference in Rochester, we were in the adolescent stage—people going off in one direction believing blindly, and people going off in another direction doubting. But at least we were together in the same room. At this fifth conference, I think we were undergraduates in college. We were much more mature about our approach. We had some history and some experience, but we also had some serious and deep doubts.

There have been some massive failures of the demand-responsive systems. Metro Toronto is probably the biggest one in terms of dollars, expectations, and results. I was disappointed that there was not a session at this conference on failures. That would have been a good session to have because there is a great deal to be learned from system failures because they cost too much. I somewhat disagree that a DRT system fails because it is implemented badly. In some cases, we just did not know before we started that the place was wrong for demand-responsive service. We should learn from those failures.

The UMTA technology display at this fifth conference was heartening because 3 or 4 years ago UMTA would not attend the DRT conference. There seemed to be a feeling that demand-responsive system service was not yet legitimate enough to be recognized at the federal level.

Having the taxicab industry participate so fully is another sign of maturing and recognizing that there is room for everybody. We have a lot of expectations for the taxi industry. Some of us have tried for a long time to work with taxi operators both locally and nationally without too much success. But they were at this conference. We listened to them, and they listened to us.

**NIGEL WILSON:** We have learned that demand-responsive service can be attractive to the community. It can attract voter support, and it can attract subsidy from the community at large. Four or 5 years ago, some of us thought it was a panacea, but few of us think so now. We have to look no farther than Toronto to see some of the limitations. DRT is one element of the system. We have to look at other transit modes to determine under what conditions DRT is an effective strategy.

**JERRY WARD:** One of the things we have clearly learned is that people like the personal touch they get from this kind of service. It is uniquely suited to the aged, the

handicapped, and the young. In the guided tour of Arcadia during the conference in 1973 in Rochester, on the DRT bus I was on, we were listening to the open mike of a report from another bus that was delivering a 7-year-old school kid to her home. The bus driver said to the dispatcher, "Susie's mother is not home. What do I do with Susie?" The dispatcher replied, "Keep Susie, and I'll try to find her mother." Four minutes later he came back on, "Mother's home. Take Susie home." That is trivial—and terribly important.

#### *General Discussion*

**JOE KATZ:** Toronto seems to be held up as an example of a failure. The thing that happened is that the minister of transport changed, and the new minister did not realize the kind of experiments that had been set up. Another experiment had been set up close to Toronto and penetrated half the market.

I do not think we are yet in the adolescent stage. We are still in a baby stage, and I think we should keep our sights much higher. About 1960 I suggested one of the first Dial-A-Ride experiments in Washington as part of the transit system there and it took about 10 years for it to start. We should consider all the experiments now as a means of amassing experience and not be so quick to judge them.

**KARL GUENTHER:** I apologize to anybody who took affront about Toronto. The point I was trying to make is that there was a grand plan that was not going to be carried out as it was originally conceived. The reasons (and I have done considerable work on this) are much more complex than a simple change in ministers. They have to do with ridership, productivity, costs, and all sorts of social and labor implications as well as the change of ministry. The point is to learn what was done so that perhaps the same things can be corrected the next time. Toronto and Ontario are still the hub of what is going on in DRT.

**AARON ISAACS:** Does anybody have cost information on voice radio versus digital communications? In one of the conference sessions, someone said that digital communications were cheaper.

**DANIEL ROOS:** I made that comment based on a limited test that was carried out by Karl Guenther at the Ford Motor Company and with Motorola in Batavia, observations on the operation of the Rochester system, and also some speculations and projections of what the impact of digital communication might be, given the availability of a computer system.

I recall in the Batavia experiment that there was an indication of a productivity improvement of 10 or 11 percent. An economic analysis indicated that either 13 or 14 vehicles would be the point at which it was more economical to go to digital communications as opposed to voice communications. That does not take into account any of the indirect benefits of digital communications, such as fewer errors and safer operation. The Rochester system is a difficult one to evaluate from that perspective simply because digital communications were used from the start. In Batavia, we started with voice and switched to digital. We have not really had the opportunity to analyze the difference. The indications are certainly that, if a computer is introduced, the economics would improve even more markedly because the computer would directly transmit the message to the vehicle and thereby eliminate to a large extent, but not totally, the need for human intervention.

I believe that figure of about 13 or 14 is reasonably accurate. But several things should be borne in mind. What type of digital communication system is it? That is, is it just a printer or an alphanumeric delay device, which is more expensive? In addition, the price of electronic technology is dropping markedly. You can now buy