RURAL PUBLIC TRANSPORTATION TECHNOLOGIES: USER NEEDS AND APPLICATIONS

EXECUTIVE SUMMARY

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16. Abstract

The *Rural Public Transportation Technologies: User Needs and Applications* study was conducted as part of the U.S. Department of Transportation' s (DOT) overall Rural Intelligent Transportation System (ITS) Program. The study examined the opportunities and challenges of planning and deploying advanced public transportation systems (APTS) technologies in rural and small urban areas.

The purpose of the study was to gain a better understanding of the state of the practice of rural APTS and to determine where the U.S. DOT could best direct its resources to close the gap between current practice and the state of the art.

User and operator surveys and site visits were conducted to determine information requirements, problems, interest, and concerns of both operators and passengers of transit systems in rural and small urban areas. A state-of-the-art technology assessment was also conducted to determine the potential for current and emerging technologies to satisfy the requirements of rural transit users and operators. Nine rural ITS action items are recommended to address the identified needs. Recommended actions could pertain to any part of the U.S. DOT' s Rural ITS Program, including research and development, deployment, and delivery/outreach. However, the study's expert panel recommended that high priority be given to the delivery/outreach aspect of the Rural ITS Program.

This volume is the second in a series. It summarizes the findings documented in the study's *Final Report*.

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STUDY BACKGROUND AND PURPOSE

Intelligent Transportation Systems (ITS) are changing the way that agencies deliver transportation services to their "customers," not only those who are traveling via private vehicles, but also those who travel via public transportation. For highway and transit travel, there are a variety of factors that determine the applicability of any particular ITS strategy or technology. Effective application of ITS for rural transit must be identified with an understanding of how rural transit agencies operate, the constituencies these systems serve, resource limitations and other characteristics that are unique to the industry.

Rural transit systems are changing through the infiltration of new technologies used for both operations support (e.g., accountability and verification) as well as for user support (e.g., traveler information). Transit operators have an interest in improving operations through the application of ITS technologies. However, this interest is hampered by their lack of experience regarding cost-effective application of advanced technologies. In some cases there is a need to test and evaluate the systems to determine cost-effectiveness. In other cases, the solutions are known and it is more a matter of better packaging and promoting the results to ease the implementation process.

The purpose of this study was to gain a better understanding of the state of the practice of rural APTS and to determine where the U.S. DOT could best direct its resources to close the gap between current practice and the state of the art. The objectives of this study were to:

- Conduct user and operator surveys and site visits to determine information requirements, problems, interest, and concerns of both operators and passengers of transit systems in rural and small urban areas.
- Conduct a comprehensive review of the state of the art and the state of the practice in APTS technologies, specifically those related to traveler information services.
- Identify and develop a series of APTS action items for rural applications on the basis of the study findings.

Identified actions could pertain to any part of the U.S. DOT's Rural ITS Program, including research and development, deployment, and delivery/outreach. Table 1 captures this list of action items in order of relative priority (based on the study team's and expert panel's evaluation). These actions are described in further detail on page 13, and in great detail in the study's final report.

Table 1. Recommendations and Prioritization

Ranking	Action Item	Duration	Time Frame[1]	Estimated Cost	Criteria Score[2]
1	**Rural Transit Operator Information Kit**	6 Months	Near Term	$75,000	29
2	**Rural APTS Success Story Booklet**	7 Months (then on-going)	Near Term	$60,000	35
3	**Demonstration of Low-Cost Technologies, e.g., Bus Arrival Notification System**	24 Months	Medium Term	$265,000	38
4	**Training Materials for Rural APTS Applications**	8 Months	Near Term	$120,000	48
5	**Fleet Management Operational Test**	46 Months	Medium Term	$850,000	59
6	**Broader Market Research Study**	12 Months	Medium Term	$280,000	62
7	**Shared Technology Infra-structure Operational Test**	40 Months	Medium Term	$800,000	64
8	**Trip Verification and Billing Operational Test**	36 Months	Long Term	$780,000	79
9	**Automated Trip Status Operational Test**	36 Months	Medium Term	$650,000	82

[1] Time Frame:
Near Term = 1-2 years
Medium Term = 3-5 years
Long Term = 6-10 years

[2] Criteria Score: The lower the score the higher the priority ranking

THE STUDY TEAM

TransCore led the team under the direction of Federal Highway Administration (FHWA) and Federal Transit Administration (FTA). Other team members were the Virginia Polytechnic Institute and State University, Multisystems, Inc., and Ecosometrics, Inc. The study team was assisted by an expert panel consisting of government officials and rural transit experts. Table 2 shows members of the expert panel.

Table 2. Expert Panel Members

Expert Panel Member	Organization
Bruce Ahern	Beaver County Transit Authority
Steve Andrle	Transportation Research Board
Mary Martha Churchman	Federal Transit Administration
Larry Harman	Moakley Center, Bridgewater State College
Charles Rutkowski	Community Transportation Association of America

STUDY PROCESS

To fulfill the objectives of the study, the study team:

- Conducted a user needs assessment,
- Performed site visits to various rural transit systems,
- Prepared a comprehensive review of the state of the art and the state of the practice in the application of APTS technologies, and
- Recommended a range of APTS action items that could address rural transit needs and issues.

Detailed descriptions of the recommended actions, including potential benefits, implementation activities, and preliminary cost estimates were also prepared. Figure 1 shows an overview of the study process.

RURAL AREAS

Rural communities can be defined in terms of their small population and distance from metropolitan areas. These two characteristics are the factors of significance in determining what makes an area "rural." One definition used within the ITS community is that "rural areas are counties with populations of less than 50,000." The small population size and relative isolation of rural areas are sufficient in their own right to produce significant social and cultural differences from life in urban areas.

There is a wide diversity in rural area characteristics. Of the nation's 3,141 counties and county equivalents, 2,288 (73 percent) were classified as non-metropolitan or rural according to the 1990 Census. Rural areas accounted for 83 percent of the nation's land, 21 percent of its population, 18 percent of its jobs, and 14 percent of its earnings. When compared with urban areas, rural areas contain greater percentages of males, senior citizens, persons in poverty, households with income below the national median, homeowners, and car owners.[1]

Many rural parts of the United States had stable or declining populations and economic bases from the 1920s until the 1970s, when the economic revitalization of some rural areas began. Rural areas not touched by such revitalization are characterized by high proportions of dependent population groups and limited tax bases.

RURAL TRANSPORTATION SERVICES

The most prevalent mode used for transporting people in rural areas is the automobile, but public transit services are needed for a significant proportion of the population who do not have access to an auto, have trouble driving, or have trouble affording automotive transportation. Following is a summary list of rural transportation characteristics.[2]

- One of every 14 households in rural America has no car.
- Fifty-two percent of all rural households own one car.
- Thirty-eight percent of the nation's rural residents live in areas without any public transit service.
- Twenty-eight percent of rural residents live in areas in which the transit service level is negligible (less than 25 yearly trips for each household without a vehicle).

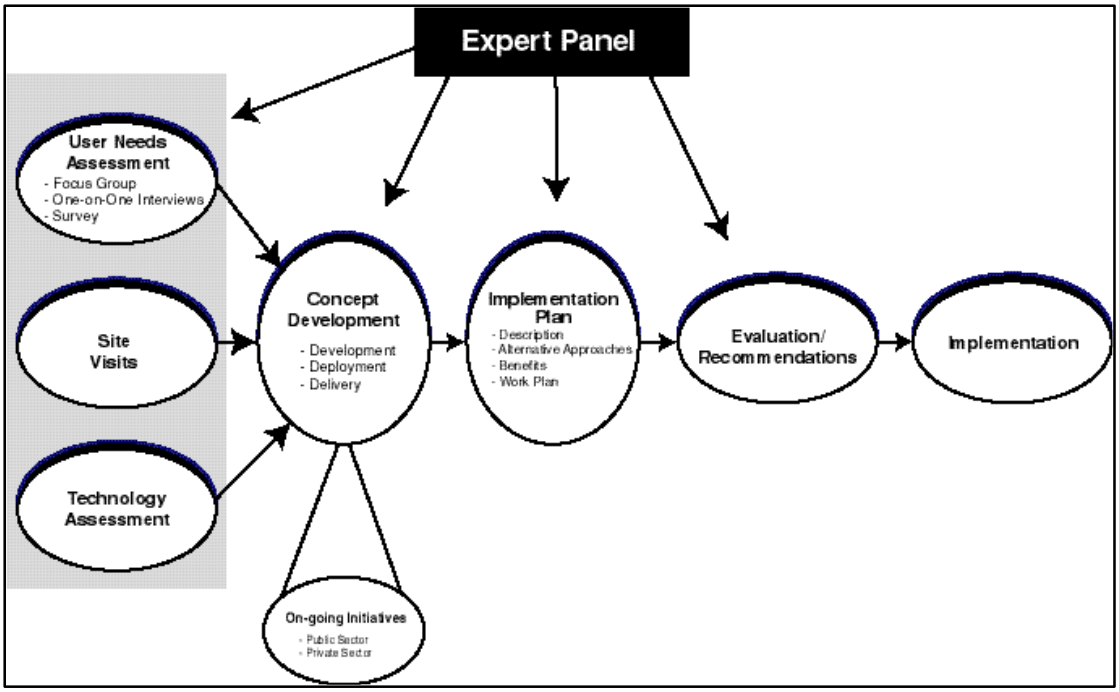

Figure 1. Rural Transit Study Process

Table 3. Transit Systems in Rural Communities

Type of Rural Community	*% with Transit*
20,000 - 49,000 persons in urban areas, not adjacent to metropolitan area	66.4
2,500 - 19,999 persons in urban areas, adjacent to metropolitan area	60.3
2,500 - 19,999 persons in urban areas, not adjacent to metropolitan area	59.0
20,000 + 49,999 persons in urban areas, adjacent to metropolitan area	57.3
No urban places over 2,500 persons, adjacent to metropolitan area	56.7
No urban places over 2,500 persons, not adjacent to metropolitan area	55.2

Source: ***Assessment of the Economic Impacts of Rural Public Transportation***, prepared by Ecosometrics, Inc. for the Transit Cooperative Research Program, October 1997, p. 19.

NOTE: Urban areas consist of 1) both incorporated and unincorporated places of 2,500 people or more and 2) the urban fringe around cities of 50,000 or more. The remainder is classified as rural. Rural areas can be further classified as metropolitan or non-metropolitan. Metropolitan rural areas are rural areas in urbanized areas (counties with a city of 50,000 or more), or rural areas in counties that are adjacent to a county with a city of 50,000 or more and that are economically and socially integrated with the county containing the central city. For transportation purposes, non-metropolitan counties are generally classified as rural.

frequently have rural public transit systems. The counties that are least likely to have rural public transit systems are the most rural.

Demand-responsive transit services predominate in rural areas. There are numerous rural transit systems with only one vehicle; there are also several systems with more than 50 vehicles. Those systems providing more than one type of service tend to have the most vehicles. The demand-responsive services tend to have more vehicles than the fixed-route services; the largest systems are those offering both fixed-route and demand-responsive services. The mean and median fleet sizes of 11 and 6 vehicles, respectively, indicate a very small base on which to apply advanced technologies. This means that technological applications at the level of the individual system may have difficulties achieving appropriate levels of economies of scale. Of the largest systems, only one had more than 200 vehicles, and only four had more than 100 vehicles; the tenth largest system has less than 70 vehicles. (These figures are based on 1993 data, the last year that such information was collected by the FTA.)

While rural transit systems also vary greatly in terms of their overall budgets, many face severe financial limitations. One system offering several service types reported total annual expenses of more than $8 million, while other systems reported less than $1,000 of annual expenses. The tenth largest rural system in 1993 had an annual budget of less than $2.5 million.[3] Rural transit systems in the top 20 percent of the budget ranges have average operational cost of greater than $1 million per year. However, smaller systems with operational cost of $20,000 to $75,000 per year, could not be expected to have much money to spend on advanced technologies because of their limited services and expenditures.

IMPLICATIONS FOR APPLYING ADVANCED TECHNOLOGIES

Even the largest of the rural transit systems are relatively small in contrast to the overall level of operations of many urban public transit systems. This small size creates large challenges in terms of funding the technological improvements and then realizing their intended productivity and economic benefits at the level of the individual rural transit system.

Rural transit systems are widely diversified. The largest systems are many times larger than the smallest systems. Very different services are offered in different communities. Some of the systems are so small, and offer such infrequent service, that the chance of their having any funds to devote to advanced technologies is slight. On the other hand, application of advanced technologies to some of the larger systems should indeed have noticeable effects on their operations.

Some technologies, e.g., automated accounting and billing systems and communications and information gathering through the Internet, can help large and small rural transit systems. Other technologies, e.g., automated vehicle location systems and computer-aided dispatching systems, will probably be more beneficial to larger systems. More research and operational tests are needed to specifically define the size of the systems for which the technology is cost effective, i.e., the number of vehicles in the fleet, number of vehicle trips, or number of passengers.

TRANSIT MARKET SEGMENTS FOR RURAL AMERICA

For several years now, the FTA has had an active interest in deploying ITS technologies in rural communities to increase the effectiveness and productivity of rural transit operations. In order to accomplish these objectives, it is necessary to understand the kinds of markets that exist for transit services in rural communities around the United States. A separate research effort identified transit market segments for rural America. The initial definition of these transit market segments contained the first five categories listed in Table 4; the last two categories were recently added based on further research.

The market segments are described in the *Rural Public Transportation Technologies: User Needs and Applications* report. These market segments were defined with two hypotheses in mind: (1) variations among different types of rural counties exist in terms of which ITS applications are most appropriate; and (2) certain public transportation services may work better in some rural communities than other rural communities.

STUDY FINDINGS

The study yielded many important findings from the user needs assessment, site visits, and technology assessment. A summary of these findings is provided below:

- Few rural transit operators know which ITS technologies are appropriate for rural transit needs, what their benefits are, and how they should be implemented. Advanced technologies can offer benefits to rural transportation in terms of operations support (e.g., financial accountability and data verification) as well as for user support (e.g., traveler information).
- Rural transit operators understand that many of their problems do not have "high tech" solutions. Attention must be focused on solving the problems faced by rural transit agencies, not on applying particular technologies to rural transportation.
- Smaller transit systems need guidance to justify cost-effective technology applications. Identifying cost levels for implementation of specific technologies (e.g., automatic vehicle location, computer aided dispatching) would be beneficial. Likewise, it would be helpful to identify logical building blocks to go from "bare bones" systems to a more sophisticated system over time. To make intelligent implementation decisions, agencies need clear information on the costs associated with training, operations, and maintenance.
- Rural transit systems need information on partnering opportunities and barriers. Partnering can be with other public agencies and/or private organizations. Some of the increased efficiencies in rural transit services can come from appropriate partnering, especially with respect to non-transit agencies, such as a state DOT or a law enforcement office. APTS can assist in making these partnerships work. Partnerships are useful for improved service coordination and also for more efficient operation and administration of public transportation systems. There is also the potential for consortium purchases, bringing down the unit cost of equipment and software purchases.

Table { SEQ Table * ARABIC }. Rural Transit Market Segments

Transit Market Type	*Percent of All 2,267 Rural Counties*	*Percent of Counties with Rural Transit*	*Distinguishing Characteristics*
Rural to urban commutes	49.0	57.6	Adjacent to metropolitan areas; more densely developed; often manufacturing or unspecified economic base; some persistent poverty counties
Large, sparsely populated areas	12.4	46.3	Primarily located in the West; often farming based; often Federal lands counties
Rural tourist areas	6.8	53.9	Emphasis on services industries; relatively high population growth; often Federal lands counties
Self-contained low growth communities	6.8	67.3	Often farming based, characterized by persistent poverty and high transfer payments
Self-contained high growth communities	2.6	57.6	Often nonspecialized or manufacturing based; relatively large counties
Small, poor, growing communities*	5.9	58.7	Often manufacturing, retirement, or unspecified economic base; often smaller countries; characterized by persistent poverty and high transfer payments
Small, poor, declining communities*	6.6	66.5	Often farming, smaller counties; characterized by persistent poverty and high transfer payments
*Recently added			

Source: ***Transit Market Segments in Rural America***, prepared by Ecosometrics, Inc. for the Volpe National Transportation Systems Center and the FTA, October 1997.

- System size and service types are the best indicators of APTS needs or potentials. The predefined rural transit market segments were not found to be powerful indicators of APTS needs or potentials.
- With respect to traveler information systems for rural transit, the needs for rural fixed-route systems are not greatly different from larger systems. The biggest benefits could be in the area of more exact pickup times, narrowing the pickup window, and translating vehicle location information into information that is usable by the customer.
- Future research is needed to determine how advanced technologies can help meet the demand for rural public transportation created by welfare reform.
- There is relatively little interest in automated fare collection among rural systems. On many systems, cash customers are a relatively small percentage, while agency-sponsored trips are a big part of the system (e.g., Medicaid and other government programs). Automation of trip verification, trip eligibility, and agency billing could prove to be more significant payoff areas than converting cash customers to electronic fare payment.

USER NEEDS ASSESSMENT

In order to assess users' needs, the study team conducted focus group sessions, interviewed transit system managers by telephone, and surveyed rural transit riders. The perceived needs of the transit riders identified in the focus group and telephone interviews were:

- Transportation services that are dependable and on time.
- A centralized information number that offers one-stop shopping for transportation.
- Information on what types of services are available to them.
- Information on eligibility for subsidies and services.
- Availability of an easier, single registration process.
- Information about how to use public transportation, what to expect when using public transportation, etc.

The transit managers maintained that the transit users are generally pleased with the safety of their transit services.

Focus group participants identified numerous institutional and technological barriers and organizational constraints that affect the operation of transit agencies. The institutional and technological barriers and organizational constraints that affect services include:

- Lack of financial resources.
- Lack of public outreach programs.
- Lack of standardization of driver/dispatcher training and lack of access to training programs.
- Usefulness of many technologies not yet proven in rural areas.
- Lack of advice about technology.
- Complexity of technology.

The most prevalent institutional barrier is the lack of financial resources to meet operating costs, undertake long-term planning, make capital investments, engage in entrepreneurialism and risk-taking, and justify the purchase of new technology. Lack of public relations/marketing programs is a barrier to attracting additional users. Lack of standardization in driver and dispatcher training is a barrier to partnering with other transportation providers.

The survey of more than 300 rural transit riders found these persons quite satisfied with the services they were receiving. Many of these persons were elderly, and many did not have access to a car at some or at all times. They found their rural transit systems easy to use and information about these systems easy to obtain. The most commonly needed information was trip schedules, and that information was most often obtained by telephone.

Additional market research is needed. Research among non-users of the transit systems should be conducted to determine barriers and problems that discourage the non-riders from regular system usage. Future research should include surveys of a larger sample of people across many different market segments. More interviews or focus groups with other agencies, such as the health and human resource departments, should also be analyzed for rural APTS needs and opportunities.

SITE VISITS

The study team visited 10 rural transit systems that are generally regarded to be leaders in the deployment of APTS technologies. The

advanced technologies that are being considered by these systems include:

- Computer-Aided Dispatch (CAD) - computer software and hardware that incorporates transit routes, schedules, and vehicle assignments and allows dispatchers to know where the vehicles are and to more efficiently schedule and dispatch transit service.
- Automatic Vehicle Location (AVL) - computer-based vehicle tracking system that allows a fleet manager to monitor vehicle location, conditions, and schedule. AVL is used to assist in dispatching.
- Transportation Management Center (TMC) – a central facility for the coordination, monitoring, and management of the transit services and traffic control systems within a jurisdiction.
- Geographic Information Systems (GIS) - combination of an electronic map and a relational database in a software package that allows the user to visualize and analyze data spatially. GIS is used in combination with AVL and CAD to provide an automatic mapping tool.
- Mobile Data Terminals (MDTs) - small in-vehicles computer terminals that allow drivers to receive and send text and numerical data by radio signals to the operations center and dispatchers, MDTs reduce the amount of air time that operators spend on the radio. MDTs allow vehicle, passenger, and other data to be transmitted in "real time," as events transpire, rather than waiting until the vehicle returns to the system's headquarters.
- Electronic fare payment systems, such as ASmart Cards" - automated fare payment systems that employ electronic communication, data processing and storage, and computer-based record keeping and funds transfer. Electronic media can store information in readable and writable form. They allow passengers to pay for their transit trips electronically.
- Advanced Traveler Information Systems (ATIS) - pre-trip, wayside, or in-vehicle information that helps travelers make decisions before or during their trip, such as real time passenger information at bus stops.

Table 5 lists the 10 rural transit systems/areas that were visited and summarizes the current and anticipated APTS deployments at these sites.

General findings of the site visits were:

- Few rural transit systems have implemented advanced or automated technologies as of 1997.
- The systems that have a formal ITS plan coordinate their efforts with external agencies. This coordination provides the opportunity to consider regional issues and share resources.
- Large systems plan to deploy Automatic Vehicle Location technology to monitor vehicles and to increase system capacity. Knowing the location of all vehicles allows dispatchers to more efficiently dispatch vehicles, which can lead to an increase in system capacity.
- Most systems that have purchased an APTS application did not budget for an appropriate level of funding for training. Training is provided by the vendors but they typically do not provide additional training to fine-tune the technology to the transit system's needs.

Table { SEQ Table * ARABIC }. Rural APTS Applications and Future Deployment at Visited Sites

Rural Transit System/Area	*No. of Vehicles*	*Annual Riders*	*Market Segment*	*Current APTS Deployments*	*Future APTS Deployments*
Linn County Lifts IOWA	12	108,000 (1996)	Slow/No Growth Self-Contained Local Community	Computer-assisted dispatch (CAD)	Automatic vehicle location (AVL)
Arrowhead Transit, Virginia Dial-A-Ride MINNESOTA	52	365,900 (1995)	Slow/No Growth Self-Contained Local Community	Transportation management system (TMS) & CAD	Mobile data terminals (MDTs), geographic information system (GIS)
Sweetwater County Transit Authority WYOMING	15	89,800 (1995)	Large, Sparsely Populated Rural Area	CAD	GIS, MDTs & AVL
Dakota Area Resources and Transportation for Seniors MINNESOTA	25	121,000 (1996)	Rural to Metropolitan Area Commute	CAD	AVL & MDTs
Pee Dee Transit SOUTH CAROLINA	180	624,000 (1997)	Multiple types	None	CAD & AVL
Blacksburg Transit VIRGINIA	35	1,600,000 (1996)	High Growth Self-Contained Local Community	Internet, cable television, AVL, CAD, kiosks & real time passenger information at bus stops	Electronic fare payment
Flagler County Transport FLORIDA	15	75,000 (1996)	High Growth Self-Contained Local Community	AVL	Electronic fare system, real-time passenger information at bus stops
Cape Cod Regional Transit Authority MASSACHUSETTS	75	500,000 (1996)	Urbanized Area	None	AVL, TMS, cable television, Internet, variable message signs, highway advisory radio, information kiosks, MDTs, & CAD, real-time passenger information at bus stops
Park City Transit UTAH	12	954,400 (1996)	Rural Tourist Area	None	AVL, advance traveler information systems (ATIS)

- Most systems do not anticipate the learning curve required to understand how to operate their APTS application.

Operators of the APTS application have to do their jobs as well as learn the technology.

- Rural transit agencies have a general awareness of ITS, but they depend heavily on the vendor for specific information on APTS applications. Vendors have been aggressive in providing rural transit agencies with information regarding their product, but in many cases APTS has been oversold as a cure for all that ails transit.
- Implementation of APTS is done in phases. Most systems begin with computer-aided dispatch and scheduling technology. Operating costs of a transit system typically account for the largest percentage of its budget. Therefore, improving schedule efficiency with computer-aided dispatch and scheduling is a logical first step.

The rural transit agencies identified a number of areas in which advanced technologies could assist them. These areas include administrative, user, and operational issues. These issues are described in detail in the study's final report. Rural transit operators anticipated (sometimes unrealistically) that applying APTS technologies would provide them with a variety of benefits. These benefits included:

- AVL will allow transit managers/ dispatchers to identify the location of their vehicles and thereby monitor/improve schedule adherence and ensure the safety and security of the drivers and riders.
- MDTs, which allow the dispatcher to send text messages and numerical data, will allow the dispatcher to reduce the amount of air time spent with the driver and to spend more time managing their system.
- AVL will improve emergency response time because the dispatcher will know the actual location of the vehicle better than by using a two-way radio system.
- CAD will enable operators to schedule more passenger trips and reduce the number of trip requests that are turned down because system efficiency will be improved, leading to increased system capacity.
- Some APTS technologies will help increase ridership due to an increase in the efficiency of the system.
- Some APTS technologies will improve passenger information because they will be able to access it on a real-time basis.

For example, the bus system in Sweetwater County, Wyoming, doubled its monthly ridership using a computer-aided dispatch system. Five years after its installation, transit-operating costs have decreased 50 percent and ridership has increased by 5 times. The transit center now provides dispatching services for approximately 20 agencies in the region. [4]

TECHNOLOGY ASSESSMENTS

A state of the art technology assessment was conducted to determine the potential for current and emerging technologies to satisfy the requirements of rural transit users and operators. The technology assessment focused on application of technologies in two areas:

1) Advanced traveler information systems (ATIS) for rural transit riders; and

2) APTS technologies to improve financial accountability and data verification for rural transit operators.

The first technology assessment effort identified the issues and a number of lessons learned related to procuring and implementing ATIS technology for rural transit applications. The research involved a survey of a variety of

transit agencies in North America. Because few rural and small urban systems have deployed or plan to deploy ATIS technology, most of the systems that responded to the survey were urban and suburban transit agencies. Therefore, the research results were based on responses from 32 primarily urban and suburban transit agencies.

The major findings of the ATIS technology survey were:

- Eighty-one percent of the 32 respondents are or will be offering pre-trip planning information such as route schedule and fare information.
- Over half of the respondents are providing static arrival/departure information, information on routes and route details, and information on fares.
- Over half of the respondents expect to provide real-time arrival/departure information.
- Seventy-five percent are using static data to support their current ATIS.
- Fifty percent are providing some ATIS functions on the Internet.
- Sixty-three percent are providing customer service information via telephone to the public using manual methods of trip planning rather than automated sources of information.
- Eighty-four percent addressed consumer needs in their ATIS development; however, only 41 percent incorporated estimates of customer usage into their development process.
- Over half have information available on the current usage of their ATIS.
- Sixty-three percent report that they are partnering with other local or regional agencies on their ATIS projects.

The second technology assessment looked at the applications of APTS technologies to accountability and data verification for rural transit services. These types of applications are geared for the systems' operators and only peripherally benefit transit riders.

The research found that technological applications to accountability and data verification would make life easier and more productive for the operators of rural public transit services. However, as of 1997, there was still much progress to be made in automating the accounting and data verification practices of rural public transit operations.

What makes this area of technology particularly promising for rural transit applications is its relatively low cost and relative ease of implementation when compared with some of the other APTS technologies. All but the smallest rural systems have the potential to implement and benefit from these applications.

Reporting to a large number of funding sources is one of the requirements of rural public transportation. This accounting becomes easier and more accurate with computerized programs.

RECOMMENDED ACTIONS

On the basis of the needs and issues identified in this project through the surveys, site visits, and technology assessment, the study team developed nine potential rural APTS action items. Their structure mirrors that of the Strategic Plan for the Rural ITS Program developed by the U.S. DOT. That Strategic

Plan focuses on the Federal government's role in three specific areas:

- **Development**: Conduct research, operational testing, and evaluation where necessary.
- **Deployment**: Promote applications through demonstrations and deployment incentives of cost-effective technologies ready for implementation.
- **Delivery**: Facilitate training and technical assistance to transportation providers who are planning or implementing ITS technologies.

U.S. DOT has prepared the Rural ITS Program Plan, which sets the strategic priorities and lays out the future program projects. As part of the overall Rural ITS Program, efforts are being made to stimulate the application of ITS in achieving goals and objectives associated with rural transit.

This study identified a variety of needs requiring a range of potential actions for ITS applications in rural areas. Using the three-part breakout identified above, these potential action items are as follows:

DEVELOPMENT

Shared Technology Infrastructure Operational Test. This action involves identifying a number of agencies that would be interested in sharing in the cost and use of advanced technologies, e.g., a joint dispatching system within their region, and conducting a field operational test.

Automated Trip Status Information Operational Test. This operational test is oriented around evaluating various affordable systems for notifying riders of the status of their eventual "pick-up" time.

Trip Verification and Billing Operational Test. This operational test seeks to evaluate the application/integration of various automated accounting systems to verify trip eligibility and improve current billing operations.

Fleet Management Operational Test. This operational test is oriented toward optimizing the available vehicles and personnel for existing rural transit services through the application of various automated vehicle location (AVL) systems.

Broader Market Research Study. This research study will help provide better information on non-riders, public agencies, and welfare reform regarding rural APTS needs and opportunities.

DEPLOYMENT

Demonstration of Low-Cost Technologies (Simple Solutions). This action would involve identifying a number of low-cost technologies that could be used in providing "simple solutions" to specific rural transit problems (e.g., bus arrival notification system) and conducting field tests and evaluation of these technologies.

DELIVERY

Rural Transit Operator Information Kit. This information kit is intended as a collection of materials that can provide information to rural operators regarding the nature of APTS and how to determine whether these systems are applicable to their situation.

Training Materials for Rural APTS Application. This action concerns the development of a Rural Transit Short Course or Rural Transit Module for inclusion within

selected existing training programs, particularly the ITS Professional Capacity Building (PCB) Program.

Rural APTS Success Story Booklet. This booklet will provide a series of case studies from rural systems (and possibly other small to mid-sized systems) that demonstrate how APTS have been successfully implemented and may be applicable to other rural transit services.

Table 6 shows how these candidate concepts relate to the demonstrated needs.

EVALUATION AND PRIORITIZATION PROCESS

The study team used their combined knowledge and experience to develop the strategic approaches outlined above in greater detail. With the assistance of the expert panel, the study team developed an implementation plan for each of the nine rural APTS action items. The implementation plans include tasks, preliminary cost estimates, time frames, and potential benefits. This material is described in detail in the *Rural Public Transportation Technologies: User Needs and Applications* report.

The nine potential rural APTS action items were evaluated and ranked by the study team and expert panel according to the following criteria:

- **FHWA/FTA priority**, in terms of the ITS Goals as stated in the ***Rural ITS Strategic Plan***.
- **Costs**, both capital and operating costs.
- **Need**, assessed in terms of the needs met and issues addressed.
- **Operator benefits**, such as reduced unproductive vehicle and driver time, improved supervision, improved record keeping, increased ridership, improved passenger and driver safety.
- **Rider benefits**, such as improved quality of service, improved passenger safety, increased customer satisfaction.
- **Technical feasibility**, in terms of ease of implementation (some technologies are already being implemented).
- **Breadth**, the ability of the application to be useful for different systems in different environments.
- **Potential to attract new riders**, which is a goal of transit systems.

Table 1, shown on page 2, presents the rankings and evaluation score for the nine actions. All nine actions are recommended for further consideration. These activities and their rankings do not necessarily reflect the opinions of the U.S. Department of Transportation or any other Federal agency.

NEXT STEPS

One of the next steps is to consider these action items in future updates of the U.S. DOT's Rural ITS Program Plan. The updates should include timetables for addressing the APTS priorities and identify potential sites for the demonstrations and operational tests. Potential sites should be identified based on site characteristics, not by geographic location.

Specifically, the following action items are recommended as the next steps toward development and application of APTS technologies in rural and small urban areas:

Table 3. The Relationship Between User Needs/Issues and Candidate Action Concepts

Candidate Action Concepts / User Needs/Issues		DEVELOPMENT					DEPLOYMENT	DELIVERY		
		Shared Technology Infrastructure Operational Test	Automated Trip Status Information Operational Test	Trip Verification and Billing Operational Test	Fleet Management Operational Test	Broader Market Research Study	Demonstration of Low-Cost Technologies	Rural Transit Operator Information Kit	Rural APTS Success Story Booklet	Training Materials for Rural APTS Applications
OPERATORS	Information on Partnering Opportunities	✓				✓		✓	✓	✓
	Assistance in Quantifying Benefits	✓	✓	✓	✓		✓	✓	✓	✓
	Threshold Levels for Technology Application	✓	✓	✓	✓	✓	✓	✓	✓	
	Improved Vehicle Utilization	✓	✓	✓	✓				✓	
	Information on Technology Applications	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Information on Institutional and Procurement Issues					✓		✓	✓	✓
	Targeted Training							✓	✓	✓
	Improved Service Quality	✓	✓	✓	✓		✓		✓	
	Improved Operating Efficiency	✓	✓	✓	✓		✓		✓	
	Improved Billing and Accounting	✓	✓	✓					✓	✓
RIDERS	Bus Schedules, Service Area, and Routes		✓		✓		✓		✓	
	Eligibility for Services	✓		✓			✓			
	Fare Information			✓	✓					
	Improved Service Quality	✓	✓	✓	✓		✓			
STATE DOTs & LOCAL DECISION-MAKERS	Information on Partnering Opportunities	✓				✓		✓	✓	✓
	Assistance in Quantifying Benefits	✓	✓	✓	✓		✓	✓	✓	✓
	Threshold Levels for Technology Application	✓	✓	✓	✓	✓		✓	✓	
	Information on Technology Applications	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Information on Institutional and Procurement Issues					✓		✓	✓	✓
	Improved Service Coordination	✓	✓	✓	✓				✓	
HUMAN SERVICE AGENCIES	Information on Partnering Opportunities	✓				✓		✓	✓	✓
	Improved Vehicle Utilization	✓	✓	✓	✓				✓	
	Eligibility for Services	✓		✓			✓			
	Improved Billing and Accounting	✓	✓	✓	✓				✓	✓

- Allocate funding for near-term priority action items:
  - Rural transit operator information kit
  - Rural APTS success story booklet
- Training materials for rural APTS.
- Design and conduct a broader market research study for rural APTS.
- Solicit proposals for demonstrations of simple technology solutions.
- Identify potential sites/problems for operational tests.

OTHER RELATED REPORTS

This report is one of a series of reports prepared for the *Rural Applications of ATIS* project. Two other published reports available through FHWA are:

- *Rural Application of Advanced Traveler Information Systems: User Needs and Technology Assessment*, July 1997.
- *Rural Application of Advanced Traveler Information Systems: Recommended Action*, July 1997.

The following related study reports are available on U.S. DOT's ITS Web Page at (http://www.its.dot.gov):

- *Rural Public Transportation Technologies: User Needs and Applications* April 1998.
- *Evaluation of Satellite Communications Systems for Mayday Application*, March 1998.
- *Surveillance and Delay Advisory System Initial Testing Report*, March 1998.
- *Rural Transit User Needs Assessment*, Draft, July 1997.
- *Advanced Public Transportation Systems (APTS) Traveler Information Service: The State of the art*, Draft, August 1997.

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[2]. George Rucker, *Status Report on Public Transportation in Rural Americ* , Prepared by the Community Transportation Association of America for the Federal Transit Administration, December 1994.

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