U.S. Department
of Transportation
Federal Transit Administration

FTA
Federal Transit Administration

BUS RAPID TRANSIT DEMONSTRATION PROGRAM

PREFACE

This report was prepared by the Federal Transit Administration's (FTA) Office of Research, Demonstration and Innovation. It describes the FTA's Bus Rapid Transit Demonstration Program, designed to provide funding and support to transit agencies engaged in coordinating improvements in infrastructure, operations, and technology within a Bus Rapid Transit framework. Bus Rapid Transit will improve the speed, reliability and convenience of bus service in this country, enhance the mobility and access needed for thriving communities, and promote a healthy environment. Advanced bus technologies and intelligent transportation systems can play an important role in these improvements.

The Bus Rapid Demonstration Program was initiated as a product of the National Bus Rapid Transit Forum sponsored by FTA on January 15, 1998. Representatives of the transit industry from metropolitan areas throughout the United States participated in the Forum, exploring existing Bus Rapid Transit applications and the role of improved bus systems in enhancing urban mobility and quality of life. FTA has published a Federal Register Notice to request participation in the Demonstration Program, which will extend over the six-year life of the Transportation Equity Act for the 21st Century (TEA-21).

Two companion FTA publications are a paper entitled "Issues in Bus Rapid Transit" and a brochure entitled "Bus Rapid Transit Initiative." Readers interested in obtaining copies of these documents or in discussing this program further may contact FTA headquarters or regional offices, or Department of Transportation metropolitan offices. Addresses and telephone numbers appear at the end of this report.

Bert Arrillaga, Chief of the Service Innovation Division in the Office of Mobility Innovation, provided guidance and overall direction for this document. It was written by staff members from both the FTA and the Volpe National Transportation Systems Center (Volpe Center). The major contributors were Mr. Joseph Goodman of FTA's Service Innovation Division; Ms. Melissa Laube and Ms. Judith Schwenk of the Volpe Center's Service Assessment Division in the Office of Research and Analysis; and Mr. Sean Libberton of FTA's Intermodal and Statewide Planning Division in the Office of Planning.

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LIST OF ACRONYMS

APTS	Automated Public Transportation Systems
CFR	Code of Federal Regulations
FHWA	Federal Highway Administration
FRN	*Federal Register* notice
FTA	Federal Transit Administration
FY	Fiscal Year
ITS	Intelligent Transportation Systems
LPA	locally preferred alternative
LRT	light rail transit
NEPA	National Environmental Policy Act
PE	preliminary engineering
PMOP	Project Management Oversight Program
TOD	transit-oriented development
US	United States

EXECUTIVE SUMMARY

Description of Bus Rapid Transit

The Federal Transit Administration's (FTA) Bus Rapid Transit Demonstration Program is designed to provide funding and support to transit agencies engaged in coordinating improvements to infrastructure, equipment, operations and technology within the framework of Bus Rapid Transit. As an integrated, well-defined system, Bus Rapid Transit would provide for significantly faster operating speeds, greater service reliability and increased convenience, matching the quality of rail transit when implemented in appropriate settings. Improved service would give priority treatment to buses on urban roadways and would be expected to include some or all of the following features:

- *Bus lanes*: Lanes on urban arterials or city streets reserved for the exclusive or near-exclusive use of buses.
- *Bus streets and busways*: Bus streets or transit malls created in an urban center by dedicating all lanes of the associated city streets for the exclusive use of buses.
- *Bus signal preference and preemption*: Preferential treatment of buses at intersections to extend the green time or actuation of the green light at signalized intersections upon detection of approaching buses.
- *Traffic management improvements*: Low-cost infrastructure elements that can increase the speed and reliability of bus service, as well as improve traffic flow for other vehicles, such as bus turnouts or curb realignments.
- *Faster boarding*: Innovations in fare collection, such as smart cards, and changes in bus design, such as low-floor buses.
- *Integration of transit development with land use policy*: Transit-oriented development with high density areas or corridors developed with building site and street designs favoring transit and pedestrian usage.
- *Incremental development*: The implementation of Bus Rapid Transit features in stages over time to relieve budgetary pressures on transit agencies and communities.

Planning for Bus Rapid Transit

Bus Rapid Transit systems can develop in several ways. First, low-cost, incrementally implemented Bus Rapid Transit systems can emerge from short range bus operations planning, e.g., the planning for bus service routes, stops, headways and schedules. Second, low-cost operational strategies related to Bus Rapid Transit may emerge from long range multimodal metropolitan transportation planning for inclusion in Metropolitan and/or State Transportation Plans and Improvement Programs. Third, where the multimodal planning process determines that some type of major transportation capital investment is necessary to meet mobility needs in a corridor, an analysis and evaluation of potential alternatives is needed, from which Bus Rapid Transit may emerge as the optimum alternative.

Funding for Bus Rapid Transit

There are several Federal program resources which may be used to fund Bus Rapid Transit and enhanced bus improvements. *Section 5309 New Starts* funds may be used to support the capital costs of any fixed guideway system, including Bus Rapid Transit, that meets certain criteria. Bus-related capital expenses are also eligible under FTA's *Section 5309 Bus Discretionary* capital program. FTA's *Section 5307 Urbanized Area Formula* program resources may be used for capital investments and transportation planning activities associated with Bus Rapid Transit; these funds may be used to support the operating costs of Bus Rapid Transit in urbanized areas of below 200,000 population. FTA's Model Deployment Incentives Program and the Intelligent Transportation Systems Integration Program may provide funding for the use of advanced technologies in Bus Rapid Transit systems. Finally, both FTA's and the Federal Highway Administration's formula planning program funds may be used to support Bus Rapid Transit planning.

Demonstration of Bus Rapid Transit

The FTA is interested in establishing one or more demonstrations of Bus Rapid Transit in US cities. The goals for the demonstration program are consistent with FTA Strategic Plan goals such as improving mobility and accessibility and providing efficient transportation. FTA expects to see improvements in bus service, operations, and ridership, as well as effects on traffic congestion. Specifically, FTA would like to examine:

- The degree to which bus speeds and schedule adherence improve.
- The degree to which ridership increases due to improved bus speeds and schedule adherence.
- The effect on other traffic.
- The effect of each of the components of Bus Rapid Transit on bus speed and other traffic.
- The benefits of ITS/Automated Public Transportation Systems (APTS) applications to the demonstration.
- The effect of Bus Rapid Transit on land use.

FTA participation in a demonstration of Bus Rapid Transit could include a number of activities, performed through direct involvement of FTA personnel, FTA funding of third party consultants, or FTA funding of certain aspects of the demonstration itself. The range of activities includes research, planning, demonstration, technical assistance and support, evaluation, and technology transfer.

FTA anticipates that $2 million in Research and Demonstration Funding (Section 5314) will be made available in Fiscal Year (FY) 99 to support demonstration projects. The FTA will publish a Federal Register Notice announcing the Bus Rapid Transit Demonstration Program and soliciting interested participants. Transit agencies, counties, states or other parties interested in participating in a US demonstration of Bus Rapid Transit should contact their local FTA regional office or the Office of Research, Demonstration and Innovation at FTA Headquarters in Washington, DC.

1.0 INTRODUCTION

This report was prepared by the Federal Transit Administration's (FTA) Office of Research, Demonstration and Innovation. It describes the FTA's Bus Rapid Transit Demonstration Program, designed to provide funding and support to transit agencies engaged in coordinating improvements in infrastructure, operations, and technology within a Bus Rapid Transit framework. Bus Rapid Transit will improve the speed, reliability and convenience of bus service, enhance the mobility and access needed for thriving communities, and promote a healthy environment. Advanced bus technologies and intelligent transportation systems can play an important role in these improvements.

Two companion FTA publications are a paper entitled "Issues in Bus Rapid Transit" and a brochure entitled "Bus Rapid Transit Initiative." Readers interested in obtaining copies of these documents or in discussing this program further may contact FTA headquarters or regional offices, or Department of Transportation metropolitan offices. Addresses and telephone numbers appear at the end of this document.

The report begins with a brief description of the need for bus service improvements in this country and the ways Bus Rapid Transit can address these needs. The second section of the report addresses how the transportation planning process can give rise to the implementation of Bus Rapid Transit systems. The third section details the features of the demonstration program. The report concludes with the program schedule and list of contacts for further information.

1.1 The Need for Better Bus Systems

Bus systems provide a versatile form of public transportation with the flexibility to serve a variety of access needs and an unlimited range of locations throughout a metropolitan area. Because buses travel on urban roadways, infrastructure investments needed to support bus service can be substantially lower than the capital costs required for rail systems. As a result, bus service can be implemented cost-effectively on routes where ridership may not be sufficient or where the capital investment may not be available to implement rail systems.

Traffic congestion, urban sprawl, central city decline, and air pollution are all problems associated with excessive dependence on automobiles. Increasing recognition of the need for high-quality transit service to alleviate these conditions has fueled growing demand for new rail services throughout the United States (US). Rail systems have in fact played an essential role in preserving and revitalizing the downtown areas of major American cities, ranging from New York to San Francisco and Washington, D.C. In these and numerous other cities, however, buses also provide an attractive and effective alternative to automobiles, reaching into central cities, local neighborhoods, suburbs and rural areas to meet the mobility needs of millions of people.

Despite the inherent advantages of bus service, the traveling public frequently finds the quality of bus service provided in urban centers to be wanting. Conventional urban bus operations often are

characterized by sluggish vehicles inching their way through congested streets, delayed not only by other vehicles and traffic signals, but also by frequent and time-consuming stops to pick up and discharge passengers. Buses travel on average at only around 60 percent of the speeds of automobiles and other private vehicles using the same streets due to the cumulative effects of traffic congestion, traffic signals, and passenger boarding. Moreover, compared to rail systems, the advantageous flexibility and decentralization of bus operations also result in a lack of system visibility and permanence that contributes to public perceptions of unreliability and disorganization.

1.2 Features of Bus Rapid Transit Systems

Low-cost investments in infrastructure, equipment, operational improvements, advanced bus technologies and intelligent transportation systems can provide the foundation for *Bus Rapid Transit* systems that substantially upgrade bus system performance. Conceived as an integrated, well-defined system, Bus Rapid Transit would provide for significantly faster operating speeds, greater service reliability, and increased convenience, matching the quality of rail transit when implemented in appropriate settings. Advanced bus technologies and other intelligent technologies could reduce operating and maintenance costs, improve safety, and enhance intermodal transfers. Improved bus service would give priority treatment to buses on urban roadways and would be expected to include some or all of the following features:

- *Bus lanes*: Lanes on urban arterials or city streets are reserved for the exclusive or near-exclusive use of buses. The lanes may be located on the curbside or in the roadway median. Curbside lanes may be implemented on one- or two-way streets and may sometimes accommodate right-turning general-purpose traffic. Median lanes are located in the middle of two-way streets and may need to accommodate left-turning vehicles. Bus lanes can also be created in abandoned rail rights of way. Studies show that dedicated lanes can improve bus operating speeds by 40 percent through the elimination of delays associated with traffic congestion and right-turning traffic, with signals remaining the only source of traffic delay.

- *Bus streets and busways*: A bus street or transit mall can be created in an urban center by dedicating all lanes of a city street to the exclusive use of buses. The operational and travel time benefits resulting from the separation of buses from general-purpose traffic can be augmented with improved bus shelters and stations. These facilities provide protection from the elements. They can be equipped to provide safety equipment and systems that furnish information such as printed routes and schedules or electronically transmitted real time schedule data. Space can also be leased to commercial convenience services.

  Streets are suited for conversion to exclusive transit use only if they are not necessary to provide routine access to buildings by general-purpose traffic. Busways connecting urban centers with the suburbs can be created on or adjacent to highways, on arterial streets, or in abandoned rail rights of way. Bus streets and busways provide for the greatest improvement in bus service by eliminating conflicts with general-purpose traffic.

- *Bus signal preference and preemption*: Preferential treatment of buses at intersections can involve the extension of green time or actuation of the green light at signalized intersections upon detection of an approaching bus. Intersection priority can be particularly helpful when implemented in conjunction with bus lanes or streets, because general-purpose traffic does not intervene between buses and traffic signals.

- *Traffic management improvements*: Low-cost infrastructure elements that can increase the speed and reliability of bus service, as well as improve traffic flow for other vehicles, include bus turnouts, bus boarding islands, curb realignments, and bus lanes and signalling technology for intersection queue jumping.

- *Faster boarding*: Conventional on-board collection of fares slows the boarding process, particularly when a variety of fares is collected for different destinations and/or classes of passengers. An alternative would be the collection of fares upon entering an enclosed bus station or shelter area prior to bus arrivals. This system would allow passengers to board through all doors of a stopped bus. A self-service or "proof-of-payment" system also would allow for boarding through all doors, but would pose significant enforcement challenges. Pre-paid "smart" cards providing for automated fare collection would speed fare transactions, but would require that boarding remain restricted to the front door of the bus.

  Another impediment to reducing boarding time is the height difference between ground level and conventional buses, as most passengers are required to climb several steps, and passengers using wheelchairs can enter the bus only with the assistance of lift equipment, the operation of which is time-consuming. Changes in bus or platform design that could provide for level boarding, such as low-floor buses, raised platforms, or some combination thereof, could make boarding both faster and easier for all passengers.

- *Integration of transit development with land use policy*: Bus Rapid Transit supports transit-oriented developments (TODs). TODs are high density areas or corridors developed with building site and street designs that favor transit and pedestrian usage. A well-designed Bus Rapid Transit system can provide high-quality service that can compete with automobiles in terms of travel time and convenience, particularly in TODs. The clustering of development has the additional benefit of conserving land and promoting the vitality of neighborhoods and urban commercial centers. Bus Rapid Transit can be most effective when integrated within a broader planning framework encompassing land use policies, zoning regulations, and economic and community development.

- *Incremental development*: Bus Rapid Transit features can be phased in stages to relieve budgetary pressures on transit agencies. As each of the various components of Bus Rapid Transit is implemented, such as exclusive bus lanes, signal preference, and improved boarding and fare collection, the operator can realize incremental benefits in terms of reduced delays.

2.0 PLANNING AND IMPLEMENTING BUS RAPID TRANSIT IN THE UNITED STATES

2.1 Planning for Bus Rapid Transit

2.1.1 Bus Operations Planning

Bus Rapid Transit systems may emerge as a result of short range bus operations planning, e.g., planning for bus service routes, stops, headways and schedules. Low-cost elements of Bus Rapid Transit operations, such as exclusive bus lanes, bus stops, transfer facilities, signal preemption, and traffic management improvements, may be implemented in an incremental fashion.

2.1.2 Regional Planning

Low-cost operational strategies associated with Bus Rapid Transit may also evolve from long range multimodal metropolitan planning. These strategies, which can improve the efficiency and effectiveness of existing bus service, must be consistent with locally established goals and objectives for improving the regional transportation system and must be programmed in the Metropolitan Transportation Improvement Program or the State Transportation Improvement Program for implementation. Where the multimodal metropolitan transportation planning process determines that some type of major transportation capital investment (such as a fixed guideway transit project, a highway facility, or other improvement) is necessary to meet the mobility needs in a given corridor, an analysis and evaluation of potential alternatives to meet these needs is required.

The need for analysis of transportation alternatives. The need to undertake an analysis of alternatives is not driven by a predisposed modal solution, such as Bus Rapid Transit (or, for example, a highway improvement, light rail transit (LRT), or high occupancy vehicle lane); rather, it is predicated on the identification of transportation needs for a given corridor. The analysis is intended to identify and compare the relative costs, benefits, and impacts of a range of alternative strategies to determine which best meets corridor needs. If stakeholders in the metropolitan planning process -- including local planners, decision makers, interest groups, and the general public -- believe that Bus Rapid Transit might help to address the problems and needs in a corridor, then it should be included as an alternative to be evaluated within a multimodal corridor analysis.

Local stakeholders have broad discretion to design a study approach to examine corridor needs and potential strategies to meet these needs. At a minimum, the analysis should reflect several considerations, including:

- Being able to support a decision on "design concept and scope" of the project, in other words, the type of investment, approximate alignment, and general capacity. Typically, more detailed design options, such as the precise placement of transit stations along a fixed guideway are addressed in preliminary engineering for the project.

- General consensus among stakeholders that the level of analysis is adequate to support selection of a locally preferred alternative.

- Consistency in the level of analysis among all alternatives, to ensure an even playing field for the comparison of alternatives. Consequently, Bus Rapid Transit must be analyzed and evaluated at the same level of detail as other alternatives considered in the corridor study.

In addition, the corridor analysis should involve significant input from communities most impacted by the potential transportation investment.

FTA discretionary New Starts funding may be used to support the capital costs of busways and Bus Rapid Transit systems. Any major transit capital investment proposed to be funded under the New Starts program must be based on an analysis of transportation alternatives, as outlined above. In addition, other project justification must be met. Funding opportunities under the New Starts program are summarized later in this paper.

Comparison of transportation alternatives. After fully establishing the nature of present and future problems in -- and goals and objectives for -- a corridor or other defined area, subsequent analysis should identify all reasonable alternative strategies which might address these considerations. It is at this point in the study where Bus Rapid Transit should be introduced, along with other potential modal solutions, such as various other public transportation alternatives, highway options, and travel demand strategies. The corridor analysis should evaluate how each of these identified alternatives meets the purpose and needs of the corridor being studied and consider the costs and environmental, socioeconomic, transportation, and land use impacts of each option:

- *Mobility Improvements* -- The analysis should examine the degree to which each transportation alternative addresses mobility needs in the corridor. One important measure of improved mobility is the number of *new transit riders* which are estimated for each of the transit (including Bus Rapid Transit) alternatives being studied, versus the ridership which is forecasted for the existing system absent of significant additional investment. Another key measure is the estimated *travel time savings* that each alternative is forecasted to produce. Travel time savings accrue to both users of the proposed transit improvements and to highway traffic along the corridor, which may experience less congestion due to the redirection of some trips from automobile to transit. Travel times for each alternative are typically measured against the forecasted travel times of the current system, assuming that no improvements are implemented. Operational strategies which improve travel times for transit, such as signal preemption or traffic management improvements, may also be introduced to estimate their impact on corridor travel.

- *Environmental Impacts* -- Transportation systems and facilities produce significant environmental impacts. Alternatives which encourage automobile use may generate increased air pollution, but alternatives such as light rail or electric-powered Bus Rapid

Transit may actually improve air quality by redirecting travel by automobile to emission-free transit. Transportation systems also impact water resources and wetlands, parks and open spaces, and historical and cultural resources. Corridor analyses should evaluate each alternative's impacts to determine its specific environmental costs and benefits.

- *Land Use* -- Transportation systems and facilities also significantly influence the way surrounding land is used and developed. The corridor analysis should examine existing local land use policies and evaluate how the various alternatives under consideration complement these policies. Bus Rapid Transit may contribute to meeting economic development and land use goals in communities which have established strong transit-oriented development policies, and which have the tools and incentives to implement such policies.

- *Project Costs* -- The costs for constructing and operating each alternative must be estimated and compared. Relative cost effectiveness may be measured by a number of indicators, for example, by calculating the operating and/or capital cost per passenger or cost per passenger-mile of each alternative. In addition to estimating costs, potential funding sources for constructing and operating the proposed system should also be examined.

Typically, alternatives cease to be considered in the analysis when they fail to meet the identified needs, goals, and objectives for the corridor, or cannot compete with other options in terms of project costs and benefits. So long as Bus Rapid Transit remains a competitive option, however, it should be carried through to the end of the corridor study process.

Selecting Bus Rapid Transit for implementation. The selection by local decision-makers of Bus Rapid Transit as the locally preferred alternative (LPA) in a corridor is identical to the process for selection of any preferred alternative. First, Bus Rapid Transit must be included early on as one of the set of reasonable alternatives being studied within the multimodal corridor analysis of alternatives. Secondly, this analysis must determine that Bus Rapid Transit substantially meets the needs, goals, and objectives for the corridor, and local decision makers conclude that its relative costs and benefits exceed or match those of the other transportation alternatives studied. Thirdly, the selection and eventual implementation of Bus Rapid Transit by local decision makers must have the support of the general public and locally elected officials.

When it is determined that reasonable revenue sources are available both to build and to operate the LPA, it must be incorporated into the officially adopted regional long range transportation plan, developed by the local metropolitan planning organization in cooperation with other participants and stakeholders in the transportation planning process. More detailed engineering and completion of required environmental documentation are necessary before FTA New Starts funding can be made available and construction can begin.

2.1.3 Future Consideration of Rail

Since Bus Rapid Transit is often less expensive to construct and operate than rail transit, it may be a more appropriate investment in areas where the demand for rail cannot quite justify its costs. However, Bus Rapid Transit's level of service, coupled with transit-supportive land use policies along Bus Rapid Transit corridors, may, over time, build a market for a higher capacity system such as light or heavy rail. In such cases, rail transit capital costs may be offset somewhat by previous investment in Bus Rapid Transit right-of-way, transit stations, and other infrastructure that can be converted to rail use.

Conversely, while Bus Rapid Transit lends itself to eventual conversion to LRT under some circumstances, it may also provide areas with adequate capacity indefinitely, or for many years into the future. Bus Rapid Transit need not be an interim step to implementation of rail transit; rather, it can be a low-cost, high-performance transit alternative which also provides localities the flexibility to implement higher capacity rail technologies more easily should there be a demand for such in the future.

2.2 Implementing Bus Rapid Transit

2.2.1 Project Development

Bus Rapid Transit systems that develop out of bus operations planning may consist of low-cost strategies that are intended to be implemented in stages. As each phase of such a system is implemented, its incremental impact on bus service may not be significant enough to be noticed by transit customers. But once all planned phases are completed, a comparison of the resulting bus service with the pre-implementation service should yield marked improvements. (Nevertheless, a low-cost, incrementally implemented Bus Rapid Transit system is unlikely to have a major effect on land use.)

For a capital intensive Bus Rapid Transit system evolving from a regional multimodal planning process, the project moves into preliminary engineering (PE) phase once a corridor study is completed, a locally preferred alternative has been selected, and a strong local financial commitment exists to implement and operate the system. The PE phase addresses project costs, alignments, and operational features in greater detail.

Where there exists a potential for Federal investment in the proposed project, environmental documentation required by the National Environmental Policy Act (NEPA) must be completed by the end of PE. The full evaluation of the social, economic, and environmental impacts of the Bus Rapid Transit proposal and the consideration of actions to avoid, minimize and mitigate those impacts is required. This evaluation is accomplished through an appropriate NEPA review process in accordance with FTA and Federal Highway Administration (FHWA) rules on the preparation of environmental impact statements and related documents (23 CFR Part 771). These regulations are

likely to be revised to reflect major investment study and environmental streamlining provisions contained in the Transportation Equity Act for the 21st Century.

Note that when Bus Rapid Transit proposals are comprised of multiple, independent bus operational and bus-related actions, they may be addressed separately under NEPA procedures. FTA and, as needed, FHWA field offices should be consulted regarding the extent to which previous studies and reviews apply to Bus Rapid Transit actions and the procedural requirements that remain unsatisfied.

In addition, in order to be eligible for FTA New Starts funding, FTA approval must be granted to enter into PE. This approval is based upon demonstration that the proposed project has emerged from an analysis of multiple transportation alternatives (as in a multimodal corridor transportation study), as well as the project's merits in terms of its mobility improvements, cost-effectiveness, operating efficiencies, environmental benefits, and land use and financial considerations. FTA subsequently rates projects competing for its discretionary capital resources, and recommends to Congress which projects best justify continued Federal investment. Consequently, reasonably priced, high-performance Bus Rapid Transit which has emerged from a locally-managed, multimodal analysis of alternatives may rate favorably in both local and Federal decisions to support the project.

2.2.2 Final Design and Construction

When Bus Rapid Transit projects are New Starts or involve major FTA capital investments of $100,000,000 or more, they are subject to monitoring by the FTA's Project Management Oversight Program (PMOP) as they move into the final design and construction phases. Under this program, consultants under contract to the FTA serve as an extension of FTA's technical staff in assessing a grantee's project management, construction management and technical capacity in building a major capital project. They help the contractor determine whether the project is on time, within budget, in conformance with the grantee's design criteria, constructed to approved plans and specifications, and implemented effectively and efficiently.

2.3 Funding for Bus Rapid Transit

There are several Federal program resources which may be used to fund Bus Rapid Transit and enhanced bus improvements. Although New Starts are usually associated with investments in light or heavy rail transit, New Starts funding may be used to support the capital costs of any fixed guideway system, including bus transit applications such as busways and Bus Rapid Transit. There are several previous and current applications of *Section 5309 New Start* funds for project development and construction of busways as a transit fixed guideway element. A Bus Rapid Transit system would be eligible for New Starts funding if it:

- has resulted from an analysis of modal alternatives to address locally-defined needs in a corridor, as in a major investment/multimodal corridor study;

- is included in a locally adopted long range regional transportation plan and transportation improvement program;
- is justified based on several Congressionally-mandated New Starts criteria, including mobility improvements, environmental benefits, cost effectiveness, operating efficiencies, transit-oriented land use, local financial commitment, and other factors. A Bus Rapid Transit investment (as well as all other guideway alternatives) is exempt from this criteria if the Federal contribution to the project is less than $25 million.

Bus-related capital expenses are also eligible under FTA's *Section 5309 Bus Discretionary* capital program. FTA's *Section 5307 Urbanized Area Formula* program resources may be used for capital investments and transportation planning activities associated with Bus Rapid Transit; these funds may also be used to support the operating costs of Bus Rapid Transit in urbanized areas of below 200,000 population.

The US Department of Transportation (USDOT) has a strong interest in improving the performance of the Nation's surface transportation system and has taken the lead in conducting research, development, and operational testing activities using advanced technologies. These technologies can be referred to as Intelligent Transportation Systems (ITS). In 1996, four cities were selected to be "models" for deployment of these technologies as part of a Model Deployment Incentives (MDI) Program. The selection process laid an important foundation of interjurisdictional, interagency and public/private cooperation for the deployment of these advanced technologies.

A natural follow-up to the MDI is the ITS Integration Program to advance the deployment of ITS in the US. This program provides Federal funding for the integration of multimodal intelligent transportation infrastructure elements in metropolitan and rural areas. Projects selected for funding will improve transportation efficiency, promote safety, improve traffic flow (including the flow of intermodal travel at ports of entry), reduce emissions of air pollutants, improve traveler information, enhance alternative transportation modes, build on existing ITS projects, or promote tourism. A request for participation is expected to be announced in early August 1998.

Both FTA's and FHWA's formula planning programs may be used to support Bus Rapid Transit planning. In addition, FHWA's Surface Transportation Program and Congestion Mitigation and Air Quality Improvement have the flexibility to be used for capital investments in public transportation, at state and local discretion. The forum for decision making on the use of Federal transportation resources in urbanized areas is the metropolitan planning organization, in cooperation with local transit operators and State Departments of Transportation.

3.0 UNITED STATES DEMONSTRATION OF BUS RAPID TRANSIT

The Federal Transit Administration is interested in supporting one or more demonstrations of Bus Rapid Transit in US cities. American transit operators, traffic engineers, city officials, and merchants may more readily adopt a Bus Rapid Transit operation, if they can first see the results of a demonstration that has encountered the situations and overcome the problems that might occur while implementing the concept in this country. A US approach to dealing with existing auto traffic both in the Bus Rapid Transit corridor and cross streets, on-street parking, turn conflicts, traffic signal preference for buses, and speedier fare collection and boarding, is likely to differ from that in Curitiba, Brazil, the site of a highly successful model Bus Rapid Transit system, because of different conditions, laws, and institutions. For these reasons, the FTA would like to monitor in detail the experiences of US Bus Rapid Transit implementations, collect data, and prepare evaluation reports documenting developments. It is felt that such information together with the opportunity to visit an operating US Bus Rapid Transit site would encourage the development of Bus Rapid Transit in this country.

3.1 Selection and Funding of Bus Rapid Transit Demonstration Projects

The FTA will publish a Federal Register Notice (FRN) announcing the Bus Rapid Transit Demonstration Program and soliciting interested participants. The FRN will contain:

- a brief description of BRT and why FTA is interested in its demonstration in the US;
- a description of FTA financial resources for the demonstration project (limited funds for demonstration project administration, data collection, etc.) (significant funds for capital improvements and operations must come from other sources);
- a description of the demonstration program:
  -- scientific evaluation of implementation and operation of BRT,
  -- data collection efforts;
- key measures of interest:
  -- reduction of bus delay by component (congestion, signal, boarding and fare collection),
  -- effect on other traffic,
  -- effect on bus ridership,
  -- change in bus operation costs, etc.; and
- project selection criteria:
  -- significance of project (expected improvement of bus speed),
  -- comprehensiveness of project (inclusion of congestion, signal, boarding and fare collection delay reduction plans, land use considerations),
  -- identification and committment of funds for capital-intensive elements
  -- evidence that planning was completed, and there is local commitment involving the partnering of the transit agency, city, county or state governments, and the private sector, if appropriate.

The FTA will hold a proposers' conference to describe project and answer questions. The FTA will select projects to participate in the Demonstration Program after Regional Offices and the Bus Rapid Transit Task Force have reviewed and commented on the submitted proposals.

FTA anticipates that $2 million in Research and Demonstration Funding (Section 26) will be made available in Fiscal Year (FY) 99 to support demonstration projects. These funds could be used for a number of project activities such as administration of demonstration project activities, data collection, evaluation, information dissemination, etc. Funds to support other project costs such as capital improvements and bus operations may be available from other Federal, state or local sources, as described above.

3.2 FTA Participation

FTA participation in a demonstration of Bus Rapid Transit could include a number of activities, performed through direct involvement of FTA personnel, FTA funding of third party consultants, or FTA funding of certain aspects of the demonstration itself. The range of activities is listed and illustrated below:

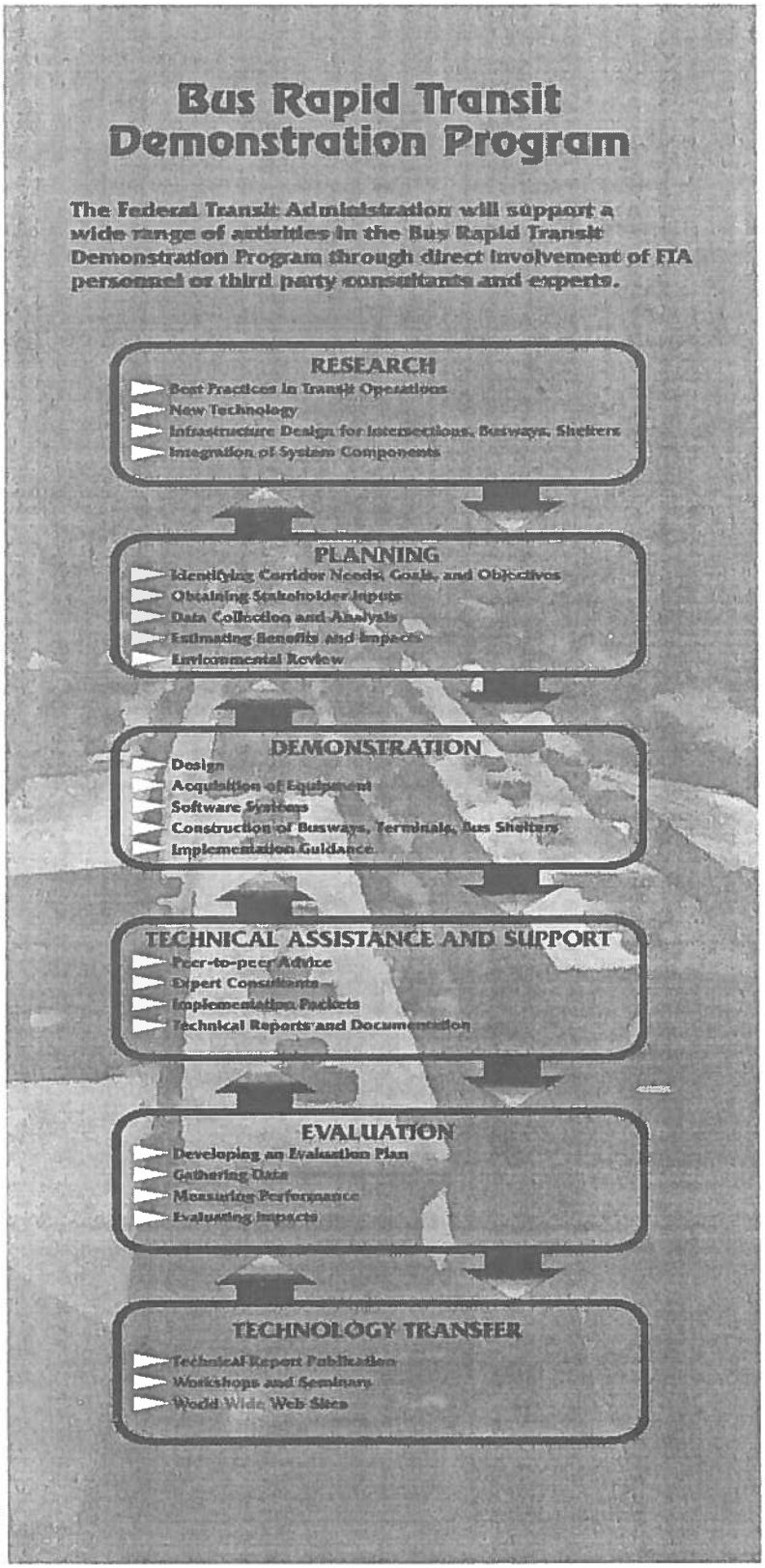
- *Research* -- FTA could provide funding for research into best practices in transit operations, infrastructure design, available new technology, and integration of system components.

- *Planning* -- FTA could assist transit agencies planning for Bus Rapid Transit in identifying corridor needs, goals, and objectives, obtaining stakeholder inputs and obtaining data, and estimating impacts, including environmental impacts, and benefits.

- *Demonstration* -- FTA-paid consultants could assist transit agencies in designing a demonstration that will achieve its goals and will provide information required to support a complete evaluation of its impacts.

- *Technical Assistance and Support* -- FTA could arrange for technical support for the demonstration in the form of paid consultants, industry peers or other experts. These experts could advise on such considerations as the choice of appropriate state-of-the-art technologies for the demonstration, exclusive bus lane design issues, low floor bus design, traffic engineering issues, and bus stop and terminal design.

- *Evaluation* -- FTA personnel or FTA-paid consultants could work with the implementing agency to develop a data collection plan and to gather the information. Examples of these activities include: conducting surveys of current and potential transit users; designing data collection forms and data or monitoring systems; observing transit operations; and interviewing transit agency employees, city planners, and traffic engineers. In addition, FTA could pay a third party contractor to perform an objective evaluation of the demonstration.


Bus Rapid Transit Demonstration Program
The Federal Transit Administration will support a wide range of activities in the Bus Rapid Transit Demonstration Program through direct involvement of FTA personnel or third party consultants and experts.
RESEARCH
Best Practices in Transit Operations
New Technology
Infrastructure Design for Intersections, Busways, Shelters
Integration of System Components
PLANNING
Identifying Corridor Needs, Goals, and Objectives
Obtaining Stakeholder Inputs
Data Collection and Analysis
Estimating Benefits and Impacts
Environmental Review
DEMONSTRATION
Design
Acquisition of Equipment
Software Systems
Construction of Busways, Terminals, Bus Shelters
Implementation Guidance
TECHNICAL ASSISTANCE AND SUPPORT
Peer-to-peer Advice
Expert Consultants
Implementation Packets
Technical Reports and Documentation
EVALUATION
Developing an Evaluation Plan
Gathering Data
Measuring Performance
Evaluating Impacts
TECHNOLOGY TRANSFER
Technical Report Publication
Workshops and Seminars
World Wide Web Sites

- *Technology Transfer* -- FTA could facilitate the dissemination of demonstration results and other research through technical reports and World Wide Web sites. FTA could arrange "scanning tours," wherein officials and designers visit other operational Bus Rapid Transit sites, and periodic workshops and seminars for mutual sharing of information and ideas.

3.3 FTA Goals of a Bus Rapid Transit Demonstration

The goals for Bus Rapid Transit are consistent with FTA Strategic Plan goals such as improving mobility and accessibility and providing efficient transportation. FTA intends for the Bus Rapid Transit demonstration to address a number of transit issues. FTA expects to see improvements in bus service, operations, and ridership, as well as effects on traffic congestion. An evaluation conducted in conjunction with the demonstration should include an assessment of the degree of improvement in these variables, cumulatively and as a result of specific components of Bus Rapid Transit. Specifically, FTA would like to examine:

- *The degree to which bus speeds and schedule adherence improve.* Perhaps the most fundamental expected result of a Bus Rapid Transit demonstration would be an improvement in travel times due to the lack of impediments to bus movement along exclusive bus lanes. Bus speeds would be expected to improve not only in absolute terms, but also relative to the automobile traffic that parallels the exclusive lanes.

- *The degree to which ridership increases due to improved bus speeds and schedule adherence.* Customers who use buses infrequently might ride more often, and some automobile users might convert to transit. An improvement in bus speeds might be noticeable to drivers of other vehicles, presenting a positive image of transit as an alternative to driving.

- *The effect on other traffic.* If the creation of exclusive bus lanes reduces the number of lanes available for other traffic, then the possibility of increased congestion on the roadways is raised. Traffic flow on cross streets and turning traffic may be disrupted as buses use their signal priority to travel unimpeded through intersections. Further, mobility on alternate routes may deteriorate, as drivers seek ways to avoid roads with exclusive bus lanes. One of the challenges of implementing an exclusive bus lane would be to minimize this disruption. On the other hand, successful Bus Rapid Transit systems may convert enough new riders from automobile to reduce traffic congestion.

- *The effect of each of the components of Bus Rapid Transit on bus speed and other traffic.* FTA would like to assess the relative contribution of each component of a Bus Rapid Transit system to determine its impact. Components of particular interest are exclusive bus lanes, signal preemption, fare collection methods, same-level boarding, and off-the-street bus terminals in center city.

- *The benefits of ITS/Automated Public Transportation Systems (APTS) applications to the demonstration.* Because of its involvement in the Federal ITS/APTS program, FTA is especially interested in the effectiveness of these technologies in this demonstration. Applications of particular interest are signal priority systems for buses, smart card fare media, precision docking systems for buses, tight terminal guidance systems, automatic vehicle location, advanced communications systems, and exclusive bus lane enforcement systems.

- *The effect of Bus Rapid Transit on land use.* It is expected that a full-featured Bus Rapid Transit system that includes exclusive lanes and/or roadways, elaborate bus stops, terminals or transfer facilities will be regarded by the general public, developers and investors as permanent and significant as other fixed guideway facilities. Such a Bus Rapid Transit system could be expected to have land use effects similar to those of rail systems. It may take some time, however, for these effects to be realized. Bus Rapid Transit systems of lesser significance and appearance of permancy would likely have lesser or no land use impacts.

3.4 Evaluation of Demonstration

With the assistance of an evaluation contractor, the FTA plans to assess the above issues through an evaluation of the Bus Rapid Transit demonstration. A carefully constructed evaluation accomplishes a number of purposes: 1) to document what happened and why; 2) to measure benefits, costs, and impacts of the demonstration on affected populations; 3) to reveal both successful and unsuccessful aspects of the demonstration; 4) to determine if the demonstration met the goals and objectives of its sponsors; and 5) to assess the applicability of the demonstration to other sites. An evaluation not only helps others learn from the demonstration, but also helps the involved parties to improve their own systems.

A classic evaluation involves a number of activities, including developing hypotheses, defining demonstration issues, identifying data needed to test hypotheses, developing a data collection plan and schedule, selecting control cases, if necessary, conducting statistical analyses of the data, and documenting the demonstration in a report. For each selected project, the evaluation contractor will prepare the evaluation plan, oversee the collection of the data by the selected participant according to the plan, evaluate the results, and prepare the evaluation report.

3.5 Performance Measures

Both qualitative and quantitative measures of performance are used to judge the success of a demonstration and to estimate its benefits. They permit a detailed examination of relevant aspects of the new system and of differences between the new system and the old. Areas examined include system efficiency and effectiveness, functional characteristics, administration, costs and revenues, ridership, effects on nonbus traffic and mobility, effects on special populations such as disabled

people, environmental effects such as air quality and energy usage, and, to the extent possible, longer term impacts such as changes in patterns of land development and job locations.

Measures in several performance areas are listed below. These are presented merely as examples and do not comprise a complete list of possible measures for assessing Bus Rapid Transit performance.

Bus Speed Measures

- *Bus speed*: average bus speeds on specific route segments, or systemwide, before and after Bus Rapid Transit; bus speed as a percentage of automobile traffic on same route segments before and after Bus Rapid Transit. Incremental effects on bus speed of Bus Rapid Transit components, e.g., signal priority and exclusive bus lanes, may be possible to calculate if they were implemented in stages with data available for each stage.

- *On-time performance*: average number of minutes buses are late (early) arriving at bus stops on a route, or systemwide, percent of buses arriving "x" minutes late or early at bus stops, percent of stops at which buses are on time, both before and after Bus Rapid Transit.

- *Dwell time*: average number of seconds it takes buses on a route, or systemwide, to load and unload passengers both before and after Bus Rapid Transit; corresponding average number of passengers loading and unloading per stop both before and after Bus Rapid Transit.

Traffic Speed Measures

- *Signal preemptions*: average number of times per trip a bus exercises signal priority; average number of minutes intersecting traffic is delayed due to signal preemption.

- *Traffic speed*: average speed of automobiles and other motorized vehicles on parallel traffic lanes on bus route, or systemwide, both before and after Bus Rapid Transit.

Ridership Measures

- *Passengers*: number of passengers on a route or systemwide, both before and after Bus Rapid Transit; passenger-miles on a route or systemwide, both before and after Bus Rapid Transit.

- *Revenue*: total fares collected both before and after Bus Rapid Transit.

Operating Efficiency Measures

- *Costs*: cost per vehicle-mile, cost per vehicle-hour, cost per passenger-mile both before and after Bus Rapid Transit.

4.0 SCHEDULE

FTA is seeking indications of interest in demonstration projects that could commence in FY 99, which begins on October 1, 1998. FTA requires that there will be a one-year evaluation period for each selected project. The overall project duration could be two to three years or more.

CONTACTS

Transit agencies, counties, states or other parties interested in participating in the Bus Rapid Transit Demonstration Program should contact Federal Transit Administration Regional and Metropolitan Offices; their staffs will work with potential applicants in developing proposals and providing guidance as needed. Contact Headquarters in Washington, D.C. for information regarding the Demonstration Program and procedural guidance.

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"Bus rapid transit embraces a holistic approach to transportation that will integrate transit development with land use planning to improve the quality of life in our cities."

Gordon J. Linton
Administrator
Federal Transit Administration