



# FTA

**Federal Transit Administration**

*"Delivering Solutions that Improve Public Transportation"*

**September 30, 2005**  
**Strategic Research Plan**

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## EXECUTIVE SUMMARY

### FEDERAL TRANSIT ADMINISTRATION'S VISION

*"Public transportation is the mode of choice in America"*

### FTA STRATEGIC RESEARCH MISSION

*"Deliver Solutions that Improve Public Transportation"*

### FTA STRATEGIC RESEARCH GOALS

1. Provide  
Transit  
Research  
Leadership

2. Increase  
Transit  
Ridership

3. Improve  
Capital &  
Operating  
Efficiencies

4. Improve  
Safety &  
Emergency  
Preparedness

5. Protect the  
Environment  
& Promote  
Energy  
Independence

### OBJECTIVES BY GOAL

1.1 Ensure transit research supports national goals

1.2 Continue to improve research management

1.3 Facilitate implementation of research results by the transit industry

2.1 Identify best practices and technologies to increase transit ridership

2.2 Identify and overcome barriers to the adoption of ridership enhancement techniques

2.3 Identify solutions to provide public transportation for targeted populations

2.4 Identify cost-effective solutions to provide rural public transportation services

3.1 Identify practices and technologies to control capital costs

3.2 Identify solutions to control operating costs

3.3 Identify methods and technologies to improve transit operational efficiency

3.4 Identify solutions to improve transit infrastructure maintenance

3.5 Improve the capacity of the transit industry and workforce

4.1 Identify solutions to improve transit safety

4.2 Identify solutions to reduce criminal activity

4.3 Identify solutions to improve transit emergency preparedness

5.1 Facilitate development of technologies to improve energy efficiency and reduce transit vehicle emissions

5.2 Identify and overcome barriers to adoption of clean technologies

Message from the Associate Administrator

I am pleased to share with you the Federal Transit Administration's (FTA) Strategic Research Plan for FY2006 – FY2010. This Plan follows the Strategic Research Plan set forth in October 2004 and sets the strategic framework for FTA's research priorities and will be our "touchstone" for investing scarce public funds in relevant and useful research projects that will improve our Nation's public transportation systems.

This Strategic Research Plan is the result of an ongoing dialogue with transit industry leaders, university researchers, FTA staff, and USDOT modal professionals. Based on this input, we have identified what we think are the "right" areas to research and it is our intention to research them in the "right" way to produce results that matter.

This Strategic Research Plan describes our strategic goals and provides a framework for how we will measure our success. This plan also describes how we will work in partnership with our customers and stakeholders to achieve our research goals.

An important feature of this Strategic Research Plan is its dynamic and flexible nature. We need to be able to adapt to emerging challenges and opportunities, and revise our priorities accordingly. Therefore, we plan to update this Strategic Research Plan periodically.

We welcome your continued interest and participation as we work to deliver solutions that improve public transportation for the American people.

Barbara A. Sisson, P.E.  
Associate Administrator  
Office of Research, Demonstration  
and Innovation

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## Introduction

This Strategic Research Plan identifies key Federal Transit Administration (FTA) goals and priorities for investing in transit research during 2006-2010. It incorporates the suggestions, ideas and comments of transit agencies, Congressional committees and staff, transit business leaders, public transportation researchers, the U.S. Department of Transportation (USDOT) modal administrations, and FTA staff. This plan is designed to be reviewed and updated periodically, in conjunction with key stakeholders, to ensure that it remains strategically relevant, provides leadership regarding new ideas, and responds to transit industry needs as they are identified.

The plan explains to stakeholders how FTA research fits into the broader context of transit research conducted by other organizations. FTA cannot achieve its research objectives in a vacuum. The agency will work in partnership with its customers and stakeholders to achieve research goals for the transit industry. FTA will work with its stakeholders on research aimed at common needs and will help guide the direction of such research through participation in a variety of partnerships.

This Plan has three parts, each of which answers one of the following questions: *why* FTA conducts and sponsors transit research; *what* FTA researches; and *how* FTA conducts and sponsors transit research. Section 1 presents the impetus for FTA's involvement in transit research. Section 2 lays out the goals, objectives, strategies, and performance measures for FTA's research activities. Note that currently the National Research and Technology Program is the only program over which FTA exercises discretion in the use of its funds. Section 3 addresses research program administration, including the important issue of determining how well the research accomplishes the goals of the program. Section 3 also sets forth the principles for how FTA selects, manages, evaluates, and undertakes research.

### 1. The Purposes of FTA Research

The central purposes of FTA research are to: (1) provide industry and policy makers with the information and skills to make good business decisions with regards to transit technology, operational, and capital investments; (2) use research results to identify best practices and share this information with others who can benefit from it; and, (3) show a range of outcomes that helps direct where future investments should be made.

Transit plays a major role in achieving important social, economic, and environmental goals including getting people to work, reducing air pollution and congestion, improving the mobility of transportation-disadvantaged persons, and supporting efficient urban and rural development. This plan positions FTA to act as a catalyst to foster innovation in the transit industry through exchange of information and dissemination of technology leading to better designed and more efficient transit services.

## FTA Strategic Research Mission

FTA's Strategic Research Mission is designed to support FTA's vision to *Make Public Transportation the Mode of Choice in America* (See Figure 1). FTA is committed to a research program that delivers results to the American public and provides real solutions to the transit industry. To achieve this mission, FTA has identified five strategic research goals. These goals flow from the USDOT Strategic Goals and FTA's Core Accountabilities.<sup>1</sup> Each strategic research goal has associated research objectives and research strategies which are fully described in Section 2 of this plan. Performance measures are in the process of being identified.

FIGURE 1: FTA's Vision, Strategic Research Mission, and Strategic Research Goals



FTA seeks a balanced portfolio of transit research efforts. A large portion of FTA's research programs will be directed towards solving problems faced by the transit industry. A certain portion will also be directed towards longer-term research projects. As the Federal agency responsible for transit, FTA assumes a leadership role in supporting research unlikely to be undertaken by the private sector, including long-term, high-risk, high potential payoff investigations of new technologies. Long-term projects represent an important investment in the future of the transit industry even though they may have no immediate tangible benefits. They also inform long-term investment strategies into the needs of the transit industry 10 to 20 years from now.

This plan is directed to multiple audiences which have different needs for information, keeping in mind that the American public is the ultimate customer of transit services (See

<sup>1</sup> The USDOT Strategic Goals are: Safety, Mobility, Global Connectivity, Environmental Stewardship, Security, and Organizational Excellence and FTA's Core Accountabilities are: Transit Ridership Growth,



Table 1). FTA seeks to identify research areas of common interest and opportunities to partner and avoid duplication of effort.

**TABLE 1: Audiences for FTA’s Strategic Research Plan and Their Reasons for Needing Information**

<b>Audience</b>	<b>Reasons for Needing Information</b>
Congress and the Office of Management and Budget	To help inform funding decisions
Transit providers	To help them make use of the results of FTA’s research and inform their own research activities
FTA staff	To establish goals and objectives for in-house research and awards of funding to external researchers
Other DOT & Federal agencies	To work with FTA in identifying areas of common interest/overlap and opportunities for collaborative research
Equipment manufacturers and systems developers	To assess their own research activities and priorities against the backdrop of FTA’s policy and technology priorities and help them work with FTA to identify research that may be appropriate for Federal funding
Industry groups/ associations	To identify research areas of common interest and opportunities to work in partnership with FTA and to avoid duplication of effort
University researchers	To identify research activities that are not only of academic merit but also relevant to FTA’s research strategy/priorities
Wider research community	To learn about FTA’s priority research areas and identify areas of common interest

## 2. Research Plan

The primary mission of FTA research is to deliver solutions that improve public transportation (See Figure 1). Of FTA’s five Strategic Research Goals, four are focused on specific areas where FTA should concentrate its research efforts. However, FTA understands that its research programs are part of a broader transit industry research effort. The first goal therefore seeks to provide transit research leadership by linking all transit research efforts across the industry.

### Goal 1: Provide transit research leadership

FTA recognizes that besides federally sponsored research, transit research is carried out by a number of entities throughout the United States, including State Departments of Transportation, transit agencies, universities, and industry-sponsored research. However, FTA alone has the responsibility for looking at transit research from a national



perspective. Thus, it is important to articulate how the FTA will assert a leadership role for all transit-related research.

FTA will ensure its research programs are balanced and support national goals. FTA's Research Programs, as amended by the *Federal Public Transportation Act of 2005*, are composed of the following major programs: The National Research and Technology Program (NRTP)<sup>2</sup>, the National Fuel Cell Bus Technology Development Program, the Transit Cooperative Research Program (TCRP), and the University Transportation Centers Program (UTC). FTA also receives considerable funding from the DOT Intelligent Transportation Systems Program. (Additional information about each program can be found in Appendix 1.)

As it undertakes research, FTA will first identify and analyze appropriate candidate methods, techniques or technologies for further research. This will be followed by testing, demonstrating, and evaluating these methods, techniques, or technologies. Once completed, FTA will work to ensure that research results are disseminated for implementation by the industry, including possible standards development.

Besides domestically conducted research, FTA will share international best practices with the U.S. industry. Beyond just the transmittal of reports, FTA will provide decision-makers with the appropriate tools and data analysis they need to make informed decisions.

### *What strategies are needed*

#### Objective 1.1 Ensure transit research supports national goals

The FTA will develop an effective and innovative approach to conducting and promoting transit research. This approach will be strategic in that it will identify selected research that promises to have high payoffs in terms of achieving national goals. Our approach will also identify and attempt to fill existing research gaps. FTA's research funds will also be highly leveraged by including partners in many of its research projects and by identifying research that is already taking place. Finally, FTA will maximize its influence by working with the leadership of other transit research programs to direct, coordinate, and support related transit research efforts.

FTA will also seek to ensure its research programs are appropriately balanced. Most research carried out through the TCRP and UTC programs is responsive in nature to immediate industry needs, is shorter term, and typically lower-risk. To create a balanced program, FTA intends to direct NRTP research to those goal areas that are not otherwise adequately funded. In addition, the characteristics of that research will be directed towards more high risk/high reward projects to ensure an overall balanced portfolio.

Congress has traditionally designated a portion of the NRTP for specified uses by specific organizations. As this is FTA's only discretionary research program, this

practice severely hampers efforts to be strategic in nature. In FY 2004, for example, out of \$35.5 million appropriated for the National Planning and Research Program (now the NRTP), approximately \$9 million was discretionary. This increased to approximately \$16 million in FY 2005. Thus, the ability of the FTA to fund research projects that strategically support its mission has been compromised by the high level of Congressional earmarking and the extent to which these earmarks support transit industry improvements.

**Objective 1.2 Continue to improve research management**

To effectively lead transit research, FTA will work to build the research management capability necessary to deliver excellence in all of its research programs. This objective seeks to establish mechanisms to ensure research projects consistently produce high-quality data and deliverables and to improve the research administration strategies outlined in Section 3 of this plan. This includes the development of the research assessment structures necessary to ensure research projects are carried out with sufficient technical rigor and that they are appropriately evaluated.

**Objective 1.3 Facilitate implementation of research results by the transit industry**

As the transit research leader, FTA’s research office envisions itself as the “go-to” resource to improve transit systems. Therefore, FTA will continually strive to be aware of other research being done both in the United States and internationally. To support implementation of results, the transit industry must receive the information it needs to make informed decisions about practices and technologies. Information will be presented in a manner that is useful to decision-makers. However, beyond just dissemination of results, FTA will analyze and help overcome barriers to adoption of new practices and technologies by transit agencies.

<b>GOAL 1. PROVIDE TRANSIT RESEARCH LEADERSHIP</b>	
<b>OBJECTIVES</b>	<b>STRATEGIES</b>
1.1 Ensure transit research supports national goals	<ul style="list-style-type: none"> <li>• Strategic Planning</li> <li>• Receive advice on transit research from Transit Research Analysis Committee</li> <li>• Work with State DOT's, universities, and the transit industry to coordinate research efforts</li> <li>• Ensure a balanced portfolio of research projects across FTA research programs</li> </ul>
1.2 Continue to improve research management	<ul style="list-style-type: none"> <li>• Monitor and implement research best practices</li> <li>• Measure, control, and compile quality research data and deliverables</li> <li>• Develop and implement research assessment</li> </ul>



1.3 Facilitate implementation of research results by the transit industry

- Identify and track domestic and international transit research
- Ensure research results are presented in a useable format and are easily accessible
- Identify barriers to adoption of practices or technologies

## Goal 2: Increase transit ridership

Each year, Americans take over 9 billion trips using public transportation. The American Public Transportation Association (APTA) estimates that more than 31 million trips are taken each weekday, by more than 14 million people. Public transportation ridership has grown by nearly 22 percent since 1995, faster than highway or air travel.<sup>3</sup> Still, transit's share of the overall "transportation market" remains small.

This plan identifies increasing transit ridership as a primary goal of FTA research. In setting this goal, FTA recognizes that increasing ridership is not an end in itself but rather a means to other ends, such as increasing mobility, achieving economically vibrant communities, improving access for the transit dependent, and reducing air pollution. Transit ridership is a proxy for a range of societal benefits that derive from increased ridership. This proxy relationship informs the aims and scope of FTA's research conducted in support of the ridership goal as well as the development of appropriate measures of research performance.

The accrual of the benefits of transit depends on attracting riders. If potential riders fail to take advantage of the convenience of transit, congestion will strangle our metropolitan areas and harm economic growth. If public transportation does not enjoy the confidence and support of elected officials and the public at large, we will not make the investments necessary to have the capacity to evacuate our cities when emergencies strike. If elective riders won't choose to ride a transit bus, we will not be able to sustain transit systems that meet community mobility needs for those who are dependent on our systems. This plan seeks to identify solutions to assist the industry to continue to increase ridership.

### *Where research is needed*

#### Objective 2.1 Identify best practices and technologies to increase transit ridership

There continues to be a need for a better understanding of public perceptions and attitudes about transit as FTA and the transit industry develop strategies to increase ridership. We need to understand why individuals choose to ride transit, or inversely why they choose not to ride transit. Research will also identify how to serve existing passengers better.

FTA will continue to monitor ridership trends to identify why transit ridership is increasing in some systems and declining in others. Successful and unsuccessful efforts to increase transit ridership cost effectively need to be better documented and disseminated within the transit industry. FTA intends to develop mechanisms for identifying successful ridership promotion strategies. We will analyze why they were successful and disseminate the findings of these studies within the industry.

FTA will also continue to research transit operating practices to analyze how they affect ridership. This includes new forms of transit services, parking policies, fare strategies, and service redesigns to determine which have the potential to attract new and retain existing riders.

#### Objective 2.2 Identify and overcome barriers to the adoption of ridership enhancement techniques

There have been a number of studies examining why transit ridership increases. TCRP Project J-6, Task 51 was an Evaluation of Recent Ridership Increases. As with other studies, it found that the most significant ridership increases took place when the transit agencies undertook a combination of the following types of initiatives:<sup>4</sup>

- Service adjustments – including service reconfigurations and expansion and new service models;
- Fare and price adaptations – including introduction of new fare media and technologies;
- Marketing and information initiatives;
- Shifts in planning orientations – including increased emphasis on strategic planning and customer-oriented planning; and,
- New efforts in service coordination, collaboration, and partnership – especially those with universities.

Some methods for increasing transit ridership are not a mystery. However, not all transit agencies are adopting techniques that are most likely to lead to increased ridership. A recent study completed by the Mineta Institute for FTA concluded that transit organizations that have adopted innovative technologies and programs exhibit some of the following behavioral characteristics:<sup>5</sup>

- Ability to overcome high initial costs;
- Ability to form partnerships;
- Ability to identify and target market segments;
- Ability to take or overcome risk; and,
- Ability to integrate technology with finance, planning, and operations.

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<sup>4</sup> Stanley, Robert G. and Robert Hyman. "Evaluation of Recent Ridership Increases." TCRP Research Results Digest (April 2005) p. 2.

<sup>5</sup> Mineta Transportation Institute. "Literature Review: Adoption of Innovation in Public Agencies." (June,



Future research will examine how to support transit agencies in these areas. This includes developing new forums for transit agencies as well as organizations such as the American Public Transportation Association (APTA), the Community Transportation Association of America (CTAA), and the American Association of State Highway and Transportation Officials (AASHTO) to exchange successful and unsuccessful experiences with attempts to increase ridership.

External factors affecting transit ridership will also be examined. Transit ridership is affected by a number of factors beyond the direct control of transit agencies such as the economy and employment levels. These issues are beyond the primary scope of FTA research. However, there are other factors on which the transit industry may be able to exact more influence, such as signal priorities, urban parking policies, and traffic management.

### Objective 2.3 Identify solutions to provide public transportation for targeted populations

Public transportation services are often targeted at specific population groups, such as the elderly, persons with disabilities, low-income dependent riders, and reverse commuters. Often elderly travelers are grouped into the same category as those with disabilities, yet the travel needs of these populations are likely to be different. Research is needed to improve our understanding of how best to serve these populations so that transit services can be improved to serve all customers' travel needs.

A large and growing proportion of the U.S. population experiences some type of limitation on their mobility. It is estimated that by the year 2025, 18 percent of the U.S. population will be over the age of 65 and many will no longer be able to drive.<sup>6</sup> In 2004, the Surface Transportation Policy Project reported that on any given day, 50 percent of non-drivers over 65 years old stay at home, partially because they lack transportation options, and as a consequence made 15 percent fewer trips to doctors and 65 percent less social trips.<sup>7</sup>

Transit agencies have dramatically improved the accessibility of their systems since the 1990 passage of the Americans with Disabilities Act (ADA). For example, agencies have increased the percentage of lift- or ramp-equipped buses. Buses with less than 25 seats increased from 79 percent compliance in 1993 to 99 percent compliance in 2003. Articulated buses increased from 38 percent to 96 percent compliance over the same period.<sup>8</sup> Research is needed to identify new methods and technologies to improve accessibility for all persons to our transit systems.

At the same time, transit services offered to mobility-impaired populations are often expensive. Research is needed as to how to efficiently and cost-effectively provide transit service to this growing segment of the population. This includes coordination of

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<sup>6</sup> Bailey, Linda. "Aging Americans: Stranded Without Options." Surface Transportation Policy Project (April 2004) p. 3.

<sup>7</sup> Bailey, p. 4.

human services transportation and examining technologies, such as Intelligent Transportation Systems (ITS), that can improve accessibility. When addressing these targeted populations, research will examine “universal design” solutions that are integrated with mainstream transit systems and do not necessarily add another layer of service.

Objective 2.4 Identify cost-effective solutions to provide rural public transportation services

Transit service is also important in rural areas, where currently 40 percent of residents do not have access to public transportation services and another 25 percent only have minimal access. Providing service in these areas is vital for the 29 million rural Americans who are transit-dependent.<sup>9</sup> This includes seniors, Americans with disabilities, and low-income families.

Not only are rural services different from urban services, but rural services themselves are not equal. Research is needed to determine a reasonable stratification of rural transit services and what are logical approaches to providing transit services in these disparate rural areas. This will also include identifying effective performance measures for demand response services. Coordination of rural services, including interstate issues, is also important to supporting more cost-effective operations.

Another avenue for research is examining appropriate vehicles and technologies, such as ITS, for rural use. Rural services may not require the large buses that are common in urban areas. Rural transit vehicles may also have different requirements in terms of terrain and weather.

<b>GOAL 2. INCREASE RIDERSHIP</b>	
<b>OBJECTIVES</b>	<b>RESEARCH STRATEGIES</b>
2.1 Identify best practices and technologies to increase transit ridership	<ul style="list-style-type: none"> <li>• Examine why individuals choose to ride or choose not to ride transit</li> <li>• Determine logical classifications of transit travel markets and identify appropriate transit services for them</li> <li>• Monitor ridership trends to identify best practices and what hasn't worked</li> <li>• Research and demonstrate methods to improve services for existing riders</li> <li>• Develop and experiment with pricing, parking, yield management strategies, etc.</li> </ul>



2.2 Identify and overcome barriers to the adoption of ridership enhancement techniques	<ul style="list-style-type: none"> <li>• Examine strategies to overcome hurdles faced by transit agencies in adopting new methods</li> <li>• Develop new forums for the exchange of successful and unsuccessful experiences with transit operator attempts to increase ridership</li> <li>• Examine external factors that affect ridership that the transit industry can influence</li> </ul>
2.3 Identify solutions to provide public transportation for targeted populations	<ul style="list-style-type: none"> <li>• Determine how to expand transit services to elderly and mobility impaired populations, with an emphasis on using existing systems</li> <li>• Research and demonstrate methods to improve coordination of human services</li> <li>• Research and demonstrate technologies to improve accessibility</li> </ul>
2.4 Identify cost-effective solutions to provide rural public transportation services	<ul style="list-style-type: none"> <li>• Determine classifications of transit services in rural areas</li> <li>• Research logical approaches to transit in rural areas</li> <li>• Identify parameters for appropriate vehicles for rural use</li> </ul>

### Goal 3: Improve capital and operating efficiencies

FTA is focused on ensuring that every transit project produces a good return on investment for the American public. To accomplish this, FTA has placed increased attention on improving capital and operating efficiencies. This includes reducing and controlling capital costs of both infrastructure and vehicles in order to produce projects that are delivered on time, within budget, and that achieve the ridership projected. Once a capital investment is in place, return on investment is maximized by ensuring that operations are both cost effective and efficient over its useful life.

The Safe, Accountable, Flexible, and Efficient Transportation Equity Act - A Legacy for Users (SAFETEA-LU) authorizes a total of \$45.3 billion in guaranteed funding for Federal transit programs for FY 2005 through FY 2009, an increase of 46 percent over the Transportation Equity Act for the 21<sup>st</sup> Century (TEA-21) funding. However, requests for investment in transit infrastructure continue to grow, as evidenced by the FY 2006 New Starts Report, which recommends funding for 16 existing, 4 anticipated Full Funding Grant Agreements (FFGAs), and a group of 6 other New Starts projects.<sup>10</sup> FTA needs to continue to seek to maximize these investments by finding ways to better manage capital costs for optimum service performance.

At the same time, transit operations face considerable challenges to control operating costs. Operating expenses, in large part due to the expansion of existing systems and the

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addition of new systems, increased nearly 57 percent between 1991 and 2003 to a total of \$24.2 billion.<sup>11</sup>

Tied to reducing operating costs, is improving transit operational efficiencies. One measure of efficiency, the average operating speed of all transit modes, was 19.6 miles per hour in 2000, down from 20.3 in 1997.<sup>12</sup> Another measure, miles between major system bus failures, has shown improvement, increasing by 56 percent from 2001 to 2003. The transit industry needs information to make appropriate decisions on service operations. It also requires support to build the capacity, both of the workforce and the manufacturing industry, to meet these challenges.

### *Where research is needed*

#### Objective 3.1 Identify practices and technologies to control capital costs

In 2003, \$13.2 billion was spent in the United States on transit capital expenses, 57 percent for facilities, guideways, stations, and administrative buildings, 28 percent for rolling stock, and 15 percent for other expenses. Almost 40 percent of this funding comes from the Federal government.<sup>13</sup> To ensure an appropriate return on these investments, and to stretch federal funds further, FTA is determined to identify methods to control capital costs.

To demonstrate the importance it places on controlling capital costs, FTA has set forth a goal for its executive team that 100 percent of New Starts projects with FFGAs will not exceed their current baseline cost estimate by more than five percent. A clear understanding of the interrelations of cost overruns, cost escalation, and the evolving nature and scale of major capital projects is necessary to meet this goal. FTA recognizes that any major construction project involves risk. Building tunnels, acquiring property, and navigating the unpredictable process of public involvement are all risky ventures. FTA will continue to focus on methods to improve risk management.

Research is needed to develop and implement better ways to control costs through better design and improved methods of cost control. FTA will work closely with new project sponsors to analyze project costs, identify important capital cost variables in project design, and to use this information to help communities design and build cost-effective transit projects.<sup>14</sup>

FTA will also examine the capital costs of non-rail vehicles. A study prepared for FTA indicates that as the number of bus orders continues to decline, vehicle costs for most

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<sup>11</sup> 2003 National Transit Summaries and Trends. p. 14.

<sup>12</sup> 2002 Status of the Nation's Highways, Bridges, and Transit: Conditions & Performance Report to Congress, U.S. Department of Transportation (2003) p. ES-7.

<sup>13</sup> 2005 Public Transportation Fact Book. p. 36.

<sup>14</sup> Important variables that affect transit construction costs include: land acquisition and clearance, the degree of environmental impact mitigation, inflation, financing charges, availability of right-of-way, number and size of vehicles, stations, tracks, lanes, maintenance yards, parking lots or garages, bridges,



types of buses are increasing. In just one year, the average cost of articulated buses and 40-ft. buses has increased by more than \$30,000. The average cost of a 40' transit vehicle increased from \$287,000 in 1999/2000 to \$341,000 in 2004/2005.

The capital cost savings and other potential benefits of utilizing standards also needs to be better quantified. Typically, standards are performance-based, and are not specifically developed to save costs. FTA will examine the development of a package of standards that may help in controlling costs.

### Objective 3.2 Identify solutions to control operating costs

Controlling operating costs remain a challenge for the transit industry. Operating expenses per unlinked passenger trips increased 37 percent between 1999 and 2003, greater than the 34.3 percent rate of inflation.<sup>15</sup> All modes, except heavy and commuter rail, had increases greater than inflation.

FTA will examine methods to reduce operating costs, including alternative service delivery providers and automation. Salaries, wages and fringe benefits account for nearly 80 percent of the total directly operated expenditures. Fifty-two percent of total expenditures are devoted to vehicle operations, 20 percent for vehicle maintenance, 10 percent for non-vehicle maintenance, and 17 percent for general administration.<sup>16</sup>

Research will also examine life-cycle costing. This includes the impact of capital expenditures on future operating costs as well as the operating costs of adopting new practices and technologies.<sup>17</sup> FTA will consider the costs and benefits of producing innovative designs and technologies for bus and rail systems and vehicles. Research will also identify platforms for systems integration to ensure technologies are interoperable.

### Objective 3.3 Identify methods and technologies to improve transit operational efficiency

Bus operations remain by far the largest component of transit services in the United States, comprising 54 percent of vehicle miles, followed by heavy rail at 18 percent, demand response at 16 percent, commuter rail at 8 percent, and light rail at 2 percent.<sup>18</sup> Therefore, given their share of the market, the most promising opportunities for operational improvements reside with bus, heavy rail, and demand response operations.

FTA will seek to identify methods and technologies to improve operations of fixed route bus and heavy rail services. This will include examinations of fleet operations and mobility management. It also includes the use of Intelligent Transportation Systems.

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<sup>15</sup> 2003 National Transit Summaries and Trends. p. 15.

<sup>16</sup> 2003 National Transit Summaries and Trends. p. 15.

<sup>17</sup> Part of the rise in operating costs is due to the increase in capital investments. Vehicle revenue miles (the miles a transit vehicle travels while in revenue service) increased by nearly 39 percent between 1991 and 2003. Light rail and demand response experienced 139 percent and 193 percent increases respectively. 2003 National Transit Summaries and Trends. p. 6.

Transit operations continue to be transformed by the rise in demand response services. The share of vehicle revenue miles for demand response has steadily increased from slightly more than 7 percent in 1991 to 16 percent in 2003 while the share of vehicle revenue miles for buses decreased from 62 percent to 54 percent. However, given that demand response services represent 20 percent of vehicle miles, but less than 1 percent of unlinked passenger trips, research will focus on improving the efficiency of demand response services.<sup>19</sup>

#### Objective 3.4 Identify solutions to improve transit infrastructure maintenance

The 2002 Conditions & Performance Report estimates that an annual capital investment in transit infrastructure of over \$9.1 billion would be needed to maintain the current condition and performance of public transit assets. Over \$5.8 billion is needed to rehabilitate and replace rail assets and over \$3.3 billion is required to rehabilitate and replace non-rail assets.<sup>20</sup> Given these requirements, FTA will seek methods to facilitate and improve the monitoring and maintenance of transit infrastructure. This includes development of improved and integrated maintenance and management systems to monitor the state of defects and repairs on transit systems. FTA will also research the ability of Geographic Information Systems to improve the capability of transit systems to track, analyze, and control transit assets.

#### Objective 3.5 Improve the capacity of the transit industry and workforce

Closely tied to improving capital and operating efficiencies is improving the capacity of the transit industry. This includes both developing the transit workforce as well as helping strengthen the domestic transit industry's suppliers and manufacturers. By improving the position of the domestic industry, FTA can ensure a market environment necessary to keep costs of infrastructure and rolling stock competitive in a global economy.

There are about 351,000 transit workers in the United States, of which 338,000 are involved in transit operations.<sup>21</sup> Transit agencies often cite severe problems in recruiting and retaining a skilled workforce, in part due to technology and demographic changes.<sup>22</sup> A TCRP Research Results Digest found that while a number of innovative programs exist, "the absence of mechanisms that help the industry as a whole learn from the successes of individual properties means that innovation is not shared effectively."<sup>23</sup> Therefore, FTA will focus on filling this gap to identify and share best practices on workforce development.

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<sup>19</sup> 2003 *National Transit Summaries and Trends*. p. 11.

<sup>20</sup> 2002 *Status of the Nation's Highways, Bridges, and Transit: Conditions & Performance Report to Congress*, U.S. Department of Transportation (2003) p. 7-22.

<sup>21</sup> 2005 *Public Transportation Fact Book*. p 23.

<sup>22</sup> Vogel, Brian H. "Identification of the Critical Workforce Development Issues in the Transit Industry" *TCRP Research Results Digest* Number 45 (December 2001) p.1.



Another issue facing the transit industry is the viability of the non-rail vehicle market. Service is provided by thousands of agencies within the United States. Almost 2,000 agencies provide bus service and about 5,300 agencies provide demand response services.<sup>24</sup> Yet only about 3,200 buses were built in 2004 and about 2,500 were on order in January 2005 from about 15 manufacturers.<sup>25</sup> Therefore, the small size and fractured nature of the bus market hinders the development of a strong domestic market.

The 2000 Bus Summit identified the following issues for further examination:<sup>26</sup>

- Improved cooperation and interaction among industry stakeholders through communication, information, and the Internet;
- Vehicle procurement and procurement guidelines;
- Deployment of new technologies; and,
- FTA policies and regulations

<b>GOAL 3. IMPROVE CAPITAL &amp; OPERATING EFFICIENCIES</b>	
<b>OBJECTIVES</b>	<b>RESEARCH STRATEGIES</b>
3.1 Identify practices and technologies to control capital costs	<ul style="list-style-type: none"> <li>• Improve risk management</li> <li>• Improve design and cost control methods</li> <li>• Analyze capital cost variables</li> <li>• Identify appropriate standards needs</li> </ul>
3.2 Identify solutions to control operating costs	<ul style="list-style-type: none"> <li>• Analyze alternative delivery providers</li> <li>• Examine full life-cycle costs of capital investments</li> <li>• Analyze costs of technology adoption on operations</li> <li>• Identify and analyze platforms for systems integration</li> </ul>
3.3 Identify methods and technologies to improve transit operational efficiency	<ul style="list-style-type: none"> <li>• Research and demonstrate methods to improve bus and heavy-rail efficiency</li> <li>• Examine operational delivery strategies involving fleet operations, mobility management, and ITS</li> <li>• Analyze technologies and practices to improve demand response performances</li> </ul>
3.4 Identify solutions to improve transit infrastructure maintenance	<ul style="list-style-type: none"> <li>• Research improved inspection and integrated maintenance systems</li> <li>• Examine the use of Geographic Information Systems to track infrastructure assets</li> </ul>

<sup>24</sup> 2005 Public Transportation Fact Book. p. 9.

<sup>25</sup> 2005 Public Transportation Fact Book. p. 53



### 3.5 Improve the capacity of the transit industry and workforce

- Promote transit workforce development best practices
- Promote the development of the U.S. transit manufacturing industry
- Strengthen viability of the non-rail vehicle market

## Goal 4: Improve safety and emergency preparedness

Transit is one of the safest modes of travel. The National Safety Council's 2004 "Injury Facts" reports that riding a transit bus is 79 times safer than automobile travel. Transit rail passengers are 42 times safer than those traveling by auto.<sup>27</sup> However, in 2003 there were 234 fatalities reported by transit agencies (most not to passengers) and about 18,235 injuries reported to FTA.<sup>28</sup> Therefore, safety remains a continuing concern of FTA and transit operators.

It is also important to distinguish between safety and security when discussing transit. Safety involves concerns such as driver training and performance and vehicle and roadway/guideway design. Security, however, involves protection against any intentional act or threat of violence or personal harm, either from a criminal or terrorist act. In the prevention of security breaches from a terrorism perspective, FTA works closely with the Department of Homeland Security's Transportation Security Administration (TSA).

*Where research is needed.*

### Objective 4.1 Identify solutions to improve transit safety

As previously mentioned, transit is one of the safest modes of transportation in the United States. However, given the number of fatalities and injuries reported on public transportation, FTA will continue to seek solutions to improve transit safety. To develop strategies to improve safety, it is important to know where and how these are occurring. Of the 234 fatalities reported in 2003, buses accounted for 87, commuter rail 77, heavy rail 49, light rail 17, and demand response for 4.<sup>29</sup> Passengers, however, only accounted for 19.7 percent of all fatalities.<sup>30</sup> Approximately 63% (11,493) of the 18,235 reported injuries were on buses.<sup>31</sup>

Using National Transit Database (NTD) data and working with State Departments of Transportation and insurance providers, FTA will identify risk factors that are causing transit incidents to determine which areas require the most focus. Potential areas to improve transit safety include improving grade crossing safety, reducing trespassing, improving vehicle crashworthiness design, and developing collision avoidance systems. These efforts will be coordinated with DOT sister agencies such as the Federal Railroad

<sup>27</sup> *Public Transportation Fact Book*. p. xiii.

<sup>28</sup> "Transit Safety and Security Statistics and Analysis Annual Report, Fatalities by Mode and Year." FTA

<sup>29</sup> "Transit Safety and Security Statistics and Analysis Annual Report, Fatalities by Mode and Year."

<sup>30</sup> *2003 National Transit Summaries and Trends*. p. 21.



Administration, the National Highway Traffic Safety Administration, and the Federal Highway Administration. FTA will also identify potential barriers to the adoption of these new technologies and strategies for overcoming these barriers so that transit agencies will be more able to employ them.

#### Objective 4.2 Identify solutions to reduce criminal activity

In 2003, there were 5,290 crimes against people (e.g., assault, robbery) across all transit modes. This translates to only 0.57 incidents per million trips and only 0.11 incidents per million passenger miles. Given the modal share of buses, it is not surprising that this mode had the most incidents overall, 2,500.<sup>32</sup>

Since the majority of security incidents for bus transit, 76 percent, occurred onboard buses, security efforts will focus on making vehicles more secure. By contrast, most rail incidents occurred at stations, so research efforts will focus on improving station safety.<sup>33</sup>

Developing methods to reduce fare evasion should also reduce crime as it is the most common security problem reported, comprising about 37 percent of all security incidents, followed by disorderly conduct at 25 percent.<sup>34</sup>

#### Objective 4.3 Identify solutions to improve transit emergency preparedness

As part of a continuous effort to secure our nation's transit infrastructure, FTA has undertaken an aggressive nationwide security program, receiving full cooperation and support from every transit agency. FTA has conducted risk and vulnerability assessments and deployed technical assistance teams to help strengthen security and emergency preparedness plans, and has funded emergency response drills conducted in conjunction with local fire, police, and emergency responders.

It is critical to integrate security throughout every aspect of transit programs, operations, and infrastructure. Public transportation also plays a critical role in evacuations. Therefore, FTA has implemented a program to improve public transit security focusing on three priorities:

- Training all transit employees and supervisors;
- Improving emergency preparedness; and,
- Increasing public awareness of security issues.

Research will focus on improving FTA's abilities to meet these three priorities. This includes identification of best practices, research and demonstration of technologies, and ensuring results are implemented in the industry.

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<sup>32</sup> *Safety & Security Newsletter*. Volume 2, issue 1 FTA (Spring 2004) p. 6.

<sup>33</sup> *Ibid.*

<sup>34</sup>

## GOAL 4. IMPROVE SAFETY & EMERGENCY PREPAREDNESS

OBJECTIVES	RESEARCH STRATEGIES
4.1 Identify solutions to improve transit safety	<ul style="list-style-type: none"> <li>• Improve grade crossing safety</li> <li>• Improve vehicle crash worthiness and occupant protection</li> <li>• Develop collision avoidance and warning systems</li> <li>• Identify barriers to the adoption of safety technologies</li> </ul>
4.2 Identify solutions to reduce criminal activity	<ul style="list-style-type: none"> <li>• Improve onboard bus and rail security</li> <li>• Improve bus and rail station security</li> <li>• Analyze and demonstrate methods to reduce fare evasion</li> </ul>
4.3 Identify solutions to improve transit emergency preparedness	<ul style="list-style-type: none"> <li>• Improve security training for all transit employees and supervisors</li> <li>• Improve emergency preparedness</li> <li>• Increase public awareness of security issues</li> </ul>

### Goal 5: Protect the environment and promote energy independence

Transit agencies have increasingly focused on incorporating new fuel technologies to make their systems cleaner and more efficient and to reduce fuel consumption. This change is in part due to community pressures and in part due to changes in emission standards set forth by the Environmental Protection Agency (EPA) and agencies such as the California Air Resources Board (CARB).

A FY 2005 analysis of electric-drive technologies carried out for FTA reports that transit agencies' primary interest in cleaner fleets was driven by regulatory and political pressure to reduce emissions and/or to bring their region into compliance with Federal air quality standards.<sup>35</sup> Specifically, heavy-duty transit bus engines are regulated by EPA for the following pollutants: particulate matter (PM), carbon monoxide (CO), nitrogen oxides (NOx), and hydrocarbon (HC) emissions. These standards become more stringent in 2007 and again in 2010.

While compressed natural gas (CNG) buses helped meet many of these goals, and comprised 11 percent of the total bus fleet in 2003, many transit agencies have been reluctant to deploy CNG buses due to associated expenses and the performance of these vehicles.<sup>36</sup> Therefore, many transit agencies are interested in finding clean alternatives to CNG, such as ultra-low sulfur diesel (ULSD) with diesel particulate filters and hybrid-electric buses.

<sup>35</sup> Callaghan, Lisa and Sheila Lynch. "Analysis Of Electric Drive Technologies For Transit Applications: Battery-Electric, Hybrid-Electric, and Fuel Cells." FTA (August 2005) pp. 7-8.



### *Where research is needed*

#### Objective 5.1 Facilitate development of technologies to improve energy efficiency and reduce transit vehicle emissions

Continuing research, development and demonstration efforts that increase the efficiency of electric drive buses will enhance their commercial viability. The current generation of hybrid electric buses relies on lead acid battery technology that has limitations in terms of weight, charge acceptance, reliability, durability and cost.<sup>37</sup> FTA will examine several different options in the energy storage area to address these concerns. These options include different battery chemistries, ultracapacitors, and flywheels. Advancements in power electronics and control would also prove beneficial to hybrid electric buses. Similar benefits would be derived from advancements in electrically driven accessories.

Researching technologies to reduce vehicle weight can also lead to important reductions in fuel consumption and emissions. The power required to accelerate a bus and overcome rolling resistance is directly proportional to vehicle weight. Composite materials are one example of an FTA research area aimed at reducing vehicle weights.

Over the last decade, the FTA has undertaken a number of research projects that demonstrate clean vehicle technologies, including fuel-cell buses, many of them Congressionally directed. To better manage these projects and to help lead the transit industry into the future, FTA will analyze and collect data on the performance of these projects. However, demonstrations of these fuel cell buses are only the first steps to the commercialization of fuel cell buses, as their cost, performance, reliability and durability currently do not meet the needs of transit operators as they are not yet affordable for revenue service.

As it undertakes research in this area, FTA recognizes that other federal agencies, especially the Department of Energy (DOE) have a much larger role and significantly more resources to advance the basic science of these technologies. The Energy Policy Act of 2005 will provide significant resources for DOE to lead hydrogen and fuel cell development as well as a program to carryout fuel cell transit bus demonstrations. FTA will seek to partner with, rather than duplicate these other basic science research efforts, to ensure the needs of transit are kept in mind as new systems are developed, and to ensure that transit is able to implement these technologies and systems once they are commercially available.

#### Objective 5.2 Identify and overcome barriers to adoption of clean technologies

Transit agencies around the country have already begun the process of deploying clean fuel technologies as they have become available and affordable, with funds from FTA's

Bus and Bus Facility Program. The percentage of bus fleets nationwide using alternative fuels increased from 1.2 percent in 1992 to 11.4 percent in 2003, with most using CNG.<sup>38</sup>

However, the adoption of alternative fuel systems has been stymied by several factors. The cost of a hybrid bus is typically more than \$500,000, while CNG requires additional infrastructure costs of over \$1.7 million for a single fueling station. And the first 40-ft. hydrogen fuel cell vehicle produced for the Santa Clara Valley Transit Authority in California cost more than \$1.6 million. The reliability, maintenance, and performance of alternative fuels and propulsion systems are also important factors that require further development before they will be practical for widespread transit revenue service.<sup>39</sup>

FTA will provide transit agencies and policy makers with the information they need to make appropriate investment decisions on these technologies. FTA will also research policies and methods to facilitate the adoption of cleaner technologies.

<b>GOAL 5. PROTECT THE ENVIRONMENT &amp; PROMOTE ENERGY INDEPENDENCE</b>	
<b>OBJECTIVES</b>	<b>RESEARCH STRATEGIES</b>
5.1 Facilitate development of technologies to improve energy efficiency and reduce transit vehicle emissions	<ul style="list-style-type: none"> <li>• Improve energy storage systems</li> <li>• Develop more advanced electric drive technologies</li> <li>• Research to decrease vehicle weights</li> <li>• Evaluate fuel cell deployment results</li> </ul>
5.2 Identify and overcome barriers to adoption of clean technologies	<ul style="list-style-type: none"> <li>• Provide transit agencies with up-to-date information on clean fuel technologies</li> <li>• Develop methods to improve reliability, maintainability and performance of clean fuel technologies</li> </ul>

### **3. Administering the FTA Strategic Research Plan**

The FTA approach to conducting and undertaking transit research is focused on meeting the Office of Management and Budget's (OMB) Research & Development Investment Criteria. There are three criteria: relevance; quality; and performance, and they apply to all Federal R&D programs. An additional fourth section lays out criteria for programs such as FTA's that are designed to develop technologies that address industry issues. The FTA plan is designed to position the agency as a *catalyst* for change in how the country views and uses transit services.

<sup>38</sup> 2003 National Transit Summaries and Trends. p. 41.



## ***Relevance of Research***

As laid out by OMB, research programs must have clear plans, must be relevant to national priorities, agency missions, relevant fields, and “customer” needs, and must justify their claim on taxpayer resources. Review committees should assess program objectives and goals on their relevance to national needs, “customer” needs, agency missions, and the fields of study the program strives to address.

## ***Strategies***

FTA intends to meet this requirement through the Strategic Planning Process. Section 1 & 2 of this Strategic Plan lay out the need for Federal transit research, the role of FTA, our strategic goals, and outcomes we hope to achieve.

In 2004, FTA supported the establishment of the Transit Research Analysis Committee (TRAC) at the National Academies Transportation Research Board. The TRAC is comprised of twelve transit professionals who serve in an advisory capacity to the FTA. The TRAC makes recommendations to FTA on transit research and advises FTA on its strategic research agenda and measurement methods. TRAC members are appointed by the President of the National Academies and serve on a rotating basis with initial terms of one to three years in length. The list of current TRAC members is included in Appendix A. The TRAC has been instrumental in reviewing and commenting on drafts of the Strategic Plan and will continue to do so in the future.

The TRAC provides an independent review and assessment of the needs of the public transportation industry that could be met through future investment in a national research and technology program. The committee will advise FTA as it develops a strategic agenda for transit research and will identify the roles that FTA and industry stakeholders could play in carrying out that agenda. The committee will advise FTA regarding:

1. The Federal role in transit research, relative to the roles and activities of others (private sector, Transit Cooperative Research Program [TCRP], states, universities, etc.) engaged in transit research;
2. High-priority opportunities proposed by the agency; and,
3. Processes that should be in place to ensure that the FTA receives the input and cooperation of transit research stakeholders in developing a Federal research program.

## ***Quality of Research***

Federal research programs are required to maximize the quality of the R&D they fund through the use of clearly stated, defensible methods for awarding a significant majority of their funding through competitive, merit-based processes. A customary method for promoting competitive, merit-based quality is the use of requests for proposals with peer or expert panel selection processes. Program quality must be assessed periodically through expert review.

### *Strategies*

FTA's ability to maximize the use of competition to award funds is dependent on the extent of Congressional direction placed in its programs. To the maximum extent possible, FTA employs a competitive process to award research grants. FTA proposes to increase the percentage of research projects selected in this way on an annual basis. Additionally, FTA will develop a peer review process for its research projects to ensure research is undertaken in a quality manner. For a significant portion of transit research, the Transit Cooperative Research Program already employs a competitive, merit-based process for project selection. The TRAC described above will play an instrumental role in assessing program quality through expert review.

### *Performance of Research*

OMB requires research programs to maintain a set of high-priority, multi-year objectives with annual performance measures and milestones that show how one or more outcomes will be reached. Metrics should be defined not only to encourage individual program performance but also to promote broader goals, such as innovation, cooperation, education, and dissemination of knowledge, applications, or tools. Program managers must demonstrate an ability to manage in a manner that produces identifiable results. At the same time, taking risks and working towards difficult-to-attain goals are important aspects of good research management, especially for basic research. OMB requires research programs to: track and report relevant program inputs annually; define appropriate output and outcome measures, schedules, and decision points; and, document performance annually.

### *Strategies*

FTA is in the process of identifying performance metrics for its research programs. Inputs, such as administrative expenses, are accounted for and tracked separately. As a follow-on to this Strategic Plan, FTA will be developing a Multiyear Program Plan to define schedules and decision points. FTA also uses a Quarterly Review process to examine the project management of all of its research projects and will be producing an annual report to document performance.

### *Criteria for Developing Technologies That Address Industry Issues*

OMB recognizes that the purpose of some technology demonstration programs and projects such as FTA's is to introduce some product or concept into the marketplace. Therefore, public-private partnerships are encouraged. However, some of these efforts engage in activities that industry is capable of doing and may discourage or even displace industry investment that would occur otherwise. OMB requires that research programs avoid duplicating research in areas that are receiving funding from the private sector, especially for evolutionary advances and incremental improvements.



As a condition for Federal investment, substantial market barriers must exist that hinder the ability of private industry to undertake the research without Federal involvement. For projects involving the development of technology, research must focus on substantial improvements that are necessary for a technology to become commercially viable for public transportation. Research and development investments must be relevant to national priorities, agency mission, and transit customer needs.

### *Strategies*

Proposed FTA research projects are evaluated for their estimated relevance using a graded scorecard system. Each proposed project is evaluated by FTA on the following criteria: (1) to what extent does the proposed research project support the attainment of DOT and FTA goals; (2) will it produce measurable results; (3) does the proposed research project need to be carried out by the Federal government; (4) is similar research being carried out in other projects or by other organizations; (5) is the project national in scope; (6) is there technological risk that requires Federal support to overcome; (7) can the results of the proposed research project be implemented within a reasonable horizon; and, (8) will the project have an appropriate return on investment.

Once a project is approved, a project evaluation plan is required to be incorporated into the project's work plan as part of the approval process. When the evaluation plan is activated in the development phase of the project, data are collected and analyzed to measure and evaluate progress. At the culmination of the development phase, a milestone review guides FTA in determining whether to continue the project.

### Appendix 1. Transit Research Programs

The following tables describe the purpose and funding levels for each of FTA's research program. In addition, the tables highlight the Strategic Goals supported by each program as well as general characteristic of the program in terms of levels of project risk and project timeframes. Funding levels are those authorized by SAFETEA-LU.

National Research and Technology Program (49 USC 5314, 49 USC 5312)			
Administered by FTA for both earmarked and discretionary research, development, demonstration, and deployment projects. FTA may make grants, contracts, cooperative agreements, or other agreements for research, development, demonstration, and deployment projects, and evaluation of technology of national significance to public transportation. This research should either improve public transportation service or help public transportation service meet the total transportation needs at a minimum cost.			
Strategic Goals: Across all 5 areas		Risk: Low & High Risk	
Timeframe: Short and Long Term		Reward: Low & High Reward	
FY2006	FY2007	FY2008	FY2009
\$33,700,000	\$36,400,000	\$40,600,000	\$44,450,000

National Fuel Cell Bus Technology Development Program (49 USC 5309, Federal Public Transportation Act of 2005)			
FTA will award three projects to geographically diverse recipients to conduct fuel cell bus technology and infrastructure research to facilitate the development of commercially available fuel cell bus technology.			
Strategic Goal: Environment & Energy		Risk: High Risk	
Timeframe: Long Term		Reward: High Reward	
FY2006	FY2007	FY2008	FY2009
\$11,250,000	\$11,500,000	\$12,750,000	\$13,500,000

Transit Cooperative Research Program (TCRP) (49 USC 5313)			
Administered by the Transportation Research Board of the National Academies of Sciences, TCRP funds research for innovative near-term solutions in response to the needs of transit service providers. Projects are competitively selected for a variety of transit research fields including planning, service configuration, equipment, facilities, operations, human resources, maintenance, policy, and administrative practices.			
Strategic Goals: Loosely aligned to 4 goals		Risk: Low	
Timeframe: Short Term		Reward: Low & High	
FY2006	FY2007	FY2008	FY2009
\$9,000,000	\$9,300,000	\$9,600,000	\$10,000,000



University Transportation Centers (UTC) (49 USC 5506)			
Administered by the Research and Innovative Technology Administration, funds are transferred to universities designated by Congress to advance significantly the state-of-the-art in transportation research and expand the workforce of transportation professionals through research, education, and technology transfer.			
Strategic Goals: Loosely aligned to 4 goals		Risk: Low	
Timeframe: Short Term		Reward: Low	
FY2006	FY2007	FY2008	FY2009
\$7,000,000	\$7,000,000	\$7,000,000	\$7,000,000

Intelligent Transportation Systems			
Funded by the ITS Joint Program Office and managed by FTA staff, the mission of the ITS Transit Program is to enhance the ability of the nation's public transportation systems to provide customer focused, seamless, responsive, and efficient end-to-end mobility for all by leading the innovative development and application of ITS technologies through research, operational tests/deployments, evaluation, training, and outreach in coordination and cooperation with the transit industry.			
FTA participates in the following ITS initiatives: Integrated Corridor Management Systems; Integrated Vehicle Based Safety Systems; Mobility Services for All Americans. FTA is also exploring Vehicle Assist and Automation Systems for Transit Operations			
Strategic Goals: Across first 4 areas		Risk: Low & High	
Timeframe: Short and Long Term		Reward: Low & High	
FY2006	FY2007	FY2008	FY2009
\$9,000,000*	\$9,000,000*	\$9,000,000*	\$9,000,000*

- Estimate based on TEA-21 averages

Small Business Innovative Research Program			
Congress established the Small Business Innovation Research (SBIR) Program to stimulate technological innovation, utilize small business to meet federal research and development needs, encourage participation by minority and disadvantaged businesses in technological innovation, and increase private sector commercialization of innovations derived from federal R&D.			
Strategic Goals: Across first 4 areas		Risk: Low & High	
Timeframe: Short Term		Reward: Low & High	
FY2006	FY2007	FY2008	FY2009
Funding is derived as a 2.6% takedown of research and research & development projects from the programs described above.			

The following are additional programs administered in connection with FTA's research program. They are mainly involved in training and technical assistance, rather than research or demonstration. They assist in the deployment of best practices and technologies.

National Transit Institute (49 USC 5315)			
Administered by Rutgers University, the National Transit Institute develops and conducts training for Federal, State, and local transportation officials and members of the transit industry on public transportation issues.			
FY2006	FY2007	FY2008	FY2009
\$4,300,000	\$4,300,000	\$4,300,000	\$4,300,000

Bus Testing Facility (49 USC 5309, 49 USC 5318)			
Administered by Penn State University, all new bus models acquired using FTA funds must be tested at the facility for maintainability, reliability, safety, performance (including braking performance), structural integrity, fuel economy, emissions, and noise.			
FY2006	FY2007	FY2008	FY2009
\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000

Project ACTION (49 USC 5314)			
Administered by the Easter Seals Society of America for demonstration programs, research, public education, and other activities to help mass transportation providers comply with the Americans with Disabilities Act.			
FY2006	FY2007	FY2008	FY2009
\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000

National Technical Assistance Center for Senior Transportation (49 USC 5314)			
Provider to be selected competitively. Will provide grants and technical assistance for senior transportation programs			
FY2006	FY2007	FY2008	FY2009
\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000



Appendix 2 – Stakeholders and the Transit Research Analysis Committee

Key Stakeholders	Transit Research Analysis Committee
<p><u>Federal Government</u>            Federal Highway Administration (FHWA)            Federal Motor Carrier Safety Administration (FMCSA)            Federal Railroad Administration (FRA)            ITS Joint Program Office (ITS/JPO)            National Highway Traffic Safety Administration (NHTSA)            Research and Innovate Technology Administration (RITA)            USDOT Research and Technology Coordinating Council (RTCC)            U.S. Department of Energy            U.S. Department of Homeland Security            U.S. Congress</p> <p><u>Non-Federal</u>            American Association of State Highway Transportation Officials (AASHTO)            American Public Transportation Association (APTA)            American Society of Civil Engineers (ASCE)            Community Transportation Association of America (CTAA)            Conference of Minority Transportation Officials (COMTO)            Council of University Transportation Centers (CUTC)            Eno Transportation Foundation            Institute of Transportation Engineers (ITE)            ITS America            Private Sector Professional Associations            Project ACTION            Transit Agencies            Transit Suppliers &amp; Manufacturers            Transportation Research Board (TRB)</p>	<p>Michael S. Townes, Chair  <i>Hampton Roads Transit, Hampton, VA</i>            Karen Antion  <i>Karen Antion Consulting, Stamford, CT</i>            J. Barry Barker  <i>Transit Authority of River City, Louisville, KY</i>            David Bayliss  <i>Halcrow Group, London, England</i>            Ronald L. Epstein  <i>New York State Department of Transportation, Albany, NY</i>            Santo A. Grande  <i>Delmarva Community Services, Inc., Cambridge, MD</i>            Delon Hampton  <i>Delon Hampton and Associates, Washington, DC</i>            Paul E. Jamieson  <i>WABCO Transit Division, Spartanburg, SC</i>            Brian Macleod  <i>Gillig Corporation, Hayward, CA</i>            Clarence W. Marsella, Jr.  <i>Denver Regional Transportation District, CO</i>            Michael H. Mulhern  <i>Jacobs Engineering, Boston, MA</i>            Nigel H.M. Wilson  <i>Massachusetts Institute of Technology, Cambridge, MA</i></p>

### Stakeholder Meetings

As part of the strategic research plan development process, the Associate Administrator for Research, Demonstration and Innovation held the following meetings:

<u>Dates</u>	<u>Attendees</u>
July 23-24, 2003	FTA Office of Research, Demonstration and Innovation Staff
September 4, 2003	Senior Management from across FTA
September 9, 2003	USDOT Research and Technology Coordinating Council
September 15, 2003	APTA Hosted Industry Working Session with COMTO, CTAA, Project Action
January 16, 2004	Industry/Government Dialogue
April 5-6, 2004	Transit Research Analysis Committee
December 2-3, 2004	Transit Research Analysis Committee
July 7-8, 2005	Transit Research Analysis Committee
August 26, 2005	Transit Research Analysis Committee