FTA

Federal Transit Administration

*"Delivering Solutions that Improve Public Transportation"*

# *FTA MULTI-YEAR RESEARCH PROGRAM PLAN (FY 2008 – FY 2012)*

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# LETTER TO THE READER

U.S. Department
of Transportation
**Federal Transit Administration**
1200 New Jersey Avenue, S.E.
Washington, D.C. 20590

Dear Colleague:

This *Multi-Year Research Program Plan (FY 2008 – FY 2012)* (Program Plan) is an integral element of the Federal Transit Administration's (FTA) strategic research planning process. The Program Plan links the goals and objectives of the FTA Strategic Research Plan to the active and planned research projects and activities funded by FTA. FTA's strategic research goals are:

Goal 1. Provide transit research leadership
Goal 2. Increase transit ridership
Goal 3. Improve capital and operating efficiencies
Goal 4. Improve safety and emergency preparedness
Goal 5. Protect the environment and promote energy independence.

This year's Program Plan updates the FY 2007 – FY 2011 Program Plan. It identifies FTA research projects and activities for FY 2008 through FY 2012, and clearly shows whether and how these projects and activities support FTA's strategic research objectives. It also identifies transit industry research needs and potential future research projects for funding consideration. In addition, the Program Plan provides more detail about the development process for new transit research within the major programs that make up FTA's research portfolio. FTA expects to make a significant effort this year to identify potential future projects as part of the FY 2009 – FY 2013 Program Plan.

We are grateful to our research partners and stakeholders for their continuing support in working with us to achieve our goals and objectives. Our FY 2007 Annual Research Report will be published in mid-2008. We are also grateful for the support of the Transit Research Analysis Committee (TRAC) in commenting and advising on our research activities at FTA.

Sincerely,

Vincent Valdes
Associate Administrator for
Research, Demonstration, and Innovation

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ADA | Americans with Disabilities Act |
| APTA | American Public Transportation Association |
| APTS | Advanced Public Transportation Systems |
| BRT | bus rapid transit |
| CBTC | communication based train control |
| CNG | compressed natural gas |
| CO | carbon monoxide |
| COOP | continuity of operations planning |
| COTA | Central Ohio Transit Authority |
| CFR | Code of Federal Regulations |
| CTAA | Community Transportation Association of America |
| DBE | disadvantaged business enterprise |
| DHS | U.S. Department of Homeland Security |
| DOE | U.S. Department of Energy |
| DOT | U.S. Department of Transportation |
| EDAPTS | Efficient Deployment of Advanced Public Transportation Systems |
| EEO | equal employment opportunity |
| EPA | U.S. Environmental Protection Agency |
| FEMA | Federal Emergency Management Agency |
| FHWA | Federal Highway Administration |
| FTA | Federal Transit Administration |
| FY | fiscal year |
| GIS | geographic information systems |
| GPS | global positioning systems |
| HC | hydrocarbon |
| HRT | heavy rail transit |
| ICMS | Integrated Corridor Management System |
| IMTP | International Mass Transportation Program |
| ITS | intelligent transportation systems |
| ITS-JPO | ITS Joint Program Office |
| JARC | Job Access and Reverse Commute |
| JPO | Joint Program Office |
| kW | kilowatt |

| | |
|---|---|
| LRT | light rail transit |
| LRV | light rail vehicle |
| MMIS | maintenance management information system |
| MOU | Memorandum of Understanding |
| NAS | National Academy of Sciences |
| NHTS | National Household Travel Survey |
| NOx | nitrogen oxides |
| NRTP | National Research and Technology Program |
| NTD | National Transit Database |
| NTI | National Transit Institute |
| OMB | Office of Management and Budget |
| OST | Office of Secretary of Transportation |
| OTC | Oklahoma Transportation Center |
| PART | Program Analysis Rating Tool |
| PM | particulate matter |
| RIAS | Remote Infrared Audible Signage |
| RITA | Research and Innovative Technology Administration |
| ROI | return on investment |
| RTA | Regional Transportation Authority |
| R&D | research and development |
| SAFETEA-LU | Safe, Accountable, Flexible, and Efficient Transportation Equity Act – A Legacy for Users |
| SBIR | Small Business Innovation Research |
| SEPTA | Southeastern Pennsylvania Transportation Authority |
| TAD | FTA Office of Administration |
| TBP | FTA Office of Budget and Planning |
| TCA | FTA Office of Communications and Congressional Affairs |
| TCC | FTA Office of Chief Council |
| TCIP | transit communications interface profile |
| TCR | FTA Office of Civil Rights |
| TCRP | Transit Cooperative Research Program |
| TERM | Transit Economic Requirements Model |
| TMCC | Travel Management Coordination Center |
| TOA | FTA Office of the Administrator |
| TOPS | TCRP Oversight and Project Selection |
| TPE | FTA Office of Planning and Environment |
| TRAC | Transit Research Analysis Committee |
| TRANSPO | National Center for Transportation Needs of Special Populations |
| TRB | Transportation Research Board |

| | |
|---|---|
| TRI | FTA Office of Research, Demonstration, and Innovation |
| TRIS | Transportation Research Information Service |
| TPM | FTA Office of Program Management |
| TRO | FTA Regional Offices |
| TSA | Transportation Security Administration |
| TSI | Transportation Safety Institute |
| | |
| ULSD | ultra-low sulfur diesel |
| USC | United States Code |
| UTC | University Transportation Center |
| UTCP | University Transportation Centers Program |
| UTFS | Universal Transit Farecard Stakeholder |
| UWR | United We Ride |
| | |
| WMATA | Washington Metropolitan Area Transit Authority |

# FTA MULTI-YEAR RESEARCH PROGRAM PLAN (FY 2008 – FY 2012)

## 1.0 BACKGROUND

This Multi-Year Research Program Plan (Program Plan) is a part of the Federal Transit Administration (FTA) strategic planning process. It supports the FTA Strategic Research Plan (Strategic Plan)[1], and is updated on an annual basis. This year's Program Plan summarizes existing FTA research projects and activities for fiscal year (FY) 2008 through 2012, and identifies transit industry research needs and potential future research projects for funding consideration. In addition, the Program Plan expands several topics addressed in last year's Program Plan.[2] FTA also reports on accomplishments in an Annual Research Report.[3] FTA's strategic planning documents are available at http://www.fta.dot.gov/assistance/research_research.html.

In 2003, the FTA requested that the Transportation Research Board (TRB) establish an advisory committee to assist in its strategic planning process. The Transit Research Analysis Committee (TRAC), created in October 2003, includes members from transit authorities, community service agencies, state departments of transportation, research institutes, consulting firms, and equipment manufacturers. TRAC provided 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. TRAC also advised FTA as the agency developed its strategic agenda for transit research and identified the roles that FTA and industry stakeholders could play in carrying out that agenda.

In September 2005, the FTA published its Strategic Plan, which describes FTA's research mission, vision, goals, objectives, and research programs and projects. Subsequent to the publication of the Strategic Plan, TRAC recommended several activities that FTA should conduct, including ongoing updates of the Strategic Plan, and the creation and annual update of a three- to five-year Research Program Plan, which became the Multi-Year Research Program Plan (Program Plan). Letter reports from the TRAC to FTA are available at http://www8.nationalacademies.org/cp/projectview.aspx?key=71.

The Program Plan links the goals and objectives of the Strategic Plan to current programs and projects, and to future research needs and potential projects. In turn, the Program Plan is linked to program and project implementation internally within FTA and externally with major stakeholders. The Program Plan outlines the types of new research projects that should be undertaken under the five goals in the Strategic Plan. Further, because it is intended to be directly connected to the budgeting process, the Program Plan assists FTA in determining future funding.

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[1] *FTA Strategic Research Plan*, September 30, 2005.

[2] *FTA Multi-Year Research Program Plan (FY 2007 – FY 2011)*, October 30, 2006.

[3] *FTA National Research Programs, Annual Research Report 2006*, March 2007.

# 2.0 FTA STRATEGIC RESEARCH GOALS

FTA's Strategic Research Plan considers the needs of the transit industry and the research community and provides specific goals and objectives for a comprehensive and multi-modal national transit research program. FTA's five goals, as presented in Table 2-1, are discussed in this section. Their corresponding objectives are discussed in Section 5.0.

**Table 2-1. FTA's Five Strategic Research Goals and Corresponding Objectives**

| Goals | Objectives |
|---|---|
| **Goal 1: Provide Transit Research Leadership** | 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 |
| **Goal 2: Increase Transit Ridership** | 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 |
| **Goal 3: Improve Capital and Operating Efficiencies** | 3.1 Identify practices and technologies to control capital costs |
| | 3.2 Identify practices and technologies 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 |
| **Goal 4: Improve Safety and Emergency Preparedness** | 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 |
| **Goal 5: Protect the Environment and Promote Energy Independence** | 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 |

FTA's research goals are aligned with the U.S. Department of Transportation (DOT) strategic goals, and with the research, development, and technology strategies advanced by the DOT,[4] as shown in Table 2-2. Thus, the FTA transit research program seeks a balanced portfolio of transit research to address the needs of the transit industry and to support DOT and FTA strategic goals.

**Table 2-2. FTA's Research Goals are Aligned with DOT's Goals and Research Strategies**

| DOT Goal | RD&T Strategies | FTA Goal |
|---|---|---|
| **Safety** | Understand and address causal factors and risks – emerging research priority is human-automation interaction enhanced safety data | **Goal 4.** Improve safety and emergency preparedness |
| | Mitigate accidents and incidents | **Goal 4.** Improve safety and emergency preparedness |
| **Reduced congestion** | Reduce passenger and freight congestion in air and surface modes – emerging research priority is congestion reduction policy research and technologies | **Goal 2.** Increase transit ridership<br>**Goal 3.** Improve capital and operating efficiencies |
| | Extend system life and improve durability | **Goal 3.** Improve capital and operating efficiencies |
| | Improve planning, operations, and management | **Goal 2.** Increase transit ridership<br>**Goal 3.** Improve capital and operating efficiencies |
| | Improve services for underserved areas and populations | **Goal 2.** Increase transit ridership |
| | Advance the nation's transportation research capability | **Goal 3.** Improve capital and operating efficiencies |
| **Global connectivity** | Harmonize standards and support leadership for U.S. transportation providers | **Goal 3.** Improve capital and operating efficiencies |
| **Environmental stewardship** | Understand and mitigate transportation impacts – emerging research priority is energy efficiency and alternative fuels | **Goal 5.** Protect the environment and promote energy independence |
| | Improve the environmental review process | **Goal 5.** Protect the environment and promote energy independence |
| **Security, preparedness, and response** | Reduce vulnerability and improve preparedness and recovery | **Goal 4.** Improve safety and emergency preparedness |
| **Organizational excellence** | Consistently apply the research and development (R&D) investment criteria | **Goal 1.** Provide transit research leadership |

[4] *Transportation Research, Development, and Technology Strategic Plan, 2006-2010*. DOT/RITA. November 2006.

### *Goal 1: Provide Transit Research Leadership*

Transit research is carried out by a number of entities throughout the United States, including the FTA, state departments of transportation, transit agencies, universities, and other members of the transit industry. FTA alone, however, has the responsibility for addressing transit research from a national perspective. Thus, FTA must provide leadership for all transit-related research.

FTA will assure that its research programs are balanced among modes and support national goals. As it undertakes research, FTA will first identify and analyze candidate methods and technologies for further research. These methods and technologies will be tested, or demonstrated, and evaluated. After testing or demonstration, FTA will work to assure that results are disseminated for implementation by the industry, including possible standards development.

Besides leading and supporting domestic research, FTA will share international leading practices with the U.S. transit industry and will provide decision-makers with the tools and data analyses they need to make informed decisions.

### *Goal 2: Increase Transit Ridership*

Public transportation ridership has grown by nearly 22 percent since 1995.[5] Although transit's share of the overall "transportation market" remains small, it is vital to segments of the population.

FTA recognizes that transit ridership is a proxy for a range of societal benefits. These benefits include increasing mobility, improving access for all travelers, and reducing air pollution. This proxy relationship informs the aims and scope of FTA's research in support of increasing ridership as well as developing performance measures to document success. Increasing transit ridership also supports the DOT's new national initiative to address congestion.[6]

### *Goal 3: Improve Capital and Operating Efficiencies*

To help ensure that every transit project produces a positive return on investment (ROI), FTA has a goal to improve capital and operating efficiencies. Reducing and controlling the capital costs of both infrastructure and vehicles helps assure that projects are completed on time and within budget, and that expected ridership is achieved. Once a capital investment is in place, ROI is maximized by assuring that operations are both cost-effective and efficient over its useful life.

Transit operations also face considerable challenges to controlling operating costs. Taking inflation into account, between 1996 and 2006, operating expenses increased nearly 35 percent to a total of $27.2 billion.[7] This increase was due primarily to the addition of new systems and the expansion of existing ones.

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[5] *2005 National Transit Summaries and Trends,* p.9.

[6] *National Strategy to Reduce Congestion on America's Transportation Network.* DOT. May 2006.

[7] *2005 National Transit Summaries and Trends,* p.14. Figures indexed for inflation.

Tied to reducing operating costs is improving transit operational efficiencies. The transit industry needs information to make appropriate decisions on service operations. The industry also needs support to build the professional capacity of the transit workforce and the manufacturing industry to meet these challenges.

### *Goal 4: Improve Safety and Emergency Preparedness*

Transit is one of the safest modes of travel. However, in 2005, transit agencies reported 236 fatalities (most not to passengers) and about 18,000 injuries.[8] Thus, safety remains a priority for FTA and transit operators.

Distinguishing between transit safety and transit security is important. Safety involves unintentional events such as crashes. Potential solutions include better driver training and testing, and better vehicle and roadway/guideway design. Security involves protection against an intentional act of violence or personal harm from a criminal or terrorist act. By statute, the lead responsibility for public transportation security against terrorism threats rests with the U.S. Department of Homeland Security (DHS). A Memorandum of Understanding (MOU) between the DOT and the DHS describes the roles and responsibilities of the Departments.[9] FTA works closely with the DHS's Transportation Security Administration (TSA) to address protection and with the DHS's Federal Emergency Management Agency (FEMA) to address preparedness related to terrorism threats. Other security threats, such as non-terrorist criminal acts against transit passengers, employees, and property are addressed within the FTA.

### *Goal 5: Protect the Environment and Promote Energy Independence*

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

A FY 2005 analysis of electric-drive technologies carried out for FTA reported that transit agencies' primary interest in cleaner fleets is driven by regulatory and political pressure to reduce emissions or to bring their regions into compliance with Federal air quality standards.[10] Heavy-duty transit bus engines are regulated by EPA for four pollutants: particulate matter (PM), carbon monoxide (CO), nitrogen oxides (NOx), and hydrocarbons (HC). Regulatory standards for these pollutants became more stringent in 2007 and will be even more stringent in 2010.

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[8] "Transit Safety and Security Statistics and Analysis Annual Report, Fatalities by Mode and Year." http://transit-safety.volpe.dot.gov/Data/samis/default.asp?ReportID=2.

[9] Annex to the Memorandum of Understanding between the Department of Homeland Security and the Department of Transportation on Roles and Responsibilities concerning Public Transportation Security. September 8, 2005.

[10] 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.

Compressed natural gas (CNG) buses, which comprised 11 percent of the total bus fleet in 2003, can help to meet these regulatory standards. However, many transit agencies have been reluctant to deploy CNG buses because of associated expenses and the performance of these vehicles.[11] These transit agencies are interested in finding clean alternatives to CNG, such as hybrid-electric buses and ultra-low sulfur diesel (ULSD) with diesel particulate filters. Also of high interest, but expensive to date, are fuel cell propulsion transit vehicles. Although focused primarily on bus programs, hybrid technologies can also be applied to rail transit programs, and developing hybrid rail propulsion technology holds promise for the future.

[11] Callaghan, Lisa and Sheila Lynch, *Analysis of Electric Drive Technologies for Transit Applications: Battery-Electric, Hybrid-Electric, and Fuel Cells*. FTA. August 2005, p. 8.

# 3.0 ORGANIZATIONAL RESOURCES AND FUNDING

Multiple organizations, both within and outside the Federal government, support FTA's transit research program, including carrying out and managing FTA-funded research. These organizations include FTA's Office of Research, Demonstration, and Innovation (TRI), which directs FTA's research program; other FTA offices; other DOT administrative offices and agencies; University Transportation Centers (UTCs); and several non-governmental organizations and agencies. This section describes TRI and discusses budgets and funding for FTA's research program.

## 3.1 Office of Research, Demonstration, and Innovation

As the office responsible for maintaining the national perspective for transit research, TRI manages and oversees FTA's transit research program and provides industry and policy-makers with the information and skills to make good business decisions about transit technology, operations, and capital investments. As shown in Figure 3-1, TRI has seven administrative divisions to administer and oversee FTA's research agenda and to disseminate results and information.

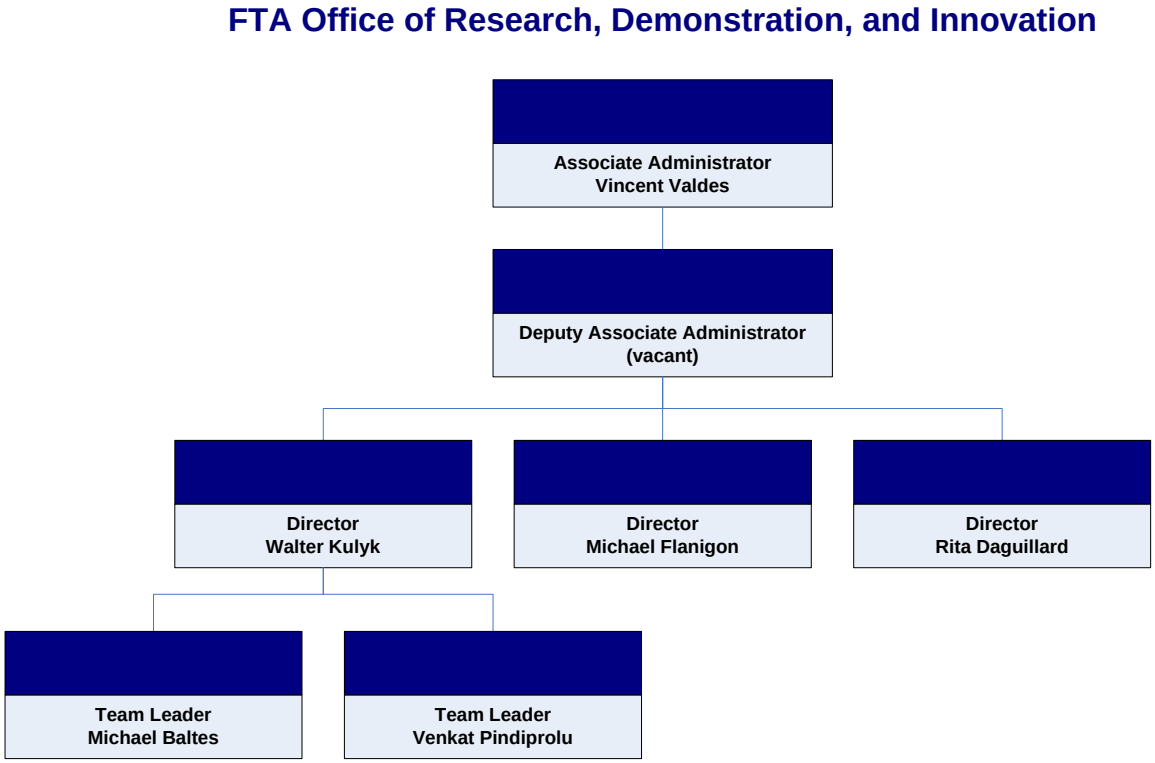


**Figure 3-1. TRI Organization Chart**

Among the larger programs and organizations funded or managed through TRI are the National Research and Technology Program (NRTP), the Transit Cooperative Research Program (TCRP), the National Transit Institute (NTI), the University Transportation Centers Program (UTCP), the International Mass Transportation Program (IMTP), the National Fuel Cell Bus Program, the Bus Testing Facility, several Maglev programs, and the transit portion of the Intelligent Transportation Systems (ITS) programs.

Although TRI is the office within FTA primarily responsible for the national transit research agenda, the research projects are managed across FTA, as well as by other organizations both within and outside of the Federal government.

## 3.2 Budgets and Funding

FTA's research programs, as amended by the *Safe, Accountable, Flexible, and Efficient Transportation Equity Act – A Legacy for Users* (SAFETEA-LU), comprise the following major programs: the NRTP, the National Fuel Cell Bus Technology Development Program, TCRP, NTI, the Bus Testing Facility, and the UTCP. The National Fuel Cell Bus Technology Development Program and the Bus Testing Facility are funded through the Bus and Bus Facility Account.

Table 3-1 shows the FTA research budget for FY 2006 through FY 2009 as prescribed in SAFETEA-LU (appropriation values are through FY 2008). The top half of the table lists the total authorization levels for Bus and Bus Facility Grants, the NRTP, the TCRP, the NTI, and the UTCP funded by FTA. The bottom part of the table shows the earmarks and designated funds within the NRTP's total authorization. The balances that comprise FTA's discretionary research funds are also shown as percentages of the total NRTP and UTCP authorization levels.

Although Table 3-1 shows an apparent increase in discretionary research funds from year to year, the values shown are existing authorization levels. Because budget appropriations are made annually, the actual level of earmarking or designation of funds from FY 2009 forward during the SAFETEA-LU authorization period is unknown. Currently, FTA has discretion over only $15.8 million of its $44.6 million NRTP funds for FY 2008.

The current FTA research program is significantly constrained by earmarked and designated programs,[12] some of which do not directly address FTA research goals and objectives as defined in the FTA Strategic Research Plan.[13] The high percentage of earmarked funds makes it impossible for FTA to address imbalances in funding to achieve its five goals through its limited discretionary funding.

[12] Earmarking of research funds occurs when Congress designates a research area or project, a funding amount, and a recipient organization (Brach and Wachs 2005). If a recipient organization is not specified, the term "designated," instead of "earmarked," is used.

[13] About $1.9 million (about 5 percent) of the funds earmarked from FTA's research budget are not transit-related.

**Table 3-1. The FTA Research Program Authorization Levels as Defined in SAFETEA-LU**

| Formula and Bus Grants in SAFETEA –LU ($000) | FY 2006 | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|---|
| Fuel Cell Bus Program (Section 5309) | $11,250 | $11,500 | $12,750 | $13,500 |
| Bus Testing Facility (Section 5318) | $3,000 | $3,000 | $3,000 | $3,000 |
| **FTA Research Budget in SAFETEA-LU ($000)** | **FY 2006** | **FY 2007** | **FY 2008** | **FY 2009** |
| National Research and Technology Programs (NRTP) (Section 5314) | $53,658[14] | $40,400 | $44,763 | $48,450 |
| Transit Cooperative Research Program (Section 5313) | $8,910 | $9,300 | $9,300 | $10,000 |
| National Transit Institute (Section 5315) | $4,257 | $4,300 | $4,300 | $4,300 |
| University Transportation Centers Program (UTCP) (Section 5506) | $6,930 | $7,000 | $7,000 | $7,000 |
| | | | | |
| Total | $73,755 | $61,000 | $65,363 | $69,750 |
| **Earmarks and Designated Funds in the National Research Programs Budget ($000)** | **FY 2006** | **FY 2007** | **FY 2008** | **FY 2009** |
| NRTP (Section 5314) | $53,658 | $40,400 | $44,600 | $48,450 |
| Project ACTION | ($2,970) | ($3,000) | ($3,000) | ($3,000) |
| National Technical Assistance Center for Senior Transportation (Section 5314(b)) | ($990) | ($1,000) | ($1,000) | ($1,000) |
| NRTP Earmarks (Section 3046 of SAFETEA-LU) | ($19,389) | ($18,855) | ($18,225) | ($18,615) |
| Appropriations Earmarks | ($17,028) | ($0) | ($6,718) | (?) |
| | | | | |
| NRTP Discretionary Research Funds | $13,281 | $17,545 | $15,820 | (?) |
| | | | | |
| Discretionary Research Funds as Percent of the FTA Research Budget (Total – NRTP and UTCP)[15] | 18.0% | 28.8% | 24.2% | (?) |

The high percentage of earmarked funds also makes it impossible for FTA to achieve a comprehensive research program within each goal. For example, in the case of Goal 5, Protecting the Environment and Promoting Energy Independence, almost all funding is earmarked or designated for research and demonstration projects on hybrid-electric and fuel cell buses, with no similar funding for rail propulsion technologies. Further, the lack of coordination among these bus research projects makes it difficult for FTA to develop a cohesive program of bus research and to eliminate duplication and overlap of effort.[16] Thus, earmarks and designated funding, although they may fund useful transit research, limit FTA's ability to achieve a multi-modal, balanced, comprehensive, and cohesive portfolio of research to meet its strategic goals.

[14] Appropriators provided $17.028 million above the SAFETEA-LU authorization level.

[15] Appropriators included an additional $17.028 million in earmarks in FY 2006. Discretionary funds in FY 2009 may be affected by additional earmarks in the appropriations process.

[16] Analyses show that the combined earmarks in the NRTP budget from the authorizers and appropriators in the goal 5 area total more than $13 million. Three authorization earmarks total about $5.8 million over the life of SAFETEA-LU. The seven appropriation earmarks for FY2006 total $7.4 million. Appropriators may earmark more funding in subsequent fiscal years during the SAFETEA-LU authorization period.

# 4.0 FUTURE RESEARCH PROJECT DEVELOPMENT

In May 2007, the FTA received TRAC's most recent letter report. In that report, TRAC requested that FTA continue to focus on defining and developing new research projects. This section describes the project development processes for four of the FTA research programs based on the sources of FTA research funding.

1) National Research and Technology Program (NRTP)
2) Transit Cooperative Research Program (TCRP)
3) National Transit Institute (NTI)
4) University Transportation Centers Program (UTCP).

## 4.1 National Research and Technology Program

NRTP is the heart of FTA's directly-managed research program and includes both earmarked and discretionary research projects. The scope of earmarked projects is defined by Congressional legislation. As it develops agreements with the recipients, FTA works with these recipients to define projects that support national goals. Where an earmarked project will have little or no benefit to national transit research needs, FTA limits its efforts to assuring that the recipient uses the funds appropriately and follows federal requirements.

The discretionary research projects in NRTP are defined as part of FTA's budgeting process. Approximately 18 months before the start of the fiscal year, FTA offices submit requests for NRTP funding to the FTA Office of Budget and Policy. These requests are aggregated and submitted to Congress as part of the President's budget during the February preceding the start of the next fiscal year. Congress then appropriates funds for the NRTP, often including additional earmarks. After it receives the Congressional appropriations, FTA develops a fiscal year program plan, revised to reflect the appropriation levels as well as any new priorities. Each office in FTA submits a request for projects to be funded. The information is reviewed by the Executive Management Team for their recommendation, and then each budget item is reviewed by the FTA Administrator for final approval.

One purpose of the Multi-Year Program Plan is to serve as a long-term planning process to define which projects will be included in both the budget development and program planning processes. Some strategic planning toward this end is underway within FTA offices, such as the Office of Safety and Security. As planning is completed, results will be inserted into the budgeting and reauthorization process. Because overall budget planning for the government is already submitted for FY 2008 and FY 2009, FTA's current planning can affect only 2010 and beyond. Thus, the FTA's current planning is for FY 2010.

## 4.2 Transit Cooperative Research Program

The TCRP program is funded by FTA through the National Academy of Sciences (NAS) and their Transportation Research Board (TRB). TCRP operating procedures are defined through a Memorandum of Understanding between FTA, the National Academies through TRB, and the

Transit Development Corporation, Inc., a nonprofit educational and research organization established by the American Public Transportation Association (APTA).

The TCRP research agenda and projects are developed and selected by the TCRP Oversight and Project Selection (TOPS) Committee. This committee is responsible for identifying the highest priority projects and defining funding levels and expected products for these projects. The participants in TOPS include FTA, APTA, and representatives of the transit industry. Each year, TCRP solicits problem statements for these research projects from anyone interested.

TCRP strategic priorities are consistent with and supportive of the FTA strategic research goals:

- Place the customer first
- Enable transit to operate in a technologically-advanced society
- Continuously improve public transportation
- Flourish in the multimodal environment
- Revitalize transit organizations.

## 4.3 National Transit Institute

NTI provides training, education, and training assistance to transit and related industries. NTI develops its training curriculum through extensive involvement and on-going contact with FTA and the transit industry. NTI maintains a broad set of advisory and support committees that advise on industry training needs. In addition to the NTI Advisory Board, NTI currently has four advisory committees in Advanced Technology, Multi-modal Transportation Planning, Management Development, and Workplace Safety and Security. NTI's funding from FTA is awarded annually and based on an annual management and implementation plan agreed to with FTA.

## 4.4 University Transportation Center Program

The UTCP conducts basic and applied research to advance the body of knowledge in transportation. Further, it conducts education programs to develop future transportation professionals. FTA and Federal Highway Administration (FHWA) funds are transferred to the U.S. DOT Research and Innovative Technology Administration (RITA) to award to the UTCs.

By statute, each University Transportation Center (UTC) must develop a multi-modal strategic plan that describes how it will meet the UTCP's legislative intent. UTCs must also report annually on the progress made in achieving identified strategic goals using specified measurable performance indicators. RITA reports that it will document the extent to which each UTC meets legislative requirements and undertakes research that directly supports appropriate strategic goals. For transit, these goals are FTA's strategic research goals. FTA also undertakes considerable outreach to the UTCs to inform them of transit priorities. Completed and ongoing research projects and products from UTCs are on the UTC website (http://utc.dot.gov/) and on the TRB website (http://rip.trb.org/browse/utcmap.asp).

## 4.5 What's Next for Research Project Development

FTA will encourage its offices to adopt more robust methods for developing research project ideas and plans that support DOT and FTA goals. FTA is also committed to actively supporting and encouraging new research project development at TCRP, NTI, and UTCs that is focused on FTA's strategic research goals.

# 5.0 CURRENT AND POTENTIAL FUTURE FTA RESEARCH PROJECTS

This section is organized by FTA's strategic research goals and objectives, and includes a list of active projects and potential future projects. It describes FTA's research objectives and provides individual tables of active and potential future FTA research projects for each objective. Although a project may address several objectives, it is mapped to only the primary objective to avoid duplication in the tables.

The tables do not include projects that were recently closed-out or that are in the closing stages as of this document (October 2007). The tables also do not include individual projects undertaken by UTCs or the training courses carried out by the NTI. The funding levels for these programs are provided in Appendix A. The tables contain the following information:

**FTA Office** – The FTA offices that manage projects include:

- Office of Research, Demonstration, and Innovation (TRI)
- Office of Administrator (TOA)
- Office of Chief Counsel (TCC)
- Office of Communications and Congressional Affairs (TCA)
- Office of Civil Rights (TCR)
- Office of Administration (TAD)
- Office of Program Management (TPM)
- Office of Budget and Policy (TBP)
- Office of Planning and Environment (TPE)
- Regional Offices (TRO)

**Funding Source –** Funding for research projects is from the following sources within the DOT:

- International Mass Transportation Program Income (International)
- National Research and Technology Program (FTA Research)
- FTA Capital Program (FTA Capital)
- FTA National Fuel Cell Bus Program (FTA Capital)
- Federal Highway Administration (FHWA)
- ITS Joint Program Office (ITS-JPO)
- FTA Oversight (Oversight)
- Transit Cooperative Research Program (TCRP)

**Funding Levels** – Funding levels indicate total project funding if a project has discreet start and end dates. Funding levels for ongoing projects are on a per year basis. Funding levels in FY 2008 or later are estimated and are based on Congressional appropriations and FTA's discretion. Earmarked projects are also indicated.

**Period of Performance** – Ongoing projects are projects that are expected to continue throughout the period of this plan. They include research program management activities.

## 5.1 Goal 1. Provide Transit Research Leadership

### *Objective 1.1 Ensure Transit Research Supports National Goals*

Objective 1.1 addresses FTA's development of an effective and innovative approach for conducting and promoting transit research. This strategic approach, involving input from transit research stakeholders, identifies high-payoff research topics and provides a starting point for identifying areas of needed research and assuring a balanced portfolio of multi-modal transit research projects across FTA research programs.

FTA will initiate the update of the Strategic Research Plan in FY 2009.

Table 5.1 presents current and future projects supporting objective 1.1.

**Table 5-1. Objective 1.1 Ensure Transit Research Supports National Goals**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| TRI-02 | **Transit Research Analysis Committee**<br>Run by the TRB, 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. TRAC advises FTA as the agency develops a strategic agenda for transit research and assists in identifying the roles that FTA and industry stakeholders could play in carrying out that agenda. | FTA Research | $200,000 per year | **Ongoing**<br>Aug 2004 to Dec 2008 |
| TBP | **Transit Conditions and Performance Report**<br>Support data collection to enhance the accuracy of the transit economic requirements model (TERM), and support updating and running TERM for the Report. | FTA Research | $300,000 per year | **Ongoing**<br>2006 to 2008 |
| **Future Projects** | | | | |
| TBP | **FTA Strategic Plan Support**<br>Develop a new agency-wide strategic plan to guide future programs and link performance and budget decisions. | FTA Research | $200,000 | **Starts FY08** |
| TBP | **Reauthorization Research and Outreach**<br>Support development of FTA's reauthorization proposals. | FTA Research | $300,000 | **Starts FY08** |
| TRI-02 | **Strategic Research Plan Update**<br>Update Strategic Research Plan to align with new FTA Strategic Plan. | FTA Research | TBD | **Starts FY09**<br>2009 to 2010 |

### *Objective 1.2 Continue to Improve Research Management*

Objective 1.2 addresses establishing mechanisms to assure that research projects consistently produce high-quality data and deliverables, and improving research administration. Improving research administration includes developing research assessment mechanisms to assure that research projects are carried out with sufficient technical rigor and are evaluated appropriately.

Using administrative resources, FTA will continue to improve oversight and management of the research program in FY 2008.

Table 5-2 presents current projects supporting objective 1.2.

**Table 5-2. Objective 1.2 Continue to Improve Research Management**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| TRI-02 | **Strategic Analysis Technical Support Project**<br>Provide technical support for planning and implementing an annual research grantee workshop, developing and updating the Multi-Year Research Program Plan, and developing the Annual Research Report. The Multi-Year Program Plan outlines the types of analysis, development, and implementation projects FTA needs to carry out over the next five years. | FTA Research | $210,000 per year | **Ongoing**<br>Feb 2006 to Dec 2009 |
| **Future Projects** | | | | |
| TBP | **Performance Management Outreach**<br>In cooperation with APTA and transit agencies, provide outreach to develop potential performance management goals for the transit industry. | FTA Research | $285,000 | **Starts FY08** |

### *Objective 1.3 Facilitate Implementation of Research Results by the Transit Industry*

Objective 1.3 establishes FTA as the source of resources to help improve transit systems. FTA will collect, analyze, and disseminate research data and results that the transit industry needs for decision making. FTA also will help transit agencies overcome barriers to adopting new practices and technologies by emphasizing ROI and life-cycle costs.

Table 5-3 presents current projects supporting objective 1.3.

**Table 5-3. Objective 1.3 Facilitate Implementation of Research Results by the Transit Industry**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| TRI-10 | **Program and Technical Support for Office of Mobility Innovation**<br>Provide technical and program support to the Office of Mobility Innovation to meet unanticipated needs in the conduct of research programs and in managing transit research projects. | FTA Research | $150,000 per year | **Ongoing** |
| TRI-20 | **Program and Technical Support for Office of Technology**<br>Provide expert technical assistance on bus, rail and infrastructure issues related to new technologies. | FTA Research | $150,000 per year | **Ongoing** |
| TRI-11 | **Advanced Public Transportation Systems (APTS) Information Exchange – APTA Best Practices Workshops**<br>Support APTA for the provision of ITS Best Practices Workshop (two or three per year) and dissemination of ITS Transit information to the industry. | ITS-JPO | $50,000 per year | **Ongoing** |
| TRI-20 | **TRB Core Technical Activities Program**<br>Support TRB activities, including public transportation sessions at the TRB annual meeting, committee meetings, and the dissemination of publications. Support the Transportation Research Information Service (TRIS). | FTA Research | $200,000 per year | **Ongoing** |
| TCR | **Support for Meeting ADA Requirements**<br>Prepare technical assistance manuals outlining requirements, past FTA positions, and best practices. | FTA Research | $250,000 per year | **Ongoing** |
| TPE | **Sponsorship and Participation in Transit Industry Forums**<br>Participate in and support critical forums of national profile with transit industry stakeholders and partners. | FTA Research | $185,000 per year | **Ongoing** |
| TPE | **New Starts Roundtable and New Starts/Small Starts Outreach**<br>Support two national New Starts roundtables and other New Starts/Small Starts outreach meetings and two technical workshops. | FTA Research | $200,000 per year | **Ongoing** |
| TPM | **Transit Security Roundtable**<br>Support DHS/TSA and FTA semi-annual roundtables for the transit industry to share experiences and best practices on safeguarding public transit. | FTA Research | $200,000 per year | **Ongoing** |
| | **TCRP** | | | |
| TRI-20 | **TCRP Research Dissemination and Information** | TCRP | $775,000 per year | **Ongoing** |
| | **Future Projects** | | | |
| TCR | **Support for Title VI/DBEs/EEO Colloquiums**<br>Provide technical assistance to grantees to assure compliance with Title VI, disadvantaged business enterprise (DBE), and equal employment opportunity (EEO) requirements. | FTA Research | $250,000 | **Starts FY08** |

## 5.2 Goal 2. Increase Ridership

### *Objective 2.1 Identify Best Practices and Technologies to Increase Transit Ridership*

Objective 2.1 addresses gaining a better understanding of public perceptions and attitudes about transit. Research in this area examines why some individuals choose to ride transit and others do not, and addresses how to better serve existing passengers. FTA will continue to examine transit operating practices to analyze how they affect ridership. Areas of research will include new forms of transit service, parking policies, fare strategies, and service redesign to determine which have the potential to attract new and retain existing passengers. In FY 2008, FTA will begin to evaluate the results of the Urban Partnership Agreements.

Table 5-4 presents current projects supporting objective 2.1.

**Table 5-4. Objective 2.1 Identify Best Practices and Technologies to Increase Transit Ridership**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| **Transit Intelligent Transportation Systems** | | | | |
| TRI-11 | **Universal Transit Farecard Standards Support**<br>Facilitate the committees and subcommittees for APTA's Universal Transit Farecard Stakeholders (UTFS) Program to develop and implement guidelines, standards, and recommended practices to assist in achieving regional standardization for transit systems' planning, designing, procuring, and implementing revenue management programs. | ITS-JPO | $250,000 | **Ends FY09**<br>Apr 2006 to Oct 2008 |
| TRI-11 | **Automated Passenger Information System**<br>Provide Miami-Dade Transit customers with an automated trip planning capability, including real-time online route and schedule information, through information kiosks. The kiosks will be installed at sites where pedestrian traffic is high. | ITS-JPO | $400,000 | **Ends FY08**<br>Jun 1995 to Dec 2007 |
| TRI-11 | **Door-to-Door Multimodal Trip Planning Demonstration**<br>Develop and demonstrate a Multimodal Trip Planner System at the Regional Transportation Authority (RTA) to provide regional coverage of the six-county RTA region of Northeast Illinois. | ITS-JPO | $1,080,000 | **Ends FY09**<br>Oct 2004 to Dec 2009 |
| TRI-11 | **Montgomery County, MD, Advanced Parking**<br>Support the Montgomery County Department of Transportation in conducting a four-phase ITS operational test of an advanced parking/ride share information system. | FTA Research | $333,000 | **Ends FY08**<br>Feb1997 to Feb 2008 |
| TRI-11 | **WMATA Lot-Full Signs**<br>The Washington Metropolitan Area Transit Authority (WMATA) will 1) upgrade communications links between bus control center and bus supervisors, 2) demonstrate automatic capacity notification at parking garages, 3) develop a fare clearinghouse, and 4) provide real-time and static information to employees who are in direct contact with transit customers. | ITS-JPO<br>**Earmark** | $1,250,000 | **Ends FY09**<br>Dec 2000 to Dec 2008 |

**Table 5-4. Objective 2.1 Identify Best Practices and Technologies to Increase Transit Ridership (Continued)**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| TRI-11 | **ITS Pilot Project**<br>Support The Ohio State University in researching ITS applications to advance the knowledge or practice of public transit planning and operations. This program is still under development. | FTA Research **Earmark** | $465,000 per year | **SAFETEA-LU** 2006 to 2009 |
| **General Research and Technical Assistance** | | | | |
| TBP | **National Household Travel Survey (NHTS)**<br>Conduct periodic telephone survey of 20,000+ households. | FTA Research | $200,000 | **Starts FY08** 2008 to 2009 |
| TBP | **National Household Travel Survey-Non Response Bias**<br>Support NHTS Federal surveys failing to achieve certain response levels. | FTA Research | $100,000 | **Starts FY08** 2008 to 2009 |
| **TCRP** | | | | |
| TRI-20 | **A Guide for Planning and Operating Flexible Public Transportation Services** | TCRP | $300,000 | **TBD** 18 months |
| TRI-20 | **Public Transportation on College and University Campuses** | TCRP | $25,000 | **Ends FY08** Sep 2007 to Feb 2008 |
| TRI-20 | **Transit Market Research: Leveraging ITS and Transit ITS Data** | TCRP | $200,000 | **Ends FY08** Feb 2005 to Nov 2007 |
| TRI-20 | **Ensuring Full Potential Ridership from Transit-Oriented Development** | TCRP | $250,000 | **Ends FY08** Oct 2004 to Dec 2007 |
| TRI-20 | **Characteristics of Premium Transit Services that Affect Choice of Mode** | TCRP | $375,000 | **TBD** 21 months |
| TRI-20 | **A National Study on Ferry Passenger/Car Transit Services** | TCRP | $200,000 | **Starts FY08** |
| TRI-20 | **Parking and Feeder/Circulator Access to Public Transportation** | TCRP | $500,000 | **Starts FY08** |

### *Objective 2.2 Identify and Overcome Barriers to the Adoption of Ridership Enhancement Techniques*

Objective 2.2 addresses how ridership enhancement techniques are chosen and implemented, and the barriers that exist to implementation. Many external factors affecting ridership, such as economic constraints, employment levels, signal priorities, urban parking policies, and traffic management, are typically beyond the direct control of transit agencies.

Table 5-5 presents current projects supporting objective 2.2.

**Table 5-5. Objective 2.2 Identify and Overcome Barriers to the Adoption of Ridership Enhancement Techniques**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| **General Research and Technical Assistance** | | | | |
| TPE | **Center for Transit Oriented Development**<br>Develop standards and definitions for transit-oriented development adjacent to public transportation facilities. Develop system planning guidance, performance criteria, and modeling techniques, and provide research and technical assistance. | FTA Research **Earmark** | $1,000,000 per year | **SAFETEA-LU** 2006 to 2009 |
| **TCRP** | | | | |
| TRI-20 | **Understanding How to Motivate Communities to Support and Ride Public Transportation** | TCRP | $300,000<br>$25,000 (CUTA) | **Ends FY09** Mar 2007 to Oct 2008 |

### *Objective 2.3 Identify Solutions to Provide Public Transportation for Targeted Populations*

Objective 2.3 addresses targeted populations and their diverse public transportation needs and interests. Research in this area focuses on cost-effective methods to provide service to these targeted populations. Investigations of "universal design" for targeted populations and mainstream service technologies also fit under this objective.

The Interagency Transportation Coordinating Council on Access and Mobility created United We Ride (UWR) to facilitate coordination between transportation and human services programs. UWR is a Federal interagency initiative to improve the availability, quality, and efficient delivery of transportation services for people with disabilities, older adults, and individuals with lower incomes. UWR is working with states and communities to identify transportation service gaps and needs, reduce transportation duplication, create more efficient and productive services, and provide assistance in building local partnerships and developing coordination plans. The three goals of UWR focus on putting the customer first: 1) provide more rides for the targeted population(s) for the same or fewer resources; 2) simplify customer access to transportation services; and 3) increase customer satisfaction.

Table 5-6 presents current projects supporting objective 2.3.

**Table 5-6. Objective 2.3 Identify Solutions to Provide Public Transportation for Targeted Populations**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| TRI-11 | **Remote Infrared Audible Signage**<br>Sound Transit will purchase, install, and demonstrate Remote Infrared Audible Signage (RIAS) technology at various multimodal and regional transit stations, and transit vehicles to provide way-finding and direction information to persons with visual, cognitive, or learning disabilities. | FTA Research **Earmark** | $395,000 -06<br>$500,000 per year 07-09 | **SAFETEA-LU**<br>2006 to 2009 |
| TRI-11 | **North Dakota – Online Transportation Information**<br>The Northland Healthcare Alliance develops an online transportation module for the collection and distribution of public transportation information. The module will allow the general public and Northland Healthcare Alliance's clients to view and retrieve information on the various types of transportation services available, enabling them to travel and connect to other localities and community services. | ITS-JPO | $140,000 | **Ends FY08**<br>Oct 2004 to Dec 2007 |
| TRI-11 | **National Center for Transportation Needs of Special Populations**<br>The National Center for Transportation Needs of Special Populations (TRANSPO) of Florida International University and the University of Miami supports FTA's United We Ride program by identifying and developing solutions to problems and issues associated with coordinating human services transportation to create a continued, standardized, and uniform database that allows policymakers, stakeholders, and service providers to monitor trends and performance and identify areas for improvement. | FTA Capital **Earmark** | $1,713,917 | **Ends FY10**<br>Feb 2006 to Nov 2009 |
| TRI-20 | **Universal Boarding Device**<br>This SBIR project examines a combined lift and ramp for commuter rail cars. | FTA Research (SBIR) | $600,000 | **Ends FY09** |
| TCR | **Transportation Equity Research Program**<br>Conduct research and demonstrate activities that address the impacts of land-use and transportation planning, investment, and operations on low-income and minority populations that are transit- dependent. | FTA Research **Earmark** | $1,000,000 per year | **SAFETEA-LU**<br>2006 to 2009 |
| TPM | **Human Services Transportation Coordination**<br>Support program management to improve the coordination of Federal resources for human services transportation with those of the Department of Transportation. | FTA Research **Earmark** | $1,600,000 per year | **SAFETEA-LU**<br>2006 to 2009 |
| TPM | **Easter Seals Project ACTION**<br>Provide technical assistance to the disability community, transportation industry, government, human service agencies, advocacy and professional organizations, and others on the full range of issues associated with the provision of accessible transportation for people with disabilities of any age. Emphasize implementation of the Americans with Disabilities Act (ADA). | FTA Research **Earmark** | $3,000,000 per year | **SAFETEA-LU**<br>2006 to 2009 |

**Table 5-6. Objective 2.3 Identify Solutions to Provide Public Transportation for Targeted Populations (Continued)**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| TPM | **National Technical Assistance Center for Senior Transportation**<br>Provide technical assistance to provide transportation for seniors. | FTA Research **Earmark** | $1,000,000 per year | **SAFETEA-LU** 2006 to 2009 |
| TPM | **United We Ride State Coordination Grants**<br>Assist states in developing coordination planning and implementation. | FTA Research | $3,750,000 | Ends FY09 2000 to 2009 |
| TPM | **JARC and New Freedom Evaluation**<br>Support the collection and analysis of Job Access and Reverse Commute (JARC) and New Freedom program evaluation data and measures for FY07, and provide resources to develop the JARC Congressional Report due August 2008. | FTA Research | $1,120,000 | Ends FY09 2006 to 2009 |
| **Mobility Services for All Americans** | | | | |
| TRI-11 | **Travel Management Coordination Center (TMCC), Aiken, South Carolina**<br>Plan and design a Travel Management Coordination Center (TMCC) using ITS. Design a national model TMCC that could be replicated anywhere. | FTA Research and ITS-JPO | $300,032 | **Ends FY09** Feb 2007 to Dec 2008 |
| TRI-11 | **TMCC, Atlanta Georgia**<br>Plan and design a TMCC using ITS. Design a national model TMCC that could be replicated anywhere. | FTA Research and ITS-JPO | $400,000 | **Ends FY09** Feb 2007 to Dec 2008 |
| TRI-11 | **TMCC, Camden County, NJ**<br>Plan and design a TMCC using ITS. Design a national model TMCC that could be replicated anywhere. | FTA Research and ITS-JPO | $413,451 | **Ends FY09** Feb 2007 to Dec 2008 |
| TRI-11 | **TMCC, Fitchburg, MA**<br>Plan and design a TMCC using ITS. Design a national model TMCC that could be replicated anywhere. | FTA Research and ITS-JPO | $298,080 | **Ends FY09** Feb 2007 to Dec 2008 |
| TRI-11 | **TMCC, Kent, Ohio**<br>Plan and design a TMCC using ITS. Design a national model TMCC that could be replicated anywhere. | FTA Research and ITS-JPO | $321,135 | **Ends FY09** Feb 2007 to Dec 2008 |
| TRI-11 | **TMCC, Louisville, KY**<br>Plan and design a TMCC using ITS. Design a national model TMCC that could be replicated anywhere. | FTA Research and ITS-JPO | $254,235 | **Ends FY09** Feb 2007 to Dec 2008 |
| TRI-11 | **TMCC, Orlando, FL**<br>Plan and design a TMCC using ITS. Design a national model TMCC that could be replicated anywhere. | FTA Research and ITS-JPO | $400,000 | **Ends FY09** Feb 2007 to Dec 2008 |
| TRI-11 | **TMCC, Paducah, KY**<br>Plan and design a TMCC using ITS. Design a national model TMCC that could be replicated anywhere. | FTA Research and ITS-JPO | $319,112 | **Ends FY09** Feb 2007 to Dec 2008 |

**Table 5-6. Objective 2.3 Identify Solutions to Provide Public Transportation for Targeted Populations (Continued)**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| **TCRP** | | | | |
| TRI-20 | **Human Services Transportation Cost Reporting to Facilitate Cost Sharing Agreements** | TCRP | $250,000 | **Ends FY09** Oct 2006 to Oct 2008 |
| TRI-20 | **Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation** | TCRP | $250,000 | **Ends FY08** Sep 2005 to Sep 2007 |
| TRI-20 | **Guidebook for Commingling ADA-Eligible and Other Passengers on ADA-Complementary Paratransit Services** | TCRP | $300,000 | **Ends FY09** Aug2006 to Oct 2008 |
| TRI-20 | **Vehicle Operator Recruitment, Retention, and Performance in ADA Complementary Paratransit Services** | TCRP | $300,000 | **TBD** 20 months |
| TRI-20 | **Developing Regional Mobility Management Centers** | TCRP | TBD | **Ends FY08** |
| TRI-20 | **Integration of Paratransit and Fixed Route Transit Services** | TCRP | $25,000 | **Ends FY08** Aug 2007 to Febr2008 |
| TRI-20 | **Travel Assist Device to Help Transit Riders** | TCRP | TBD | **Ends FY08** |
| TRI-20 | **Improving ADA Complementary Paratransit Demand Estimation – Phase II Regional Travel Demand Forecasting** | TCRP | $330,000 | **Starts FY08** |
| TRI-20 | **Tribal Transit Service, Training and Funding Challenges** | TCRP | $400,000 | **Starts FY08** |
| **Future Projects** | | | | |
| TPM | **CTAA of America Nationwide Joblinks** Support the Community Transportation Association of America (CTAA) Joblinks program as designated by Congress. | FTA Research **Earmark** | $1,666,000 | **Starts FY08** |
| TRI | **Remote Infrared Audible Signage (RIAS) Support** Support the RIAS project with discretionary research. | FTA Research | $70,000 | **Starts FY08** |

### *Objective 2.4 Identify Cost-Effective Solutions to Provide Rural Public Transportation Services*

Objective 2.4 addresses cost-effective transit service in rural areas. Research is needed to determine a reasonable stratification of rural transit services and logical approaches to providing transit services in rural areas with different characteristics and requirements. Additionally, research is needed to examine appropriate vehicles and technologies, such as ITS and appropriately sized and designed buses.

Providing adequate and effective rural public transportation service is challenging because of a lack of funding and human resources at the local level, a lack of coordination among service providers, and the high cost of needed new technologies. New low-cost technologies to meet rural needs, including technologies for operations management, reservations, and paratransit, must be identified, developed, and tested. New technologies addressing the needs of the elderly and disabled must also be identified and tested, because these populations are growing, especially in rural areas.

Continued research and testing to improve coordination among different service providers is needed to deploy coordinated transportation management centers for wide use by rural public transit providers. Additionally, better methods are needed for communicating best practices and cost-effective ways to operate and maintain rural transit system services, including use of websites and webinars for rural operators and riders. Industry guidelines and performance specifications are also needed for low-floor, smoother riding buses with better lift technologies to serve the rural environment.

Table 5-7 presents current projects supporting objective 2.4.

**Table 5-7. Objective 2.4 Identify Cost-Effective Solutions to Provide Rural Public Transportation Services**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| **General Research and Technical Assistance** | | | | |
| TRI-20 | **Small Urban and Rural Transportation Center**<br>Research at the Small and Urban Rural Transportation Center at North Dakota State University addresses management and institutional issues faced by transit client groups, and technical and operating issues with emphasis on ITS. | FTA Research **Earmark** | $800,000 per year 2006-2007<br>$1,200,000 per year 2008-2009 | **SAFETEA-LU**<br>2006 to 2009 |
| **Transit Intelligent Transportation Systems** | | | | |
| TRI-11 | **Modoc Mobility Management Center**<br>Stimulate the Modoc County Transportation Commission to initiate a Mobility Management Center in rural northeastern California that will centralize and coordinate transportation services, mobility options, eligibility screenings and information in a "one stop shop." Modify the Client Referral, Ridership and Financial Tracking system. | ITS-JPO | $120,000 | **Ends FY08**<br>Sep 2004 to Aug 2008 |
| TRI-11 | **Rural ITS Operational Test (Phase I)**<br>LYNX and Polk County Transit System will use advanced technologies to help synchronize feeder vans with buses, providing door-to-fixed route service and fixed route-to-door service for rural residents. | ITS-JPO | $197,000 | **Ends FY08**<br>Sept 2004 to Aug 2008 |

**Table 5-7. Objective 2.4 Identify Cost-Effective Solutions to Provide Rural Public Transportation Services (Continued)**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| TRI-11 | **Testing of Advanced Technologies**<br>Cape Ann Transportation Authority is demonstrating 1) that administration of rural transit service can be enhanced through closer cooperation and coordination among state agencies and different transit systems, and 2) that the integration of different information technology systems with existing APTS technologies improves the delivery of rural transit services. | ITS-JPO | $250,000 | **Ends FY08**<br>Feb 2004 to Oct 2007 |
| TRI-11 | **Advanced Technologies in Rural Transit**<br>Allow the seven transit operators in Eastern Carolina to view trips or routes being made by the other operators. Provide opportunities for coordination of trips and sharing of passengers. Merge seven databases of customer, vehicle, driver, and operational data into a single data structure. | ITS-JPO | $145,000 | **Ends FY08**<br>Sep 2004 to Dec 2007 |
| TRI-11 | **Rural Transit ITS**<br>The Capital Area Rural Transportation System of Austin, TX will develop an electronic fare payment system that coordinates human services agencies ridership and generates reports required by the Texas Department of Transportation. | ITS-JPO | $205,000 | **Ends FY08**<br>Sep 2004 to Jan 2008 |
| | **TCRP** | | | |
| TRI-20 | **Employee Compensation Guidelines for Transit Providers in Rural and Small Urban Areas** | TCRP | $300,000 | **Ends FY08**<br>Sep 2005 to Sep 2007 |
| TRI-20 | **Innovative Rural Transit Services** | TCRP | $25,000 | **Ends FY08**<br>Oct 2007 Feb 2008 |
| TRI-20 | **Methods for Forecasting Demand and Quantifying Need for Rural Passenger Transportation** | TCRP | $300,000 | **TBD**<br>20 months |
| TRI-20 | **Estimation of Demand for Rural Intercity Bus Services** | TCRP | $200,000 | **TBD**<br>12 months |
| TRI-20 | **Rural Transit Achievements: Assessing the Outcomes of Increased SAFETEA-LU Funding for Rural Passenger Services** | TCRP | $75,000 | **FY08** |
| | **Future Projects** | | | |
| TRI | **Advanced Small Vehicle Demonstration Program**<br>Provide information and suggested functional specifications to transit agencies on the performance of several small transit vehicles. | FTA Research | $150,000 | **Starts FY08** |

## 5.3 Goal 3. Improve Capital and Operating Efficiencies

### *Objective 3.1 Identify Practices and Technologies to Control Capital Costs*

Objective 3.1 addresses improving cost control of transit projects and operations. Research is needed to determine better ways to control costs through improved design and improved cost control methods. Transit projects include any infrastructure or building construction, such as guideways, tunnels, and bridges. Purchase and operation of rail and bus vehicles will also be studied.

Escalating capital costs are an impediment to meeting the growing demand for bus and rail service. For bus operations and acquisitions, new and improved propulsion systems that cost less, use more environmentally friendly fuels, and reduce maintenance and operations costs must be tested. These systems include lower-cost hybrid-electric and fuel-cell propulsion systems. Development, testing, and demonstration are needed for vehicle-assist and automation technologies for buses using dedicated rights-of-way. These technologies will help reduce the cost of dedicated rights-of-way by allowing smaller pavement widths than are currently standard in many locations. The technologies can also be incorporated into vehicle platooning strategies that allow closer headways, thus expanding capacity without adding vehicles.

Industry standards and open source systems, including open source software, are also needed to reduce the capital costs of proprietary technology. Continued research into transportation demand management methods involving transit and integrated land use and transportation policies is needed to address the problem of increasing traffic on roadways.

Table 5-8 presents current projects supporting objective 3.1.

**Table 5-8. Objective 3.1 Identify Practices and Technologies to Control Capital Costs**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| **General Research and Technical Assistance** | | | | |
| TPM | **Major Capital Projects Roundtable**<br>Support for the roundtable, a three-day conference held semi-annually in cities with on-going major capital projects in significant stages of construction. FTA facilitates the roundtable, which is hosted by the local grantees. Participants include the chief engineers or construction chiefs for the 50 largest transit agencies in the United States. | FTA Research | $160,000 per year | **Ongoing** |
| TPE | **Improve New Starts Forecasts**<br>Continued improvement of methods and tools for technical planning activities, such as travel demand forecasting analyses, and development of refinements to New Starts criteria measurements. | FTA Research | $1,550,000 | **Ongoing**<br>2005 to 2009 |
| TPE | **Public Transportation Participation Pilot Program**<br>Support for planning and public transportation activities related to public transportation projects, such as data collection and communication and coordination. | FTA Research<br>**Earmark** | $1,000,000 per year | **SAFETEA-LU**<br>2006 to 2009 |

**Table 5-8. Objective 3.1 Identify Practices and Technologies to Control Capital Costs (Continued)**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| TRI-20 | **Shared Track – Safe Transit Operations**<br>Develop parameters for a future rail shared use demonstration and three case studies on equivalent safety analysis of shared track operations. | FTA Research | $500,000 | **Starts FY08**<br>2008 to 2009 |
| **Standards Development and Transit Intelligent Transportation Systems** | | | | |
| TRI-30 | **Maintain and Develop Transit Standards**<br>Develop, implement, and maintain identified, cost-effective transit standards, recommended practices, and design guidelines to achieve safety, reliability, and efficiency in transit system design and operation. | FTA Research | $4,000,000 | **Ongoing**<br>2005 to 2009 |
| TRI-11 | **UTFS Facilitation**<br>Facilitate the committees and subcommittees of APTA's Universal Transit Farecard Stakeholders (UTFS) Program. | ITS-JPO | $100,000 | **Ends FY09**<br>Apr 2006 to Oct 2008 |
| TRI-11 | **Transit Communications Interface Profile (TCIP)**<br>Develop TCIP dialogues, document the dialogues, and submit them to an open consensus process via an APTA Technical Committee. | ITS-JPO | $3,096,300 | **Ends FY09**<br>Aug 2001 to Oct 2008 |
| TRI-11 | **TCIP TIRCE Development**<br>APTA is building a software tool, "TIRCE," to help transit agencies navigate the TCIP standard and generate specifications for TCIP subsystems. TIRCE is based on "Turbo Tax" for completing income tax filings. | ITS-JPO | $155,000 | **Ends FY09**<br>April 2006 to Oct 2008 |
| TRI-11 | **TCIP Program Management/Tech. Costs** | ITS-JPO | $100,000 | **Ends FY09**<br>Apr 2006 to Oct 2008 |
| TRI-11 | **California Smart Traveler (EDAPTS)**<br>Make ITS more available to small transit systems. Perform a hands-off test deployment of EDAPTS in San Luis Obispo, California. | FTA Research | $1,520,000 | **Ends FY09**<br>Oct 1992 to Feb 2009 |
| **TCRP** | | | | |
| TRI-20 | **Shared Use of Railroad Infrastructure With Non – Federal Railroad Administration – Compliant Public Transit Rail Vehicles** | TCRP | $200,000 | **Ends FY08**<br>Aug 2005 to Aug 2007 |
| TRI-20 | **Technical Assistance for Development of Transit Bus Standards** | TCRP | $125,000 (01)<br>$250,000 (02)<br>$250,000 (03)<br>$250,000 (04)<br>$250,000 (05)<br>$150,000 (06) | **Ends FY08**<br>Oct 2001 to Dec 2007 |
| TRI-20 | **Continuing Update of the Traveler Response to Transportation Systems Changes Handbook** | TCRP | $300,000 | **Ends FY08**<br>Nov 1999 to Dec 2007 |
| TRI-20 | **A Guidebook for the Evaluation of Project Delivery Methods** | TCRP | $300,000 | **Ends FY08**<br>Oct 2006 to Mar 2008 |
| TRI-20 | **Guidebook for Estimating "Soft Costs" for Major Public Transportation Capital Infrastructure Projects** | TCRP | $300,000 | **TBD**<br>18 months |

**Table 5-8. Objective 3.1 Identify Practices and Technologies to Control Capital Costs (Continued)**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| TRI-20 | **Local and Regional Funding Mechanisms for Public Transportation** | TCRP | $250,000 | **Ends FY09** Aug 2006 to Nov 2008 |
| TRI-20 | **Methodology for Determining the Economic Development Impacts of Transit Projects** | TCRP | $400,000 | **TBD** |
| **Future Projects** | | | | |
| TBP | **Transit Infrastructure Needs Report (Rail Modernization Study)** Review past funding levels, investment needs, and asset management strategies to evaluate future funding options. | FTA Research | $218,000 | **Starts FY08** |
| TPM | **FTA Rail Cost Database Update and Training** Provide information on past rail costs and analysis of cost drivers and requirements for commuter rail systems. | FTA Research | $250,000 | **Starts FY08** |
| TRI | **Rail System Capacity Improvement Study** Examine the costs and improvements to the infrastructure that could support the largest growth in ridership. | FTA Research | $300,000 | **Starts FY08** |

### *Objective 3.2 Identify Practices and Technologies to Control Operating Costs*

Objective 3.2 addresses the control of operating costs including alternative services; salaries, wages, and fringe benefits; vehicle operations and maintenance; infrastructure maintenance; and general administration. Research will focus on the life-cycle costs of each of these operating costs to improve system capacity. FTA will study innovative designs, integration, and interoperability to reduce costs or to manage additional operating costs.

FTA will develop an operating cost model for transit agencies that shows how much each operating cost adds to the total cost of operation and demonstrates opportunities to control costs. The adoption of new technologies in transit often involves known and unknown risks. FTA will examine the costs and benefits of adopting new technologies for rail systems and will study their life-cycle costs. FTA will study optimizing rail operations by reducing headways and will evaluate state-of-the-art communication and location systems and new energy saving ideas for rail equipment.

Table 5-9 presents current projects supporting objective 3.2.

**Table 5-9. Objective 3.2 Identify Practices and Technologies to Control Operating Costs**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| **General Research and Technical Assistance** | | | | |
| TPE | **The Taxi Cab, Limousine and Paratransit Association Partnership Project**<br>Assist private transportation operators in becoming more involved in the Metropolitan Planning Organization, state department of transportation, and transit agencies' planning process. | FTA Research | $200,000 per year | **Starts FY08** |
| **Bus Programs** | | | | |
| TRI-12 | **BusSolutions Prototype**<br>Develop lightweight modular manufacturing techniques to reduce the capital and maintenance costs of buses while improving fuel economy and reducing emissions. | FTA Capital & Research **Earmark** | $693,000 & $1,446,930 | **Ends FY09** Sep 2006 to May 2009 |
| **Bus Testing** | | | | |
| TRI-12 | **Bus Testing**<br>The Pennsylvania Transportation Institute operates and maintains the Altoona Bus Testing Center to test new bus models for maintainability, reliability, safety, performance (including braking performance), structural integrity, fuel economy, emissions, and noise in accordance with 49 Code of Federal Regulations (CFR) Part 665. | FTA Capital **Earmark** | $3,000,0000 per year | **SAFETEA-LU** 2006 to 2009 |
| **TCRP** | | | | |
| TRI-20 | **Practical Measures to Increase Transit Industry Advertising Revenues** | TCRP | $285,000 | **TBD** |
| TRI-20 | **A Methodology for Performance Measurement and Peer Comparison in the Public Transportation Industry** | TCRP | $300,000 | **TBD** 21 Months |

### *Objective 3.3 Identify Methods and Technologies to Improve Transit Operational Efficiency*

Objective 3.3 addresses operational improvements in bus, light rail, heavy rail, and demand response operations. FTA will examine methods and technologies to improve fleet operations, mobility management, and ITS. Research is also planned for improving the efficiency of demand response services.

Despite multi-billion dollar subsidies and frequent fare increases, many transit agencies face increasing operating deficits, with some near financial collapse. New low-cost technologies for transit must be identified, developed, tested, and deployed. FTA will examine the role of technology, particularly ITS, for improving operational efficiency.

Continued research and testing of technologies, such as vehicle assist and automation technologies for revenue service and for depots and maintenance facilities, is needed. Use of these technologies will reduce revenue service operating costs by permitting faster average travel speeds and adding capacity, thus reducing fleet size. Use of these technologies will also help

reduce costs by permitting the precise movement of buses in depots and maintenance facilities, thus lessening the chance of incidents during fueling and washing.

Continued research and testing of bus integrated collision warning systems is needed to help reduce the costs of vehicle repairs and increase passenger safety. Continued promotion of best practices and lessons learned and development of guidelines for reducing transit operating costs is also needed, as is research on transit signal priority and preemption, and the use of SmartCards for electronic fare payment.

Table 5-10 present current projects supporting objective 3.3.

**Table 5-10. Objective 3.3 Identify Methods and Technologies to Improve Transit Operational Efficiency**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| **Bus Rapid Transit** | | | | |
| TRI-11 | **Vehicle Guidance and Accessibility**<br>Evaluate vehicle guidance technologies (i.e., lane keeping technologies) to determine their operational issues and effectiveness. | FTA Research | $1,300,000 | **Starts FY08**<br>2008 to 2009 |
| TRI-12 | **Bus Rapid Transit (BRT) Initiative Support**<br>Provide technical assistance to the BRT program. | FTA Research<br>**Earmark** | $993,500 | **Ends FY08**<br>Sep 2003 to Dec 2007 |
| TRI-12 | **National Bus Rapid Transit Institute**<br>Facilitate the sharing of knowledge and innovation for increasing the speed, efficiency, and reliability of high-capacity bus service through the implementation of BRT systems in the United States. Serve as a resource to transportation professionals, consultants, and the transit community. | FTA Research<br>**Earmark** | $1,750,000 per year | **SAFETEA-LU**<br>2006 to 2009 |
| TRI-12 | **Advanced Technology Bus Rapid Transit**<br>Collect and analyze advanced vehicle data, alongside data on existing vehicles, to provide operating cost, performance, and reliability comparisons of advanced vehicles over a range of seasonal operating conditions. These data will aid transit planners and operators in making effective vehicle selections, and in finding the best use of these vehicles. | FTA Research<br>**Earmark** | $495,000 – 06<br>$540,000 – 07<br>$550,000 – 08<br>$625,000 – 09 | **SAFETEA-LU**<br>2006 to 2009 |
| TRI-12 | **Honolulu – BRT Demonstration Project**<br>BRT research and development, including working with FTA to develop evaluation plans, collect data as directed by the evaluation plan, and report events and current status to FTA. | FTA Research | $100,000 | **Ends FY09**<br>Jul 2001 to Dec 2008 |
| TRI-12 | **MBTA Silver Line – BRT Demonstration Project**<br>BRT research and development, including working with FTA to develop evaluation plans, collect data as directed by the evaluation plan, and report events and current status to FTA. | FTA Research | $100,000 | **Ends FY08**<br>Jul 2004 to Mar 2008 |

**Table 5-10. Objective 3.3 Identify Methods and Technologies to Improve Transit Operational Efficiency (Continued)**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| **Bus Programs** | | | | |
| TRI-12 | **Small to Medium-Size Bus Market Analysis**<br>Evaluate the short-, intermediate- and long-term viability of the small- to medium-sized bus market and the bus manufacturers serving that market. | FTA Research | $150,000 | **Ends FY08**<br>Apr 2007 to Dec 2007 |
| **Transit Intelligent Transportation Systems** | | | | |
| TRI-11 | **Regional Rail On-Board Payment Project**<br>The Southeastern Pennsylvania Transportation Authority (SEPTA) and Temple University are collaborating to improve and modernize fare collection procedures on the SEPTA's commuter rail system. The project will integrate several non-proprietary plug-and-play, off-the-shelf products, record on-board cash fare transactions, and process electronic payments on commuter rail. | ITS-JPO | $75,000 | **Ends FY09**<br>Jan 2007 to Nov 2008 |
| TRI-11 | **Cleveland – Integrated Center for Multimodal Services**<br>The Greater Cleveland Regional Transit Authority will design, construct, and operate a Traffic Management and Integrated Communications Center to provide multi-modal transportation services. | ITS-JPO **Earmark** | $791,469 | **Ends FY09**<br>Apr 2001 to Dec 2008 |
| TRI-11 | **ITS Deployment in Central Ohio**<br>The Central Ohio Transit Authority (COTA) will upgrade its radio communication system to integrate with the Franklin County Public Safety system so that dispatchers and bus drivers have direct communications with the county police and emergency forces. COTA also will install an automated vehicle locator system on a portion of its existing fleet and provide real-time transit information in selected central business district bus stop locations. | ITS-JPO **Earmark** | $1,577,890 | **Ends FY09**<br>Apr 2001 to Dec 2008 |
| TRI-11 | **Transit Operations Decision Support System**<br>Provide support for implementing and testing the viability of the core requirements to support dispatchers and others in real-time operations management. | ITS-JPO | $600,000 | **Ends FY08**<br>Apr 2006 to Sep 2008 |

**Table 5-10. Objective 3.3 Identify Methods and Technologies to Improve Transit Operational Efficiency (Continued)**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| **TCRP** | | | | |
| TRI-20 | **Passenger Counting Technologies and Procedures Update** | TCRP | $25,000 | **Ends FY09** Sep 2007 to Oct 2008 |
| TRI-20 | **Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Alignments** | TCRP | $375,000 | **Ends FY08** Jul 2006 to Jan 2008 |
| TRI-20 | **A Guide for Implementing Bus-On-Shoulder Systems** | TCRP | $200,000 | **Ends FY08** Sep 2006 to Mar 2008 |
| TRI-20 | **Impact of 511 Deployment on Transit Call Center Operations** | TCRP | $250,000 | **Ends FY08** Dec 2006 to Aug 2008 |
| TRI-20 | **Industry Assessment of Radio Frequency and Wireless Data Systems** | TCRP | $225,000 | **TBD** |
| TRI-20 | **Operation of Street Running Light Rail Transit at Higher Speeds** | TCRP | $295,000 | **TBD** |
| **Future Projects** | | | | |
| TRI-20 | **American Cities Transportation Institute** Provide outreach to students regarding careers in transit. Open opportunities for minority contractors to work with Philadelphia transit providers. | FTA Research **Earmark** | $294,000 | **Starts FY08** |
| TRI | **Incremental BRT: Research of Concept and Demonstration** Examine costs and benefits of incremental BRT strategies. | FTA Research | $250,000 | **Starts FY08** |
| TRI | **Communication Based Train Control (CBTC) Before/After Cost Effectiveness Study** Collect and analyze cost/benefit information for CBTC systems. CBTC systems permit more efficient operations by allowing trains to operate at closer headways with appropriate safety protection. | FTA Research | $200,000 | **Starts FY08** |

### *Objective 3.4 Identify Solutions to Improve Transit Infrastructure Maintenance*

Objective 3.4 addresses FTA's plans to seek methods to facilitate and improve the monitoring and maintenance of transit infrastructure, including the development of improved and integrated maintenance and management systems to monitor the state of defects and repairs on transit systems.

Adequately maintaining transit infrastructure, both real and vehicle assets, in the face of increasing budgetary pressure to delay maintenance is challenging. The riding public, who demand safe, clean, and operationally reliable systems, constantly reminds transit agencies of the need to use the latest methods to keep their capital assets in top condition. Use of the latest maintenance management information systems (MMIS) is fundamental to effective transit operations. However, many transit agencies lack MMIS software and many do not effectively use the latest geographic information system (GIS) tools to track their assets. Better outreach and guidelines on use of these tools is needed. Additionally, research is needed to identify, test, and demonstrate failure sensors and diagnostics equipment in critical transit components. When failures occur, sensors and diagnostic equipment automatically relay failure and diagnostic data to a central location responsible for maintenance.

Table 5-11 presents current projects supporting objective 3.4.

**Table 5-11. Objective 3.4 Identify Solutions to Improve Transit Infrastructure Maintenance**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| **General Research and Technical Assistance** | | | | |
| TRI-20 | **Third Rail Insulator Cleaning**<br>This SBIR project examines the feasibility of cleaning third rail insulators with high-pressure water jets or focused intense lights. | FTA Research (SBIR) | $200,000 | **Ends FY08**<br>Jan 2008 to Sep 2008 |
| TRI-20 | **Analysis of Monitoring Tools**<br>Develop a cost/benefit analysis tool for use by individual train operators to assess opportunities for implementing performance monitoring technologies. | FTA Research | $90,000 | **Starts FY08** |
| **TCRP** | | | | |
| TRI-20 | **Joint Track-Related Research With the Association of American Railroads/TCC, Inc.** | TCRP | $250,000 | **Ongoing** |
| TRI-20 | **Cleaning Device for Electrified Third Rail Insulators – Phase 2** | TCRP | TBD | **Ends FY08**<br>Sep 2005 to Sep 2007 |
| TRI-20 | **Portable Electronic Wheel Gauge** | TCRP | TBD | **Ends FY08**<br>Dec 2004 to Dec 2007 |

### *Objective 3.5 Improve the Capacity of the Transit Industry and Workforce*

Objective 3.5 addresses improving the capacity of the transit industry, which includes the workforce and the manufacturers and suppliers. Improvement of capacity includes improving workforce recruitment, sharing recruitment best practices, and developing and strengthening transit manufacturers and suppliers.

Current projects supporting this objective are shown in Table 5-12.

**Table 5-12. Objective 3.5 Improve the Capacity of the Transit Industry and Workforce**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| **International Mass Transportation Program (IMTP)** | | | | |
| TRI-30 | **Trade Promotion, Technical Assistance, and Training**<br>Pursue technology transfer with developed countries with which FTA has Memorandums of Understanding and with developing countries where trade opportunities exist. Provide increased trade support to the domestic transit industry through trade missions, reverse trade missions, market research, and other trade related activities. | FTA Research | $400,000 per year | **Ongoing** |
| TRI-30 | **International Tenders List**<br>Researches international opportunities and provide a web-accessible list of current public transit tenders to help inform U.S. companies about these opportunities. This list can be found by searching for "international tenders" on FTA's website. | FTA Research | $64,000 per year | **Ongoing** |
| TRI-30 | **International Mass Transportation Program Evaluations**<br>Support the IMTP in evaluating the results of trade missions to foreign countries and cooperation projects with foreign governments. | FTA Research | $32,000 per year | **Ongoing** |
| **National Transit Institute** | | | | |
| TRI-30 | **National Transit Institute**<br>Develop and deliver training courses for the transit industry; establish performance outcomes for measuring effectiveness of training; develop alternative delivery methods for selected courses; implement a project management system; and develop and implement a strategic marketing plan. | NTI **Earmark** | $4,300,000 per year | **SAFETEA-LU** 2006 to 2009 |
| **Small Business Innovation Research (SBIR)** | | | | |
| TRI-20 | **Small Business Innovation Research (SBIR) Program**<br>Develop technological innovations using high-level expertise in small businesses throughout the United States. Mandated by Congress in 1982, the SBIR Program is managed for DOT by the Volpe Center. | FTA Research | 2.5% takedown of all R&D projects SBIR projects identified individually | **Ongoing** |

**Table 5-12. Objective 3.5 Improve the Capacity of the Transit Industry and Workforce (Continued)**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| **General Training and Capacity Building** | | | | |
| TRI-20 | **Portland Streetcar Prototype Purchase and Deployment**<br>Develop a new Streetcar. | FTA Research **Earmark** | $1,000,000 per year | **SAFETEA-LU** 2006 to 2009 |
| TRI-30 | **Transit Technology Career Ladder Partnership Program**<br>Address the skills gap for hourly transit maintenance employees by 1) building and supporting state and local partnership programs that address skills training needs of the current workforce and 2) documenting the relationship between training and organizational improvement in transit systems capacity. | FTA Research **Earmark** | $1,000,000 | **SAFETEA-LU** 2006 to 2009 |
| TRI-30 | **Regional Transit Training Consortium**<br>Support the Southern California Regional Transit Training Consortium Pilot Program. | FTA Research **Earmark** | $267,300 – 06<br>$380,000 – 07<br>$380,000 – 08<br>$450,000 – 09 | **SAFETEA-LU** 2006 to 2009 |
| TPE | **Transportation Planning Capacity Building Program and Peer Exchanges**<br>Revise, update, and expand the Program based on solicited stakeholder needs. | FTA Research | $185,000 per year | **Ongoing** |
| TPE | **Planning Partnerships for Improved Transit Planning**<br>The Association of Metropolitan Planning Organizations, APTA, and the National Association of Regional Councils will promote facilitated membership dialogue and case studies of effective practice. | FTA Research | $150,000 per year | **Ongoing** |
| TPM | **Major Capital Projects, Project Management Outreach**<br>Develop and implement a NTI pilot course and curriculum materials for risk management and project strategy development for capital projects. | FTA Research | $150,000 | **Ends FY09** 2008 to 2009 |
| TRI-30 | **Careers in Transportation Internship Program**<br>The Conference of Minority Transportation Officials will implement an internship program to develop future transit industry professionals. | FTA Research | $200,000 | **Ends FY09** 2008 to 2009 |
| **TCRP** | | | | |
| TRI-20 | **Transit Bus Mechanics: Building for Success-- The ASE Transit Bus Maintenance Certification Test Series** | TCRP | $450,000 (04)<br>$300,000 (05)<br>$300,000 (07)<br>$275,000 (08) | **Ongoing** |
| TRI-20 | **International Transit Studies Program** | TCRP | $425,000 per year | **Ongoing** |
| TRI-20 | **Advancing the Implementation of Maintenance Training Standards** | TCRP | $250,000 | **Starts FY08** |
| TRI-20 | **Establishing a National Transit Industry Rail Vehicle Technician Certification Program** | TCRP | $400,000 | **Starts FY08** |
| TRI-20 | **Outreach to Minorities for Executive Searches in Public Transit** | TCRP | $250,000 | **Starts FY08** |
| TRI-20 | **Recruitment, Performance and Retention of Quality Transit and Paratransit Managers – Skills, Qualifications, Needs and Future Prospects** | TCRP | $250,000 | **Starts FY08** |

**Table 5-12. Objective 3.5 Improve the Capacity of the Transit Industry and Workforce (Continued)**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| **Future Projects** | | | | |
| TRI | **Prototype Vehicle Domestic Manufacturer**<br>Support the Portland Streetcar Prototype Purchase and Deployment project above. | FTA Research **Earmark** | $490,000 | **Starts FY08**<br>2008 to 2009 |

## 5.4 Goal 4. Improve Safety and Emergency Preparedness

### *Objective 4.1 Identify Solutions to Improve Transit Safety*

Objective 4.1 addresses collecting and analyzing transit safety data and examining potential tools for improving transit safety. FTA is interested in using the National Transit Database (NTD) and working with state departments of transportation and insurance providers to identify risk factors that cause transit incidents. FTA can then focus safety research to address these risk factors. Potential areas for safety improvements include improving grade crossing safety, reducing trespassing, improving vehicle crashworthiness design, and developing collision avoidance systems. FTA is also interested in identifying potential barriers to the adoption of new technologies and strategies for improving transit safety.

As it develops a new strategic plan, the Office of Safety and Security will work with TRI to propose research projects based on an all-hazards management analysis of needs. By identifying safety and emergency preparedness research based on need, FTA can better prioritize its research funding.

Table 5-13 presents current projects supporting objective 4.1.

**Table 5-13. Objective 4.1 Identify Solutions to Improve Transit Safety**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| TPM | **Transit Safety and Security Information Sharing and Public Awareness**<br>The FTA Safety and Security clearinghouse and website contains current resources for the transit industry on topics of safety and security and related technologies. | FTA Research | $300,000 per year | **Ongoing** |
| TPM | **Transit Safety and Security Statistics Analysis**<br>Provide enhanced safety and security data analysis for FTA and the transit industry to identify important safety and security problems. | FTA Research | $200,000 per year | **Ongoing** |
| TPM | **Drug and Alcohol Testing Compliance**<br>Support compliance with the Omnibus Transportation Employee Testing Act of 1991, which authorized FTA to mandate drug and alcohol testing of grantees, sub-recipients, and their contractors' safety sensitive employees. FTA implementing rules require grantees to submit annual reports using the Drug and Alcohol Management Information System. | FTA Research | $1,350,000 per year | **Ongoing** |
| TPM | **Transit Fire Safety & Analysis Program for Transit Rail & Bus Equipment**<br>Assess the performance of fire safety materials and products used in constructing the interiors of railcars and buses. | FTA Research | $50,000 per year | **Ongoing** |
| TPM | **Operation Lifesaver – Safety Awareness Outreach**<br>Develop light rail training materials, update marketing strategies, and disseminate information. | FTA Research | $100,000 per year | **Ongoing** |
| TPM | **Safety and Security Training**<br>Support the transit safety and security training program. Most of the safety and security courses were developed at the Transportation Safety Institute (TSI) and are taught by members of the Associate Staff. | FTA Research | $1,600,000 per year | **Ongoing** |
| TRI-20 | **Research on Preventing Rail Transit Suicides**<br>Phase I will identify the scope of the problem of suicides that occur on commuter rail and subway systems' rights of way in the United States. | FTA Research | $200,000 | **Starts FY08**<br>2007 to 2008 |
| TRI-20 | **Safety Audit Training**<br>Develop a training course on rail transit safety auditing. | FTA Research | $275,000 | **Starts FY08**<br>2008 to 2009 |
| TRI-20 | **Crash Energy Management of Light Rail Vehicles**<br>Evaluate the standard leading end configuration of LRVs and make recommendations for modifications to reduce the severity of damage/injury to motor vehicles and motor vehicle occupants involved in collisions. | FTA Research | $275,000 | **Starts FY08**<br>2008 to 2009 |
| **Transit Intelligent Transportation Systems** | | | | |
| TRI-11 | **Object Detection System Early Adopter Evaluation**<br>Evaluate three early deployments of the enhanced object detection system (WMATA, Cleveland, Utah Transit Authority). Develop an evaluation plan, conduct the evaluation, and provide an evaluation report that highlights the expected return-on-investment. | ITS-JPO | $399,988 | **Ends FY08**<br>Jul 2004 to Apr 2008 |

**Table 5-13. Objective 4.1 Identify Solutions to Improve Transit Safety (Continued)**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| **Safety and Emergency Preparedness** | | | | |
| TRI-20 | **SharpRAIL**<br>Using a mobile camera, demonstrate an automatic incident detection system for safety events occurring along rail tracks or in stations. | FTA Research | $100,000 | **Ends FY08**<br>Apr 2007 to Jan 2008 |
| TRI-20 | **Crashworthiness of Transit Buses**<br>Wichita State University is performing finite-element engineering analysis of crash performance of buses to better understand how forces are transmitted to passengers. Use virtual reality simulation to describe effects of bus crashes graphically and conduct sled tests using instrumented crash dummies to verify results of mathematical modeling of injury severity. Provide recommendations for improved vehicle design to mitigate passenger injuries. | FTA Research **Earmark** | $1,239,500 | **Ends FY08**<br>Jul 2005 to Jul 2008 |
| **TCRP** | | | | |
| TRI-20 | **Warning Device for Rail Rapid Transit Personnel for Approaching Subway Trains** | TCRP | TBD | **Ends FY08**<br>Jun 2008 |
| TRI-20 | **Development of Crash Energy Management Performance Requirements for Light-Rail Vehicles** | TCRP | $300,000 | **Ends FY08**<br>Sep 2006 to Sep 2007 |
| TRI-20 | **Improving Pedestrian and Motorist Safety Along Light Rail Transit Alignments** | TCRP | $300,000 | **Ends FY08**<br>Sep 2006 to Sep 2008 |
| TRI-20 | **Guidebook for Mitigating Fixed Route Bus-and-Pedestrian Collisions** | TCRP | $250,000 | **Ends FY08**<br>Nov 2005 to Sep 2007 |
| TRI-20 | **Light Rail Transit / Motor Vehicle Left Turn Collisions** | TCRP | $25,000 | **Ends FY09**<br>Sep 2007 to Nov 2008 |
| TRI-20 | **Ultraviolet Germicidal Irradiation for Transit Buses** | TCRP | TBD | **Ends FY08**<br>Apr 2008 |
| **Future Projects** | | | | |
| TPM | **Safety First**<br>Prepare a final report to show trends and best practices in mass transit safety. Focus on awareness and outreach. | FTA Research | $200,000 | **Starts FY08**<br>2008 to 2010 |
| TPM | **Evaluation of Safety and Security Training Courses**<br>Evaluate existing transit safety and security training courses to better plan new and updated training. | FTA Research | $100,000 | **Starts FY08** |
| TRI | **Emergency Communication System in Subway Trains**<br>Demonstrate the use of wireless or other technology to provide communication with subway train passengers from a remote location if the train operator is unable to make announcements. | FTA Research | $200,000 | **Starts FY08** |
| TRI | **Real-Time Subway Train Location Demonstration**<br>Support transit agencies in improving their ability to identify the exact locations of trains. | FTA Research | $400,000 | **Starts FY08** |

### *Objective 4.2 Identify Solutions to Reduce Criminal Activity*

Objective 4.2 addresses security practices and technology for vehicles (bus and rail) and stations, transit centers, and transit facilities. Fare evasion is also included under this objective.

FTA has no current projects supporting this objective.

### *Objective 4.3 Identify Solutions to Improve Transit Emergency Preparedness*

Objective 4.3 addresses integrating security into transit programs, operations, and infrastructure. Public transportation also plays a critical role in evaluations.

Table 5-14 presents current projects supporting objective 4.3.

**Table 5-14. Objective 4.3 Identify Solutions to Improve Transit Emergency Preparedness**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| TPM | **Model for Developing a Transit Agency Emergency Management Program**<br>Create a model for establishing an emergency management program within transit agencies nationwide. | FTA Research | $556,000 | **Starts FY08**<br>2008 |
| TPM | **Connecting Communities**<br>Promote the safety and security of mass transit passengers, employees, and properties through the collection and sharing of policies, procedures, resources, and best practices with local first responders. | FTA Research | $880,000 | **Ongoing**<br>2002 to 2009 |
| TPM | **Continuity of Operations Planning (COOP)**<br>Support COOP planning for FTA to continue critical functions during an emergency. | FTA Research | $221,978 | **Ongoing**<br>2005 to 2009 |
| | **Safety and Emergency Preparedness** | | | |
| TRI-20 | **Use of Mass Transit Buses for Emergency Evacuation of Major Urban Areas**<br>A National Academy of Sciences (NAS) committee will prepare a report to Congress on the roll of public transit vehicles in evacuations | FTA Research **Earmark** | $497,500 | **SAFETEA-LU**<br>2006 to 2008 |
| | **TCRP** | | | |
| TRI-20 | **Supplement to SAFETEA-LU NAS/TRB Policy Study on Transit Evacuations in Urbanized Areas** | TCRP | $65,000 | **Ends FY09**<br>Nov 2006 to Nov 2008 |
| TRI-20 | **A Guide to Transportation & Hazards Resources (joint with the National Cooperative Highway Research Program)** | TCRP | $37,500 | **Ends FY08**<br>Oct 2007 |
| TRI-20 | **Improving Transit Security Update** | TCRP | $25,000 | **Ends FY08**<br>Aug 2007 to Feb 2008 |
| TRI-20 | **Biometric Notification Network for Transit Employees** | TCRP | TBD | **Ends FY08** |
| TRI-20 | **Detection of Radioactivity in Transit Stations – Phase II** | TCRP | TBD | **Ends FY08** |

## 5.5 Goal 5. Protect the Environment and Promote Energy Independence

### *Objective 5.1 Facilitate the Development of Technologies to Improve Energy Efficiency and Reduce Transit Vehicle Emissions*

Objective 5.1 addresses research, development, and demonstration of energy efficient technologies such as hybrid electric and fuel cell bus and rail vehicles. Research topics include reduction of vehicle weight, power to accelerate, and overcoming rolling resistance. FTA will partner with other Federal government agencies, including the U.S. Department of Energy (DOE), to assure that transit needs are considered as new systems are developed, and to assure that transit can implement these (electric-propulsion-related, including hybrid and fuel cell) technologies and systems when they are commercially available.

Because they have a leadership role in transportation in many large cities with air pollution issues, transit agencies are aware that they need to make their bus fleets less polluting and more energy efficient. They also recognize that certain fuels and technologies can significantly improve operational efficiency. Some technologies, especially those involving hybrid-electric and all-electric drive propulsion systems, have been commercialized and are being deployed. However, more data are needed on their life-cycle costs and the operational lessons learned. Operational guidelines are needed to assist transit agencies in the optimal use of propulsion technologies.

Further development, testing, and demonstration are also needed to improve early propulsion systems, especially those for vehicle accessory subsystems and power grid connectors. More development and testing are also needed for advanced technologies, such as those involving fuel cells, exotic batteries and ultracapacitors, and hydraulic hybrids. Significant FTA research and testing have already begun on fuel cells. This research will accelerate the introduction of fuel cell technology into the commercial marketplace.

Research is also needed on rail hybrid-electric and fuel cell systems as well as the electric grid. A federal role also exists for identifying emerging technologies and associated subsystems that may reduce fuel consumption, air emissions, and energy use. This role includes information gathering and sharing through technology reviews, conferences, symposiums, and exchange of personnel.

Table 5-15 presents current projects supporting this objective 5.1.

**Table 5-15. Objective 5.1 Facilitate the Development of Technologies to Improve Energy Efficiency and Reduce Transit Vehicle Emissions**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| **Bus Alternate Fuels** | | | | |
| TRI-20 | **Biodiesel Hybrid Bus Research**<br>Establish an engine testing facility capable of making detailed measurements of engine performance, fuel economy, and pollutant emissions. Acquire data on the performance and emissions of diesel engines fueled with conventional and biodiesel fuels at speed and load conditions typical of urban and suburban transit routes. Develop a detailed computational simulation of a hybrid electric powertrain that will allow the integration of the experimental data. | FTA Research **Earmark** | $964,260 | **Ends FY08** Oct 2006 to Oct 2007 |
| TRI-12 | **Phase 1 Hydrogen Powered Vehicles**<br>To increase ridership and reduce pollution, the Greater New Haven Transit District will develop hydrogen powered transit vehicles and their operational support infrastructure. | FTA Capital **Earmark** | $3,430,019 | **Ends FY08** Jul 2005 to Jan 2008 |
| TRI-12 | **San Francisco MUNI Alternate Fuels New Technology Consortium**<br>Determine if battery-powered buses or diesel-electric hybrid powered buses can successfully replace diesel buses in an urban transit environment. | OST **Earmark** | $497,050 | **Ends FY09** Oct 2005 to Oct 2008 |
| **Bus Programs** | | | | |
| TRI-12 | **Clean Mobility and Transit Enhancement**<br>Encourage the development and use of advanced transportation technologies in partnership with transit agencies through three projects: 1) Innovative Clean Mobility; 2) Fuel Cell and Hydrogen Bus Technology Facilitation; and, 3) Advanced Transportation Technology Industry Support. | FTA Research **Earmark** | $1,987,000 | **Ends FY08** Oct 2003 to Sep 2008 |
| TRI-12 | **Advanced Transit Technology FY06**<br>Support WestStart-CALSTART in conducting Clean Fuels, Clean Propulsion Systems and Transit Enhancement projects for Bus Rapid Transit, Hydrogen and Fuel Cell Bus, Transit Linked Mobility and First Mile Solutions, Advanced Technology Fuels, and Advanced Transportation Technologies Industry Support. | FTA Research **Earmark** | $1,980,000 | **Ends FY08** Sep 2006 to Sep 2008 |
| **Emissions** | | | | |
| TRI-20 | **Transit Vehicle Exhaust Emissions Evaluation**<br>West Virginia University has an emissions research program that provides public transit agencies, engine and vehicle manufacturers, transit industry associations, government regulatory agencies and other transit industry constituents with information concerning the exhaust emissions of existing and new technology transit vehicles. | FTA Research **Earmark** | $6,389,479 | **Ends FY09** Jan 2003 to Dec 2008 |

**Table 5-15. Objective 5.1 Facilitate the Development of Technologies to Improve Energy Efficiency and Reduce Transit Vehicle Emissions (Continued)**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| **Fuel Cells** | | | | |
| TRI-12 | **Dual Variable Output Fuel Cell Hybrid Bus Validation and Testing Center for Transportation and Environment**<br>Develop battery-dominant 35-foot plug-in hybrid fuel cell bus (Hydrogenics) and demonstrate it in Birmingham, Columbia, SC, and in cities in CT. | FTA Capital: National Fuel Cell Bus Program | $5,668,000 | **SAFETEA-LU** 2006 to 2009 |
| TRI-12 | **Survey and Analysis of Bus Demonstrations Center for Transportation and Environment**<br>Document and analyze bus demonstrations around the world from 2002-2007. | FTA Capital: National Fuel Cell Bus Program | $84,000 | **SAFETEA-LU** 2006 to 2009 |
| TRI-12 | **Fuel Cell Bus Demonstration**<br>**Northeast Advanced Vehicle Consortium**<br>Advanced bus development and in-service evaluation of hybrid 40-foot fuel cell buses. Enhanced UTC 120 kW Proton exchange membrane fuel cell with upgraded seals, catalysts, bipolar plates, balance of plant. | FTA Capital: National Fuel Cell Bus Program | $8,355,000 | **SAFETEA-LU** 2006 to 2009 |
| TRI-12 | **Lightweight Fuel Cell Hybrid Bus**<br>**Northeast Advanced Vehicle Consortium**<br>Develop advanced propulsion system and integrate on mule bus, then lightweight bus platform with field evaluation. Ballard Mark 1100 Light Duty fuel cell Module, (75 kW) with ultracapacitors or Lithium-ion batteries. | FTA Capital: National Fuel Cell Bus Program | $6,695,000 | **SAFETEA-LU** 2006 to 2009 |
| TRI-12 | **MA Hydrogen Fuel Cell Powered Bus Fleet**<br>**Northeast Advanced Vehicle Consortium**<br>Advanced bus development and in-service demonstration. Integrate Nuvera 82 kW fuel cell with rive system from ISE Corp. and advanced energy storage. Demonstration includes Nuvera's novel PowerTap refueling infrastructure. | FTA Capital: National Fuel Cell Bus Program | $4,875,000 | **SAFETEA-LU** 2006 to 2009 |
| TRI-12 | **Fuel Cell Bus Program**<br>**Northeast Advanced Vehicle Consortium**<br>Develop and demonstrate 40-foot buses, one prototype and one pre-commercial bus for up to 2 years. Bus may benefit from similar design to 2010 BC Transit design for Olympics. Next generation Ballard 155 KW automotive fuel cell stack (Mk902) in hybrid configuration with ISE drive ultracapacitors or batteries. | FTA Capital: National Fuel Cell Bus Program | $6,120,000 | **SAFETEA-LU** 2006 to 2009 |
| TRI-12 | **American Advanced Fuel Cell Bus Program – Weststart-CALSTART**<br>Design and demonstrate 40-foot fuel cell bus with design improvements; in service evaluation in hot desert climate. | FTA Capital: National Fuel Cell Bus Program | $2,832,000 | **SAFETEA-LU** 2006 to 2009 |

**Table 5-15. Objective 5.1 Facilitate the Development of Technologies to Improve Energy Efficiency and Reduce Transit Vehicle Emissions (Continued)**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| TRI-12 | **Compound Fuel Cell Hybrid Bus for 2010 – Weststart-CALSTART**<br>Develop 40-foot fuel cell bus with fuel cell auxiliary power unit coupled with diesel engine. Demonstrate for one year at San Francisco MUNI. | FTA Capital: National Fuel Cell Bus Program | $5,350,000 | **SAFETEA-LU** 2006 to 2009 |
| TRI-12 | **AC Transit HyRoad: Commercialization of Fuel Cells for Public Transit**<br>**Weststart-CALSTART**<br>Accelerated testing to failure (partial phase 1) of existing fuel cell buses. Partners include Alameda-Contra Costa Transit District | FTA Capital: National Fuel Cell Bus Program | $3,575,000 | **SAFETEA-LU** 2006 to 2009 |
| TRI-12 | **Hybrid Fuel Cell Power Converter – Weststart-CALSTART**<br>Design and bench-test bi-directional, DC-DC converter for reduced cost, weight, and volume. | FTA Capital: National Fuel Cell Bus Program | $152,550 | **SAFETEA-LU** 2006 to 2009 |
| TRI-12 | **Integrated Auxiliary Module for Fuel Cell Buses – Weststart-CALSTART**<br>Design, fabricate, and bench test Integrated Auxiliary Module. | FTA Capital: National Fuel Cell Bus Program | $138,450 | **SAFETEA-LU** 2006 to 2009 |
| TRI-12 | **Fuel Cell Bus Data Collection and Outreach**<br>NREL will collect data on the individual projects within the National Fuel Cell Bus Program. | FTA Research | $300,000 | **Ends FY08** Oct 2006 to Dec 2007 |
| TRI-12 | **National Fuel Cell Bus Program Support**<br>Provide program support for the National Fuel Cell Bus Program. | FTA Research | $450,000 | **Ends FY09** Oct 2006 to Jan 2009 |
| TRI-12 | **Fuel Cell Transit Bus**<br>Support Georgetown University fuel cell bus research. SunLine Transit in Palm Springs, California is currently demonstrating a fuel cell bus. Define future research in coordination with the National Fuel Cell Bus Technology Development Program. | FTA Capital **Earmark** | $62,934,487 | **Ends FY08** Aug 2001 to Dec 2007 |
| TRI-12 | **National Fuel Cell Bus Program Training & Technical Support**<br>Support program management, including program reviews, program reporting, and information dissemination. | FTA Capital **Earmark** | $500,000 | **Ends FY08** Jan 2004 to Dec 2007 |
| TRI-12 | **Greater New Haven Transit District Fuel Cell Powered Bus Research**<br>Design and develop two hydrogen-powered buses and related infrastructure for revenue service in New Haven, Connecticut. | FTA Research **Earmark** | $482,130 – 06<br>$540,000 – 07<br>$550,000 – 08<br>$625,000 – 09 | **SAFETEA-LU** 2006 to 2009 |
| TRI-12 | **Alabama Fuel Cell Vehicle Consortium**<br>Develop a 30-foot fuel cell bus. | FTA Capital **Earmark** | $1,980,630 | **Ends FY09** Sep 2004 to Jun 2009 |

**Table 5-15. Objective 5.1 Facilitate the Development of Technologies to Improve Energy Efficiency and Reduce Transit Vehicle Emissions (Continued)**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| TRI-12 | **Delaware Auto Fuel Cell Vehicle Consortium**<br>The Delaware Automotive Fuel Cell Consortium, the University of Delaware, the Electric Power Research Institute, and the Delaware Transit Corporation, will conduct research to design, build, operate and test an automotive-based fuel cell transit vehicle. The project is testing an Ebus 22 ft battery electric containing a Ballard 19.3 KW fuel cell stack. | FTA Capital **Earmark** | $2,942,608 | **Ends FY09** Aug 2005 to Oct 2008 |
| **Potential Future Projects** | | | | |
| TRI | **Missouri Transportation Institute**<br>Support a plug-in electric vehicle demonstration in Kansas City. | FTA Research **Earmark** | $1,667,837 | **Starts FY08** |
| TRI | **East Tennessee Hydrogen Initiative**<br>Demonstrate (pilot) a hydrogen-generating fueling facility. | FTA Research **Earmark** | $667,135 | **Starts FY08** |
| TRI | **Hybrid Bus Deployment and Performance Evaluation**<br>Provide transit agencies with the results of objective evaluations of the performance of hybrid electric buses. | FTA Research | $250,000 | **Starts FY08** 2008 to 2009 |
| TRI | **Energy Storage for Hybrid Electric Buses Assessment**<br>Identify best available technologies for energy storage on-board transit vehicles. | FTA Research | $200,000 | **Starts FY08** 2008 to 2009 |
| TRI | **Rail Transit Operating Strategies for Energy Conservation**<br>Examine alternative methods for conserving power in transit buses and rail systems. | FTA Research | $200,000 | **Starts FY08** 2008 to 2009 |
| TRI | **Return on Investment of Diesel Electric Energy Storage Technologies**<br>Identify state-of-the-art on-board energy storage systems for diesel electric commuter rail systems. | FTA Research | $150,000 | **Starts FY08** |
| TRI | **Transit Carbon Management Compendium**<br>Examine potential benefits from reducing carbon emissions in transit agency operations. | FTA Research | $175,000 | **Starts FY08** |

### *Objective 5.2 Identify and Overcome Barriers to Adoption of Clean Technologies*

Objective 5.2 addresses reducing the costs of adopting clean technologies such as hybrid electric (initial cost of the bus), alternative fuels (infrastructure costs of natural gas), and fuel cells (purchase costs of buses and infrastructure). Other issues include implementation costs and operating cost increases for adopting these clean technologies. FTA is also concerned with providing technology, demonstration, and evaluation information needed by transit agencies to make investment decisions for these technologies.

Many transit agencies are aware that they need to adopt clean technologies that will reduce energy use, reliance on foreign oil, and air emissions, and will improve operational efficiency. Transit agencies in large cities have already adopted some of these technologies, including compressed natural gas and hybrid-electric propulsion and all-electric systems. A few agencies have conducted limited operational tests of the most advanced technologies, including fuel cells and plug-in hybrids. However, major barriers exist for many transit agencies, and the transit industry in general, to adopt the latest clean technology systems. These barriers include high capital costs, risks associated with the technologies, and low use. Legislative incentives have helped transit agencies partially overcome these barriers by reducing or eliminating the local cost share of federally-sponsored capital acquisitions. Federal research can help transit agencies through more shared development, testing, and demonstrations of these systems.

Effective incentives should lead to the introduction, demonstration, and deployment of more clean technologies. FTA must continue to work with the transit industry to identify barriers to implementing new systems and incentives to effectively overcoming these barriers. FTA will document and share with the industry the success or failure of incentives. In addition, FTA will document and share with the transit industry case studies of the effects of the existing incentives in SAFETEA-LU and the Energy Policy Act.

Table 5-16 presents current projects supporting objective 5.2.

**Table 5-16. Objective 5.2 Identify and Overcome Barriers to Adoption of Clean Technologies**

| FTA Office | Project Title and Description | Funding Source | Funding Level | Period of Performance |
|---|---|---|---|---|
| **Electric Drive** | | | | |
| TRI-12 | **Hybrid Bus Emission Certification** | FTA Research | $300,000 | **Ends FY09** Dec 2006 to Dec 2008 |
| **General Research and Technical Assistance** | | | | |
| TRI-12 | **Clean Car Sharing and Mobility Program** Linked with mass transit, this program will maximize the benefits from existing transportation resources by allowing commuters from dispersed suburban neighborhoods to Car Share (Car Pool) to transit stations, leave their vehicle, and ride mass transit the last link of their trip into the city. | FTA Research **Earmark** | $1,948,000 | **Ends FY09** 2006 to Jan 2009 |
| TBP | **DOT Center for Climate Change** Support the study of the effects of transportation on climate variability and the impacts of climate change on transportation infrastructure. | FTA Research | $100,000 per year | **Ongoing** |
| TPE | **Air Quality and Environmental Research** Conduct highly specialized research in environmental quality. | FTA Research | $785,000 | **Ends FY09** 2007 to 2009 |
| **TCRP** | | | | |
| TRI-20 | **Guidebook for Evaluating Fuel Choices for Post-2010 Transit Bus Procurements: Update of TCRP Report 38** | TCRP | $150,000 | **TBD** 15 months |
| TRI-20 | **Assessment of Hybrid-Electric Transit Bus Technology** | TCRP | $300,000 | **Ends FY08** Dec 2004 to Sep 2007 |

## 5.6 Strategically Unaligned Projects

As FTA organized its current research projects under its research goals and objectives, many projects did not fit. Table 5-17 presents these strategically unaligned projects. These projects have little relation to public transportation, address local needs rather than national priorities, are not research, replicate previous research, or have a project scope outside of FTA's research goals and objectives. In general, these projects do not actively support the objectives specified in the strategic plan. Some are funded out of proportion to their value.

**Table 5-17. Strategically Unaligned Research Projects**

| Project Title and Grantee Agency | Funding Source | Funding | Period of Performance |
|---|---|---|---|
| **Staten Island Transit Enhancement Plan – Phase II** | FTA Research Earmark | $220,500 | **Starts FY08** |
| **Wisconsin Supplemental Transportation Rural Assistance Program**<br>WI DOT | FTA Research **Earmark** | $8,000,000 authorized | **SAFETEA-LU**<br>2006 to 2009 |
| **Silverliner IV Electric Commuter Car Propulsion System Upgrade**<br>SEPTA | FTA Research **Earmark** | $7,788,877 | **Ends FY08**<br>1999 to 2008 |
| **Purchase Vehicles and Technical Assistance**<br>Advanced Transportation Technology Institute | FTA Capital **Earmark** | $5,414,462 | **Ends FY08**<br>2002 to 2008 |
| **National Bio-Terrorism Civilian Medical Response Center**<br>Drexel University | FTA Research **Earmark** | $4,171,725 | **Ends FY08**<br>2005 to 2008 |
| **Oklahoma Transportation Center**<br>The University of Oklahoma, Oklahoma State University, and Langston University. | FTA Research & Capital **Earmark** | $3,475,150 & $1,943,557 | **Ends FY08**<br>Jul 2004 to Sep 2008 |
| **Flywheel Power System for Transportation**<br>WestStart-CALSTART | FHWA **Earmark** | $3,312,842 | **Ends FY08**<br>2004 to 2008 |
| **Transit Security Training Facility**<br>Chester County Community College | FTA Research **Earmark** | $3,000,000 Authorized | **SAFETEA-LU**<br>2006 to 2009 |
| **Advanced Lead Acid Battery Consortium**<br>International Lead-Zinc Research Organization | FTA Research **Earmark** | $2,689,100 | **Ends FY08**<br>1993 to 2007 |
| **Transportation, Economic, and Land Use System**<br>New Jersey Institute of Technology | FTA Research **Earmark** | $2,205,000 authorized | **SAFETEA-LU**<br>2006 to 2009 |
| **Center for Advanced Transit Initiatives**<br>Rutgers, The State University (2510) | FTA Research **Earmark** | $2,205,000 authorized | **SAFETEA-LU**<br>2006 to 2009 |
| **Hybrid Electric and Fuel Cell Research**<br>University of Alabama | FTA Research **Earmark** | $2,000,000 authorized | **SAFETEA-LU**<br>2006 to 2009 |
| **Transportation Infrastructure and Logistics**<br>Univ Alabama in Huntsville | FTA Research **Earmark** | $2,000,000 authorized | **SAFETEA-LU**<br>2006 to 2009 |
| **Trauma Care System Research and Development**<br>University of Alabama-Birmingham | FTA Research **Earmark** | $2,000,000 authorized | **SAFETEA-LU**<br>2006 to 2009 |
| **Regional Public Safety Training Center**<br>Lehigh Carbon Community | FTA Research **Earmark** | $2,000,000 authorized | **SAFETEA-LU**<br>2006 to 2009 |

**Table 5-17. Strategically Unaligned Research Projects (Continued)**

| Project Title and Grantee Agency | Funding Source | Funding | Period of Performance |
|---|---|---|---|
| **Application of Information Technology to Transportation Logistics and Security**<br>Northern Kentucky University | FTA Research<br>**Earmark** | $1,600,000 authorized | **SAFETEA-LU**<br>2006 to 2009 |
| **Charleston Monobeam Project**<br>Charleston Area Regional Transportation Authority | FTA Capital<br>**Earmark** | $1,495,150 | **Ends FY08**<br>1999 to 2007 |
| **Energy Management Study**<br>West Virginia University | FTA Research<br>**Earmark** | $971,860 | **Ends FY08**<br>2004 to 2007 |
| **Flywheel Bus and Truck Program**<br>University of Texas at Austin | FTA Research<br>**Earmark** | $964,260 | **Ends FY08**<br>Aug 2006 to June 2008 |
| **Nanostructured Catalysts for Hydrogen Fuel Cells**<br>University of Alabama - Center for Advanced Vehicle Technology | FTA Research<br>**Earmark** | $917,898 | **Ends FY08**<br>2005 to 2007 |
| **Low-Cost Carbon Fiber Production Technology FY06**<br>University of Tennessee Space Institute | FTA Research<br>**Earmark** | $964,260 | **Ends FY08**<br>2006 to 2008 |
| **Vashon Island – Passenger Only Ferry Initiative**<br>King County Metro | FTA Research<br>**Earmark** | $868,253 | **Ends FY08**<br>2004 to 2008 |
| **Fischer-Tropsch Clean Diesel Technology Demonstration (OK)**<br>Integrated Concepts and Research Corporation | FTA Research<br>**Earmark** | $845,432 | **Ends FY08**<br>2005 to 2008 |
| **Fischer-Tropsch Diesel Fuel Transit Demonstration (Alaska)**<br>Integrated Concepts and Research Corporation | FTA Research<br>**Earmark** | $777,486 | **Ends FY08**<br>2005 to 2008 |
| **Indoor Air Quality Engine Control Demonstration**<br>Zenith Fuel Systems | FTA Research<br>**Earmark** | $844,985 | **Ends FY08**<br>2005 to 2007 |
| **Galveston Fixed Guideway**<br>City of Galveston | FTA Research<br>**Earmark** | $750,000 | **Ends FY08**<br>2000 to 2007 |
| **Missouri Biodiesel Mass Transit Demonstration**<br>National Biodiesel Board | FTA Research<br>**Earmark** | $670,186 | **Ends FY08**<br>2007 to 2008 |
| **Advanced Vehicle Emission Reduction Sensor Program**<br>Orbital Research, Inc. | FTA Research<br>**Earmark** | $495,000 | **Ends FY08**<br>2007 to 2008 |
| **WestStart Vehicular Flywheel Project**<br>CALSTART, Inc. (5552) | FTA Research<br>**Earmark** | $491,964 | **Ends FY08**<br>2006 to 2008 |
| **Cooperative Procurement Pilot Program Evaluations**<br>Determine the benefits of cooperative procurement of major capital equipment. | FTA Research | $268,434 | **Ends FY08**<br>Sep 2005 to Dec 2007 |
| **Electronic Government (E-Gov) Initiatives** | FTA Research | $204,000 per year | **Ongoing** |
| **FTA Workforce Planning** | FTA Research | $160,000 | **Starts FY08** |
| **DBE Electronic Reporting Project** | FTA Research | $200,000 | **Starts FY08** |
| **Low-Speed Urban Maglev Program**<br>California University of Pennsylvania | FHWA | $1,900,000 | **Ends FY09**<br>2007 to 2009 |
| **Sky Shuttle System Maglev Project**<br>California University of Pennsylvania | FHWA | $2,459,820 | **Ends FY09**<br>2007 to 2009 |

**Table 5-17. Strategically Unaligned Research Projects (Continued)**

| Project Title and Grantee Agency | Funding Source | Funding | Period of Performance |
|---|---|---|---|
| **Sky Shuttle System Maglev**<br>California University of Pennsylvania | FHWA | $2,000,000 | **Ends FY08**<br>2006 to 2007 |
| **FHWA Urban Maglev Technical Support Services**<br>Science Applications International Corporation | FHWA | $399,983 | **Ends FY08**<br>2006 to 2008 |
| **Low-Speed Urban Maglev Support**<br>Volpe National Transportation Systems' Center | FHWA | $300,000 | **Ends FY08**<br>2006 to 2007 |
| **TOTAL FUNDING** | | **$72,966,184** | |

# 6.0 TRACKING PROGRESS

In 2006, FTA completed the Office of Management and Budget (OMB) Program Analysis Rating Tool (PART) process,[17] receiving the highest ranking possible – an "effective" rating with a score of 95 out of 100. FTA's research program includes the following performance objectives developed originally in response to PART:

1. Assure that 90 percent of all projects are on-time and on-budget
2. Increase transit ridership by one percent per year
3. Reduce transit fatalities
4. Deliver six innovations or products per year (30 over 5-year period) across the goals.

These performance objectives are included in FTA's internal Annual Performance Plan, which defines the projects, deliverables, and major milestones expected for a given fiscal year. The performance objectives are also associated with DOT goals and FTA research goals, as shown in Table 6-1.

**Table 6-1. Performance Objectives Align with FTA and DOT Goals**

| DOT Goals | FTA Research Goals | Performance Objective |
|---|---|---|
| Organizational Excellence | Goal 1: Provide transit research leadership | 90% projects on time and on-budget |
| Mobility | Goal 2: Increase transit ridership | Increase ridership 1% per year |
| | | Deliver innovations/products in support of Objective 4. |
| | Goal 3: Improve capital and operating efficiencies | Deliver innovations/products in support of Objective 4. |
| Global Connectivity | | |
| Safety | Goal 4: Improve safety and emergency preparedness | Reduce transit fatalities |
| Security | | Deliver innovations/products in support of Objective 4. |
| Environmental Stewardship | Goal 5: Protect the environment and promote energy independence | Deliver innovations/products in support of Objective 4. |

FTA updates the projects and accomplishments for PART annually. The updates are posted with the PART assessment. Table 6-2 presents the annual innovations and products that FTA has delivered or expects to deliver for FY 2006 through FY 2008.

[17] FTA's research program PART assessment is shown at http://www.whitehouse.gov/omb/expectmore/detail/10004008.2006.html

**Table 6-2. FTA Delivers Six Innovations/Products Per Year to Benefit the Transit Industry**

| Number | Innovation/Product |
|---|---|
| **FY 2006** | |
| 1 | Advanced Public Transportation Systems: The State of the Art Report |
| 2 | Non-Rail Vehicle Market Viability Study |
| 3 | Crash Energy Management Specifications for Commuter Rail Cars |
| 4 | Disaster Response and Recovery Resource for Transit Agencies |
| 5 | Analysis of Capital Cost Elements and Their Effect on Operating Costs Report |
| 6 | ITS Applications for Coordinating and Improving Human Services Transportation: A Cross-Cutting Study |
| **FY 2007** | |
| 1 | Alternative Fuels Study: A Report to Congress on Policy Options for Increasing the Use of Alternative Fuels in Transit Vehicles |
| 2 | Construction Project Management Handbook |
| 3 | Useful Life of Transit Buses and Vans Report |
| 4 | Assessing the Business Case for Integrated Avoidance Systems on Transit Buses |
| 5 | Transit Bus Life-Cycle Cost and Year 2007 Emissions Estimation |
| 6 | Environmental Benefits of Alternative Fuels and Advanced Technology in Transit report |
| 7 | 2006 Status of the Nation's Highways, Bridges and Transit Conditions and Performance Report to Congress (joint report with FHWA) |
| **Planned FY 2008** | |
| 1 | Second phase research activities under the Mobility Services for All Americans initiative |
| 2 | Complete and publish an update to the "Characteristics of Bus Rapid Transit for Decision- Making" Report |
| 3 | Issue report on improving bus passenger safety during accidents |
| 4 | Complete feasibility study on using machine vision (smart video) to detect obstacles on, and intrusions into, rail rights-of-way |
| 5 | Complete strategic plan addressing the needs of bus and rail electric drive technology research and development |
| 6 | Deliver Report to Congress on results of Cooperative Procurement Pilot Program projects |

# 7.0 CONTACT FOR COMMENTS AND QUESTIONS

Comments and questions regarding this Program Plan or any research strategic planning at FTA should be directed to:

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# APPENDIX A – PROGRAM FUNDING LEVELS

The tables in Appendix A describe the purpose and annual funding levels for FTA's research programs. Funding levels are those authorized by SAFETEA-LU.

| National Research and Technology Program (49 United States Code [USC] 5314, 49 USC 5312) | | | |
|---|---|---|---|
| Administered by FTA for both earmarked and discretionary research. Under this program, 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. Research under this program should improve public transportation service and help public transportation service meet transportation needs at a minimum cost. | | | |
| FY 2006 | FY 2007 | FY 2008 | FY 2009 |
| $53,658,000[18] | $40,400,000 | $44,600,000 | $48,450,000 |

| 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. | | | |
| FY 2006 | FY 2007 | FY 2008 | FY 2009 |
| $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. | | | |
| FY 2006 | FY 2007 | FY 2008 | FY 2009 |
| $7,000,000 | $7,000,000 | $7,000,000 | $7,000,000 |

[18] An additional $17.028 million was appropriated above the SAFETEA-LU level of $37.7 million.

| National Transit Institute (49 USC 5315) | | | |
|---|---|---|---|
| Administered by Rutgers University. NTI develops and conducts training on public transportation issues for Federal, State, and local transportation officials and members of the transit industry. | | | |
| FY 2006 | FY 2007 | FY 2008 | FY 2009 |
| $4,300,000 | $4,300,000 | $4,300,000 | $4,300,000 |

| Bus Testing Facility (49 USC 5309, 49 USC 5318) | | | |
|---|---|---|---|
| Administered by Pennsylvania State University. All new bus models acquired using FTA funds are tested at the facility for maintainability, reliability, safety, performance (including braking performance), structural integrity, fuel economy, emissions, and noise. | | | |
| FY 2006 | FY 2007 | FY 2008 | FY 2009 |
| $3,000,000 | $3,000,000 | $3,000,000 | $3,000,000 |

| National Fuel Cell Bus Technology Development Program | | | |
|---|---|---|---|
| Three non-profit consortia that include multiple fuel cell and other component manufacturers are conducting fuel cell bus technology and infrastructure research to facilitate the development of commercially-available fuel cell bus technology. The consortia are developing and testing components, conducting outreach, and demonstrating fuel cell buses in a variety of geographic locations and climates across the United States. | | | |
| FY 2006 | FY 2007 | FY 2008 | FY 2009 |
| $11,250,000 | $11,500,000 | $12,750,000 | $13,500,000 |