Transit Cooperative Research Program

FY 2009

Announcement of Transit Research Projects
November 2008

The 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) established the Transit Cooperative Research Program (TCRP), and the Transportation Equity Act for the 21st Century (TEA-21) and the Safe, Accountable, Flexible, and Efficient Transportation Equity Act—A Legacy for Users (SAFETEA-LU) reauthorized it through 2009. The TCRP undertakes research and other technical activities in response to the needs of local transit service providers and suppliers on a variety of transit problems involving operations, service configuration, engineering, maintenance, human resources, administration, policy, and planning.

A memorandum agreement outlining operating procedures for the TCRP has been executed by the cooperating organizations: the Federal Transit Administration (FTA); the National Academies, acting through the Transportation Research Board (TRB); and the Transit Development Corporation, Inc. (TDC), a non-profit educational and research organization established by the American Public Transportation Association (APTA).

The TCRP Oversight and Project Selection (TOPS) Committee, the governing board for the program, recently selected projects for the Fiscal Year 2009 program. The purpose of this announcement is to inform the research community of these projects.

This announcement contains problem statements that are preliminary descriptions of the selected projects. Detailed project statements, formally soliciting proposals for these projects, are expected to be released starting in March 2009.

TCRP project statements are available only on the World Wide Web. Each project statement will be announced by Electronic Mail. A form to register for e-mail notification of project statements is available at TCRP's website, http://www.trb.org/tcrp. Research project statements will be posted at the same Internet address when they are active.

The TCRP is an applied, contract research program with the objective of developing near-term solutions to problems facing transit-operating agencies. Proposals should evidence strong capabilities gained through extensive, successful experiences. Any research agency interested in submitting a proposal should first make a frank and thorough self-appraisal to determine whether or not it possesses the capability and experience necessary to ensure successful completion of the project. The specifications for preparing proposals are quite strict and are set forth in the brochure entitled, *Information and Instructions for Preparing Proposals*, available on the Internet at the website referenced above. Proposals will be rejected if they are not prepared in strict conformance with the section entitled, "Instructions for Preparing and Submitting Proposals."

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Transit Cooperative Research Program
Projects in the Fiscal Year 2009 Program

■ Project A-33
Emergency Preparedness and Recovery Outreach and Communications to Vulnerable Populations

Research Field: Operations
Allocation: $350,000
TCRP Staff: Stephan A. Parker

The natural disasters encountered by the coastal states in 2005 increased national awareness of the role that public transportation has in planning, response, and recovery with regard to weather-related threats. State departments of transportation and their public transportation divisions were required to communicate and coordinate with local, state, and federal agencies with which they may have had little or no prior exposure. Emergency operation practices for natural disasters, such as hurricanes, flooding, tornadoes, and blizzards vary from state to state. In addition to varying on a state level, there may also be institutional differences in how operations and communications are handled among the highway divisions compared to public transportation and rail divisions.

Two separate reviews of how transit agencies prepare for emergencies with a focus on vulnerable populations (i.e., transit-dependent, disabled, poor, low English proficiency, racial and ethnic minorities, etc.) were conducted by the Federal Transit Administration's (FTA's) Office of Civil Rights and the Conference of Minority Transportation Officials. FTA's 12-month review culminated in the release of *Transportation Equity in Emergencies: A Review of the Practices of State Departments of Transportation, Metropolitan Planning Organizations, and Transit Agencies in 20 Metropolitan Areas*. COMTO's expedited 2-month review—completed with a white paper entitled *Emergency Preparedness and Response for Vulnerable Populations*—was the focal point of a June 2007 discussion during its 2007 National Meeting & Training Conference. Both reports summarized existing preparedness and recovery policies and processes regarding vulnerable populations.

What is abundantly clear in both reviews is that vulnerable populations—residents who have no other means of transportation when an evacuation is called for—must rely on public assistance. With no discernable means of communications to this specific population, there is a gap of awareness regarding the role of public transit agencies versus the public emergency response operations and the impact on the communities they serve. This gap was evident during the evacuation of New Orleans residents during Hurricane Katrina. It was evident in the 12-month review conducted by the FTA as well as in the review conducted by COMTO, and it is apparent that this gap still has not been fully addressed.

The objective of this research is to identify and disseminate best internal and external planning, response, and recovery policies and practices pertaining to weather-related emergencies with an emphasis on specific outreach to vulnerable populations.

The proposed research objective will be reached through the following potential activities.

- Identify the best current weather-related emergency communication and response practices in a sample of states;
- Identify lessons learned from recent emergencies (e.g., Hurricanes Katrina & Rita in addition to assessment of 2007 hurricane season);
- Identify key issues associated with the involvement of state and local public transportation operations in targeting vulnerable populations as specific state and local coordinated emergency planning activities;
- Identify best practice examples of internal and external preparations for communications targeted for vulnerable populations;
- Test results of analysis with a pilot program that mirrors the most effective communications outreach to vulnerable populations to be conducted in cooperation with New Orleans public transportation operations for evacuation of vulnerable populations.

- Capture results of analysis and pilot program through presentations that can be shared with other transit entities seeking to address vulnerable populations for specific outreach, preparation and response during emergency incidents.

Without question, more communications strategies need to be developed to address the gaps by public transit and public emergency response operations during the Hurricanes Katrina and Rita evacuations. There are myriad ways to identify vulnerable populations and provide them with vital information to be used in emergency situations, whether there are advance warning time frames or not. In 2008, the urgency is evident in that not enough has been accomplished on this subject over the past 3 years. The payoff will be saved lives.

■ Project A-34
Enhancing Rail and Bus Transit Operating Rule Compliance: Lessons from Commercial Aviation and Other Relevant Industries

Research Field: Operations
Allocation: $350,000
TCRP Staff: Dianne S. Schwager

The issue of rail and bus transit personnel compliance with operational rules remains a significant and growing concern in the public transportation industry. The majority of accidents, incidents, and hazardous conditions are often the direct result of non-compliance with rules which were established by transit systems to govern safe operations. While rail and bus transit are extremely safe modes of transportation, and while the numbers of rule violations that result in serious outcomes involving death or injury are statistically insignificant, the industry as a whole is always looking for methods to further improve its enviable safety record. Just one major accident that stems from non-compliance with rules can call into question the safety of the entire industry, and transit must then prove that its practices are truly effective. In recent times, the issue of rule compliance has been of significant concern to the National Transportation Safety Board (NTSB) and is the subject of several findings in recent accident investigation reports.

In the relatively recent past, many transit systems have examined methods for enhancing rule compliance. These approaches have included the development of a standard for managing employee efficiency checks (monitoring of rule compliance), enhanced training, re-training and certification requirements, offering new approaches to positive reinforcement for addressing violations when they occur, and improving safety with other techniques. These are all valuable and proactive steps, which are intended to minimize the rare instances in which rule violations occur. Given the potentially catastrophic consequences that could occur in the event of an accident, however, the industry always strives to ensure it is doing everything reasonable and practical to minimize this risk. Even though these steps have been taken, and the industry does have a strong safety record, what else can be done? What other industries offer a similar, if not better, safety record? The aviation industry is one that, due in part to strong regulation and a critical need for safety at all times, may offer lessons for transit on how to achieve even greater rule compliance. While there are some obvious differences between the operational environments in which flight crews and rail and bus transit operational personnel work, the similarities between the industries are many:

- The need to zealously comply with established rules and procedures;
- Compliance with external directions (generated by other workers or technology);
- Absence of full-time "on-site" supervision while they are performing their duties;
- A stressful work environment, often the result of factors outside of their control;
- Potential for monotony, as a result of performing the same tasks numerous times during each work shift (this concern cannot be overstated when it comes to rule compliance);
- Interaction with passengers;
- The requirement to provide leadership and direct others during safety/security emergency conditions;

- The serious and direct risk of injury or death to passengers, other co-workers, and themselves if they violate a safety rule.

Since the commercial aviation industry also has an excellent safety record, it would be worthwhile to examine the approaches that aviation utilizes to ensure compliance with complex operational rules. While not all activities used in aviation may be directly transferable, the opportunity exists for new approaches to be implemented in rail transit based upon the aviation model.

The objective of this study is to evaluate and introduce proven methodologies, techniques, and procedures from the aviation industry and other relevant industries, as appropriate, to the rail and bus transit industry in an effort to further enhance system safety. In particular, the lessons learned in conducting this review could result in modifications to traditional forms of training or retraining, corrective actions, compliance testing, or other aspects of transit worker safety. While the rail and bus transit industry often looks to itself and gains valuable insight into lessons learned from previous incidents or best practices of peer agencies, it may be unaware of what practices work even better in other industries. The detailed objectives of this study would include researching and clearly describing:

- Methodologies for employee qualification;
- Development of training, retraining, and certification requirements;
- Employee supervision and control;
- Employee performance assessment;
- Response to employee rule violations (both disciplinary and positive approaches);
- Management of "person/machine" interface issues – e.g., how safety technology is integrated into the workplace;
- Employee fitness for duty issues;
- Impact on licensing or qualification to perform duties; and
- Other issues, as appropriate, and as discovered.

The final work product would include:

- Research synopsis of aviation industry regulations, best practices, lessons learned, and general approach to providing operating employee safety;
- Research synopsis of transit industry regulations, best practices, lessons learned, and general approach to providing operating employee safety;
- Comparison of industry practices and synopsis of aviation applications that may work in transit;
- Toolbox of methodologies and practices linked directly to the objectives listed above that offers transit new approaches (to include appropriately scaled concepts, based on transit funding and other practical issues); and
- Recommendations for the rail and bus transit industry to continue its focus on worker safety.

To meet the objectives listed above, comprehensive research must be conducted, both in the rail and bus transit and commercial aviation industries. It is critical that appropriate regulatory bodies, industry trade groups, labor organizations, private companies, and other affected parties be included in this research. The basic research proposed could include:

- Interviews with stakeholders
  - Government: FAA, NTSB, FTA, DOT;
  - Labor: ALPA, AFA-CWA, TWU, UTU, ATU;
  - Commercial airlines: Training departments, HR, other departments;
  - Transit systems: Training departments, HR, other departments;
  - Industry Trade Groups: APTA, Air Transport Association; and
  - Others
- Workshops with airline employees to discuss compliance issues;
- Request & review of written policies, practices, and procedures;
- Request & review of regulations & standards;

- On-site reviews of employee training programs:
  - Participate in classes
  - Participate in practical training – e.g., emergency drills
- Workshops with stakeholders to discuss and finalize:
  - Proposed findings
  - Toolbox elements
  - Recommendations for transit

These steps will ensure that information is properly gathered, understood and presented. The research in this study is critical since these industries are as different as they are similar, and a strong research component will ensure the accuracy and practicality of the final work product.

Given that transit continues to grow across America, with new starts and line extensions gaining funding on a regular basis, and new service opening up every year, transit industry is at a critical point in its recent history. More and more systems are providing more service, and this is expected to continue to grow as more Americans switch to public transit. Further complicating this is the fact that institutional knowledge may be spread thin as more systems vie for qualified individuals to operate and maintain their rail transit lines. As such, the industry must continue to provide tangible products that contain consistent and applicable advice on improving system safety.

The payoff potential for this study is enormous. Even minor accidents involving transit vehicles and infrastructure can exceed $100,000. If only four incidents of this magnitude are prevented because of improved employee rule compliance, this study will have paid for itself; and this does not even take into account the less quantifiable cost to any human lives that are harmed or lost in an incident. With more people riding more miles of rail and bus transit every day, the lessons learned from another very safe industry could reap significant rewards for transit.

■ Project B-39
Research to Increase Transit Advertising Revenues

Research Field: Marketing
Allocation: $350,000
TCRP Staff: Gwen Chisholm Smith

Sale of advertising in public transit facilities and vehicles is a nearly $1 billion industry generating approximately $500 million annually to transit authorities. Yet transit advertising revenue is less than half of one percent of total U.S. ad expenditures. The other 99.5% of advertising revenues goes to television, radio, billboards, the internet, newspapers, magazines, and other media.

The American Public Transportation Association (APTA), as a service to its transit agency members, has set out to boost transit's share of national advertising expenditures. This is one of several self-help, revenue-generating strategies to enable the transit industry to keep fares down and sustain service to its customers.

To increase transit advertising revenues, a recent TCRP study was conducted, *Practical Measures To Increase Transit Industry Advertising Revenues* (TCRP Project B-33). Preliminary results from TCRP Project B-33 indicate that a key impedance to increasing transit advertising revenues is the lack of an audience measurement system that can demonstrate the value of transit advertising to potential advertisers. Other more lucrative media, such as radio and television, have standardized audience measurement systems. These standardized audience measures are successful because they give media buyers confidence that ads will deliver messages to the right audiences cost effectively.

The proposed research to develop an audience measurement system for transit is expected to increase transit advertising revenue. Each additional tenth of one percent of advertising

market share will generate upwards of $125 million in annual revenue to transit authorities.

The objective of this research is to develop an audience measurement system to sharply boost advertising revenue for transit systems.

Surveys of media buyers and advertisers conducted for TCRP Project B-33 indicate that the absence of credible and accepted audience measurement data limits the sale of transit advertising. The proposed research would remove this barrier by defining and validating an audience measurement system for transit advertising.

The proposed research would not only build upon the findings of TCRP Project B-33, but would also build upon recent work by the Traffic Audit Bureau, based in New York City, which developed and tested a similar system for billboard advertising last year.

The development of a transit audience measurement system would put transit on par with more successful media such as television and radio in the eyes of advertisers and media planners. These more lucrative media enjoy independent audience measurement systems that assure advertisers and media buyers of credible audience reach and frequency information. Prospective advertisers rely heavily on audience measurement information to decide where to advertise (television vs radio vs internet vs transit, etc.), and to document the cost effectiveness of the money they invest in advertising to reach a particular audience. TCRP Project B-33 is finding that development of this kind of system for transit will be the single most effective step the transit industry can take to grow advertising revenues.

The research may consist of the following potential tasks:

1. Development of audience measurement methodologies for all types of transit advertising, including bus exteriors and interiors, bus shelters, and rail station and rolling stock.
2. Defining uniform data collection standards for transit systems to adopt as part of a national network of transit ad sales that present a uniform face to advertisers.
3. Testing and validation of the new audience measurement methods in multiple transit markets.

Recent trends in the advertising industry have begun to weaken traditional advertising media. Television advertising, in particular, which has long dominated national advertising sales, faces both media fragmentation due to a mushrooming spectrum of cable and satellite channels, and commercial-skipping technologies such as TIVO. These trends begin to decrease the attractiveness of television as a medium for advertisers. In this context, transit advertising can potentially generate more revenue to transit agencies. Unlike television, it cannot be turned off, zapped, fast forwarded, or easily ignored.

With more than 370,000 bus, 13,000 subway and rail, and 32,000 shelter and kiosk displays, transit advertising has the power to deliver an advertiser's message on a local, regional, and national stage. Transit advertising can also be targeted geographically to allow for ad message customization along demographic and psychographic lines. Transit offers a variety of media that can target nearly any segment of metropolitan populations, including bus riders, train riders, and autoists and pedestrians (via advertising on the outside of transit vehicles and facilities).

Given the aforementioned trends in the advertising industry, public transit has a window of opportunity to increase its share of the $250 billion a year spent annually on advertising in the United States. Audience measurement research is a vital step to this end.

■ Project D-14
Update of TCRP Report 57: Track Design Handbook for Light Rail Transit

Research Field:	Engineering of Fixed Facilities
Allocation:	$300,000
TCRP Staff:	Stephan A. Parker

TCRP Report 57: Track Design Handbook for Light Rail Transit provides guidelines and descriptions for the design of various types of light rail transit track. The track structure types covered include ballasted, direct fixation ("ballastless"), and embedded track. The components of the various track types are discussed in detail. The guidelines consider the characteristics and interfaces of vehicle wheels and rail, track and wheel gauges, rail sections, alignments, speeds, and track moduli. The handbook includes chapters on vehicles, alignment, track structures, track components, special trackwork, aerial structure/bridges, corrosion control, noise and vibration, signals, and traction power. These chapters provide insight into considerations that affect track design and require interface coordination.

Since its original publication in 2000, this handbook has been extensively used in the design of light rail transit track systems and is now being used as the basis for the development of AREMA/APTA light rail track design standards. However, there is a need for portions of the handbook to be updated based on advancements that have taken place since 2000 before the material can be adopted as AREMA/APTA standards. Information on several additional subjects not fully covered in the original handbook (e.g., stray current, restraining rail issues, ride quality standards and measuring methods) also need to be addressed in more detail in an updated handbook.

The objective of this research would be to update *TCRP Report 57: Track Design Handbook for Light Rail Transit* for use in the development of AREMA/APTA light rail track design standards.

This research will review each section of existing TCRP Report 57, identify those sections that are in need of revision, and prepare and execute research plans necessary to update each section. The research will also identify additional sections that need to be added and will provide the necessary material for those sections. Finally, information will be provided that weighs the cost-effectiveness, maintenance requirements, and constructability tradeoffs of the various types of track for use by track designers.
Transit agencies frequently build new light rail transit systems, procure light rail vehicles, and undertake track improvements to existing systems to increase operating speeds, enhance service and expand ridership. This research will provide needed technical input into the newly initiated AREMA/APTA light rail track design standards process. These standards will assist in minimizing capital and maintenance costs associated with such efforts.

■ Project G-12
Fuel Purchasing Strategies for Public Transit Agencies

Research Field:	Administration
Allocation:	$300,000
TCRP Staff:	Lawrence D. Goldstein

Transit agencies in America have experienced an increase in fuel prices of approximately 166% over the past four years. This continued trend is limiting their ability to provide the essential services that are required to serve passengers. Therefore, it is extremely important to develop purchasing strategies that will permit the agencies to deal effectively with the changes in the fuel market.

The increase in fuel prices has affected the way that transit agencies conduct business. This increase has negatively impacted their budget and limited their resources for expansion. Consequently this has delayed their ability to perform service improvements, and capital improvements. The increase in fuel prices has a direct impact on their fuel budget as well as an indirect impact on the purchase of all petroleum-based products. Additionally, it increases the cost of all purchases that have transportation components associated with them. As a result of the increase in fuel, residents across America are

depending more on public transportation. This dependency increases the demand for service which creates an increasing need for transit service expansion. As these demands increase, the cost of transportation increases, and the cost of maintaining an infrastructure increases simultaneously.

The ability for a transit agency to increase revenues is limited. A main revenue source is fares, and without the ability of expanding services or frequency due to budget constraints, this source is restricted. Other options are to increase fares and reduce service. This is not a positive solution for a market that is demanding an increase of service. Another concern from rising gasoline prices is that there has been a decline by the general population in driving, and thus a decline in fuel purchasing and sales taxes revenues that are per-gallon based and that are dedicated to transit. The end result is that there will be less revenue for the transit property, further straining the limited revenues to meet the rise in passenger volume and expectations. Therefore, it is critical for transit agencies to implement different strategies such as using future contracts, derivates, swap strategies, spot market, joint purchasing, etc.). Strategies should take into account the size of the agencies and which strategies work best for agencies of different sizes, with different funding sources, and have limitations imposed by federal, state and local governments.

The objective of this research is to develop and evaluate different fuel purchasing strategies that will benefit public transportation agencies as fuel prices continue to increase, hindering their ability to perform their basic function of transporting passengers and inhibiting their ability to expand service in a market that is expanding.

Potential research tasks may include the following:

(1) Through surveys determine the different type of purchasing strategies being used or that could be used by transit agencies to deal with ever increasing costs of purchasing fuel and petroleum-based products.

(2) Evaluate the different strategies for transit agencies of differing sizes, jurisdictions, and with differing revenue sources. Purchasing fuel practice at transit properties across America needs to be reviewed and evaluated.

(3) Provide guidelines that could be used by transit agencies to help them determine the best way to purchase fuel and petroleum-based products.

This is an extremely urgent matter as it affects all of the transit agencies across North America. As transit agency costs are increasing, of which fuel and associated products are a major component, transit revenues are decreasing. These events are taking place in an environment in which the demand for transit service is increasing. Transit managers need information on how to purchase fuel and associated products in the most cost-effective manner.

■ Project H-41
Methodology for Comparing the Environmental Benefits of Transit Projects

Research Field: Policy and Planning
Allocation: $400,000
TCRP Staff: Dianne S. Schwager

Federal transit law provides that FTA may financially assist a proposed New Starts project only if it is justified based on a comprehensive review of its environmental benefits (among other criteria). To implement this requirement, the transit community needs a methodology that can be uses to assess the environmental benefits of a transit project in a way that facilitates its comparison to other transit projects in other metropolitan areas. While much thought has been given to comparing the environmental benefits of a transit project to the alternative highway project in the same corridor, an approach to comparing the environmental benefits of transit projects in different cities and of different modes, lengths, and costs is not readily available.

The objective of this research would be to develop a methodology for assessing and comparing the environmental benefits of transit fixed guideway projects that can be applied by project sponsors and FTA.

FTA has considered using the forecasted air pollutant emission reductions of the transit project as a measure of environmental benefits, but this approach fails to consider the vastly different health benefits of identical emissions reductions in a populous, highly air-polluted metropolitan area compared to a much less populous area that is in attainment of all EPA air quality standards. Furthermore, Federal transit law envisions a broader definition of the human environment than simply the air we breathe. It states that, in reviewing a project's environmental benefits and the other statutory criteria, FTA must evaluate and consider, among other things: the direct and indirect costs of relevant alternatives; factors such as—(i) congestion relief, (ii) air pollution, (iii) noise pollution, (iv) energy consumption, and (v) all associated ancillary and mitigation costs necessary to carry out each alternative analyzed; reductions in local infrastructure costs and other benefits achieved through compact land use development; and the cost of suburban sprawl. Thus, the methodology developed should take into account a broad range of environmental benefits and disbenefits of a transit project, in addition to air quality, including especially the other resources protected in Federal law, such as parklands, historic sites, wetlands and waters of the United States, endangered species, etc.

An approach modeled on FTA's approach to cost-effectiveness would be to develop a highway-only environmental baseline alternative and to compare the relative environmental impacts and benefits of the highway baseline and proposed transit alternatives for each project. However, this approach would be difficult to manage and monitor and prohibitively expensive to implement.

The project should develop a methodology for assessing environmental benefits that comports with the following attributes:

1. As much as possible, the measures or indicators of environmental benefits should be based on existing data readily available to metropolitan planning organizations, State departments of transportation, transit agencies, and State or regional air quality and environmental agencies.

2. Scaling of the environmental indicators may be necessary to account for the size of the project or investment. A $300-million project can hardly be expected to have the same environmental benefit as a $5-billion project.

3. Simple is better from several perspectives. Public and political understanding and acceptance of the environmental benefits of a project will be greater if the outcome is intuitively correct and somewhat transparent. The environmental benefits of a proposed project may be computed many times during project development as the project changes and gels and information is firmed up as the project advances. Computing a highly complex measure of environmental benefits would become very expensive.

4. Disbenefits may encompass externalities or social costs to the environment not typically included in transit project evaluation. A 40-mile commuter rail project that requires numerous, large park-and-ride lots for access by private automobile may or may not be beneficial to the environment.

5. Short term disbenefits of a project (e.g., the carcinogenic diesel emissions from unregulated construction equipment operating in a dense urban setting) may override the long term benefits (e.g., reduced emissions from autos whose former drivers switch to transit).

This TCRP project may include the following potential tasks:

1. Review previous research on the environmental benefits of transit projects and how such benefits are measured or assessed.

2. Develop a method to evaluate the various environmental benefits and disbenefits of a transit project and to roll up the resulting measures, indicators, or ratings into a single measure, indicator, or rating for comparison to other projects.

3. Develop procedures and technical tools required to implement this methodology for projects across the country.

There is a great deal of interest in the transit community and in Congress in crediting transit projects with their environmental benefits within FTA's project evaluations. Having the capability to reliably assess the environmental benefits of transit projects would improve FTA's evaluation and rating process and help decision-makers direct FTA's approximately $1.5 billion annual New Starts funding to the most deserving projects.