10-A-01

I. TITLE: COMMAND-LEVEL DECISION-MAKING FOR TRANSIT EMERGENCY MANAGERS

II. RESEARCH PROBLEM STATEMENT

The recent 2009 Security Update Report published by the Transit Cooperative Research Program (TCRP) stated, "The lack of ample security training sources and materials for and delivery to transit managers above the supervisory level is a concern that needs to be addressed."[1] Additionally, TCRP identified that "Transit agencies demonstrate wide variation in the levels of preparedness, including provision of security awareness training, National Incident Management System (NIMS) and Incident Command System (ICS)".[2]

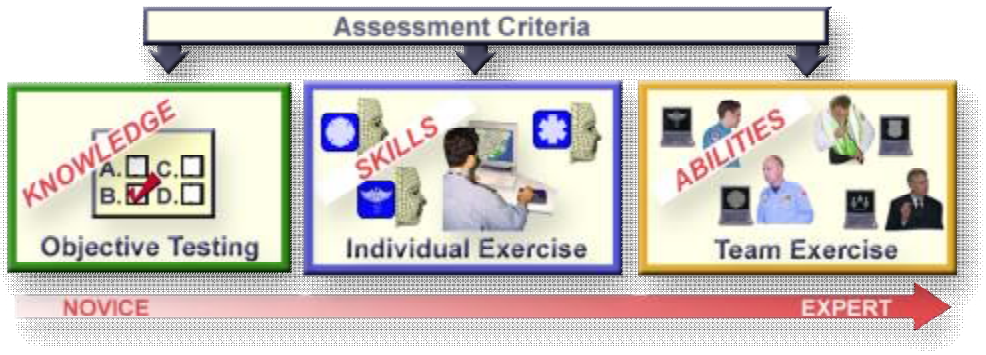
Command-level decision-making is a critical factor in the success of management and mitigation efforts of critical incidents. Emergency and law enforcement personnel need a safe and realistic environment in which to hone their decision-making skills. Research has shown that the more experience emergency responders have with critical incidents, the more "workable," "timely," and "cost effective" their decisions become.[3]

A review of training courses provided by transit or emergency response agencies confirms that the majority of available training is designed for front-line transit workers and first responders. Live, inter-agency exercises are performed annually, at most. For rail workers, such training is required bi-annually, as defined in 49 CFR Part 239, *Passenger Train Emergency Preparedness*. Therefore, frequency and depth of training is negatively impacted by availability, travel costs, time required for attendance and personnel replacement, and the high cost of executing live exercises. These conditions limit the opportunities for transit emergency managers to improve their skills.

III. OBJECTIVE

This Problem Statement proposes an automated, functional exercise simulation system to provide on-demand emergency response training compliant with National Incident Management System (NIMS) and in conformance with transit regulations and standards.

The system must allow individual training, team training, and multi-agency training within one framework. The system should address all levels of learning and provide foundational concepts in a knowledge-level system for prerequisite study prior to team exercises, thus moving the learner from novice to expert, as shown in Figure 1.



[1] Transit Cooperative Research Program, *Transit Security Update: A Synthesis of Transit Practice*. Transportation Research Board, Washington, DC. 2009. Page 64.
[2] Ibid, page 99.
[3] Klein, G. and Klinger, D. *Naturalistic Decision Making*. Human Systems IAC GATEWAY Volume XI: Number 3. Winter 1991. <http://www.au.af.mil/au/awc/awcgate/decision/nat-dm.pdf>

Figure 1. The system should help learners advance from novice to expert level within the same framework.

The system must be cost-effective, scalable, easy to setup and use, have readily available support, provide a measured assessment, and allow participants to exercise the resources and policies they use in everyday life.

The system should include automated assessments based on measurable actions that can be used to gauge individual and team comprehension and effectiveness, and a clear mechanism to meet specific compliance activities defined by the DHS/FEMA NIMS Integration Center in accordance with Homeland Security Presidential Directive 5.

IV. RESEARCH PROPOSED

By leveraging the Think-Under-Fire Decisions simulation (TUFD), transit objectives can be realized with maximum return on investment. TUFD was initially sponsored by the National Guard Bureau and has been extended through funding by the Airport Cooperative Research Program (ACRP 04-04). *The TCRP will benefit from approximately $1M in previous development efforts.*

TUFD is a complete training solution with capabilities for basic knowledge-level training through a scenario-based simulation and exercise for increasing expertise and decision-making capability. The system runs over the web using any browser, and provides a broad collection of emergency scenarios. TUFD provides individual training and both tabletop and functional exercise capability, and offers an automated, unbiased assessment of participant actions both individually and as a team.

Figure 2. TUFD is a proven computer-based simulation system for emergency responders. TUFD provides individual and team training and exercise, and gives objective feedback via an automated assessment based on a system of Tasks, Conditions, and Standards.

The proposed research will create a tailored version of TUFD that provides transit-specific scenarios for both natural and terror-related hazards. The recent 2009 Security Update Report revealed that the terrorist threats of primary concern to multimodal, rail-only, and ferry systems were explosives, chemical and biological threats, hijackings and shootings, and sabotage. The terrorist threats of primary concern to bus agencies were hijackings, shootings, explosives, and sabotage. Natural hazards include weather-related events such as hurricanes and floods.

Participant roles for functional sections and typical transit agencies will be modified to reflect transit needs. Areas for which it is consistently difficult to train personnel will be identified by working with transit emergency personnel, law enforcement, and subject matter experts. TUFD will be updated to effectively address these issues. Tools to customize TUFD to meet specific transit needs and geographic areas will also be developed. Finally, a web-based system will be developed to deliver training and exercise options and track training requirements fulfillment for individual employees and teams. Problem Funding and Research Period is presented in Table 1.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Table 1. TUFD Transit Rough Order of Magnitude (ROM) cost and period of performance.

Task	ROM Estimate	Period of Performance
Develop system requirements and define learning objectives	$75K	4 months
Create 8 Transit-Specific Scenarios	$170K	8 months
Develop an online ICS/NIMS foundation course modified for transit agencies	$40K	2 months
Create Fulfillment Tracking System	$75K	6 months
Create Customized Transit Roles, Resources and Tools	$95K	3 months
Execute 4 Field Exercises with Usability Study	$25K	2 months
Total	$435K	24 months

VI. URGENCY AND PAYOFF POTENTIAL

Each weekday, 34 million people board public transportation. Public transportation ridership continues to rise as a consequence of high gas prices, economic hardship, and awareness of global warming. Public transportation systems serve the largest economic and financial centers in the nation. Transit systems operate alongside or near our largest business and government buildings, intermodal transportation centers, and many of our nation's most visible icons. These facts make transit a high-value target for terrorist attack.

Despite significant improvements since 9/11, and large educational investments, such as the Federal Transit Administration's (FTA) on-site Security and Emergency Management Technical Assistance Program for the 50 largest transit agencies (Top 50 SEMTAP), critical gaps remain in the state of emergency management and response.

In a study conducted by the FTA's Security and Emergency Management Technical Assistance Program, "wide variation is evident in the levels of security preparedness among the 50 transit agencies studied. … Areas needing improvement also existed, which, if left unattended, may leave these transit agencies vulnerable to terrorist or criminal activity."[4] Although that study was conducted in 2007, the picture remains largely unchanged, for the following reasons:

- Transit security and emergency management professionals now have more courses than ever available to them, but such training has been reported as often generic, or disjointed. Standards of performance are inconsistent. A unified framework is needed to ensure that training is consistent.
- Because training is disjointed, a comprehensive program is needed that can be used by the individual, small teams, the organization, or across organizations. Such a program should accommodate novice transit employees, as well as highly-experienced and managerial levels.
- Although new employees receive security training, ongoing training has proven difficult to achieve. A system should be provided to allow individuals to refresh their training on demand, at no additional cost.
- Insufficient understanding of Incident Command Systems (ICS) and National Incident Management Systems (NIMS) remains prevalent in the transit industry.

[4] U.S. Department of Transportation, Federal Transit Administration, Office of Safety and Security and Emergency Management. *Technical Assistance for the Top 50 Transit Agencies*. Washington, DC, April 2007.

Finally, even given comprehensive, evolving, consistent, and highly-available courseware, higher order skills such as critical thinking, analysis, and problem solving occur more naturally through application and practice. Live exercises, though optimal for this purpose, are undoubtedly the most costly type of training, and cannot be successfully replicated.

TUFD addresses the above-listed weaknesses and it can fulfill all of the following requirements:

- Unified framework
- Consistent standards of performance tied to learning objectives
- Scalable training from individual to multi-agency
- Learning effectiveness, taking trainees from novice to expert through classic online learning to practice through functional simulations
- On-demand training, any time, any place, free to the transit community
- NIMS compliant, and customizable.

With widely varying terrain, resources, personnel, and identified vulnerabilities, it is important to be able to customize training to the needs of the local agency. TUFD provides a Scenario Builder capability that allows users to create their own scenarios, or modify existing scenarios.

By increasing the effectiveness of training through TUFD Transit, transit agencies will be better prepared to manage critical incidents. TUFD Transit provides the opportunity to standardize training and exercise requirements mandated in compliance with NIMS. TUFD Transit will not only provide more effective training, but will also meet and exceed certain DHS mandates, squeezing every drop of utility out of a limited training budget.

Implementing TUFD Transit throughout the community requires no new equipment, IT support, or special software. TUFD runs in any browser and uses Adobe PDF and the Flash player, which are typically installed in any PC by default.

It bears repeating that the TCRP will be able to leverage previous investment in TUFD. TUFD is entirely government owned, with the exception of the scenario builder, which was developed using ARA IR&D funds. Those portions of TUFD developed through ARA IR&D funds will be freely licensed to the TCRP. The TUFD Transit software and any government-sponsored updates will therefore be free to the transit community. The user audience will not have to worry about incorporating the system into their policies and practices and then not being able to afford software updates.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES AND TCRP STRATEGIC PRIORITIES

This Problem Statement is written in support of TCRP Strategic Priority III: "The TCRP will support communities throughout the United States to continuously improve public transportation." The TCRP focuses on research that is consistent with, and supportive of, FTA's strategic research goals and TCRP strategic priorities. An FTA strategic research goal is to "Support Improving the Conditions of Transit Operations and Systems" which includes emergency response and emergency preparedness. The TCRP itself asks, "What new knowledge, technology and practical solutions can help transit agencies increase safety and security training, public awareness, and emergency preparedness?"

This Problem Statement goes directly to the issue of emergency preparedness, and addresses gaps identified in a May 2009 report, *Transit Security Update: A Synthesis of Transit Practice*.

VIII. RELATED RESEARCH

Currently, ARA is nearing completion of ACRP project 04-04, *Exercising Command-Level Decision Making for Critical Incidents at Airports*. (See http://www.trb.org/TRBNet/ProjectDisplay.asp?ProjectID=147 for details.) The objective of this research is to create a tool for exercising command-level decision making for critical incidents at 14 CFR Part 139 airports. The tool will include methods to measure and evaluate actions and outcomes including compliance with nationally recognized standards and Federal Aviation Administration (FAA) and Department of Homeland Security (DHS) requirements.

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

This problem statement is the result of the identification of a need in the transit community based upon similar civil aviation emergency response training and exercise needs. Stephan Parker, Program Manager for the AEROS project (ACRP 04-04) identified TUFD as having strong potential to fill transit emergency response training needs.

XI. DATE AND SUBMITTED BY

Submitted June 2nd, 2009

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10-A-02

TCRP PROBLEM STATEMENT

I. Problem Title

- Paratransit Emergency Operations and Preparedness Handbook

II. Research Problem Statement

ADA paratransit operators face special challenges in responding to natural disasters and other emergencies. Not only do these systems transport a particularly vulnerable population, most systems are operated by contract providers so that drivers are not employees of the transit agency and are not under direct control of the transit agency. Response issues to emergencies can be divided according to whether the emergency is one that can be predicted (such as hurricanes) and ones that occur suddenly with no warning (earthquakes, major electrical blackouts, terrorism).

In the case of emergencies that can be predicted, such as hurricanes, paratransit systems may be called upon to assist in evacuation or to bring people with disabilities to shelters. TRB Special Report 294: The Role of Transit in Emergency Evacuation, released in July 2008, generally found that transit (defined to include bus, rail, and paratransit) is not sufficiently integrated into emergency response planning. In addition, the report notes:

> "The type of transit service—whether publicly owned and operated or contracted out—can also affect the extent to which transit drivers and equipment will be available in an emergency. In many urban areas, for example, paratransit service is contracted out, and control over drivers and equipment can be an issue during an emergency. Special arrangements must be made in advance in contract agreements to help ensure continuity of service during an emergency evacuation."

Where paratransit contractors are not solely dedicated to the transit agency contract, additional concerns arise. The TRB report notes:

> "Transit agencies are likely to be hard pressed to accommodate those who need special assistance because these services are often contracted out to smaller paratransit operators or demand-responsive service providers. In an emergency evacuation, these specialized providers often face competing demands for their services and have limited drivers and equipment that may not be available to provide the necessary emergency service."

In the case of sudden, unpredictable emergencies, evacuation is often not an option. When a sudden emergency strikes, paratransit operators need to make decisions about the passengers currently on-board their vehicles, such as whether to attempt to bring them to their destinations or to return them home, and then what to do if conditions at the destination or home do not allow the passenger to be dropped off. Paratransit operators may also be called upon to assist passengers who have been delivered to programs earlier in the day. Drivers need guidance about how to proceed, particularly in the event that communication with dispatchers is disrupted or if roads are impassable.

In the event of a declared emergency, county and regional emergency operations centers will begin operating. Transit systems are represented at some but not all of these centers. However,

the individuals who staff these centers (including transit agency liaisons to them) are often not familiar with paratransit operations and the special set of issues that paratransit providers will face following a major regional disaster. Paratransit resources may go unused and the needs of paratransit customers may not be adequately considered. In the case of a sudden emergency, many hours or even days may go by before an emergency operations center issues guidance for use of paratransit resources.

Paratransit operations depend on the continued availability of databases and software systems for management of trips and customer information. Protecting these databases and systems is of critical importance. Similarly, because of the demand-responsive nature of paratransit, operations depend on continuous communication between control centers and drivers. Paratransit systems need to better understand and prepare for likely disruption to communications systems, including establishing backup communications methods and protocols for use if communications are unavailable.

The databases maintained by paratransit operators contain sensitive personal information about customers. In addition to names and address, the databases often include information about disabilities and medical conditions, as well as frequent travel destinations. Operators are under an obligation to safeguard their passengers' privacy. In an emergency, operators may be called upon to share this information with first responders or others. They need guidance about procedures and legal concerns surrounding sharing of passenger information.

Many paratransit customers travel to and from programs operated by public and community agencies. In principle, these agencies should have their own emergency plans and be prepared to respond to sudden disasters. However, many of them most likely intend to rely on paratransit to return their clients to safe locations. Ideally, some of these agencies would serve as safe dropoff locations in the event that passengers on-board vehicles cannot be returned to their homes. Paratransit operators need guidelines for communicating with these community partners, including social service agencies, medical facilities, and dialysis centers, regarding expectations about preparing for emergencies and what they can expect from paratransit.

Many paratransit customers require life sustaining treatments such as dialysis and rely on paratransit for transportation to and from these treatments. In the event of predictable emergencies, procedures such as those developed by many transit systems in Florida can ensure that these customers receive their treatments immediately prior to evacuation and upon return. In the case of a sudden, unpredictable disaster, guidelines and procedures are needed for identifying these customers, providing continuing service to the extent possible, and coordinating with dialysis centers to determine which ones are operating and alternative locations to the extent possible.

Because most paratransit systems are operated by contractors, it is important for these contractors to develop methods to maintain contact with their employees, know how to keep appropriate records to assure reimbursement for extraordinary expenses, and help their employees be personally prepared for emergencies in order to increase the likelihood that they can assist during an emergency and can be assured about the safety of their families. Many paratransit providers are small local companies that may have limited financial resources. Extraordinary expenses in an emergency or disruption of normal payment mechanisms could result in business failures, which could cause service disruption and place transit systems in the position of needing to conduct an emergency procurement. Transit systems need models for

provisions that they can include in paratransit service contracts, and how they should work with contract providers to assure emergency preparedness.

ADA paratransit systems operate within a regulatory framework based on civil rights of people with disabilities. These systems need to ensure that they continue to observe these requirements as much as possible, to the extent that they continue to apply during an emergency. Operators need guidance about the extent to which normal ADA regulatory requirements continue to apply in extraordinary circumstances. Issues include providing paratransit service that is comparable in hours and coverage to fixed-route transit services, accommodating all trip requests from eligible individuals, and prioritizing trips for life-sustaining treatments or urgent needs during an emergency.

In small urban and rural areas, paratransit is often the sole form of public transportation and transit agency employees the only full-time personal transportation professionals in the community. The research project should investigate unique issues (if any) where paratransit is the only available form of transportation.

III. Objective

The objective of the research is to create a handbook that provides guidance to public transportation agencies with responsibility for paratransit services about how to prepare for all types of emergencies, including predictable natural events such as hurricanes or blizzards, as well as sudden, unpredictable disasters, including those that may cause regional disruptions such as earthquakes, power blackouts, and acts of terrorism. The guidelines should be designed to address passenger safety, continuity of operations to the extent possible during the emergency, and preservations of resources and contractor business viability for post-emergency recovery.

IV. Research Proposed

1. Determine the extent of existing paratransit emergency operations resources based on review of the literature and interviews with key informants with knowledge of paratransit operations and planning. This process should include consultation with people with disabilities and organizations that advocate for them.

2. Conduct a survey of paratransit operators to determine their current state of emergency preparedness and their priority concerns with respect to emergency response.

3. Summarize the information from Tasks 1 and 2 to show the extent of current resources, gaps in knowledge and established practices, and the most critical issues that need to be addressed.

4. Prepare a detailed outline for a Paratransit Emergency Operations and Preparedness Handbook for review and approval by the project panel.

5. Prepare the handbook. Likely topics may include:

- Planning and communicating with community and partners
- Connecting and coordinating with county and regional emergency planning, including emergency operations centers
- Response to requests for transportation assistance
- Ensuring contractor preparedness and business continuity

- Immediate response to a sudden emergency
- Extended emergency operations
- Operational communications
- Protecting databases and computer systems
- Sharing customer information
- Inventories of necessary equipment and supplies
- Registries
- Civil rights issues
- Unique issues in rural areas

The *Handbook* should provide practical and detailed guidance and models to assist paratransit operators in each of the topics addressed.

V. Estimate of the Problem Funding and Research Period

$350,000 over 24 months.

VI. Urgency and Potential Payoff

The research will help paratransit operators be ready to respond during an emergency. It will help them to provide essential life-sustaining service during an emergency, to assist during a general evacuation or evacuation of threatened facilities involving concentrations of people with disabilities, and to recover as quickly as possible following an emergency. By promoting coordination with regional and county emergency planning, the research will help emergency managers by providing them with resources to assist people with disabilities during an emergency.

VII. Relationship to FTA Strategic Goals and Policy Initiatives and TCRP Strategic Priorities

The proposed research addresses the FTA strategic research goal of Improving the Conditions of Transit Operations and Systems. The proposed research addresses all of the five TCRP Strategic Priorities:

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

The research would also respond to Executive Order 13347, "Individuals with Disabilities in Emergency Preparedness," issued July 22, 2004 "To ensure that the Federal Government appropriately supports safety and security for individuals with disabilities in situations involving disasters including earthquakes, tornadoes, fires, floods, hurricanes, and acts of terrorism."

VIII. Related Research

TCRP Project A-33, "Communication with Vulnerable Populations: A Transportation and Emergency Management Toolkit," is pending contractor selection. According to the problem statement, it "focuses on: (a) public education and (b) the public alerting system. The public education component is intended to be an ongoing educational campaign that provides advance, generic information about emergency preparation including, but not limited to, transportation, pets, shelters, and evacuation. The public alerting system component is intended for immediate emergency situations and focuses on public protective actions."

"TRB Special Report 294: The Role of Transit in Emergency Evacuation" (July 2008) provides a useful assessment of preparedness for one aspect of emergency operations. Its primary relevance to the proposed research is that it documents the need for additional work in this area.

TCRP Report 86, volumes 1 – 8, issued between 2002 and 2007, addresses transportation security issues. Volume 7, "Public Transportation Emergency Mobilization and Emergency Operations Guide," issued in 2005, addresses some of the same issued described in this research proposal. However, it includes very limited information of use in paratransit operations, particularly in the common case where paratransit is operated by a contract provider.

IX. Persons Developing the Problem Statement

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X. Process Used to Develop Problem Statement

Collaborative work of the TRB Committee on Paratransit, including a special Sunday Workshop held by the Committee at the January 2009 Annual Meeting that featured speakers from around the country who discussed the role of paratransit in emergency situations. The problem statement builds on a year-long process conducted by the San Francisco Bay Area Metropolitan Transportation Commission, with the participation of over 20 transit operators and emergency planners, that determined the current state of disaster preparedness among paratransit operators and identified critical needs for improvement, some by the operators themselves and some requiring a regional response.

XI. Date and Submitted by

Submitted by the TRB Committee on Paratransit (AP060), June 2009

10-A-04

TCRP Problem Statement

I. PROBLEM TITLE

Analysis of Mobility Device Safety Issues -- Protections for Passengers and Transit Operators

II. RESEARCH PROBLEM STATEMENT

This is a long-time issue that is driven by the significant and often exceptionally positive advances in personal mobility devices available for persons with physical disabilities. Wheelchairs, scooters, and related equipment are becoming larger, heavier, and with structural and design changes and numerous new accoutrements not envisioned when the current securement systems and vehicle design guidelines were developed. At the same time, there are finite physical limitations on the amount of space or weight-bearing capacity available to safely transport such equipment and their occupants on public transit and paratransit vehicles. Additionally, transit operating personnel are becoming older and in many cases, less mobile themselves. This combination of less agile staff and larger, heavier, and/or differently-"shaped" mobility devices is resulting in a situation where it is increasingly difficult to adequately and safely accommodate many riders. While some of these larger devices are the result of the current trend of people getting larger, in many cases the larger devices have been purchased or provided without consideration of the transportability or securability of such devices. In many cases, Federal agencies such as the Centers for Medicare and Medicaid and the Veterans Administration are prescribing and/or procuring mobility devices on the basis of lowest cost, not what most effectively suits the individual's lifestyle and/or transportation needs. Many individuals, on their own or with governmental assistance, get devices that are actually labeled by the manufacturer as "not intended for use in a moving vehicle," and then are surprised when it is difficult to accommodate these devices on public transit vehicles.

The situation is rapidly becoming exacerbated by other pending regulatory actions. In June 2008, the Department of Justice's (DoJ) issued a Notice of Proposed Rulemaking (NPRM) to update their Americans with Disabilities Act (ADA) regulations, including their ADA Standards for Accessible Design. While the focus of the NPRM is facilities, it also proposes to add a new definition for "other powered mobility devices," thereby expanding the potential scope of "wheelchairs" that may be required to be accommodated in public spaces. DoJ quickly turned around their proposed rule and had sent an anticipated final rule for approval in December 2008, but this has been withdrawn, for the moment at least, pending review by the Obama Administration. While the Department of Transportation (DOT) has independent authority to define what is required to be transported on public transit vehicles, history has shown that a similar proposal and/or adoption may be likely from DOT.

Concurrently, the Architectural and Transportation Barriers Compliance Board (Access Board) issued the equivalent of an Advance NPRM in 2007 to request input into a pending update of their ADA Accessibility Guidelines (ADAAG) for Buses and Vans, currently expected to be issued as an NPRM in the Autumn of 2009. Among other proposals, it appears that the Access Board is planning to eliminate the definition of what until now has been known as a "common wheelchair" that must be transported, and to expand the size and weight dimensions that must be accommodated by ramps and lifts, as well as the interior of the vehicle. There is a concern that, because of very real budgetary constrains, the Access Board's proposed solutions to these significant issues have not been evaluated through adequate scientific research that could benefit both our country's transit systems and passengers with disabilities.

III. OBJECTIVE

The purpose of this project is to conduct a scientifically valid study to determine the maximum weight, size, and other design characteristics of wheelchairs and other mobility devices that can be safely (for the user and other passengers' safety, as well as the driver's) transported on public transit vehicles. The research must be data-based and satisfy common engineering and analytical principles. While the research must be scientifically valid and result in improvements in the safe transportation of individuals, it must also recognize that one of the primary desired outcomes is an increase in the independent mobility of persons with disabilities.

IV. RESEARCH PROPOSED

In addition to transit representatives and persons with disabilities, the project panel should include persons with knowledge of rehabilitation engineering and ergonomics, representatives of transit labor, and NHTSA and other appropriate federal agencies. The integrity of the National Academies and of TRB for rigor and objectivity should be carefully protected.

As part of the study, the inter-relation of various accessibility requirements needs to be more comprehensively and scientifically evaluated. If, for example, the Access Board requires that larger chairs be transported, but does not similarly address the dimensions of buildings and elevators, what good does that accomplish? Similarly, DOT has issued "ADA Disability Law Guidance" that indicates that transit systems should allow persons with disabilities to use Segways® on vehicles, yet there are some municipalities that prohibit them from using sidewalks or public streets for access.

The project should include at a minimum:

- Literature search including current and potential access standards, International examples should be included.

- Review available mobility devices including what testing has been done for crash-worthiness or transportability.
- Review the U.S. voluntary industry standard "WC 19" and ongoing work by the ANSI/RESNA Committee on Wheelchairs and Transportation (COWHAT), as well as international approaches to transportability and "securability" of wheelchairs.
- Identify current accommodation challenges and identify the various strategies currently used to provide accessibility. Evaluate these strategies for safety and acceptability.
- Determine the maximum size and weight limits that can be accommodated on existing public transportation equipment and determine if-or-how readily achievable modifications could increase accessibility. Estimate the cost and impacts of such modifications.
- Survey transit systems for liability claims, settlements, and lawsuits relating to mobility device transportation and safety, including tip-over incidents as well as other accident or crash situations. Include relevant Workers Compensation data to the extent available.
- Identify any alternative methodology that could allow the safe transport of devices that cannot currently be safely transported on a public transit vehicle.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: Due to the technical complexities and political sensitivities of this topic, a budget of at least $500,000 is likely to be necessary.

Research Period: Due to the technical complexities and political sensitivities of this topic, a minimum of 24 months is likely to be necessary to complete the project. However, due to the urgency of the issues, any way to expedite the research would be very useful.

Several problems statements similar to this one made it to the final round for TOPS review in 2008, but were not selected for final funding. The need for this substantive, objective research remains critical.

VI. URGENCY AND PAYOFF POTENTIAL

This project has long been needed to supplement dated research on safe transportation of wheelchairs and mobility devices, most of which is several decades old and which does not recognize the wide variety of new equipment available today. The urgency of the matter is becoming critical with agencies such as the Dept. of Justice and the Access Board preparing to promulgate wide-ranging new rules on the basis of anecdotal concerns rather than substantive evidence. The payoff will be safer and easier transport for mobility device users, all other passengers including other customers with disabilities, and transit operating personnel.

This research is explicitly proposed to increase the mobility options and ease the process of transportation for mobility device users. Under no circumstances is the goal of this project to reduce the mobility of mobility device users. The conduct of the study must be sensitive to such unintended consequences.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

This proposed research supports all four of FTA's Strategic Research Goals:
(1) Increasing Ridership:
(2) Improving Capital and Operating Efficiencies:
(3) Improving Safety, Security and Emergency Preparedness:
(4) Protecting the Environment and Promoting Energy Independence:

This project is also in furtherance of all five of TCRP's Strategic Priorities:
I. Place the Transit Customer First
II. Enable Transit to Operate in a Technologically Advanced Society
III. Continuously Improve Public Transportation
IV. Flourish in the Multimodal Environment
V. Revitalize Transit Organizations

VIII. RELATED RESEARCH

In the 1980s, "crash testing" of wheelchairs, primarily manual ones, identified safety issues for both occupants and other passengers on transit vehicles. That level of rigorous examination has not been repeated in recent years or with the plethora of new devices available to users. Interpretations of DOT's ADA regulations emphasis civil rights over safety, yet liability of transit operators continues and increases. Among the most recent research on this topic, from a variety of sources (although the first two listed are not widely known or available), includes:

Volpe National Transportation Systems Center, "*Tri-Wheeled Scooters Transported on Buses and Vans: Assessment of Securement and Restraint Issue*s" (Final Report October 1995)

An article by the Dept. of Veterans Affairs, in the *Journal of Rehabilitation Research and Development*, "Appropriate protection for wheelchair riders on public transit" (2003) concluded in part that "studies spanning 30 years indicate that the large transit bus is one of the safest forms of transportation, so that wheelchair riders do not face undue risk of injury on these buses."

TCRP Synthesis #50: *Accommodation of Common Wheelchairs on Transit Buses Using Rear-Facing Position* (2004)

In late 2008, Project ACTION released a report entitled "*Status Report on the Use of Wheelchairs and Other Mobility Devices on Public and Private Transportation*." While this document is a significant contribution to available literature, its purpose was not as extensive or in-depth as is still needed. A distance learning opportunity was presented in April 2009, with a transcript and other resources now available at: http://projectaction.easterseals.com/site/PageServer?pagename=ESPA_distance_learning_2009_wheelchair_securement

Other research, although not generally available, is also being conducted through the National Institute of Disability Research - Carnegie-Mellon & SUNY Buffalo, National Rehabilitation & Research Centers, and the European Union.

IX. PERSON(S) DEVELOPING THE PROBLEM

The Problem Statement was developed by members of the APTA Access Committee and included discussions with FTA staff and transit personnel.

X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

The problem statement is the result of long-ongoing discussions among members of the APTA Access Committee, and its submittal has been endorsed by that committee. We have worked to seek a sensitive, yet scientific and substantive, review of the issues described. The situation is being brought to immediacy by recent and pending regulatory actions proposed by the Dept. of Justice and the Access Board. A safer operating environment for all passengers and transit personnel requires better data and more informed decision-making than is currently available. In addition, the APTA Bus Safety Committee has been investigating similar concerns, and this problem statement has been endorsed by their Chair on behalf of the Committee's efforts. This project was also discussed at the January 2009 meeting of the TRB Paratransit Research Subcommittee, with agreement that it would be developed and submitted.

XI. DATE AND SUBMITTED BY

June 15, 2009

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10-A-14

I. PROBLEM TITLE

A Guidebook for Improving the Accuracy of Automated Passenger Counters (APCs)

II. RESEARCH PROBLEM STATEMENT

Use of Automated Passenger Counters (APCs) is becoming commonplace across the transit industry as transit agencies seek to gather better information about ridership numbers and patterns. The use of APCs has afforded transit agencies an unheralded opportunity for data collection. However, as agencies accumulate significant amounts of data through APCs, standard procedures for gathering, managing, and verifying that collected data have often been implemented haphazardly or not at all.

As APCs provide a finer detail of data collection than previous sampling methods (such as ride checks), procedures and best practices should be developed and implemented to ensure that APCs continue to gather accurate information as ridership and agency needs change.

Current methods for validating and scrubbing APC data are often fairly simple – involving simple methodology such as a static percentage adjustment for APC undercounting, or simple balancing of boarding and alighting counts. But there are often issues with the accuracy of manual counts that these adjustments are based on, and the accuracy of APCs themselves often varies significantly based on other factors such as boarding/alighting patterns, vehicle type, and passenger load.

For instance, on lines with particularly heavy load (10,000-50,000 unlinked passenger trips/day), APC accuracy often decreases dramatically at high passenger load, often falling far below manual counts of both maximum load and boardings/alightings. In addition, implementation of new vehicles may cause APCs to differ in accuracy as well. Finally, changes in boarding/alighting patterns (such as a shift from proof of payment system from a farebox method) may cause problems as well.

This TCRP proposal would implement a guidebook for transit agencies on best practices and strategies for improving the accuracy of the APCs across their transit vehicles, with particular attention paid to data validation and scrubbing techniques. In addition, the guidebook would provide guidelines for transit agencies to periodically verify the accuracy of their APCs.

Finally, a specific section would also include information regarding implementation of APCs as they relate to mandatory reporting to the Federal Transit Administration's National Transit Database (NTD).

III. OBJECTIVE

Production of a guidebook for transit agencies regarding implementation and continued maintenance of accurate APCs on transit vehicles.

IV. RESEARCH PROPOSED

The proposed research will:

- Survey current best practices and lessons learned in implementation of automated passenger counters by different transit agencies.
- Given that these strategies may vary (based on transit agency size, vehicle mode mix, ridership,

financial resources , urban density, service level, primary mode, and other factors), the guidebook will provide diverse approaches that each transit agency can utilize.
- Provide a methodology for periodically monitoring the accuracy of APCs as operating conditions shift.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended funding: $350,000
Research Period: 18 months

VI. URGENCY AND PAYOFF POTENTIAL

The payoff to transit agencies could be significant, given that use of APCs is rapidly becoming ubiquitous across transit agencies as the technology becomes more affordable, and as ridership grows. APCs provide transit agencies the ability to gather and process data that is unmet by any manual sampling methods in either cost or scope, and proper usage of that data will allow them to better produce and refine transit service in regard to customer needs.

No real institutional, political, and socio-economic barriers to the research product exist.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES AND TCRP STRATEGIC PRIORITIES

This problem statement addresses several FTA Strategic Research Goals
- FTA Strategic Goal 2: Increasing Transit Ridership.
- FTA Strategic Goal 4: Protecting the Environment and Promoting Energy Independence

This problem statement also addresses all the TCRP Strategic Priorities.
- Place the Transit Customer First
- Enable Transit to Operate in a Technologically Advanced Society
- Continuously Improve Public Transportation
- Flourish in the Multimodal Environment
- Revitalize Transit Organizations

VIII. RELATED RESEARCH

Two recent TCRP reports provided the catalyst for this research proposal. Both suggested the need for further study and support of APC accuracy.

- TCRP Synthesis 77: Passenger Counting Systems (2008):
- TCRP Report 113: Using Archived AVL-APC Data to Improve Transit Performance and Management (2006).

TCRP Synthesis 77 provided a brief snapshot of the quickly moving state of APC implementation at different agencies. TCRP Report 113 briefly discusses APC accuracy in Chp 8 (Passenger Count Processing and Accuracy) and 9 (APC Sampling Needs and National Transit Database Passenger-Miles Estimates), acknowledging that many agencies don't have the resources or background necessary to measure and quantifiable the significance of APC undercounts/overcounts, particularly the variance arises from so many different conditions (boarding/alighting volumes, bus types and so on)

IX: PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

Individual submission.

XI. DATE AND SUBMITTED BY:

Date of Submission: 5/4/2009

10-A-16

OUTLINE FOR TCRP PROBLEM STATEMENTS

I. PROBLEM TITLE

Operational Strategies for Electric Bus Service

II. RESEARCH PROBLEM STATEMENT

The diesel-powered transit bus has long been the standard mass transit vehicle for use on public streets. Alternative-fuel replacements for these buses have been successful to the extent that they are interchangeable with diesel-fuel vehicles. As long as diesel is the predominant fuel in use this makes sense. However, if we look to the future where this will no longer be the case we can have more options if we consider fitting our routes and schedules to match the characteristics of newer vehicles. The automobile was able to replace the horse, but only on its own terms. In the same way, battery-powered electric buses have potential to provide better maintenance and environmental performance than diesel-powered vehicles, but may never be drop-in replacements for them.

III. OBJECTIVE

The objective of this research project is to consider how transit operations could be adapted so that, rather than waiting for electric vehicles to perform like diesel vehicles, we could build our transit systems around the electric vehicles that are now technically feasible. This may mean shorter routes, smaller vehicles, use of catenaries or other methods of recharging in-route, feeder lines, or any of a number of operational possibilities, either new or adapted from past experience or experience in other industries.

IV. RESEARCH PROPOSED

A great deal of experience with electric propulsion is available from streetcars and trolleys that were powered by catenaries. The reliability of some of these vehicles was legendary. Their maintenance requirements, power, acceleration, and braking characteristics should be well documented and could be used, along with specifications from commercially available electric buses to develop a very good concept of the operating characteristics of a potential fleet of battery-powered electric buses.

Hours-of-operations, length of runs, routing philosophies and objectives, and many other operating parameters are easily available for existing bus systems that were designed for diesel-powered vehicles. With this information the research team should examine how to fit the problem (designing transit operations) to the solution (battery-powered electric buses). It is hoped that this new way of looking at the problem will result in several potential operational strategies that, if adopted, could speed up the transition to zero-emission electric vehicles.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: $150,000

Research Period: 24 Months

VI. URGENCY AND PAYOFF POTENTIAL

The need to reduce carbon emissions, air pollution, urban noise, and protect budgets from the variable cost of petroleum-based fuels provides significant motivation to adopt battery-powered electric vehicles. The technology exists and, if transit operations can be re-structured to match the characteristics of the new vehicles, can be ready for adoption in the very short term.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

This project falls under the headings of Increased Ridership and Environmental Stewardship.

VIII. RELATED RESEARCH

Feasibility of Electric Bus Operations for Austin Capital Metropolitan Transportation Authority, Transportation Research Record No. 1496, Public Transportation 1995: Current Research in Planning, Management, Technology, and Ridesharing

IX. PERSON(S) DEVELOPING THE PROBLEM

Keith Gates, FTA TBP-10, 202-366-1794

X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

Discussion between TBP & TRI

10-A-19 / 10-F-06

OUTLINE FOR TCRP PROBLEM STATEMENTS

I. PROBLEM TITLE

Defining a Transit Safety Culture

II. RESEARCH PROBLEM STATEMENT

The news of transit accidents in the last two years has been significant and in many cases made national headlines in part because of the human errors made resulting in the accident and in some cases, because of a fatality. In at least two of these major accidents, transit operators/transit workers and passengers, were either seriously injured or killed.

One of the questions to be answered is what is the culture of the working environment where serious accidents occur? Another question is what truly constitutes a culture of safety in a transit agency? "Safety Culture" belies the concept that a culture of safety exists in the transit community. There is some evidence to suggest that safety culture that is ingrained from the boardroom to the rail platform does not exist. There are many different safety programs, some of which are mandated by government organizations, and/or groups outside of the immediate transit community. Even where there are collective representative workers organizations, safety programs exist, but not a culture of safety since accidents occur in these situations as well.

It is a legitimate statement to say that a safety culture is defined by top management in the organization, or is it equally legitimate to say the front line worker defines the safety culture? ***There has been serious discussion about safety, but out of these discussions, there has not emerged a concept of how transit organizations design, develop, and implement a "safety culture" resulting in no or few accidents***.

III. OBJECTIVE

To define the 'ingredients' of an effective transit safety culture; the outcome of this research would be to establish the necessary protocols, communication requirements, and best practices for how transit organizations would go about implementing a true safety culture and committing to the willingness of establishing metrics as part of a national program.

IV. RESEARCH PROPOSED

Research the literature, on a global scale, to identify key elements of what a transit safety culture could "look like." Survey selected American transit organizations to aid in identifying key elements of information about transit culture as well as transit safety issues. Outcomes would be to present a national policy on safety culture, a means to track aspects of the safety issues involved with the program to see if the metrics will aid in building the culture, thus reducing the accidents.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: $250,000.

Research Period: The research should be completed within 18 months from the date of the award.

VI. URGENCY AND PAYOFF POTENTIAL

This project is a necessary step in the development of an overall review of what a transit safety culture is and what does it mean to agencies. The research results would provide national guidance for transit agencies in order to build an effective Safety Culture with metrics to measure its performance and thus minimize accidents.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS and POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

FTA's Strategic Research Initiatives – Goal 3: Support Improving the Performance of Transit Operations and Systems; Objective: 3.6 Perform research to improve safety, security, and emergency preparedness.

TCRP Strategic Priorities – V. Revitalize Transit Organizations: Information technologies, changes in the work force, and new roles and partnerships are revolutionizing the workplace. By reinventing themselves, transit organizations can "Work Better – Cost less."

VIII. RELATED RESEARCH

Safety Takes a Front Seat at WMATA (TRB Document 2002).

IX. PERSON(S) DEVELOPING THE PROBLEM

Lisa Colbert, Federal Transit Administration, Office of Research, (202) 366-9261

X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

This problem statement was developed collectively as a result of a one-day working conference with the University Transportation Centers and Transportation Industry representatives to discuss National Transportation Priorities in the areas Workforce Development and Transit Safety held in March 2009.

XI. DATE AND SUBMITTED BY

June 2009, Lisa Colbert

TCRP Problem Statement

I. PROBLEM TITLE

Transit Safety Culture: Impact on Safety and Leadership

II. RESEARCH PROBLEM STATEMENT

An institution's safety culture has a direct impact in its performance. A successful safety culture will enhance employees' safety performance to the point where they will own the safety process (French & Geller, 2009). Most leaders will visualize the safety culture as guidelines for their leadership style as well as the foundation for behavior and performance evaluation. Successful safety cultures contain factors such as the commitment of leadership to safety, shared understanding of potential safety issues and their importance between employees and leadership, realistic safety policies, and continual monitoring, analysis, and feedback regarding safety (Pidgeon & O'Leary, 2000). Agencies and institutions can implement these factors in a variety of manners with outcomes varying in both success and efficiency.

Research needs were developed during a roundtable discussion between the Virginia Tech Transportation Institute (VTTI) and FTA's Office of Safety & Security during the first quarter of 2009. Discussions during the roundtable focused on the current state of transit safety culture and understanding how this impacts safety. Little published information is available to provide the vital information needed to understand the relationship between safety culture and different leadership styles on transit safety. This information could inform the groundwork needed to guide, restructure, and improve current and new leaders in transit to ensure safety is a core value and not just a priority.

III. OBJECTIVE

The main objective of this problem statement will be to identify different safety culture and leadership styles. The safety culture at different representative transit agencies will be characterized, as well as the leadership styles, via questionnaires. Protocols and other documents that characterize both the safety culture and leadership will be requested from the agencies. In addition, the existent literature will be reviewed to identify questionnaires and other tools used in the past for similar efforts. Once a successful leadership style is identified, it will be documented as a set of successful practices for transit agencies. The documentation and best practices provided by the proposed research will help identify an effective leadership style for transit agencies in order to improve safety.

IV. RESEARCH PROPOSED

Task 1 – Kickoff Meeting at FTA Headquarters in Washington, D.C.

Research personnel will meet with relevant FTA personnel at FTA headquarters in Washington, D.C. to discuss the proposed research. The meeting will include a PowerPoint presentation where the proposed methods, analyses, and expected results will be discussed. The discussion and associated comments will be incorporated in the Task 2: Work plan. The kickoff meeting will occur 1 month after task award (ATA)

Task 2 – Submit Detailed Work Plan

A detailed work plan of the proposed research will be submitted to FTA. The work plan will outline the methods to be conducted in the proposed research. Feedback from the Task 1: Kick Off meeting will be incorporated in the work plan. The work plan will describe, in detail, a task-by-task description of the following: proposed methods, analyses, questionnaires, and expected results. The work plan will be submitted 3 months ATA

Task 3 – Conduct Literature Review on Safety Culture

Relevant transit safety culture literature will be consulted to assess the relationship between safety culture and safety outcomes, identify important safety culture constructs (e.g., commitment to safety), and validated safety culture instruments (i.e., questionnaires and surveys). As there is likely to be few published studies regarding safety culture in transit settings, the literature review will likely include relevant articles in other transportation settings. However, this may need to be broadened to published studies in industrial settings if few published studies exist in transportation setting. Task 3 will be completed at 6 months ATA.

Task 4 – Study Preparatory Work

In Task 4 all relevant preparatory work will be completed. Of critical importance is obtaining Virginia Tech Institutional Review Board (IRB) approval to conduct research on human subjects. IRB approval will ensure that all proposed methods are ethical and will not adversely affect research participants. The VTTI has significant experience in this area and has successfully been awarded IRB approval to conduct research with human subject in numerous prior studies. Task 4 will also include a scan of validated safety culture measures and leadership styles. These could include the Safety Culture Survey (Geller, Roberts, & Gilmore, 1996) or the Myers-Briggs personality inventory (Brigss et al., 2001). Note that OMB approval may be necessary to use surveys in the proposed research. This will adversely affect the timeline in the proposed research. The timeline indicated in the current problem statement assumes an OMB waiver. All preparatory work will be completed at 9 months ATA.

Task 5 – Indentify and Select Potential Research Sites

In Task 5 potential research sites will be identified. The ideal approach will be to identify those transit organizations that have very low safety outcome data (i.e., incidents, injuries, fatalities, property damage) and compare them to those organizations that have high safety outcome data. Potential research sites will be identified using the National Transit Database (NTD). Transit safety data are collected in four basic categories: (1) collisions, (2) derailments/buses going off road, (3) personal casualties, and (4) fires. Each of these categories is further delineated in order to obtain detailed information on the exact nature of the incident. All transit agencies subject to NTD reporting are required to report safety data. The proposed analyses will compare and contrast the safety culture and leadership styles in these organizations to identify the safety culture factors and leadership styles that predict beneficial safety outcomes. A stratified selection approach will be used to identify different geographic (e.g., Southwest, East) and sized (i.e., small, medium, large) transit operations. It is anticipated that a total of 8 different transit operations will be selected (4 each with high and low safety outcome data). Note that budget implications will dictate the final sampling approach. It has been VTTI's experience that potential research sites would desire to remain anonymous (given the nature of the data). Prior VTTI studies have addressed this issue with a non-disclosure agreement (NDA). The NDA allows potential research site to share data with VTTI; however, the research sites will remain anonymous in all publications (e.g., Transit Operation A). Task 5 will be completed at 12 months ATA.

Task 6 – Conduct Data Collection

Task 6 will involve the collection of all data from participating transit operations. The research team will travel to the selected research sites to administer the safety culture survey(s) to all employees (front-line and management). However, management will also complete a survey on leadership styles. Given project resources, it may not be possible to administer these surveys to all employees in large transit operations. Task 6 will be completed at 18 months ATA.

Task 7 – Analyze Data

Data collected in Task 6 will be analyzed to compare and contrast employee opinions and perceptions regarding safety culture in low and high safety outcome transit operations. Further, leadership styles among management in these transit operations will be compared. It is expected these analyses will identify specific safety culture and leadership style constructs in low safety outcome transit operations that are not present in high safety outcome transit operations. The results will clarify the relationship between safety culture and different leadership styles in safety-conscious transit operations. Moreover, the results will inform the development of training materials (e.g., lectures, seminars), to be distributed to other transit operations, to train current and new transit employees. Task 7 will be completed at 20 months ATA.

Task 8 – Draft Final Report

A draft final report will be submitted to FTA for review. The draft final report will include the methods, analyses, results, summary, conclusions, and future research needs. FTA personnel will have 2 months to provide feedback. The draft final report will be submitted to FTA personnel at 21 months ATA.

Task 9 – Prepare Final Report Based on Comments from FTA/Final Presentation

A final report will be submitted to FTA. The final report will include comments from FTA personnel. The final report will be 508 compliant. Research personnel will meet with FTA personnel at FTA headquarters in Washington, D.C. for a final

project briefing. The final project briefing will include a PowerPoint presentation that reviews the methods, analyses, results, summary, conclusions, and future research needs. The final report will be submitted on the last day of the contract.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: The estimated funding needed is $500,000
Research Period: The performance period for this research effort would be 24 months.

VI. URGENCY AND PAYOFF POTENTIAL

The urgency and potential payoff are significant. Safety culture permeates all aspects of a transit organization's safety policies, procedures, safety management techniques, and technical systems. Increased safety will benefit all transit employees and passengers. Moreover, given the increased demand for transit services, the need for safe and efficient transit services has never been greater. Transit organizations with safety conscious organization and effective leadership styles are likely to reduce incidents and their associated fatalities and injuries, thereby resulting in increased ridership (as existing and new passengers will use a mode of transportation they perceive as safe).

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

The fourth strategic goal in FTA's Strategic Plan is to improve safety and emergency preparedness. This goal is addressed in the proposed research. Identifying safety culture and leadership constructs in safety conscious organizations will lead to improved transit safety. Also, effective leadership styles in safety conscious transit organizations will be identified. These results could be used to train current and new transit leaders in effective management approaches with respect to safety. Safer transit organizations are likely increase transit ridership (FTA's second strategic goal).

VIII. RELATED RESEARCH

There is a paucity of research examining the relationship between transit safety culture and safety and leaders style.

INFORMATION SOURCES:

Briggs, Katherine C., Myers, Isabel Briggs., Quenk, Naomi L., Kummerow, Jean, Hammer, Allen L., Majors, and Mark S. (2001). Myers-Briggs Type Indicator(r) Step II (Form Q). Mental Measurement Yearbook, Vol. 15.

French, A. R., and Geller, E. S. (2009). Creating a Culture Where Employees Own Safety. Proceedings of the Building a Successful Safety Culture Symposium. Des Plaines, IL: ASSE.

Geller, E.S., Roberts, S.D., & Gilmore, M. (1996). Predicting Propensity to Actively Care for Occupational Safety, Journal of Safety Research, vol. 27, 1-8.

Pidgeon, N., and O'Leary, M. (2000). Man-made disasters: Why technology and organizations (sometimes) fail. Safety Science, 34, 15-30.

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

This problem statement was developed based on the FTA research needs highlighted during a safety roundtable performed at FTA in conjunction with VTTI, under Levern McElveen's supervision (Levern.McElveen@dot.gov).

XI. DATE AND SUBMITTED BY

Submitted June 9, 2009 by Jeffrey S. Hickman, Ph.D. (e-mail: jhickman@vtti.vt.edu; telephone: 540-231-1542).

10-B-01

OUTLINE FOR TCRP PROBLEM STATEMENTS

I. PROBLEM TITLE

Optimization of Transit Networks Using Origin-Destination and Timetable Data

II. RESEARCH PROBLEM STATEMENT

Optimization of transit networks and service levels using real-world data such as origin-destination surveys and timetable data offers the promise of improving bus route and system efficiencies and effectiveness. Unfortunately, little research has been conducted in this area, and prior related work did not address the issue of optimizing service levels (i.e., headways and hours of operation) within a transit operators' overall budget constraints (e.g., total revenue vehicle hours) nor maximum policy headways acceptable for effective transit service. The purpose of this proposed research is to develop a high-level design that could be used by transit agencies, universities, and the consultant community to dynamically build and modify a route network layout and service levels to optimize route network directness, reduce travel times, minimize transfers, and maximize ridership. The system would be designed to allow transit agencies to specify parameters and constraints including maximum headways (i.e., minimum frequencies), hours of operations, and resources (e.g., total revenue vehicle hours). A major input to the system will be a static origin-destination table built from transit travel data such as on-board surveys, automated passenger counters, or other data prepared by transit operators. A second major input will be a spatial network built from timetable data that includes segment transit travel times, transfer points, headways, and hours of operation.

The output will be a spatial network and service levels optimized for the input parameters (e.g., route and system recommendations for improving route directness subject to constraints). The output of this system could result in improved bus route and system efficiencies and effectiveness, better decision-making, and cost-effective management of the planning and design of transit services. By building on existing ridership and timetable data, the system could also result in higher ridership by deploying resources in a more effective manner. A system that is more direct and more competitive with auto travel is likely to attract new users as well as reduce transit rider turnover and attrition.

III. OBJECTIVE

The end result of this work will be a high-level system design that can be implemented in more detailed efforts by transit agencies for use in general transit planning, route planning, and operational analyses. The overall objectives include improved bus route and system efficiencies and effectiveness, better decision-making and resource allocation, and cost-effective management of the planning and design of transit services.

IV. RESEARCH PROPOSED

The high-level system design would: (1) specify the purpose, intended audience, and provided definitions and references; (2) provide an operational overview of the system, including optimization methodologies and functional groupings of data and related computer code; (3) articulate general design principles and guidelines related to performance, scalability, and reliability; (4) recommend minimum hardware and software requirements necessary to build and maintain the system; (5) create a description of the spatial and non-spatial data sources for the system as well as deal with any security issues; (6) develop a conceptual user interface for system use and maintenance; and (7) provide a flow-chart sequence of data and computer processing flows including brief descriptions of each step. The results of these tasks would be packaged into draft and final reports.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: A high-level system design of this type would typically cost about $125,000.
Research Period: The typical design period would run about nine months plus three months for draft and final reports.

VI. URGENCY AND PAYOFF POTENTIAL

This effort has high potential payoff for improving transit network efficiencies and effectiveness, depending on the input parameters. When deployed, the system could be used periodically (e.g., following an on-board bus survey) to review

network performance and recommended changes to improve the system based on input parameters. The work can be considered urgent given diminishing funds for transit nationwide and the need to effectively allocate limited resources and seek ways to improve system performance. There are no known institutional, political, or socio-economic barriers to implementation of this work effort.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

The work effort supports FTA two strategic research goals including: (1) *Support Increasing Transit's Market Share* by improving methods and technologies to contain the cost of maintaining services; and (2) *Support Improving the Conditions of Transit Operations and Systems* by advancing technical processes that will result in better decision-making and cost-effective management of the planning and design of transit services. The work efforts also supports FTA's five strategic priorities including *Place the Transit Customer First* (improving route directness places the customer first); *Enable Transit to Operate in a Technologically Advanced Society* (this work effort proposes state-of-the-art technology to improve mobility); and *Continuously Improve Public Transportation* (the work effort can be continuously deployed).

VIII. RELATED RESEARCH

In 2003, the Florida Department of Transportation (FDOT) completed a report that documented a dynamically-assigned system built in TransCAD that "dealt with optimization of transit route network in an attempt to find the optimal route network layout in terms of network directness, transfer directness, and ridership coverage." (FDOT, 2003). The study and related work did not address the issue of optimizing service levels (i.e., headways and hours of operation) within a transit operators' overall budget constraints (e.g., total revenue vehicle hours) nor maximum policy headways acceptable for effective transit service.

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

This problem statement is the product of an individual consulting with subject matter experts in the GIS field.

XI. DATE AND SUBMITTED BY

By: Kurt Brotcke (original includes signature)

Date: June 8, 2009

Submitted To:

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10-B-05

TRANSIT COOPERATIVE RESEARCH PROJECT (TCRP) PROBLEM STATEMENT

I. PROBLEM TITLE

Evaluation of the Use of Social Networking Websites in Public Transportation

II. RESEARCH PROBLEM STATEMENT

Over the past several years social networking websites (Facebook, MySpace, Twitter, YouTube, etc.) have emerged as means not only for individuals to "stay connected," but also for organizations to communicate with their constituencies. Public transportation agencies have not been blind to these new developments, and some have begun to utilize these new mechanisms to provide information to their customers. The proposed research would assess how extensively the transit industry is using these new social networking websites, what has been learned by the early adopters, and how successful these sites really are at providing useful information to transit customers.

III. OBJECTIVE

The anticipated product of this research will be a "handbook" that will provide guidance to transit systems and others in the public transportation industry on how to get the greatest value from social networking websites. Because new developments are occurring so rapidly, and because the consumers of the research will be highly computer literate, the findings should be disseminated on the internet, and as much as possible, information should be shared as it is developed, rather than waiting until the end of the project.

IV. RESEARCH PROPOSED

The proposed research would be a survey of transit systems and possibly other entities in the public transportation industry (suppliers, consultants, labor unions, etc.) to assess their use of social networking websites. The questionnaire would – of course – be disseminated over the internet. A selected group of the more advanced users of each of the three or four more heavily used social networking websites would be the subject of more in depth follow-up, which is expected to consist of telephone interviews.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESERARCH PERIOD

Recommended Funding: This project should be able to be accomplished for no more than $250,000.

Research Period: The project should be completed within one year (ideally sooner).

VI. URGENCY AND PAYOFF POTENTIAL

With the use of social networking websites expanding rapidly, this information was really needed yesterday. Transit systems and others are spending time and money to develop their presence on the various sites without any great understanding of what works and what doesn't. A handbook detailing how to get the greatest value from social networking will allow those agencies that are not early adopters to learn from those who have gone before, rather than having to "reinvent the wheel."

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

Simply stated, this research hits on both of the goals and at least four of the five strategic priorities. Better communication with customers cannot help but increase transit's market share and improve the conditions of transit operations. The use of emerging means of connecting with riders places the customer first, enables transit to operate in a technologically advanced society, and represents continuous improvement and the revitalization of transit organizations. An argument might even be made that the use of these new media might also address the fifth strategic priority, helping transit flourish in the multimodal environment.

VIII. RELATED RESEARCH

Back in 2003 or thereabouts, there was a TCRP study on Strategies for Improved Traveler Information, but that report would have predated the social networking phenomenon. We are not aware of anything similar that has been done since the emergence of these new websites, nor any research looking specifically at how they are being employed in the transit industry.

IX. PERSON DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP THE PROBLEM STATEMENT

This problem statement was developed by the Centre Area Transportation Authority (CATA) planning and marketing staff, with the support of the General Manager. Included in this group are the Marketing Manager, the Manager of Service Development (who also serves as CATA's webmaster), the Ridesharing Coordinator and the Assistant to the General Manager.

XI. DATE AND SUBMITTED BY

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June 15, 2009

10-B-06

TCRP Problem Statement

I. PROBLEM TITLE

Improving transit performance in sprawled low-density areas

II. RESEARCH PROBLEM STATEMENT

Urban and suburban sprawling is one of the most obvious phenomena occurring in the last few decades. Cities and suburbs expand following a dispersed and decentralized model in order to accommodate the growing population. This pattern can clearly be observed within the whole range of social classes: from the upscale, rich and exclusive neighborhoods of major cities (like Los Angeles, Houston, etc…) to the underdeveloped realities of low income communities, such as the numerous "Colonias" along the U.S. border with Mexico.

One of the typical characteristics of sprawling areas is the relatively low population density which does not facilitate the development of traditional transportation infrastructures and transit services, creating "car dependent" communities. This problem becomes especially significant within disadvantaged communities, where cars can not be easily afforded and most people basically have no means of transportation.

Recently, innovative and flexible concepts in transit (such as "demand responsive connectors", "route deviation", "point deviation", "zone route", among others) have been considered by practitioners to respond to the transportation needs of relatively low density areas. However, they have received limited attention from researchers and never considered for large-scale implementations.

III. OBJECTIVE

The *overall objective* of this research is to maximize the performance and productivity of transit services for low population density areas, for a smarter development of these new/existing communities. We will provide administrators, transit planners and decision makers with tools and guidelines which will help them in the design/revamp of such systems, allowing them to perform tradeoffs between operating costs and service quality much more efficiently.

IV. RESEARCH PROPOSED

The questions answered will be: *when* and *under what circumstances* is more efficient to implement *what type of transit service*?

The proposed research will consist of the following key points:

- Identify, categorize and model the configurations (geometrical shapes, road networks, demand distribution, fluctuation and level, etc…) of the low density areas. A few representative scenarios ranging from "small" to "medium" to "large" service areas will be considered.
- Review on transit performance measures, defined as a combination of operating costs and quality of service provided to customers. A particular attention will be devoted to the definition of transit service quality, which can be a function of several variable and factors.
- Analyze the above mentioned flexible transit services to quantify and compare their productivity among each other and vs. traditional fixed-route services for each considered scenario. A systemic approach to the analysis will also be adopted, considering combinations of connected services whenever appropriate and suggested by the considered configuration.

- Develop handy decision tools which will help in identifying the most appropriate transit configuration depending on the scenario to maximize the overall performance of the system.

The research will be conducted with extensive simulation and regression analyses, with the use of optimization tools whenever appropriate and with an extensive data collection from existing transit systems and practice and past studies.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: $250,000-300,000.
Research Period: 2-3 yrs.

VI. URGENCY AND PAYOFF POTENTIAL

The most crucial phase in determining the success or failure of any project is its design. Transit planners often face a difficult decision when having to choose what type of service to put in place in a given area and they often incur in designing errors which are hard, long and costly to fix, establishing systems with poor service quality and/or high operating costs.

The link between the rapidly expanding urban sprawl phenomenon and its inadequacy for the implementation of traditional transit services calls for an immediate attention. Researchers and practitioners need to look for alternative transit solution which would allow for a sustainable development of the communities in terms of their transportation infrastructures and services.

This research will help in identifying solutions to the transit problem in low-density sprawled areas, suggesting the most appropriate services for different scenarios. The current inadequacy of transportation services in most of these areas indicates that there is a lot of room for improvement and therefore a high payoff potential.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

The proposed research will directly address the following FTA and TCRP strategic priorities:

- Increasing Ridership: One of the objectives of this research is to maximize the overall performance of transit systems by improving its service quality, which will naturally lead to an increase in transit ridership. The current inadequacy of transit services in sprawled areas is mostly due to the missing connection from the closest stop to the actual customers' origin/destination point. This is perceived by customers as poor service quality, which will lead most of them to rely on private cars for their mobility needs. The flexibility of many transit services mentioned above can address the problem and improve the service quality. We will investigate the cost-effectiveness of this feature in its different forms.
- Improving Capital and Operating Efficiencies: The product of this research will be a set of decision tools which will contribute to a better decision-making in the planning and design of transit services for low density areas. This will not only quicken the decision process, but also reduce the risk of the investment.
- Place the Transit Customer First: This research will particularly focus on properly defining transit customer service, as the base to characterize transit performance.
- Enable Transit to Operate in a Technologically Advanced Society: While this research does not directly focus on technology, we would like to emphasize that a major implementation of flexible transit services would certainly call for an extensive use of new technological tools (such as GPS systems, scheduling algorithms, web-based booking systems, etc…).

VIII. RELATED RESEARCH

SWUTC – FTA: "Performance assessment and comparison between fixed and flexible transit services for different urban settings and demand distributions" – completed (P.I.: Luca Quadrifoglio)

TCRP B-25: "Guidelines for Evaluating, Selecting, and Implementing Suburban Transit Services" – completed (P.I.: Marlene Connor)

TCRP B-31: "Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation" – completed (P.I.: Elizabeth Ellis)

TCRP B-35: "A Guide for Planning and Operating Flexible Public Transportation Services" - pending

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

This problem statement has been developed by Dr. Luca Quadrifoglio (Texas A&M University and Texas Transportation Institute).

XI. DATE AND SUBMITTED BY

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Submitted on June 15th, 2009

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10-B-07

TCRP Problem Statement

I. PROBLEM TITLE

Evaluation of the decentralized control strategies ("zoning") for ADA paratransit services

II. RESEARCH PROBLEM STATEMENT

The passage of the American with Disabilities Act (ADA) revolutionized the requirements and expectations for transit agencies, forcing them to provide demand responsive paratransit services to the disabled. As a consequence, the demand for this type of services has experienced tremendous growth in the last dozen years, nearly doubling their ridership. The operating costs have tremendously increased as well and, because these services are currently still not cost-effective, transit agencies are forced to rely on heavy subsidies from the federal government.

A few transit agencies in the U.S., mainly the ones operating within very large cities (such as Los Angeles), adopt decentralized control strategies, the so called "zoning", as opposed to a centralized one. These operating practices consist in dividing the whole (large) service area into several independent sub-areas, served and operated by different providers, with the intent to ensure an easier, smoother and less costly management of the entire operations. Zoning practices are also preferred by drivers, which would be assigned to more familiar and confined areas. Different "zoning" operating practices may exist, depending on whether vehicle transfers are allowed or not or other smaller technicalities.

Demand responsive services rely on "ridesharing" to significantly reduce their mileage and operating costs. However, the "zoning" might cause to considerably increase the costs of these services, because additional constraints are added to the system; the ridesharing might be reduced and the so called deadhead miles (miles driven with no customers onboard) increase along with the operating costs. Furthermore, customers having pick-up and drop-off location in different sub-areas may be required to rely on two different providers for their trip and/or perform undesired transfers between vehicles.

In summary, zoning strategies may provide significant advantages in managing the whole paratransit systems, but may also cause more driven mileage and less customer satisfaction.

III. OBJECTIVE

The objective of this research is to study the impact of the "zoning" practice for paratransit agencies, identifying what circumstances would justify its use and providing recommendations and guidelines to decision makers with the aim to maximize the overall service productivity.

IV. RESEARCH PROPOSED

The proposed research will respond to the need of quantifying the benefit and costs associated with the operating practice of "zoning" to help in the design of the organizational structure of paratransit agencies and will consist of the following key points:

- Review of the current practices adopted by paratransit agencies concerning the decentralized vs. centralized control strategy.

- Identify the costs structure associated with the management of paratransit service providers and particularly the relationships between the cost and the size of the service area.
- Perform simulation analyses to analyze the "zoning" effect on the operating costs for different demand distribution and size of service area. Also, analyze the possibly significant impact of different scheduling practices on the overall performance, within the "zoning" scenarios. Extensive sensitivity analyses will also be performed to embrace a wide variety of scenarios.
- With the goal of minimizing the overall cost, identify break-even points in terms of demand distribution, size of service areas, typology of customers and possibly other variables, which would represent switching points between a centralized and a decentralized ("zoning") control strategy.
- Conduct case studies by collecting representative actual demand data from paratransit agencies. Ideally, we will consider three representative cases ("small", "medium" and "large" agencies).

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: $250,000-300,000.
Research Period: 2-3 yrs.

VI. URGENCY AND PAYOFF POTENTIAL

Demand for partransit services consistently increased during the last 10-15 years and transit agencies are struggling to cope with the associated high and raising operating costs. In addition, urban sprawl, one of the most obvious phenomena of the last few decades, will only contribute to further increase the demand for these services and simultaneously enlarge the service area.

Under these circumstances, transit agencies may be interested in organizing themselves in a decentralized fashion ("zoning"). A few of them are already adopting it. However, this operating practice has not been thoroughly evaluated in all its aspect yet. A quantification of the benefit and cost associated with it will be beneficial the transit business to maximize the productivity of their service.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

The proposed research will directly address the following FTA and TCRP strategic priorities:

- Improving Capital and Operating Efficiencies A better understanding of the benefits and costs of "zoning" will enable transit agencies to make better decisions about their organizational forms and ultimately contribute to contain their already high costs of maintaining and operating their services.
- Continuously Improve Public Transportation Public transportation as a whole will benefit from this study. In fact, while the "zoning" control strategy is currently and specifically related to paratransit services, future developments of the industry might also include an extensive use of flexible or demand responsive service for traditional transportation services for the general public.

VIII. RELATED RESEARCH

PATH/CALTRANS: "Productivity and cost-effectiveness of demand responsive transit systems" – completed

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

This problem statement has been developed by Dr. Luca Quadrifoglio (Texas A&M University and Texas Transportation Institute).

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10-B-08

OUTLINE FOR TCRP PROBLEM STATEMENTS

I. PROBLEM TITLE

Understanding Users' Diverse Vision Needs for Safe, Usable Transit Systems

II. RESEARCH PROBLEM STATEMENT

What are the vision needs of transit users who are neither fully sighted nor legally blind? The "low vision" population greatly exceeds the legally blind population, yet the needs of this population have not been adequately researched and documented so as to inform transit systems planning. In the context of current demographic shift, we need to better accommodate the needs of low vision Americans presents the threat of over-burdening our more expensive accessible transportation system.

If transportation and enforcement professionals assume that pedestrians are either blind or have unrestricted vision, they may establish false expectations of pedestrians' ability and responsibility. Indeed, transit riders who are not legally blind, but are navigating with imperfect vision may constitute our most vulnerable population. Numerous impairments affect this population and their ability to use existing transit systems. These vision problems include:

- Cataracts
- Macular degeneration
- Diabetic retinopathy
- Albinism
- Glaucoma
- Corneal opacity
- Myopia magna
- Retinitis pigmentosa
- Uveitis
- Trachoma
- Stargardt's disease

III. OBJECTIVE

The objective of this research is to develop tools for planners and engineers to accommodate the mobility and safety needs of low vision transit users.

The project will do so by categorizing how vision is used. It catalogs the incidence of the variety of vision impairments and in the U.S. population by age. Then, it identifies how these impairments affect the identified vision needs of transit users. Knowing that low vision people typically have little if any training, this population is harder to serve through targeted services and are better served through Universal Design approaches. The research enables informed Universal Design for vision needs in transit environments. Practitioners with this will be able to better anticipate and accommodate pedestrians who possess low vision in one or more of these categories.

By more accurately portraying the visual restrictions of pedestrians, safety planners, driver educators, and our enforcement and engineering professionals will be able to better serve the greatest number of people.

IV. RESEARCH PROPOSED

This research project involves the following five tasks:

(1) Determine the specific ways in which seeing transit users rely on their vision through task analysis,
(2) Catalog the type and prevalence (present & projected) of low vision as found in the American population, in consultation with researchers and medical professionals,
(3) Consult disability advocates and leaders to explain how these limitations affect one's interactions with others in a transportation environment,
(4) Explore the implications of these findings for the broad TRB community, and
(5) Develop a tool for integrating these concerns into the workflow of various aspects of transit planning and engineering.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: $175,000.
Research Period: 12 months.

VI. URGENCY AND PAYOFF POTENTIAL

Better understanding transit riders' physical capabilities is necessary to create transit conveyances, stops, information systems, and interfacing traffic environments which enable safe and efficient boarding and disembarking. According to census and other estimates, 1% to 3% of the American adult population is estimated to have "low vision". A guide to specific vision limitations, their prevalence in the general population, and how they impact transit-inclusive trips is not presently available to transportation planners, designers and other traffic safety professionals.

Demographic shifts in the U.S. are presently threatening the viability of Accessible transportation. Aging baby boomers will outnumber the younger population in number of states. A concerted effort to enable as many older adults as possible to use transit includes accommodating a diverse set of vision needs, not just reading signs, but also crossing streets at transit stops and making transfers within multi-route systems. At present, these challenges are not adequately understood. With a new commitment to constructing transit systems, a timely investment in this research will proactively enable us to plan and engineer universal designs that serve all Americans.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS & POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

This problem statement is inherently strategic and is an excellent fit with:

I. Place the Transit Customer First: The importance of the transit rider as the customer was a principal outcome of the TCRP Future Search.

II. Enable Transit to Operate in a Technologically Advanced Society: Supports integration of state-of-the-art technology for way-finding, signage, trip-planning.

III. Continuously Improve Public Transportation: This RPS is inherently usability-focused.

IV. Flourish in the Multimodal Environment: Provides tools that will enable transit agencies to better persuade local and state DOTs to invest in and design more accommodating streetscapes for transit users and intermodal flexibility.

V. Revitalize Transit Organizations: Universal Design done right inherently reduces the costly add-on equipment and customer service phone calls.

VIII. RELATED RESEARCH

The literature in this area relates to (a) modeling of pedestrian tasks, (b) data on vision characteristics in the general population, and (c) a review of low vision guides and mobility training materials. There has been considerable work done to improve accessible design for people who are blind, but little done to establish expectations regarding what might be considered a "worst" case in transit user safety and mobility: those who are not legally blind, but are navigating with imperfect vision.

TCRP Report 125, "Guidebook for Mitigating Fixed-Route Bus-and-Pedestrian Collisions," published March 24, 2008.

Waldau, Nathalie and Peter Gattermann, Hermann Knoflacher, and Michael Schreckenberg, eds. (2005) Pedestrian and Evacuation Dynamics. Berlin: Springer.

Hugo H van der Molen (1984) Identification of Child Pedestrian Training Objectives: the role of task analysis and empirical research British Journal of Educational Technology 15 (2) , 125–150.

Prevent Blindness America. "Vision Problems in the U.S.: Prevalence of Adult Vision Impairment and Age-Related Eye Disease in America." 2008. Update to the Fourth Edition. http://www.preventblindness.org/vpus/. Accessed June 13, 2008.

Houtenville, Andrew J. 2008. "Disability Statistics in the United States." Ithaca, NY: Cornell University Rehabilitation Research and Training Center, www.disabilitystatistics.org Posted May 15, 2003. Accessed May 14, 2008.

http://www.nfb.org/nfb/blindness_statistics.asp

Orientation & Mobility Training (e.g., http://www.lighthouse.org/clinical-services/orientation-mobility-training)

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

Drafts of this problem statement were reviewed by: Scott Windley (U.S. Access Board), Robert Schneider (Committee on Pedestrians), Janet Barlow (Accessible Design for the Blind), Steven Swedberg (President, American Academy of Ophthalmology, Washington State).

XI. DATE AND SUBMITTED BY

Submitted June 15, 2009 by David Levinger

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10-B-10

OUTLINE FOR TCRP PROBLEM STATEMENTS

I. PROBLEM TITLE

Advance Features of Transit Website Study: Update

II. RESEARCH PROBLEM STATEMENT

This research proposed to update the TCRP R-84 report Volume 4, E-Transit: Electronic Business Strategies for Public Transportation - Advanced Features of Transit Websites, with emphasis on technologies, advances or features that make public transit more accessible and easier for everyone to understand and use and opportunities to leverage existing platforms (such as Google Transit) to lower the cost of developing these features in a dedicated proprietary transit system's website.

III. OBJECTIVE

The objective is to leverage existing technology and platforms to lower the cost of developing transit trip planners and provide more and better access/information to the transit users.

IV. RESEARCH PROPOSED

TCRP R-84 report, written in 2003, explored the potential of the following advanced website features for the transit industry: automated itinerary planning systems, real-time transit information, e-mail notification, and the application of customer relationship management concepts to these services. The report provided an overview of the implementation, technology, value creation, lessons learned, and best practices associated with web-based advanced features. However, a lot of advances have transpired in the last 5 years since the research was conducted. The World Wide Web and communication technologies, such as, wireless internet, GPS, smartphones, etc, are revolutionizing the way services are delivered, structured, displayed and consumed by the public.

"Google Transit" was launched in 2005 that allowed unprecedented access to the public to obtain transit trip planning at global scale and free of charge to transit systems, cities, local governments participating in the program. In addition, use of Real Time data such as automatic vehicle location (AVL) information has been made available publicly via Chicago Transit Authority's website as an added feature (Bus Tracker) to their trip planner in 2008. All these new advances have lowered barriers to public transit use by providing the knowledge required to use the system: where to wait, when to wait, where to transfer, how much to pay, etc.

This research proposed to update the TCRP R-84 report Volume 4, E-Transit: Electronic Business Strategies for Public Transportation - Advanced Features of Transit Websites, with emphasis on technologies, advances or features that make public transit more accessible and easier for everyone to understand and use and opportunities to leverage

existing platforms (such as Google Transit) to lower the cost of developing these features in a dedicated proprietary transit system's website.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding:

$200,000

Research Period:

12 month.

VI. URGENCY AND PAYOFF POTENTIAL

The study could provide guidance to transit agencies to better use existing technologies to provide better service to the transit riders.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

This research meets TCRP Strategic Research Priorities: Continuously Improve Public Transportation.

This research meets FTA Strategic Research Goals: Increase Capital and Operating Efficiencies; Protect the Environment and Promote Energy Independence.

VIII. RELATED RESEARCH

TCRP Report R-84

IX. PERSON(S) DEVELOPING THE PROBLEM

Federal Transit Administration, Roy Chen, 202-366-0462

X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

Update TCRP report based on new technological developments

10-D-01

Cooperative Research Program
Transportation Research Board, National Research Council
TCRP

Research Problem Statement

Problem Title: Reducing Flange Way Gaps Hazards at Railroad Crossings.

Problem Statement: Highway Rail grade crossings and in-street running alignments by necessity create flange way gaps in the walking and roadway surfaces that present unique hazards to pedestrians, bicyclists, motorcyclists and persons using wheelchairs, walkers and other related mobility devices. For Motorcycle and bicycle crossings, specialized warning signage has been developed to alert road users to the potential hazard of the lower coefficient of friction and the entrapment of the wheel within the open flangeway, however hazards to pedestrians and to the mobility impaired have not been addressed. Even with limited signage available to bicyclists and motorcyclists, there is no indication that the signage used is effective in identifying the uniqueness of the hazards or in preventing accidents.

The Americans with Disabilities Accessibility Guidelines (ADAAG) require that gaps in pedestrian paths (sidewalks and crosswalks) not exceed 1/2 inch. The Draft Guidelines for Accessible Rights of Way (June 17, 2002) allow pedestrian paths crossing railroads at grade to have a 2-1/2 inch gap on the inside of the rail for the railroad car's wheel flanges (3 inches are allowed for tracks carrying freight).

The Public Rights-of-Way Accessibility Advisory Committee recommended that this exception expire since these larger gaps can trap a wheelchair wheel. That committee recognized, however, that no technology exists to reduce the gap without increasing the likelihood of train derailment. Flange way fillers that are currently available do not hold up to the conditions associated with rail operations in-street or at highway rail grade crossings. That committee stressed the need for research to find a solution to this problem.

This problem exists for both freight and passenger rail systems. As an increasing amount of light rail installations interface with current street infrastructure more persons using mobility aides will be affected by this issue. There is also an increase in shared track use between passenger and freight rail operations. Many heavy and light rail commuter stations have access to the platforms, which cross the tracks. Finally, communities are installing paved pedestrian paths that cross railroads separately from roadways and sidewalks.

Research Objective: The objective of this research is to develop promising designs for reduction in the hazards associated with flangeway gap and that meet ADAAG requirements for pedestrian path gaps and do not endanger trains. Successful designs will be rigorously field tested in a subsequent effort. Secondary effect of the treatment would be the effect on bicyclists and motorcyclists crossing the gap.

Task 1. Search existing documents and resources, including existing or recent installations or concepts. While it is believed that no successful installations exist except in very low speed, low rail-traffic situations, there is always the possibility that this belief is not correct. In cases where flangeway fillers have been installed but have failed, the failure mode should be described.

Task 2. Test flangeway fillers or other concepts to scientifically document the reasons for failure with the goal of seeing how the designs could be changed to allow them to be successful. This research could also develop parameters for successful performance.

Task 3. As designs are developed, evaluate them for two basic safety criteria. First, providing for the safe passage of trains without derailment under actual conditions of service, including climate, weather, and grade crossing environment conditions such as dirt, debris, and casual vandalism. Second, but equally important, is to provide a safe crossing for wheelchair users under these same conditions. For flangeway fillers, this second criteria means that after the passage of a train they will reliably return to a position that provides a safe crossing for wheel chair users that have, through previous use of that crossing, come to expect that flange way gaps at that crossing will not be present.

Task 4: Complete a final report recommending one or more solutions. The final report would be expected to address estimated costs to construct and install each of the solutions. It could also contain a plan for implementation over a given period.

Estimate Funding And Research Period:

Total Funds Requested: $400,000
Research Period: 30 months

Urgency, Payoff Potential, And Implementation: Very High to Meet ADA Requirements
The number of crosswalks and sidewalks crossing railroad tracks is not known but is considerable, particularly in areas with light rail transit and shared use corridors. The U.S. Access Board has resisted pressure to terminate the exemption for railroad tracks but this may change.

Relationship to FTA Strategic Goas and Policy Initiaties: If successful, the research will increase the safety and efficiency of pedestrians, bicyclists and those using wheelchairs or assist devices who cross railroad tracks, while not substantially impeding the public safety benefits derived from the use of rail facilities. This project will also have impact on improving mobility and access to transit facilities under the Americans with Disabilities Act for which the FTA has been designated with a primary leadership role.

Literature Search Summary: Despite the mention in DOT reports as early as 1980, no research related to this matter since that time is known to exist. Limited commercial entities have developed flangeway fillers but these technologies have not received extensive objective evaluation. There is significant anecdotal information on the limited success of existing technologies. Studies are needed to evaluate the success of light rail treatments and to research and develop solutions for heavy rail crossings and high use crossings.

Submitted By:
TRB Committee AHB60 – Highway-Rail Grade Crossing
AASHTO Standing Committee on Rail Transportation
APTA Rail Safety Committee

Process Used to Develop this Problem Statement:
The primary sponsor of this problem statement is the TRB Committee AHB60 – Highway-Rail Grade Crossing Committee. It has been endorsed by the AASHTO Standing Committee on Rail Transportation and the APTA Rail Safety Committee. The Association of American Railroads and the American Public Transportation Association representatives on the TRB Committee AHB60 have contributed to the development of the problem statement.

Person(S) Developing The Problem April 2008
Paul Worley
North Carolina DOT

William Browder
American Association of Railroads

Richard Raub
Raub Associates, Portland

W. P. Grizard
American Public Transit Association

Dated: 9/14/2009

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10-D-04

TCRP Problem Statement

I. PROBLEM TITLE

A.C. Circuit Breaker Re-ignition Transients Creating Resonant Overvoltages in Traction Power Rectifier Transformers

II. RESEARCH PROBLEM STATEMENT

There were two sequential failures of 26.4 KV/490V, 3 MVA, ANSI 25, 26 traction rectifier transformers in a single traction substation. The 2nd transformer failed upon being installed and energized as a direct replacement for the first failed transformer. The 2nd transformer was completely factory tested prior to being placed into service.

From the nature of the failures (turn/winding fault in the middle of the center coil), it was speculated that a resonance overvoltage phenomena within the transformer windings had occurred, possibly due to the transients associated with the line side vacuum breaker operation. The theory is that a resonant overvoltage may be generated within a transformer's windings if the circuit breaker re-ignition transients create a transient frequency which matches a natural frequency of the transformer. Additionally, there are numerous traction power transformer failures suspected of the same cause of failure in the transit industry.

III. OBJECTIVE

Development of an application guide and testing methods to demonstrate in a practical sense (without resorting to speculative, extensive and expensive modeling) the precise factors which create resonant condition within a substation, so that it may be addressed by either the equipment manufacturers or through proper equipment layout in the substation during the design stage.

III. RESEARCH PROPOSED

Gather data on transformer failures within the transit environment. Supplement data with other applicable industry transformer failure information.

Identify, organize and describe the reasons for transformer failures focusing on failures associated with re-ignition.

Determine location of failures within the failure listing. Ascertain if failures were associated with vacuum circuit breakers. Research power feeder cable electrical characteristics associated with failures. Prepare a matrix of failures ad causes.

Determine through engineering analysis if the "pingtest" is a viable and accurate method of determining presence of resonance overvoltage by transience associated with vacuum breaker operation to damaged transformers. Evaluate the necessity of applying snubber circuits to transit transformers to eliminate failures due to transience associated with vacuum breaker operation.

Generate guidelines that will provide approaches for engineers to apply results of research in designing and operating transit system power transformers.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: In order to accomplish the objectives stated in Section III, the estimated cost for this research should cover two professional staff-years, which means approximately $150,000.

Research Period: Two years is required to accomplish the objectives, three months for review and revision of a draft final report are included.

VI. URGENCY AND PAYOFF POTENTIAL

While the current available data does not indicate any failures associated with resonance associated with vacuum circuit breakers; there have been significant number of transformer failures that could possibly be the result due to vacuum circuits technically in transit power systems. It is suspected that significant number of transit failures are a result of this phenomenon. The pay off potential is associated with capital cost of new and existing transit power systems which could result in reduction of cost to the FTA.

There is no institutional, political, or socio-economic barriers to implementation of the anticipated research.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

This research can meet the FTA strategic goals :Improving Capital and Operation Efficiencies.

This research can meet the TCRP strategic goals : Enable Transit to Operate in a Technologically Advanced Society.

VIII. RELATED RESEARCH

None.

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

Edward J Rowe in concert with APTA Power, Signals, and Communications Technical Forum.

XI. DATE AND SUBMITTED BY

Edward J. Rowe
June 24, 2009

10-D-05

TCRP Problem Statement

I. PROBLEM TITLE

Guidelines and Guidebook for Stray Current Control and Monitoring In Transit Systems.

II. RESEARCH PROBLEM STATEMENT

Stray current is produced by DC traction systems which are used in public transit systems worldwide. It is invisible and hard to measure, but the evidence of stray current exists in the corrosion found in reinforcing steel of infrastructures and private/public utilities' metallic pipelines adjacent to transit systems. If stray current is not controlled and monitored, it can cause damage to pipelines and cable resulting in huge repair costs.

In the engineering practice, insulated running rail installation is generally used to reduce stray current. But still, there are other issues that may result in corrosion if stray current is not addressed. For instance, what can be done in some special track sections where insulted running rail installation is impossible? What can be done if the insulation of the running rail does not work well? Can something be done with the track bed and the tunnel structure to reduce the stray current further? Is there a margin for optimization in power supply systems; the source of stray current? Can engineers from other disciplines do something to collaborate with power supply engineers to minimize the stray current? What is an efficient way to monitor the corrosion status and stray current distribution?

The majority of these issues are related to stray current control and monitoring. Unfortunately, there is no in-depth study and no guidelines for design engineers; not even for power supply engineers. There are only some discrete solutions for separate transit systems and consulting companies.

III. OBJECTIVE

The object of this research is to develop guidelines for use when designing a new transit system or maintaining/modifying an existing transit system. These guidelines will help optimize stray current control and monitoring and ultimately protect the property of transit agencies and public/private utilities.

IV. RESEARCH PROPOSED

- Describe the corrosion threats to metallic structures along and adjacent to the DC transit system.
- Prepare and assemble typical corrosion cases worldwide cause by stray current.
- Collect, identify, organize, and describe the methods of stray current control and monitoring worldwide.
- Analyze the advantages and disadvantages of every method.

- Use simulation software to quantify and qualify each method (if financially available).
- Interview experienced engineers and conduct some field testes at typical locations (if financially available).
- Generate guidelines that can provide standard approaches for engineers of different disciplines when designing and maintaining/modifying a transit system.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: In order to accomplish the objectives stated in Section III, the estimated cost for this research should cover two professional staff-years, which means approximately $150,000. We have already taken the software simulation and field test into consideration.

Research Period: Two years is required to accomplish the objectives, three months for review and revision of a draft final report are included.

VI. URGENCY AND PAYOFF POTENTIAL

Presently, there are more and more transit system projects being constructed, but these transit projects are all without standard approaches that address stray current control and monitoring. Stray current control and monitoring methods must be considered and designed during the construction period of a project. Little can be done to prevent stray current when the projects are complete. So the urgency of this research cannot be stressed enough.

There are many corrosion cases reported due to the lack of stray current control and monitoring. If a comprehensive guidebook was available to help prevent such corrosion during the engineering stage, the payoff would be priceless. This is because it is nearly impossible to replace corroded reinforcing bards in transit tunnels and other structures without rebuilding them. It is also impossible to repair corroded metallic utility pipes except to replace them.

Currently, there are no institutional, political, or socio-economical barriers to implement this anticipated research.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

This research can meet the FTA strategic goals: Improving Capital and Operation Efficiencies.

This research can meet the TCRP strategic goals: Enable Transit to Operate in a Technologically Advanced Society.

VIII. RELATED RESEARCH

None.

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

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XI. DATE AND SUBMITTED BY

Edward J. Rowe
June 24, 2009

10-D-09

OUTLINE FOR TCRP PROBLEM STATEMENTS

I. PROBLEM TITLE

Research the Installation Implications of Platform Edge Doors at Existing and New Rapid Transit Stations.

II. RESEARCH PROBLEM STATEMENT

Platform Edge Doors exist in Europe and Asia transit systems. In the U.S. there is resistance by transit agencies to consider installation. The fears of transit agencies are based on misinformation and the unfounded belief that the benefits are few but the costs are very high. No one has investigated the considerable benefits such as the safety for disadvantaged ADA issues, the financial benefits from advertising and marketing revenues that the platform edge-wall panels provide for flat screen TV type media and the operational messaging that is also provided. An investigation can also show the additional safe platform area that becomes available because a warning edge is not needed on the platform. Installation at existing stations by retrofit also needs to examine precision stopping at stations.

III. OBJECTIVE

Objective is to document the costs and advantages and potential magnitude of revenue that such installations can generate. The research should also examine the operational challenges and the institutional and political implications and resistance to installation.

IV. RESEARCH PROPOSED

The research will collect data on existing systems in Europe and Asia where such platform edge doors are used and also gather data from some people mover installations at several US airports. The research will also gather data from manufacturers and suppliers on costs of manufacture and installation. The research will partner with two or three transit systems as members of the research team and use some specific stations that can focus on specific requirements and difficulties that would provide specific examples.

The research team will also contact electronic media companies to determine the utilization of flat screen panels that will enable real time and recorded video messaging. This will allow marketing and generate revenues and will also provide safety and operational messaging. The research group will also contact media marketing firms and organizations to look at the immediate and long term revenue generation potential.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: -$500,000

Research Period: 18 months

VI. URGENCY AND PAYOFF POTENTIAL

This research is long due. Many Transit systems are currently non compliant in meeting ADA requirements. The gap between rail cars in a problem on many transit systems. They do not have any solution for this very unsafe and difficult situation. People are hurt and there is loss of life when someone accidentally falls or jumps on the tracks. The system wide security also demands that transit track ways be secure and not openly accessible. The safety payoff alone is potentially huge. Combine this with the electronic age and the fact that flat screen video media is greatly advanced and the potential revenue generation from advertising could be huge. With the limited operating revenues, how can transit systems afford to ignore this huge revenue source, if true. The institutional, political and socio-economic barriers to implementation of this proposed implementation are many. Results of this study should help to break these barriers and move the US transit systems out of the dark ages.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

It meets the FTA strategic initiatives and the TCRP Strategic Priorities.

VIII. RELATED RESEARCH

Not aware of what may be available.

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

Individual proposal

DARTS-2009-1007
February 19, 2009
Enclosure (1)

10-E-01

TCRP FY2010 Research Problem Statement

Maintenance and Training Information Presentation to Upcoming Repair Personnel

D & R Technical Solutions, Inc.

I. PROBLEM TITLE

Maintenance and Training Information Presentation to Upcoming Repair Personnel

II. RESEARCH PROBLEM STATEMENT

Two factors are combining to rapidly complicate maintenance of transit equipment. The first is the ever-increasing complexity of highly integrated systems due to advances in technology. The second is the change in the background and upbringing of today's youth who will become tomorrow's technical specialists. The research problem is the assessment of these factors and their potential impact on the transit maintenance environment, especially as it relates to the delivery of technical information.

The first factor is self-explanatory; the second is best understood as follows. The transit maintainer of tomorrow is growing up in an age where electronics and digital media are the norm. Advances in technology have enabled the development of realistic graphical images, and the ensuing application of these images to convey information and provide entertainment. Visual cues and prompts are evident in everyday items such as cell phones and personal computers, where familiarity and use is accomplished through the use of icons, not words. Graphical imagery has exploded into the home entertainment field, with video gaming a billion dollar industry. Advances in hardware devices used to access information, enable communication, and provide entertainment have kept pace with the software, providing wireless and compact laptops, cell phones, and video games. This is the dynamic environment that surrounds the transit maintenance workforce of tomorrow.

Application of these advances in information technology has not yet been applied in earnest to the current transit training and maintenance environment. In general, technical manuals and training materials are still developed and presented in much the same manner as they have been for the past 50 years. Technology today has advanced to the point where a better training and technical manual solution, more akin to the mindset and background of the youth entering the workforce, should be explored. In addition, as system complexity increases due to technology infusion and system integration, it is expected that the need for recurring training will grow. The notion of an individual becoming thoroughly knowledgeable of a system and then supporting that (unchanged) system for the duration of his/her career is a thing of the past.

III. OBJECTIVE

The objectives of this research are:

- to understand how maintenance and training information can best be presented to the current and future generations of transit equipment support personnel in light of the increased complexity of transit equipment and the changes in mindset of the members of the future workforce, and
- to understand how the products of emerging design technologies (e.g., digital data generation, including three-dimensional modeling) can be applied to the development of transit training material and maintenance manuals.

IV. RESEARCH PROPOSED

The general sequence of the research will be to start with our detailed understanding of the techniques currently being used in the rail industry to present information in both training materials and maintenance manuals. We will then augment this with an assessment of information presentation across the broader transit industry. The composite of these findings will be evaluated in the context of what was learned in the research identified in Section VIII, with consideration given to the increasing infusion of technology and integration into transit systems. The result will be a set of suggested improvements/changes in the information presentation. The tools and techniques used in the design process will be evaluated to determine how their output can be used to produce the desired information and presentation.

Additionally, techniques for visual data presentation will be investigated and the findings incorporated into the recommendations.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: It is estimated that $185,000 will be required to achieve the objectives in Section III within the research period stated in the following.
Research Period: Including 3 months for review and revision of a draft final report, it is estimated that 12 months will be needed.

VI. URGENCY AND PAYOFF POTENTIAL

With the expected increased usage of public transit, expanded service in both current and new areas is likely, and the need for maintenance personnel will grow. Training needs will similarly increase to address the additional numbers of maintainers needed as well as the increased system complexity resulting from the use of technology and system integration. The urgency attached to this situation is associated with the ability to attract and retain the type of personnel needed. If the transit industry does not adapt to the needs and expectations of the future generation of technicians, the youth will be pursuing careers more in line with their upbringing and desires. The industry will be forced to offer higher salaries, signing bonuses and other incentives to initially hire and subsequently retain qualified personnel. The increased usage and ridership will result in additional system failures. These will increase maintenance costs. In addition, the negative impact on the ~~in~~ability to support equipment will result in reduced vehicle availability, which will produce less than satisfied ridership.

Our initial assessment is that there are not any institutional, political, or socio-economic barriers to the implementation of the anticipated research products. On the contrary, institutional and socio-economic considerations are actually the forcing function for this research.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

The proposed problem statement supports the second identified FTA strategic research goal, Support Improving the Conditions of Transit Operations and Systems. More effective presentation of information to maintenance personnel will result in reduced downtime for service and repairs, thereby improving the availability (effective reliability) and reducing maintenance cost. In addition, better and more effective presentation of information will reduce maintenance induced errors which will improve system safety.

The proposed problem statement supports two of the five identified strategic priorities of the TCRP:

- Number II – Enable Transit to Operate in a Technologically Advanced Society – by using state-of-the-art technology in training and maintenance
- Number V – Revitalize Transit Organizations – Using technology to provide more effective training and support material thereby enabling transit personnel to "Work Better – Cost Less".

VIII. RELATED RESEARCH

As a part of Phase II Small Business Innovative Research (SBIR) Program contract number FA8650-05-C-6524 with the U.S. Air Force Research Laboratory (AFRL) at Wright Patterson Air Force Base in Dayton, OH, D & R Technical Solutions, Inc. has performed the Visualization Technology Project. Focus was the adaptation of traditional hardcopy technical order (TO) format of text and two-dimensional static graphics into a visual rendering. Emphasis was placed on conveying maintenance information in a dynamic visual style, which would support maintenance manual enhancement and training material development.

As noted, this research was performed for the military sector. However, the problem faced in the transit industry is comparable to that faced by the military services. There is a specific mission to perform, with definite requirements and very real resource limitations. The systems used in the military are technologically complex and highly integrated. Also, the future generation of transit industry maintainers will come from the same population as those for the military service. Consequently, the knowledge acquired in the Visual Technology Project is an excellent starting point for this transit related research.

An example of the product produced may be viewed at the D & R Technical Solutions Web Site, (http://www.dandr.com/3dmodeling.stm).

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

This problem statement is the result of the efforts of the individuals identified in Section IX, which were then reviewed with and augmented by the senior business and technical management of D & R Technical Solutions, Inc.

Stimulated by a combination of the research identified in Section VIII and our experience with a variety of mass transit hardware and service providers, we recognize that the transportation training and maintenance environment is changing in much the same manner as in the military. Therefore, application of forward-looking techniques being applied to the military sector in the transit arena is a logical progression.

XI. DATE AND SUBMITTED BY

Submitted on February 19, 2009 by:

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State of Good Repair: Evaluating the Implications for Transit

10-E-03

I. Problem Title

State of Good Repair: Evaluating the Implications for Transit

II. Research Problem Statement

Public transportation is a backbone of regional accessibility, and mature transit systems continue to be important in shaping regional growth and contributing to greenhouse gas (GHG) emissions reductions. Keeping these mature systems in a state of good repair is essential to sustaining the existing transportation benefits, such as GHG emission reductions, let alone support additional GHG reductions from ridership growth. Transit agencies find that reliability and on-time performance - which are sustained by keeping transit systems in a state of good repair - are fundamental to maintaining, and expanding, transit's market share and reducing GHG emissions. There are however significant funding constraints. The Federal Transit Administration's (FTA) Rail Modernization Study Report to Congress (April 2009) evaluated the nation's seven largest rail operators and found a backlog over $50 billion.

If transportation funding agencies are not able to adequately keep transit systems in a state of good repair, what would be the impacts on the transportation system, including GHG emission reductions due to any mode shift away from a less reliable transit network to driving? If transit service deteriorates, what other key transportation measures (such an increase in passenger vehicle hours of delay or criteria pollutants) would be affected?

III. Objective

The objective is to evaluate the impacts transit service deterioration, stemming from a failure to keep transit systems in a state of good repair, would have on critical performance measures for the transportation system, including impacts on transit ridership and GHG emissions.

IV. Research Proposed

The proposed study approach includes a mix of national case studies based on ridership performance during earlier period of disinvestment, focus groups and stated preference surveys, along with transportation modeling and analysis. In coordination with selected regional MPO's and transit agencies, the survey and modeling tasks would be conducted for transit systems in three regions.

The following tasks will be performed in order to gauge the ridership implications of service quality deterioration in transit.

1) Project Start-Up

The project team will convene a kick-off meeting to finalize scope and schedule.

2) Case Studies

This task will include a review of up to four American transit systems that experienced service and reliability decline over the years and how their ridership was influenced by that decline. Potential candidates include CTA, NYMTA, SFMTA and SEPTA. The review of transit systems will allow for references as to the influence of transit service levels on ridership. In order to accomplish this task, selected experts will be interviewed and where available documents and reports pertaining to system investment strategies and their ridership implications will be assessed.

3) Focus Groups

Deferred investment in transit could have an adverse effect on quality of service components. These quality of service elements are often difficult to quantify but they may impact mode choice by passengers nonetheless. Therefore, the team will convene focus groups of current transit riders to test their response to service decline, such as comfort, cleanliness and aesthetics of the stations and cars, and whether decline in those parameters of the system may result in shifts to other modes. We will also examine willingness to pay for greater reliability, maintenance, etc., and form of payment preferred (bonds, ticket increases, sales taxes, etc.) as part of the focus groups. Two focus groups with 12-15 participants in each are proposed. Incentives will be provided.

The qualitative nature of focus groups implies that the results of this task will be used as indicators rather than for quantitative estimations of ridership shifts. Nevertheless, the survey instrument that will be administered in Task 4 will be tested in the focus groups, and potentially revised depending on the focus group feedback.

4) Reliability Focused Stated Preference Survey

This element of the study will include a quantitative effort at estimating the implications of reliability deterioration on ridership. The focus on reliability is derived from two main reasons; first, most agencies do not intend to allow cuts in investment to affect the schedule or to compromise safety in the system. Therefore, the main manifestation of investment cuts will most likely be a negative impact on service reliability, through increased train and equipment malfunctions. Second, reliability issues have been identified as among the most important quality of service components, in surveys conducted by BART as well as by other transit authorities. Hence, reliability deterioration could potentially result in a relatively large ridership decline. A Stated Preference survey would be developed for this study, based on initial research from the University of California Transportation Center (UCTC). The survey will be tested during the focus groups and potentially revised before distribution.

The survey protocols will be developed, but would take place in each of the three selected regions. For each region, stations would be selected based on their geographic location, the proportions of access modes used by passengers to each of them, and the socioeconomic characteristics of the population that uses them. Each station will be surveyed on a single, middle-of-the-week day, between 7:00 AM and noon. For the purposes of the survey, AM peak will be considered as 7:00am-10:00am and the off-peak period will be considered 10:00am-12:00pm. The survey will be administered as a

paperback survey and completed questionnaires will be returned either through drop boxes at destination stations or by prepaid envelopes.

In order to minimize the bias of the sample, passengers will be approached based on a random selection process, so that every n^{th} transit patron will be asked to participate in the survey. In all stations the distribution of surveys will be done immediately after the entrance gates. Each station will be assigned enough surveyors so that a single surveyor will be assigned to each array of gates at all times (an array of gates is a line of gates that are located next to each other). At least 3,000 surveys will need to be administered during the day of survey. Assuming a 40% response rate, this would guarantee 1,200 responses.

Prior to the actual survey, a pilot survey will be conducted in one other station in order to make sure all the procedures work well.

The completed questionnaires will be coded into an electronic format and cleaned.

5) Modeling Passenger Sensitivities to Reliability

For each of the three selected regions, the results of the stated preference survey will be utilized to estimate the sensitivity of transit passengers to reliability compared to other trip factors (mean travel time and trip cost). The modeling will be done through market segmentation of trips into three groups; peak hour trips for work purposes, peak hour trips for non-work purposes and off peak trips.

A second phase of quantitative analysis will be focused on identifying the sensitivities to reliability of different segments of transit passengers; that is, whether sensitivity to reliability varies systematically with factors such as trip length, car availability, income, etc. While this information is not likely to be introduced to the final modeling (performed in Task 5), it would provide potentially valuable information to transit agency decision makers about which populations will be most affected by deterioration in service reliability.

6) Introduction of Survey Results into the Travel Demand Model

This task would be done for each of the three regions to be studied. As long as the models from Task 4 show significant effect of reliability on travel choices, they will be utilized in order to introduce reliability deterioration into the regional travel demand model. This will provide estimations of ridership decline and GHG emission implications of a deteriorated reliability. The actual introduction of the reliability parameters into the regional model and conducting of model runs based on it will be done by MPO modelers in collaboration with the modelers of task 4.

7) Blue Ribbon Panel

In addition to the team, there will be a Blue Ribbon Panel of 5-8 transit system experts drawn nationally from academia and practice that will meet twice during the study to provide advice on the project's key research questions and tasks. During the first meeting, the Panel will be informed about the project and the results of the focus groups and survey. During the second meeting, the Panel would meet to discuss the draft results

of the study, followed by an afternoon session at which the panelists either produce a presentation or a brief memo on their input.

8) Regional Economic Analysis

In addition to analyzing the impacts of deferred investment on GHG, congestion and delay, there is also an interest in analyzing the regional economic impacts of a deteriorating transit system. This task is optional and may be further expanded upon if funding can be secured.

9) Final Report

All working papers and findings will be merged into a draft report. The project team will revise the draft report based on a single set of non-conflicting written comments. A presentation will be developed and presented to the transit agency decision markers and executives (up to 2 meetings), as well as discussions with key transit industry representatives.

V. Estimate of the Problem Funding and Research Period

The budget is estimated to be $400,000, and proposed for an 18 month research period.

VI. Urgency and Payoff Potential

Several of the nation's largest rail transit systems have been in service for a century, and even systems like BART and Washington Metro are over 35 years old. Ridership growth is straining existing system capacity in many key segments, and the infrastructure is aging, and many cases beyond the useful life. The FTA's State of Good Repair (2009) report identified a state of good repair backlog of $50 billion for seven agencies that they analyzed. Keeping transit infrastructure in a state of good repair is essential to sustain on-time performance, as reliability is a critical factor in traveler's decision to choose transit. Reliability is key to maintain existing ridership, and to increase transit's mode share in coming decades.

VII. Relationship to FTA Strategies Goals and Policy Initiative and TCRP Strategic Priorities

This problem statement is consistent with many of the FTA's Strategic Research Goals and TCRP's Strategic Priorities. The key ones are listed below.

FTA #2 – Support Improving the Conditions of Transit Operations and Systems. Transit agencies find that reliability and on-time performance are critical for our customers, especially to those that could drive. Maintaining transit in a good state of repair is essential to putting the customer first.

TCRP I - Place the Customer First. Transit agencies find that reliability and on-time performance are critical for our customers, especially to those that could drive. Maintaining transit in a good state of repair is essential to putting the customer first.

VIII. Related Research

BART, 2006, 2006 BART Customer Satisfaction Study, http://www.bart.gov/about/reports/index.aspx

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Tseng, Y.Y., 2008, A meta-analysis of travel time reliability, http://econpapers.repec.org/paper/wiwwiwrsa/ersa04p415.htm

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X. Process Used to Develop Problem Statement

Initial scope developed by the University of California Transportation Center (UCTC), at the request of BART, but work was unfunded. Obtained additional comments from BART and transportation consultants. Solicited input from the American Public Transit Association (APTA) Climate Change Working Group and revised accordingly.

XI. Date and Submitted By

_____ June 15, 2009

Val Menotti
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June 15, 2009

10-F-02

May 29, 2009

OUTLINE FOR TCRP PROBLEM STATEMENTS 2010

1 Problem Title

To develop a Healthy Habits Wellness Program for Bus Operators to reduce health care risk such as diabetes obesity and high blood pressure associated with this particular occupation/lifestyle and control health care cost.

2. Research Problem Statement

In the 21st century the need for public transportation has grown significantly due to booming population growth and environmentally demands, limited highway space for motorist, rising fuel cost and downturn in the economy. In the city and suburban areas, more customers are relying on public /private bus services to transport them to and from their homes and work locations. Due to this increase demand in public transportation service, the average bus operator is facing serious health risk, due to long hours of driving, to provide safe service, to maintain on time performance, to deliver customer service and juggling all of these demands.

The bus operator's position requires them to sit for many hours each day in the driver's seat in traffic congestion. The majority of bus operators are trying to maintain schedules, safety and their health. Most of today's bus schedules were developed with a main thrust of providing on time service for the customers without considering the human factor that the bus operator must be healthy behind the wheel in order to maintain service.. Long hours of driving and limited "swing time" for eating or resting contributes to an unhealthy workforce who are at a greater risk of developing Diabetes Type 2, High Blood Pressure, Obesity, Sleep Apnea Heart Attack or Stroke that leads to an untimely death or fatal accident. This can cost an employer millions of dollars in lawsuits compensation and medical claims.

3.Objective: To develop a Wellness/Training program to improve the bus operator's health and reduce the risk of Diabetes Type 2, High Blood pressure, Obesity and Sleep Apnea and other diseases that this population is susceptible due to the physical inactivity of the job and poor eating habits. Provide health and nutritional educational programs targeted towards this population including exercise, weight management and being pro active in their health care. Communicate to the population that maintaining good health is vital to their ability to perform their job function and enjoy their life. Provide incentives/ rewards for employees who are able to maintain their healthy habits such as losing weight, changing their behavior or lowering their cholesterol or high blood pressure. A healthy work force is

important to increasing productivity, reduce medical cost and maintain a competitive edge.

4. RESEARCH PROPOSED: To study the bus operator's population at New York City Transit, Department of Buses, (known as Regional Bus) for a period of a year at a depot in the Bronx Division. Secondly to determine the internal and environmental factors that contributes to this populations growing health and safety risk. Based on the findings, implement an internal wellness training program that address ,identify and monitor's the bus operator's health from a holistic approach to reduce their health and safety risk .Further, the research should examine the work schedules and examine the impact of limited lunch periods and productivity. Design and develop healthy food plan for this particular group. An unhealthy bus operator in the workplace affects the day to day bus operations reduce productivity and, increase in operational cost and absenteeism.. Instead, we would like to emphasize the importance of " Fit for Duty / Maintaining Good Healthy Habits".. . **Motto:" A safe bus operator on the road is a healthy driver.."**

ESTIMATE OF THE PROBLEM FUNDING and RESEARCH PERIOD

Recommend of Funding: The average cost for this project would be approximately to be 100,000 -150,000.

Research Period: I would like this population to be studied for at least six months to a year.

Urgency and Payoff Potential: This situation is a very urgent matter not just here at NYC Transit but across the country for most bus operators.. A few changes in the workplace could reduce personnel cost and increase productivity. A large segment of the population has developed serious health conditions in this job position. This is a critical situation that can directly impact on the agency's operating budget: by an increase in accidents/ personal injuries, a increase in hiring cost, a rise in overtime expenditures, chronic sick leave usage and low productivity/ morale..

Relationship to FTA Strategic Goals and Policy Initiatives and TRCP Strategic Priorities

This problem can be addressed under TRCP strategy priorities number 3 and number 5. The finding of this study can be used throughout the transportation agencies to address a growing health and safety concern with CDL/Bus operator population.

Related Research: At the New York City Transit, Dept of Buses, Safety and Training Division, I have implemented a training program called Healthy Habits for over a two year period to address some of these issues.. Unfortunately, the scope of this training was limited. A more extensive assessment of this problem is needed in order to identify the root cause of the problem and provide practical solutions that can improve and reduce this growing health crisis and safety risk in this industry.

Person Developing the Problem Statement

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10-F-07

Transit Cooperative Research Program – 2010 PROBLEM STATEMENT

I. PROBLEM TITLE

Establishment of a National Transit Vehicle Maintenance Instructor Training and Certification Program for the Public Transportation Industry

II. RESEARCH PROBLEM STATEMENT

In the past several years, the Public Transportation Industry has made significant progress in establishing industry standards for a National Transit Bus Technician Certification, a National Apprenticeship which eventually will also establish a National Journeyist Bus Mechanic occupation, and National Training Standards. All of this progress was the result of the TCRP Project E-6, ***Transit Bus Mechanics: Building for Success — The ASE Transit Bus Maintenance Certification Test Series.*** Additionally, in like kind, as the result of the efforts of TCRP Project E-8, ***Extending and Deepening National Transit Training Standards,*** similar progress in developing training standards and certifications will be realized.

The continued advancement of transit vehicle technology and the failure of an external workforce to provide qualified employees are the main drivers for National Standards. Public confidence, safety, Going "Green", and security are the objectives for these efforts. Yet, we have failed to define and establish credentials for the most important group that makes all of the aforementioned a reality, National Certification for Transit Vehicle Maintenance Instructor.

The lack of a national certification fails to bring recognition and credentials to one of the most important job careers in our industry. This research will help to establish the skills and competencies required for an individual to qualify to be a Transit Vehicle Maintenance Instructor. It will establish minimum competency levels and necessary skills so that authorities are not constantly "reinventing the wheel."

III. OBJECTIVE

The objective of the research will partner the transit industry, as a result of a Request for Proposal (RFP), with a company, organization or institution that has the capability to develop a National Transit Vehicle Maintenance Instructor Certification Program as well as provide the Certificate of Achievement of same. An example of such program is the Leadership APTA Program. The Leadership APTA Program is the American Public Transportation Association's premier professional development program designed to develop and support the next generation of transit leaders and future leaders of the transit industry. What about the group of individuals that is responsible for developing and grooming the next generation of transit vehicle maintenance mechanics and technicians?

How do we prepare and qualify this group for the tasks that they are responsible for? Just as the education and development of our children are tasked to qualified and certified academic teachers, the skills and competencies that are provided to transit vehicle maintenance employees should also be provided by qualified and certified vehicle maintenance instructors. In the transit industry we recognize that much of the training is peer to peer. Utilizing the knowledge and experience of a trained mentor in conjunction with a structured OJT process is another key to a successful training program. On the shop floor, a mentor can reinforce the training and instruction delivered in the classroom

The potential outcome or product of this project could be an off-the-shelf "Instructor Training Program" as well as an "Instructor Certification" earned upon completion of the training program. Including a multi-tiered instructor certification program, with a mentor training and certification component or module will provide skilled subject matter experts with the understanding of how to deliver practical training to adults/peers and help ensure consistency and uniformity in instruction.

Ultimately this program would be distributed nationally. Initially a cohort of instructors would complete the training and become certified and then be able to provide the training to other instructors, who would then sit for the certification test. Ideally, the program could be offered through APTA, NTI or some other national educational institutions. The goal would be broad availability of the training and central administration of the test to maintain quality and consistency. Some examples of established transportation related national certifications are:

- North American Transportation Management Institute
    - Certified Supervisor of Maintenance/Equipment (CSM/E);
    - Certified Director of Maintenance/Equipment (CDM/E);
    - Certified Safety Supervisor (CSS);
    - Certified Director of Safety (CDS);
    - Certified Driver Trainer (CDT).
- NAFA Fleet Management Association
    - Certified Fleet manager (CFM).

IV. RESEARCH PROPOSED

Working with representatives from the transit industry and associated transit labor unions, an oversight committee would be established to evaluate and recommend the best means to initiate and implement the Request for Proposal process. It would be the responsibility of the company, organization or institution awarded the project to work with industry professionals to identify the required curriculum, training material content, reference material, qualifying tests and achievement certificate of qualification.

Some preliminary material has already been developed by Andrea Dobson, retired Training Manager for Tri-Met in Portland Oregon. The material suggested includes *Guidelines for Instructor Development* (attachment I) and the National Transit Institute Training Seminar that addresses '*Training and Coaching Skills for Bus Maintenance Instructors in Preparing for the ASE Transit Bus National Certification Tests*'.

In addition, through the APTA Bus Maintenance Training Standards Working Group, Ken Mall from EDSI has developed a draft *Transit Vehicle Maintenance Instructors Curriculum* (attachment II). This material provides the basic outline for what a well-developed Transit Vehicle Maintenance Instructors Training and Certification Program should contain. In addition, there is also the issuance and support of the Certificate of Credentials that a seminar doesn't provide. The means to accomplish this may include a thorough review of all the material presented to date, development of an in-depth program, and the support of the National Certification.

The awarded company, organization or institution must also have the means to present the training program on a national basis.

Task 1: Develop national maintenance instructor training curriculum

Task 2: Develop instructor training course materials

Task 3: Develop instructor certification test

Task 4: Implement instructor training and certification test

V. ESTIMATE OF PROBLEM FUNDING AND RESEARCH PERIOD

Recommended funding:	The estimated funds for this research are proposed at $185,000.00 to $250,000.00
Research period:	The estimated research period is twenty-four (24) months.

VI. URGENCY AND PAYOFF POTENTIAL

Many transit vehicle maintenance instructors, just like many of the transit vehicle mechanics, are reaching retirement age. As this group retires into the sunset, the knowledge and experience that will be lost is priceless and irretrievable as the industry has failed to provide for succession and consistency in this area. The lack of industry standards for training, certifications, testing, job definitions and curriculum is requiring individual transit authorities to expend resources to develop the necessary criteria,

programs, training and testing. If industry standards were developed and implemented, the cost of implementing a program or certification would be negligible.

Common practice in the public transportation industry is to promote from within; maintenance training instructors often come from the ranks of the mechanics. This proposed research would enhance the "build your own" workforce development practice of the public transportation industry by providing clear required competencies and a path to becoming a maintenance instructor in the industry.

Using the industry standards for transit training, educational institutions could develop training curriculums specifically for the transit industry. The establishment of a National Transit Vehicle Maintenance Instructor Training and Certification Program would promote additional interest from the external job market, technical schools, and colleges. With national standards established, transit vehicle mechanics would be able to seek out new career paths once they were able to learn or acquire the identified qualifications and skill competencies. Transit authorities would be able to establish resources for qualified personnel to fill vacant positions.

With a well-manned and qualified instructor workforce to support and maintain qualified mechanics and technicians, vehicle availability would be increased, vehicle downtime reduced, maintenance costs reduced and passenger safety enhanced.

The establishment of a national training and certification program would promote individual pride and ownership in the occupation. This would relate to individual recognition in the form of salary increases, bonuses or promotions based on increased knowledge and skill competencies.

The return on the investment from all of the above is immeasurable at this time. The qualification of the transit vehicle maintenance instructor equates directly to improved reliability of the equipment and the overall safety of the customers that use the transit service. Considering the potential for reducing operating costs and improving service and safety, the cost savings realized from a national transit vehicle maintenance instructor training and certification program could be estimated in the millions of dollars from an industry point of view. Therefore, this research should be considered as a high priority item.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES AND TCRP STRATEGIC PRIORITIES

In reference to the FTA strategic research goals this research has a direct relationship to the following highlighted areas:

1. **Support Increasing Transit's Market Share** FTA conducts research designed to help transit agencies improve methods and technologies to contain the cost of maintaining and expanding transit facilities and services. What infrastructure improvements are needed to increase capacity? What new or existing tools for

assessing the cost benefits of increasing ridership are available to transit agencies? What are the most rapidly developing technologies or services available to make public transportation the mode of choice for commuter travel?

2. What marketing methods are available that have proved to be successful in increasing ridership? What measures of effectiveness are most beneficial to use for effecting positive changes in ridership? How can we improve the capacity of our transit workforce and industry?

   The benefits of new technology implemented in the industry are often not fully realized due to the adoption and utilization of the workforce. Advanced electronic diagnostic and troubleshooting features have been a part of transit vehicles for over 15 years, but their utilization has been slowed in part due to the lack of familiarization with these features by the maintenance workforce. A maintenance instructor certification program will help to ensure that instructors and maintainers are prepared to utilize new and advancing technologies.

   Ultimately these skills will lead to increased in-service time of transit vehicles, resulting in better customer comfort and safety.

3. **Support Improving the Conditions of Transit Operations and Systems**: FTA strives to make safe, affordable, reliable, accessible and efficient public transportation available to all Americans, as ridership is critical for realizing the economic, environmental and mobility benefits of federal investments. This is particularly true for meeting the basic day-to-day mobility needs of everyone including older Americans, persons with disabilities, and low-income populations who rely on mass transit to stay active in our communities. What coordination technologies or methods are available to ensure that the transportation benefits available to seniors and disadvantaged populations are fully utilized?

   What technical, process and operational advances best contribute to better decision-making and cost-effective management of the planning, design and construction of major transit investments? How can we best apply recent advances in project planning and development to reduce the risks and uncertainties associated with large transit projects? What technologies and practices are available to help control costs of capital investment, service operations and maintenance?

   How can more efficient and more effective provision of transit services promote movement toward sustainability? What improvements to transit vehicles and infrastructure would reduce emissions and promote energy independence? Which technologies now available or currently being tested promise the greatest improvements in energy conservation, fuel economy and reduction of harmful emissions? What can FTA and individual transit agencies do to foster introduction of economical and environmentally friendly transit vehicles? How can land use policies support these efforts?

   Instructors with a deep understanding of the latest emissions and powertrain technologies, as well as the ability to convey this knowledge will help ensure that these technologies are utilized effectively.

Of the five TCRP Strategic Priorities, this problem statement directly relates to three:

I. **Place the Transit Customer First** The importance of the transit rider as well as the community at large as the customer was a principal outcome of the TCRP Future Search. The American consumer society is demanding; no industry can prosper that does not place the customer first.

II. **Enable Transit to Operate in a Technologically Advanced Society** TCRP will support public transportation to integrate state-of-the-art technology in all aspects of its business so that mobility needs can be served as communities change and customer needs evolve.

III. **Revitalize Transit Organizations** Information technologies, changes in the work force, and new roles and partnerships are revolutionizing the workplace. By reinventing themselves, transit organizations can "Work Better – Cost Less."

Transit rider safety and comfort with a consistently reliable service are some of the keys to success in this industry. A well prepared maintenance workforce will help to ensure that that transit vehicles and the infrastructure are capable of placing the customer first and help public transportation to become a leader in adopting and utilizing advanced technology, enabling organizations to realize the cost savings of working smarter.

VIII. RELATED RESEARCH

The extent of any related research that may be completed, pending or in progress at this time is not known.

This proposed research would build upon the efforts currently underway with TCRP Project E-6 (Bus Mechanic Certification) and E-7 (Rail Mechanic Certification) by helping to ensure that instructors are sufficiently prepared and qualified to teach public transportation's maintenance workforce. This project will also help to further the impact of TCRP Project E-8 (Extending and Deepening Training Standards) by ensuring that industry instructors who complete this instructor certification project are aware of the various industry-developed certifications and training standards.

Finally, this proposed research would build upon the possible outcome of TCRP project J-06 (Professional Certification and Credentialing Program for the Transit Industry) that is currently out in an RFP. The objectives of the J-06 project are as follows: to identify the range of existing certification and credentialing programs applicable to transit professionals; to identify gaps discovered in the existing programs related to the identified needs of transit professionals; to develop a framework for a voluntary transit professional development certification or credentialing program; and to recommend a comprehensive work plan for the development and implementation of certification and credentialing programs for transit professionals. Project J-06 is expected to be

completed by May of 2010, and will likely identify the lack of a maintenance instructor certification as a gap in the existing range of certifications.

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

The problem statement is the product of developmental efforts made through the APTA Bus Maintenance Training Working Standards Group, the involvement of staff from the International Learning Center and input from members of the TCRP Project E-6.

XI. DATE AND SUBMITTED BY

Submitted on June 09, 2009 by Dennis M. Cristofaro, with two (2) attachments

Attachment 1

Guidelines for Maintenance Instructor Development

The purpose of this document is to help increase the training capacity of transit agency maintenance departments by:

- Providing a career path for technicians to become qualified instructors
- Increasing the pool of instructor candidates

A combination of forces such as increasingly sophisticated technology, declining availability of trained technicians in the labor market, and accelerated baby-boom retirements has increased the need for many agencies and labor-management training partnerships to develop new maintenance training programs or upgrade existing ones. However, they are recognizing that there is more to the creation of a professional training staff than finding people with good mechanical skills. Being a trainer requires a combination of technical expertise and personal and interpersonal competencies in order to get the most return from the investment in training programs. Labor and management need to work together to create an environment that supports the training function and promotes continuous improvement of maintenance practices.

In order to help agencies and partnerships find, train, and support maintenance training instructors, this document sets forth guidelines for four areas:

- Increasing the Instructor Candidate Pool
- Selection Criteria
- Training Curriculum
- Support and Mentoring

These recommendations have been compiled with input from representatives of transit unions, agency training staff, and instructors whose experience ranges from a few months to over 20 years.

Increasing the Instructor Candidate Pool

There are several ways agencies and partnerships can increase the pool of technicians qualified to be instructors:

Adopting a set of selection criteria and posting them to encourage technicians to build their skills in these areas—by offering in-house training in areas such as technical writing or computer skills, or by tuition reimbursement programs for courses available at local colleges more mechanics can be encouraged to apply to be instructors.

Recruiting highly skilled senior technicians with the requisite qualities who are planning to retire—using retirees or senior technicians who could work as part time instructors are options where agencies are losing many of their experienced technicians to retirement.

Implementing the practices suggested in this guide—technicians who might not otherwise think of themselves as candidates can be encouraged if they see a career path and training program. The majority of maintenance technicians tend to be introverts, who may assume that only extraverts would make good instructors. They need to see a process by which they can acquire the necessary skills, and to see others like themselves being successful.

Providing practical experiences—encourage technicians by asking them to participate in developing a project such as training and implementation of new equipment, or assisting a regular instructor. Roadeo team members should also be considered potential trainers.

Removing barriers and disincentives—some labor agreements have disincentives for technicians to move into training, such as losing their seniority or pension rights by moving into a different bargaining unit. Supervisors should also be encouraged to balance productivity needs with the need for technicians to broaden their experience, rather than being "stuck" doing the same job over and over.

Maintaining a positive image for the Training Dept—new trainers interviewed stated their motivation for applying was how everyone looked up to the training staff.

Selection Criteria

In interviews and group discussions, trainers and training managers identified the following list of qualities and characteristics of successful trainers. Finding someone who has every one of these qualities would be difficult, if not impossible, so it is important to recognize that each person has strengths and weaknesses, and to think about what he or she may contribute to the team. It should be noted that agencies who do not need or cannot afford full time training staff can apply the same criteria to select technicians who do training on an as-needed basis.

Technical Skills—may include years of experience as a technician, expertise in specific systems, demonstrated problem solving/troubleshooting experience, ASE or other certifications, continuing education, coaching or teaching experience (e.g. in military, youth sports, or church) as well as demonstrated ability to do one-on-one training or coaching with co-workers.

Very few technicians know every system on the vehicle; on a small staff, a trainer should have the ability to learn new information quickly when necessary.

"People" Skills

- Working with diverse personalities, race, gender, age etc.
- Connecting with people on a personal level, empathy, respectful treatment
- Listening skills (including hearing what the student needs, not just teaching what you think they need)
- Conflict management
- "Coachability" (ability to learn from others, not pretend to know everything)

Writing Skills—Business, technical and persuasive

Presentation Skills—Being authentic, feeling confident speaking in front of groups

Computer Skills—some familiarity with applications such as Office Suite (Word/PowerPoint/Excel), Email/internet, databases, and vehicle diagnostics

Personal Competencies

- Trustworthiness/Integrity (someone who will be respected by other technicians)
- Ability to lead change/ help the organization adopt and support new learning
- Accountability/quality-consciousness
- Flexibility
- Resilience/positive/optimistic outlook
- Creativity/curiosity/problem solving
- Time management/multitasking
- Willingness to learn and research new topics and share knowledge with others
- Patience
- Follow-through
- Practical/realistic (understand the environment the trainee is going back to)

Appendix A contains suggested interview questions to help identify people who have these qualities.

Training Curriculum

The following table shows suggested curriculum divided into basic and advanced. The beginning curriculum should be offered to instructors as soon as possible after their selection. Although the list is long, most basic items can be taught by experienced instructors in-house or covered in 1-2 day seminar format such as NTI Training and Coaching Skills class or EDSI Curriculum Development class and do not require extensive schooling.

Timing of advanced training will depend on availability of training resources, the individual's needs and the agency's resources. Appendix B lists examples of training resources. In larger agencies where there is a separate engineering department, instructors may not need to be trained on CAD or how to set up new product tests as these functions would more likely be done by the engineers.

Suggested Training Curriculum for New Instructors

	Basic	Advanced
Training skills	• Using audio-visual aids, flip charts, training mockups/simulators • Public Speaking • Verbal communication skills	• Research • Setting up and monitoring tests/data analysis • Student assessment • How to evaluate impact of training • Dealing with disruptive behavior
Curriculum Development	• Task analysis • Curriculum development • How to write a lesson plan	
Writing skills	• Technical (procedure) writing • Business writing • Writing learning objectives	• Persuasive writing (e.g. proposals, justification for purchases)
Computer skills	• Word • PowerPoint • Agency maintenance management/ learning management information systems • Outlook (e-mail, calendar, task lists etc.) • Vehicle diagnostics	• Excel • CAD/Visio • Photoshop or other graphic software • Desktop publishing • Training software
Personal/Interpersonal skills	• Communicating with diverse personalities • Active listening skills • Adult learning principles/ learning styles / tailoring training • Problem solving	• Managing conflict • Dealing with difficult behavior • Dealing with change • Creativity

Supervisory/management skills	• Giving feedback • Basic office organization (organizing files, using office equipment, etc.) • Meeting facilitation	• Interactive counseling • Intro to management (labor law, local bargaining agreement, workers comp, OSHA, industry certifications, harassment prevention, diversity, etc) • Directive counseling • Apprenticeship regs, VA and other benefits affecting apprentices • Agency procurement process

Support and Mentoring

There are two areas of support needed to improve maintenance training capacity:

- Support for individual instructors
- Support for the training department or the training function

Support for individuals—instructors should be given clear expectations for their new role. They should have access to continuing education to keep up with changes in technology. They should be encouraged to network with experienced instructors in-house as well as at other agencies. Agencies should support to the best of their financial ability instructors' participation in APTA committees, NTI workshops etc. Ideally instructors would continue to be union members, but in agencies where the instructor is considered a supervisor or moves to another bargaining unit, they should receive an orientation to explain the changes in benefits, reporting and resources.

Support for the program or the training function—the maintenance program can benefit from creating an environment where the training staff is respected and is seen as the "go-to" resource for information. This includes developing a cadre of floor technicians who consistently employ the methods taught by instructors. This builds the credibility of the training program and avoids the situation where experienced mechanics tell apprentices: "Forget what they taught you in the training department—here's how we do it in the real world." Technicians who work with apprentices doing on-the-job training must agree to do things "by the book". In exchange, they get to help "write the book" by offering their suggestions for continuous improvement of maintenance practices. Growing your own training staff from among the mechanic workforce makes it easier to build the credibility of the training program.

Instructors should be involved in management decisions and change efforts as much as possible. For example, involving maintenance instructors in equipment procurement processes can result in buses that are higher quality and easier to maintain. Trainers are also ideally positioned to be ambassadors from the maintenance department to upper management and to other departments within the agency.

For example, many IT departments don't understand the changing technology needs in bus maintenance, and the training department can educate them in this regard. They can also build teamwork with operations staff, and train operators, road supervisors, and dispatchers to provide better information and smoother handling of defects on the road.

With their knowledge of maintenance information systems and performance data, trainers can help make sure the key performance measures for maintenance make sense, and develop training that has a positive impact on the effectiveness of the maintenance operation. The department should also solicit feedback from supervisors on how well training is meeting operational needs, and use the feedback for continuous improvement. Agencies should be careful to ensure sufficient staffing so that these other duties for training staff are not done at the expense of their training duties.

Often trainers have other job requirements, such as covering for absent supervisors. Maintenance management needs to be flexible to help trainers balance these conflicting priorities. Providing space and equipment for training can reduce disruptions of day-to-day operations.

Appendix A
Suggested Selection Process

In addition to the agency's normal promotion process, the selection of maintenance instructors could include:

1. Writing sample—ask each applicant to write a step-by-step explanation of a familiar work process. Samples should be judged on clarity, technical accuracy, professional appearance, etc.
2. Group presentations—using a group of novices such as HR reps, have each applicant demonstrate how to do a simple maintenance function. Presentations should be judged on clarity of explanation, comfort with speaking in front of a group, as well as how presentations are tailored to the level and learning styles of the audience.
3. Pose a scenario – e.g. purchase of new fleet—ask the candidate to describe all the steps, including how they would train the workforce; or pose a potential problem and ask if the problem could be addressed with a training response, and if so what they would do. *[This gets at the point that training is not the solution for every problem, but also tests creativity of person being interviewed.]*
4. Panel interview—after giving the applicant an opportunity to outline their technical experience, questions should focus on the personal and interpersonal competencies suggested above under Selection Criteria. Following are some examples.

    - Tell us about a time when you came up with a creative solution for a problem at work. (Creativity/problem solving)
    - Talk about a time when you were involved in changing an established procedure; what process did you follow? (Ability to lead change)
    - What speaking, training, or teaching experiences have you had, either personally or during your employment, that helps to prepare and qualify you for the position of Trainer? (training/coaching skills)
    - Tell us about a time where you found it necessary to speak up about a quality issue where there was a real or potential risk to the company's reputation or safety. (leadership/quality-consciousness)
    - Describe the system you use for keeping track of multiple projects. How do you track your progress so that you can meet deadlines? How do you stay focused? (time management)
    - Describe how you have been able to maintain an optimistic and positive outlook in a situation where a lot of people were being negative? (resilience/positive outlook)

Appendix B
Training resources

National Transit Institute (NTI) offers free training including

- Training and Coaching Skills for Maintenance Instructors (includes adult learning, how to give feedback, active listening, etc.)
- How to Write Policies and Procedures
- Changing to Supervision

Community Transportation Center provides technical assistance to agencies building labor/management partnerships and training consortia

Community Colleges provide computer classes and writing skills. Some may offer train-the-trainer or curriculum development internally, for their own faculty; it may not be reflected in their catalog

Educational Data Systems Inc. (EDSI) offers training needs analysis and train the trainer programs

American Management Association (AMA) and others offer one-day seminars in a variety of supervisory/people skills

Networking resources

- International Automotive Technicians Network (www.iatn.net) Get answers to your technical questions from other professionals in your field
- American Public Transportation Association Standards Program (www.aptastandards.com) Recommended practices for bus and rail maintenance

Attachment 2

Instructor Training Curriculum
Course Catalogue

Required Courses:

101: Learning Styles and the Adult Learner

102: Educational Psychology and Differentiated Instruction

201: Classroom Dynamics

202: Instructional Methods

301: Planning Lessons

302: Presentation Skills

Optional Courses:

Enhancing Presentations through PowerPoint

Curriculum Development

Technical Writing

Course Title

Instructor Training 101:

Learning Styles and the Adult Learner

Goal:

At the end of the course participants should be able to recognize that adults learn differently than children and that each person possesses their own unique learning style.

Objectives:

Participants should be able to:

- Discuss theory of Self-Directed Learning
- Compare and contrast teaching theories and adult learning strategies.
- Identify barriers unique to adult learners
- Identify techniques to engage and motivate adult learners
- Identify 5 different ways that people learn
- Identify their own unique learning style
- Identify the techniques that work best with each type of learner

Course Description:

This course covers the foundations of Adult Education by focusing on Malcolm Knowles' theory of Self-Directed Learning (SDL) and Andragogy. Adult specific barriers and ways to engage adult learners are discussed. The course ends with an introduction to learning styles and the identification of each participant's individual learning profile.

Course Duration:

1 day classroom instruction

Target Audience

Any new, existing, or potential instructor, trainer, or mentor.

Instructional Equipment and Supplies:

Notepads, pens/pencils, flip chart or white board (and markers), chart markers, classroom, laptop, projector, highlighters, note cards, and name cards

Course Materials/References:

1. PowerPoint Presentation: Malcolm Knowles: Adult Education, Self-Direction, and Andragogy; Summary by Kim Harris, EDSI. Source: Smith, M. K. (2002) 'Malcolm Knowles, informal adult education, self-direction and andragogy', *the encyclopedia of informal education*, www.infed.org/thinkers/et-knowl.htm
2. Handout/Exercise: Learning Styles and the Adult Learner; created by Rebecca Nessenthaler, EDSI. Source: Cantor, Jeffrey A. (1992) *Delivering Instruction to Adult Learners.* Toronto: Wall & Emerson.
3. Handout/Exercise: Learning Styles: Understanding Learning; created by Rebecca Nessenthaler, EDSI. Source: Fleming, N.D. and Mills, C. (1992), Not Another Inventory, Rather a Catalyst for Reflection, *To Improve the Academy*, Vol. 11, 1992.

Course Developer:

Kim Harris, EDSI: kharris@edsincorporated.com; 215-564-0015

Subject Matter Experts:

Ed Quintavalle, EDSI: equintavalle@edsincorporated.com; Ken Mall, EDSI: kmall@edsincorporated.com; 313-271-2660

Revision Dates:

8/21/06; 11/29/06; 4/17/07; 6/3/2007; 9/24/2007; 7/2/08; 10/21/08; January 2009

Course Title

Instructor Training 102:

Educational Psychology and Differentiated Instruction

Goal:

At the end of the course participants should be able to understand the concepts behind Educational Psychology and Edward Thorndike's' Laws of Learning. In addition, participants should understand the concept of Differentiated Instruction, its importance, and the application of the Multiple Intelligences theory.

Objectives:

Participant should be able to:

- Understand the basic principles behind Educational Psychology
- Explain Edward Thorndike's Laws of Learning and their practical application
- Define Differentiated Instruction and the benefits of using it
- Identify ways to create a learning environment accommodating Differentiated Instruction
- Discuss Howard Gardner and his Multiple Intelligences Theory
- Define the 8 intelligences in the theory
- Implement the Multiple Intelligence Theory into lessons using the MI Planning Sheet

Course Description:

This course builds on the concepts taught in 101 by introducing Educational Psychology and the Laws of Learning. Differentiated Instruction and its benefits, along with the Multiple Intelligence Theory are introduced to encouraged learning experiences that are inclusive to varying learning styles and preferences.

Course Duration:

1 day classroom instruction

Target Audience

Anyone successfully completing 101

Instructional Equipment and Supplies:

Notepads, pens/pencils, flip chart with sticky back, chart markers, classroom, laptop, projector, white board and markers, highlighters, note cards, and name cards

Course Materials/References:

1. Handout and PowerPoint Presentation: Multiple Intelligences Theory: Created by: Kim Harris, EDSI; Source: Gardner, Howard; *Multiple Intelligences: New Horizons in Theory and Practice*, (2006) Basic Books
2. Handout and PowerPoint Presentation: Differentiated Instruction: Created by: Kim Harris, EDSI; Source: Hall, Tracey: Differentiated Instruction, (2008) CAST: www.cast.org/publications/ncac/ncac_diffinstruc.html
3. Handout: Educational Psychology: Created by: Kim Harris, EDSI; Source: Division of Educational Psychology of the American Psychological Association; *What is Educational Psychology?*
4. Handout and PowerPoint: Laws of Learning: Created by Kim Harris, EDSI; Source: Thorndike's' Laws of Learning; (2008) http://coestudents.valdosta.edu/klawson/thorndike's_3_laws_of_learning.htm

Course Developer:

Kim Harris, EDSI: kharris@edsincorporated.com; 215-564-0015

Subject Matter Experts:

Ed Quintavalle, EDSI: equintavalle@edsincorporated.com; Ken Mall, EDSI: kmall@edsincorporated.com; 313-271-2660

Revision Dates:

8/21/06; 11/29/06; 4/17/07; 6/3/2007; 9/24/2007; 7/2/08; 10/21/08; January 2009

Course Title

Instructor Training: 201

Classroom Dynamics

Goal:

At the end of this course participants should be able to create a motivational learning environment for their participants by using the Wlodkowdski and Ginsberg model. In addition, they should be able to identify personalities commonly found in the classroom and how to best work with those personalities.

Objectives:

Participant should be able to:

- Define intrinsic and extrinsic motivation
- Explain the Wlodkowdski and Ginsberg model for creating a motivational learning environment
- Identify and explain the four critical motivational conditions that influence intrinsic motivation
- Identify learning activities that can influence a motivational learning environment
- Identify the various personality types typically seen in classroom environments
- Identify potential problems that each personality can bring and solutions to dealing with those problems

Course Description:

This course is designed to introduce the participant to classroom dynamics. Emphasis is placed on how to create a motivational learning environment for all types of learners. This includes identifying various personalities typically found in classroom environments and how to effectively manage those personalities to ensure the instructor is providing an environment that fosters intrinsic motivation.

Course Duration:

1 day classroom instruction

Target Audience:

Anyone successfully completing 102

Instructional Equipment and Supplies:

Notepads, pens/pencils, flip chart with sticky back, chart markers, classroom, laptop, projector, white board and markers, highlighters, note cards, and name cards

Course Materials/References:

1. Handout and PowerPoint: Creating a Motivational Learning Environment for All Types of Learners: Created by: Kim Harris, EDSI. Source: Wlodkowski, R. J. and Ginsberg, M. B. (1995) "A framework for culturally responsive teaching," Educational Leadership
2. Handout and PowerPoint: Personality Parade: Created by: Kim Harris, EDSI. Source: Jolles, Robert. L., How to Run Seminars and Workshops, 3rd Edition (2005), John Wiley & Sons, Inc.

Course Developer:

Kim Harris, EDSI: kharris@edsincorporated.com; 215-564-0015

Subject Matter Experts:

Ed Quintavalle, EDSI: equintavalle@edsincorporated.com; Ken Mall, EDSI: kmall@edsincorporated.com; 313-271-2660

Revision Dates:

8/21/06; 11/29/06; 4/17/07; 6/3/2007; 9/24/2007; 7/2/08; 10/21/08; January 2009

Course Title

Instructor Training: 202

Instructional Methods

Goal:

At the end of this course participants should have the foundational skills needed to begin planning a lesson. They should understand how to select instructional methods that best suit the material and audience being taught.

Objectives:

Participants should be able to:

- Use a planning pyramid when planning a lesson
- Understand the instructional model of method selection
- Define the Instructional Strategies and appropriate uses of each strategy
- Select Instructional Methods that best suit the material and audience
- Develop the ability to select new methods by using the Instructional Strategies/Methods selection tool

Course Description:

The purpose of this course is to begin planning a lesson by using a planning pyramid and becoming familiar with different instructional strategies and methods. The process for choosing methods is discussed and multiple methods per learning activity are highly encouraged to ensure all learners are being reached. Emphasis is placed on understanding the differences in learning styles and expanding an instructor's repertoire of techniques.

Course Duration:

1 day classroom instruction

Target Audience:

Anyone successfully completing 201

Instructional Equipment and Supplies:

Notepads, pens/pencils, flip chart with sticky back, chart markers, classroom, laptop, projector, white board and markers, highlighters, note cards, and name cards

Course Materials/References:

1. Handout: Planning Pyramid: http://www.teachervision.fen.com/tv/printables/0865863393_31.pdf
2. Resource: Questions for Reflective Planning: http://www.teachervision.fen.com/tv/printables/0865863393_33_34.pdf
3. Handout and PowerPoint: Instructional Methods Model, Created by: Kim Harris. Source: Saksed: http://www.sasked.gov.sk.ca/docs/policy/approach/instrapp03.html

Course Developer:

Kim Harris, EDSI: kharris@edsincorporated.com; 215-564-0015

Subject Matter Experts:

Ed Quintavalle, EDSI: equintavalle@edsincorporated.com, Ken Mall, EDSI: kmall@edsincorporated.com; 313-271-2660

Revision Dates:

8/21/06; 11/29/06; 4/17/07; 6/3/2007; 9/24/2007; 7/2/08; 10/21/08; January 2009

Course Title

Instructor Training: 301

Planning Lessons

Goal:

At the end of this course participants should be able to write goals and objectives for a lesson plan, identify lesson plan formats and options, and write a quality lesson plan. They should understand why all components are necessary and where to access the resources needed to write quality lesson plans.

Objectives:

Participants should be able to:

- Define goals and objectives
- Write goals and objectives for a lesson plan
- Identify the components of a lesson plan (Master Sheet and Lesson Plan Matrix)
- Use resources taught in previous classes to select methods and plan a lesson
- Write a lesson plan that anyone with subject matter experience can use

Course Description:

This course is designed to introduce participants into the formal aspect of writing lessons. Material taught in previous courses is re-introduced during the lesson planning phase. Focus is on understanding the format of a lesson plan and actually writing a lesson plan of their choice. Participants are encouraged to include an assortment of methods to ensure differentiated instruction is available to all learners.

Course Duration:

1 day classroom instruction; 1 day hands on exercises

Target Audience:

Anyone successfully completing 202

Instructional Equipment and Supplies:

Computer lab equipped with Internet, MS Word, MS Excel, flash drive, notepads, pens/pencils, flip chart with sticky back, chart markers, classroom, laptop, projector, white board and markers, highlighters, note cards, and name cards

Course Materials/References:

1. Handouts: Planning Lessons: Master Sheet and Matrix: Created by Rebecca Nessenthaler, EDSI, 2005. Revised by: Kim Harris, EDSI 2006, 2007, and 2008

Course Developer:

Kim Harris, EDSI: kharris@edsincorporated.com; 215-564-0015

Subject Matter Experts:

Ed Quintavalle, EDSI: equintavalle@edsincorporated.com, Ken Mall, EDSI: kmall@edsincorporated.com; 313-271-2660

Revision Dates:

8/21/06; 11/29/06; 4/17/07; 6/3/2007; 9/24/2007; 7/2/08; 10/21/08; January 2009

Course Title

Instructor Training: 302

Presentation Skills

Goal:

Upon completion of this course participants should understand what makes a good presentation and their own strengths and weaknesses regarding presentation skills. Participants should significantly improve their speaking and presentation skills by the end of this course.

Objectives:

Participants should be able to

- Identify the three areas that make a good presentation
- Identify the do's and don'ts of presentations
- Structure a presentation to effectively deliver information
- Improve their presentation skills and ability to communicate with an audience
- Understand how to maintain audience interest during a presentation

Course Description:

This course is designed to take everything the participant has learned in previous courses and help them gain the skills needed to effectively deliver the information to an audience. This course is highly interactive and focuses on helping improve structure, voice, and content of presentations.

Course Duration:

1 day classroom instruction; 1 day hands on – utilizing training aids and mockups

Target Audience:

Anyone successfully completing 301

Instructional Equipment and Supplies:

Video camera, DVD-RW's, notepads, pens/pencils, flip chart with sticky back, chart markers, classroom, laptop, projector, white board and markers, highlighters, note cards, and name cards

Course Materials/References:

Presentation skills PowerPoint and handout, maintaining interest

Course Developer:

Kim Harris, EDSI: kharris@edsincorporated.com; 215-564-0015

Subject Matter Experts:

Ed Quintavalle, EDSI: equintavalle@edsincorporated.com, Ken Mall, EDSI: kmall@edsincorporated.com; 313-271-2660

Revision Dates:

8/21/06; 11/29/06; 4/17/07; 6/3/2007; 9/24/2007; 7/2/08; 8/11/08; 10/21/08

Course Title

Enhancing Presentations through PowerPoint

Goal:

Upon completion of this course participants should have an understanding of how to effectively use PowerPoint to enhance their classroom presentations.

Objectives:

Participants should be able to

- Understand how PowerPoint can enhance a presentation
- Understand how PowerPoint can detract from a presentation if used in excess
- Understand balance, clarity, and simplicity while creating presentations
- Create an effective PowerPoint presentation that enhances interest in the presentation topic

Course Description:

This course is designed to demonstrate the pro's and con's of using PowerPoint to convey information to an audience. Compare and contrast between good and bad presentations will occur emphasizing the importance of balance, clarity, and simplicity while creating PowerPoint presentations.

Course Duration:

1 day of classroom instruction; 1 day hands on

Target Audience:

Anyone successfully completing 301

Instructional Equipment and Supplies:

Computer lab equipped with PowerPoint, notepads, pens/pencils, flip chart with sticky back, chart markers, classroom, laptop, projector, white board and markers, highlighters, note cards, and name cards

Course Materials/References:

PowerPoint: Presentation Zen, Summary by: Kim Harris, EDSI: Source: Reynolds, Garr, *Presentation Zen: Simple Ideas on Presentation Design and Delivery* (2008); New Riders

Course Developer:

Kim Harris, EDSI: kharris@edsincorporated.com; 215-564-0015

Subject Matter Experts:

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Revision Dates:

7/2/08; 8/11/08; 10/21/08; January 2009

Course Title:

Curriculum Development

Goal:

At the end of this course participants should have the foundational knowledge needed to begin preparing curriculum. Participants will learn to group related responsibilities and task to form coherent and logical curricula.

Objectives:

Participants should be able to:

- Define what curriculum is and the purposes behind developing solid curricula
- Identify responsibilities and how to organize them into course titles to ensure a comprehensive curriculum
- Group related tasks (learning objectives or training guidelines) into courses to create logical and effective curriculum that covers all job tasks and responsibilities needed
- Reorganize tasks to modify curriculum in a more logical or time efficient manner
- Identify existing resources and resources that need to be developed to fulfill instructor and courseware needs

Course Description:

This course is designed to assist qualified instructors with developing curriculum off of existing training guidelines or job task analysis. Focus is on how to organize the information in a logical sequence and grouping. This is a workshop course where each participant will take part in designing a curriculum, therefore, gaining hands-on experience to curriculum development.

Course Duration:

1 - 2 day of classroom instruction; extensive practice exercises

Target Audience:

Anyone successfully completing 301

Instructional Equipment and Supplies:

Computer lab equipped with MS Excel, notepads, pens/pencils, flip chart with sticky back, chart markers, classroom, laptop, projector, white board and markers, highlighters, note cards, and name cards

Course Materials/References:

1. Responsibility/Task lists from respective company(ies)
2. PowerPoint: Tasks to Curriculum, Created by: Rebecca Nessenthaler, EDSI (2006). Revised by Kim Harris, EDSI (2008)

Course Developer:

Kim Harris, EDSI: kharris@edsincorporated.com; 215-564-0015

Subject Matter Experts:

Ed Quintavalle, EDSI: equintavalle@edsincorporated.com; Ken Mall, EDSI: kmall@edsincorporated.com; 313-271-2660

Revision Dates:

7/6/06; 12/4/07; 10/21/08; January 2009

10-F-08

Transit Cooperative Research Program

Problem Statement Outline

I. Problem Title: Comparative employee satisfaction data for transit industry

II. Research Problem Statement

The basic premises of this research proposal are:

- Employee satisfaction is important to the overall success of a transit agency;
- Transit agencies need to gather useful data to measure employee satisfaction and employee surveys are an effective means to gather data;
- Transit agencies would benefit from sharing and comparing employee satisfaction information with each other so that data can be better analyzed.

Why is employee satisfaction important?
Studies show that employee satisfaction has many positive benefits to a business. A few recent findings:

- "Profit and growth are stimulated primarily by customer loyalty. Loyalty is a direct result of customer satisfaction. Satisfaction is largely influenced by the value of service provided to customers. Value is created by satisfied, loyal, and productive employees."[1]
- A 1998 study conducted by a national retailer finds: "a happy employee will stick with the company, give better service to the customer and recommend company products to others." [2]
- A study of the "100 Best Companies to Work For" finds that the companies with the most satisfied employees had an above-average annual return to shareholders, as reported in Fortune Magazine, Dec. 1998.[3]
- A Gallup study finds positive correlation between employee satisfaction and financial performance, as reported in The Economist, August 1998.[4]

Why is it important to gather data to measure employee satisfaction?
Transit companies need data that is useful and actionable. There are many indicators of employee satisfaction, including objective data such as employee turnover rates, absenteeism, or grievances filed. However, these measures have limited value to evaluate how employees feel about the job since they can be influenced by so many external factors such as the economy, employee demographics, the job market and other factors not related to the employee's experience on the job.

According to Patrick Gilbert a principal and employee research expert for Mercer, an international survey research group, companies typically can get a sense of what engages their employees by conducting employee surveys.

Surveys can provide important insights when an organization has already established a climate of open communication and trust with employees, says Marshall Paepke, SPHR, senior vice president/chief human resources officer for Mountain America Credit Union in Salt Lake City.

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[1] ("Putting the Service-Profit Chain to Work" by James L. Heskett, Thomas O. Jones, Gary W. Loveman, W. Earl Sasser, Jr., and Leonard A. Schlesinger, Harvard Business Review, July-August 2008, p. 120
[2] Ibid, p. 2
[3] Ibid, p. 3
[4] Ibid, p. 3

"The act of asking for input can send a positive message. And it can be dangerous to surmise the issues or attitudes that are prevalent in the workplace. Better to find out and focus energies where they can most make a positive impact, experts say," according to a recent article published by the Society for Human Resources Management.

"In my experience, management's guesses as to what employees will say are often wrong," says Chris Stiehl, president of StiehlWorks, a consulting firm in San Diego according to the same article.

Why is it important to share data among transit agencies in a centralized data depository?
Right now there is no methodology for sharing transit agencies' human resources data. Transit human resources offices rely on informal networks of email and telephone numbers to contact other agencies and gather data. Often management is provided data that is an "apples and oranges" approach, limiting its value to decision makers.

Transit agencies have much in common, offering similar services using similar employee titles, job duties, work environment and hiring requirements. In particular, transit agencies rely on their workforces to provide quality services to passengers of the transit system.

If one transit agency surveys employees and gathers data, how will it know how important the results are? Transit agencies can better understand employee satisfaction data by comparing data over time within one transit agency and against other agencies in the same transportation industry. Tracking employee satisfaction could be greatly enhanced if there is a standardized approach and ability to share employee satisfaction data across transit agencies.

A centralized data depository would allow agencies to pull data as needed, comparing their data results to other agencies, based on whatever criteria that is important to the specific agency.

III. Objective

The objective of the research project is to get useful employee satisfaction data from participating transit agencies that can be shared by all transit agencies.

IV. Research Proposed

TCRP is requested to establish an Employee Survey Working Group consisting of representatives of transit agencies to provide guidance and support to assist TCRP with the following outcomes:

- Establish a standardized methodology for collecting employee satisfaction data in transit agencies, including development of survey instruments and a recommendation on best practices for administering the survey instruments in a transit environment;
- Establish a method for sharing data across transit agencies, such as a central depository with the ability to "slice and dice" the data;
- Recommend a mechanism for supporting the centralized data depository; and
- Complete a pilot project to test the survey instruments and data collection methodology

V. Estimate of the Problem Funding and Research Period

Capital Metropolitan Transportation Authority has hired marketing firms to design and conduct customer satisfaction surveys, using a random sample approach. If a similar model were used just in one transit

agency, the estimated cost was approximately $40,000 for a one time survey. This includes survey design, survey administration, analysis and reporting of data.

If TCRP were to take on this project, the cost would be significantly higher, although there would be economies in the design phase for developing a survey instrument that could be used at multiple locations. An effective employee satisfaction survey might require input from transit properties to identify the types of data that would be useful. Administration of the survey in a pilot project would then require survey staff training and time and cost would depend on number of properties included in the pilot.

Another part of the project would be investigate opportunities to establish a clearinghouse to collect and make data available for sharing among transit agencies.

VI. Urgency and Payoff Potential

Employee satisfaction matters to the successful operation of any transit agency. Right now there is no existing standard for gathering employee satisfaction data so that management has information for effective workforce management. What are the consequences if we don't have good data? Scott Gingold, CEO of Powerfeedback, a market research firm in Easton, Pa says: "Intuition alone is not enough to bet the ranch on. Surveys take the guesswork out of smart business decisions."

While data does not solve all problems, it can serve as a basis for effective management decisions. It reduces the chance that employers, making incorrect assumptions will try to solve the wrong problems regarding employee satisfaction. Problems associated with low employee morale include:

- Poor performance, poor customer service
- High turnover, low retention.
- Increased conflict in the workplace, union strikes, etc.

Having data that can be shared and compared to other transit agencies allows for richer analysis and understanding of issues and trends in individual properties. It is a starting point for providing information to transit agencies to better manage the workforce. As the research demonstrates, improving employee satisfaction can improve customer satisfaction and affect the bottom line.

VII. Relationship to FTA Strategic Goals and Policy Initiatives and TCRP Strategic Priorities

This research proposal supports the following FTA strategic research goals:

(2) Support Improving the Conditions of Transit Operations and Systems

This research proposal also supports the following TCRP strategic priorities:

III. Continuously Improve Public Transportation
And
V. Revitalize Transit Organizations

VIII. Related Research

Part of the concept for this research is based on a similar data sharing model used by city governments. The International City/County Management Association has had a project that has select cities reporting operational data to a central data base in order that all participating cities have comparative data available. In that project the focus was on each city reporting data that was independently gathered, although the cities worked together to identify the performance data and collection methodology.

IX. Person(s) Developing the Problem

Capital Metropolitan Transportation Authority, Austin, Texas:

- Mr. Fred Gilliam, President & CEO
- Mr. Randy Hume, Chief Financial Officer
- Ms. Donna Simmons, SPHR, Director, Human Resources
- Ms. Kim Peterson, SPHR, Manager, Employee Relations & HRIS

X. Process Used to Develop Problem Statement

The successful development of this project will require participation of many transit agencies. Initial contact has been made with Human Resources offices in public transit agencies in order to start gathering contact names and level of interest. Due to time constraints, no significant response rate has been received but will be made available if the project is selected. Anecdotally, HR representatives from several agencies expressed interest in participating, including:

- **Mya Coursey**, Director of Management Services, Dallas Area Rapid Transit (DART), stated that her agency already conducted employee surveys but would welcome the opportunity to collaborate with other transit agencies in order to have comparative data available.
- **Nancy Malecker,** Human Resources Manager, Utah Transit Authority (UTA) says thatUTA is very interested in participating, has been doing their own survey of other transits for the last 5 years and also participate in other transit surveys.
- **Paul Andruszkiewicz**, Deputy Director of Human Resources for the Massachusetts Bay Transportation Authority, said that they are interested in the data and participating in the project, with some concern about time availability, as was voiced by others.
- **Karen Kauffman**, Manager of Compliance/Org. Development for the Houston Metropolitan Transit Authority is interested in participating in the project and having the data available for her use.

This project was designed and developed by the Human Resources Department of Capital Metropolitan Transportation Authority in response to Route 2025, the strategic plan for Capital Metro. That plan was developed by the entire management team and employee representatives at all levels of the organization with the assistance of the Balanced Scorecard Institute. That plan identifies the following long term objectives for Capital Metro:

- Improving organization alignment
- Improving service delivery
- Improving and integrating business practices and accountability
- Increasing employee empowerment and ownership

For each of these objectives, specific strategic initiatives and performance measures were developed. Many of the initiatives and measures required employee input and in many cases there was no existing data gathering method or baseline to set reasonable goals. This project was born out of a need to respond to these data requirements and the belief that other transit agencies had similar requirements.

XI. Date and Submitted By

Date submitted: 6/11/09

Submitted by: Capital Metropolitan Transportation Authority
Fred Gilliam
Randy Hume
Donna Simmons
Kim Peterson

Contact: Ms. Kim Peterson, SPHR, Manager, Employee Relations & HRIS
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2910 E. 5th Street, Austin, Texas 78702

10-F-10 / 10-F-09

Research Problem Statement for the Fiscal Year
2010 Transit Cooperative Research Program

I. PROBLEM TITLE

The Public Transportation Industry's Professional Development/Human Capital Needs to Build a Sustainable Workforce

II. RESEARCH PROBLEM STATEMENT

There is consensus on significant workforce challenges facing transit leaders across North America – retirement of baby-boom era employees, a generally tight labor market, increasing technological requirements across job functions and growing diversity of the workforce. Our industry faces a critical shortage of skilled and seasoned employment as thousands of workers from the baby-boom generation near retirement over the next 5 – 10 years. There have been recent studies conducted by the industry, including Leadership APTA program participants, on strategies for attracting Generation X, Y and Millennium to jobs and careers in public transportation, particularly "green collar" jobs. The research has shown that having proactive and systematic approaches to address future workforce development needs is critical as the industry is faced with a competitive job seekers' market.

Building upon the success of implementing recommendations outlined in APTA's 2001 report, "*Workforce Development: Public Transportation's Blue Print for the 21st Century*," Dr. Beverly Scott, chair, American Public Transportation Association (APTA), established a one-year blue ribbon panel on workforce development representing the public and private sectors of the transit industry, key stakeholders and partners, including labor, academia and the next generation of leaders in the industry. The panel is charged with (1) reviewing the research and recommendations of the earlier workforce development initiative; (2) identifying gaps, new opportunities, programs and services geared to helping to create and sustain a vibrant, efficient and effective workforce; and defining APTA's role in providing ongoing support to members and the industry on these issues.

In 2008, APTA created a long-term vision of public transportation's role in the fabric of our nation's surface transportation system over the next several decades: "In 2050, America's energy efficient, multi-modal, environmentally sustainable transportation system powers the greatest nation on earth."Across the North American continent, trends in population, urban growth, energy, environmental and economic all point favorably to a ripe, robust future for public transportation. As part of this vision, the public transportation industry has career appeal to a new, diverse population of the best and brightest. Growth challenges since 2009 have required an intense effort to attract, train and develop a new workforce on the scale of the U.S. space program of the 1960s. The many individuals who want to work in "green collar" jobs will recognize public transportation as an "employer of choice."

Once a unified work plan for the next five years is presented at APTA's October 2009 annual meeting, and development of the association's 2010 – 2014 Strategic Plan, the recommendations of the blue ribbon panel will require implementation of activities emerging from the panel's strategic vision and plan. These projects may include new programs, projects and services to address: image and branding; higher education issues, including the role of colleges, universities, community colleges and technical/vocational schools; youth outreach and awareness programs; partnerships and collaborations, including labor-management partnerships; development of performance metrics to determine the return on investment (RO; and the impact of authorization of the federal public transportation law and other legislative proposals on workforce development. Moving forward toward implementation of these recommendations, there will be a need to conduct a comprehensive workforce development assessment for the public transportation industry. This assessment will provide a thorough overview of the evolving challenges and opportunities faced by the transit industry and the related implications for its workforce.

III. OBJECTIVE

The objectives of this research are to: (1) assess the current and future business environment of the public transportation industry as it relates to workforce development and human capital issues and resources; (2) develop industry models that could measure the return on investment for training strategies and other human capital resources, and establish a framework for regular benchmarking; (3) identify "best practices" and new business models with respect to key issues recognized by the industry, including the impact of labor-management partnerships; and (4) assess the current perception of the public transportation industry as an "employer of choice," and identify how these perceptions might be addressed through image and branding strategies, including an emphasis on "green collar" jobs."

IV. RESEARCH PROPOSED

The proposed research project will identify the complex influences that continue to present challenges that require the industry to adapt, innovate and invest, particularly in relation to its human capital. The findings will assist in the development of a forward-thinking and sustainable human capital and resources strategy applicable to the next decade. One of the key deliverables will be a guide outlining a framework for workforce development planning (outlined in Section III) for the decades ahead. The following is a possible research approach:

- Assess the current and future business environment for public transportation;
- Examine current and future workforce planning and development activities and recommend recruitment, retention and return on investment (ROI) metrics for training strategies.
- Identify "best practices" within and outside the public transportation industry with respect to the key issues outlined in Section II.
- Develop an encompassing vision and recommendations to create a targeted sustainable human capital/resource strategy for the public transportation industry.

The following are potential tasks and research activities to support this approach: approach:

Conduct web surveys of a representative sampling of transit employees, stakeholders and employers from other industries.

Conduct consultation/brain-storming sessions with industry employers and employees, labor, associations, educational institutions, and governmental partners.

Conduct extensive in—person and telephone interviews with transit employers and employees, stakeholders and employers from other industries.

Conduct a comprehensive review of "best practices" in performance measurements/metrics to develop an industry-wide model that could be used to determine the return on investment (ROI) on training and workforce development initiatives.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: $300,000 is the estimate of the funds necessary to accomplish the objectives stated in Section III.

Research Period: This project should take 24 months to complete the research, including 3 months for review and revision of a draft final report. This project has strong potential for a second phase of activity.

VI. URGENCY AND PAYOFF POTENTIAL

For business and industries today, no competition is greater than the global race for talent to fill these gaps. In every industry, employers are asking the same question: "How are we going to find, train and retain the best workers?" Given the quickening pace of change in workplace technology and the growing demand for flexible, high-skilled employees in all sectors of the economy, including transportation, not even the most experienced workers can rely on existing skills. To remain competitive, the public transportation industry must invest not only in the preparation and recruitment of new talent, but also the continuing development of employees in all stages of their careers. The proposed research will help the public transportation industry continue to design effective and forward-thinking workforce development plans.

The proposed research supports the Administration's focus on "green collar" jobs as a strategy to advance climate change and environmentally-friendly initiatives by building a sustainable workforce. As a high-demand growth industry, public transportation plays a key role in accomplishing these goals and objectives.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

This research problem statement supports the Federal Transit Administration's two (2) strategic research goals. Improving the professional capacity of public transit's workforce is critical as we focus on the challenges, opportunities and future of the industry. The proposed research also supports improving the conditions of transit operations and systems given the transit industry's mission to provide safe, affordable, accessible and efficient public transportation services available to all Americans. The industry's workforce must be effectively trained in all aspects of operational, technical and managerial innovations. The focus of the proposed research supports all of the Transit Cooperative Research Program's Strategic Priorities.

VIII. RELATED RESEARCH

Attachment A highlights completed and current related research through the Transit Cooperative Research.

IX. PERSON(S) DEVELOPING THE PROBLEM

This problem statement was developed by APTA's Workforce Development Blue Ribbon Panel chaired by Doran Barnes, APTA Vice Chair-Human Resources. The staff advisor for this effort is Pamela Boswell, Vice President-Program Management and Educational Services, 1666 K Street, NW, Suite 1100, Washington, DC 20006, (Tel: (202) 496-4803; (Fax: (202) 496-4323; and (Email: pboswell@apta.com).

X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

This problem statement is the product of APTA's Workforce Development Blue Ribbon Panel (see Attachment B for roster of blue ribbon panel members and technical resources group).

XI. DATE AND SUBMITTED BY

Submitted on _____, 2009 by Pamela Boswell, Vice President-Program Management and Educational Services, 1666 K Street, NW, Suite 1100, Washington, DC 20006, (Tel: (202) 496-4803; (Fax: (202) 496-4323; and (Email: pboswell@apta.com) on behalf of APTA's Workforce Development Blue Ribbon Panel.

Submit to:

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Director
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Transportation Research Board
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202/334-3089/ (202/334-2006

ATTACHMENT A

WORKFORCE DEVELOPMENT PUBLICATIONS AND CURRENT PROJECTS OF THE TRANSIT COOPERATIVE RESEARCH PROGRAM (TCRP)

REPORT

NO.	TITLE, PROJECT NO., PAGES, PUBLICATION YEAR
29	Closing the Knowledge Gap for Transit Maintenance Employees: A Systems Approach (Proj. F-5), 56 p. (1998)
77	Managing Transit's Workforce in the New Millennium (Proj. F-09), 146 p. (2002)
84	e-Transit: Electronic Business Strategies for Public Transportation, Volume 3: Using the Internet for Transit Training and Certification (Proj. J-09, Task 6), 10 p. (2003)
103	Public Transportation Operating Agencies as Employers of Choice, (with CRP-CD-45) (Proj. F-11), 12 p. (2004)
120	Racial and Gender Diversity in State DOTs and Transit Agencies (Proj. J-6, Task 59) (joint report with NCHRP Report 585), 52 p. (2007)
127	Employee Compensation Guidelines for Transit Providers in Rural and Small Urban Areas (Proj. F-12), 204 p. (2008)

RESEARCH RESULTS DIGEST

NO.	TITLE, PROJECT NO., PAGES, PUBLICATION YEAR
3	Total Quality Management in Public Transportation (Proj. F-3), 40 p. (1994)
45	**Identification of the Critical Workforce Development Issues in the Transit Industry (Proj. J-6, Task 38), 23 p. (2001)**
88	International Transit Studies Program: Innovative Practices in Transit Workforce Development (Proj. J-3), 36 p. (2008)

SYNTHESIS

NO.	TITLE, PROJ. NO., PAGES, PUBLICATION YEAR
3	Incentive Programs to Improve Transit Employee Performance (Proj. J-7, Topic SF-2), 46 p. (1994)
33	Practices in Assuring Employee Availability (Proj. J-7, Topic SF-6), 75 p. (1999)
40	A Challenged Employment System: Hiring, Training, Performance Evaluation, and Retention of Bus Operators (Proj. J-7, Topic SF-7), 72 p. (2001)
46	Diversity Training Initiatives (Proj. J-7, Topic SF-8), 59 p. (2003)
47	Corporate Culture as the Driver of Transit Leadership Practices (Proj. J-7, Topic SF-10), 91 p. (2003)

52 Transit Operator Health and Wellness Programs (Proj. J-7, Topic SF-11), 80 p. (2004)

71 Paratransit Managers' Skills, Qualifications, and Needs (Proj. J-7, Topic SB-15), 52 p. (2007)

TCRP CD-ROMS

NO.	PROJECT NO.	TITLE
CRP-CD-45	TCRP F-11	Public Transportation Operating Agencies as Employers of Choice: Toolkit

TCRP PROJECTS UNDERWAY IN WORKFORCE DEVELOPMENT

PROJECT NO.	TITLE
E-6	Transit Bus Mechanics: Building for Success—The ASE Transit Bus Maintenance Certification Test Series
E-7	Initiating a National Transit Industry Rail Vehicle technician Certification Program: Building for Success
E-8	Extending and Deepening National Transit Training Programs
F-13	Vehicle Operator Recruitment, Retention and Performance in ADA Complementary Paratransit Services
F-14	Addressing Critical Shortfalls: Recruitment, Development, and Retention of High-Quality Managers for Public Transportation Systems
F-15	A Practical Guide for Recruiting Minorities for Chief Executive Officers at Public Transportation Agencies
J-6/Task 72	Developing a Professional Certification and Credentialing Program for the Transit Industry

OTHER TRB PUBLICATIONS

PUBLICATION	TITLE
TRB Special Report 275	The Transportation Workforce Challenge: Recruiting, Training, and Retaining Qualified Workers for Transportation and Transit Agencies
TRB Special Report 284	Transportation Knowledge Networks: A Management Strategy for the 21st Century

ATTACHMENT B

American Public Transportation Association
2008 – 2009 APTA Workforce Development Blue Ribbon Panel

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OUTLINE FOR TCRP PROBLEM STATEMENTS

I. PROBLEM TITLE

Best Practices in Attracting Young People to Transit as a Career Choice

II. RESEARCH PROBLEM STATEMENT

The public transportation industry is trying to position itself as an employer of choice for young people looking for career opportunities. Baby boomers will begin their retirement in numbers never seen before, including those who have helped build the transit industry to what it is today. The competition for talent is expected to be much more severe assuming the US economy recovers. . Following generations will have many opportunities to select from. Transit needs to change its history of being a career that people find out about accidentally, and become better known by graduates as a field in which there are many attractive opportunities. A number of actions have no doubt been taken by transit agencies to try to get the attention of younger people, but there is no centralized collection of information on what has been successful that others can try in their communities.

III. OBJECTIVE

To produce a report that provides insights and practical guidance for transit agencies to follow that will help them increase their profile as an employer of choice within their communities and appeal to young people looking for career opportunities.

IV. RESEARCH PROPOSED

This project will be primarily a best practices report, based on results of surveys of transit properties to find out how they have attempted to make themselves better known as attractive career choice employers. There have no doubt been activities like career days, internships, partnerships with local colleges. But there might be new ways that various agencies have pursued to attract young people to the field. This project will also call for the establishment of an advisory panel made of those with a keen interest and ideas on how new forms of electronic communication can provide channels to reach young people with the message of opportunities that exist in the field of transit. This project advisory panel will be facilitated by the researcher to develop new ideas through brainstorming sessions.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: This project might be better included in the TCRP synthesis program. However, if the screening panel determines a need for more in-depth effort, then the project should be funded at the $175,000 level.

Research Period: This project should take 15 months to complete, including literature search, surveys, case studies, site visits, and report review.

VI. URGENCY AND PAYOFF POTENTIAL

Due to the downturn in the economy, the competition for talent is not as urgent as it was even 18 months ago. However, it is expected that the economy will recover. Hence, this would be an excellent

time for transit to start in advance of a hotter economy to get its message out to young people who will have more choices in the future. The payoff can be enormous given the level of competition that will be re-established once the economy turns around.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

This problem statement is related to increasing transit's market share. Transit is provided not just through vehicles and equipment, but first and foremost with good people, good employees. Without talented, interested staff, transit will not be provided in efficient ways that attract and keep passengers. In the same way, by having committed and talented employees working in transit systems, this project satisfies the TCRP priorities of putting the customer first and enabling transit to operate in a highly technological society. It also addresses the continuous improvement of transit services only possible through well prepared employees, and obviously the priority of revitalizing transit organizations. It's very simple – it all starts with and depends on the quality of the people you have.

VIII. RELATED RESEARCH

APTA is putting energy into the issue of Workforce Development, but has not established any research that we are aware of. Different people are making efforts to expose young people to career opportunities in transit, but these efforts could be enhanced with organized research on what has already been done, and creative brainstorming to conceive of new activities.

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

This problem statement came to the attention of the submitter through participation in a workshop put on by FTA in Washington, DC in March 2009. This workshop brought 50 transit managers and university transportation center directors and others together to identify issue that were important to the industry and could be assisted through research that could be done either by universities, the FTA, or TCRP. This was the second highest rated proposal identified in the workshop among a dozen possibilities.

XI. DATE AND SUBMITTED BY

This problem statement was submitted by Joel Volinski on June 15, 2009.

10-G-04

TCRP Problem Statement

I. PROBLEM TITLE

Contracting Commuter Rail Services

II. RESEARCH PROBLEM STATEMENT

Over the past 40 years, there has been considerable change in the way commuter rail services are provided in the major metropolitan areas of the United States and Canada. Up until the early 1960's commuter rail services in these two countries were owned, operated and paid for by the privately owned freight railroads. Starting around that time, public agencies began to subsidize the continued operation of the trains that, without the promise of public funding, would have soon disappeared.

At that time, service existed in only a handful of metropolitan areas. By contrast, the commuter rail industry in North America today has grown to 24 systems, serving 20 metropolitan areas in the U.S. and Canada. More than half of these systems are "New Starts", having commenced operations since January 9, 1989. All of the "New Starts", as well as several of the legacy systems, contract for all or part of their essential operating and maintenance services. In fact, only five systems "do it all themselves".

This rapid expansion and evolution of commuter rail has led to a wide variety of strategies and approaches for obtaining and managing the operation and maintenance of these services. A growing number of non-railroad entities are managing and providing these services due in a large part to the growing disinterest on the part of the traditional railroads in being involved in any type of passenger service. The result has been two basic approaches to service delivery: bundled services where one entity provides all the essential components to operate the service; and unbundled services where the provision of the service is broken down into separate contracts for each essential component.

III. OBJECTIVES

The objective of this research is to provide guidance to public agencies and other key stakeholders in the contracting of commuter rail service operations. This research project will address four key questions:

1. How have the various service delivery models evolved over the years?
2. How effective have the new service delivery models been?
3. What are the current Best Practices for contracting out commuter rail service?
4. What lessons have been learned from the past 40 years of industry experience?

The expected product is a guidebook that describes/defines the various service delivery models for contracting commuter rail operations. This guidebook will also include an evaluation of the impacts, advantages, and disadvantages of each model as well as the effectiveness of the approach. Key system attributes should be included as part of the

evaluation such as passenger miles, train miles, revenues, costs and other appropriate criteria that could help the practitioner assess the value of the various service models.

IV. RESEARCH PROPOSED

At the present time, of the 24 commuter rail services in operation in North America, all but five procure some or all of their operational and maintenance services from contractors. While it will be the intent of the research team to gather data and develop information from all 19 of the systems using contractors, the focus will be on those systems that have recently (i.e., within the past five years) undergone a significant change in the type of contractor(s) providing services, in the manner in which services are contracted for (e.g., from "bundled" to "unbundled" service provision) and/or in the nature of the contract employed and its principal terms and conditions.

As this will not be, for the most part, information that can be gleaned from published sources or from the internet, It is anticipated that the research team will need a number of face-to-face meetings with the decision makers and contracting officers at the target services (systems). From these meetings, it is expected that key background information will be identified and the logic of the thought processes that led to the agency's current service delivery model will be identified.

The overall approach to the research is expected to consist of the following steps:

1. General research and documentation of the service delivery models at the 24 commuter rail services in North America
2. Identification of the targeted systems
3. Request for background contracting information from targeted systems
4. Interviews at the targeted systems
5. Follow-up request for additional information related to service delivery contracting
6. Follow-up interviews as required
7. Identification of potential key parameters (train miles, passenger miles, revenues, fare box recovery, etc.)
8. Documentation of key parameters at targeted systems
9. Evaluation of service delivery models
10. Identification of Best Practices
11. Documentation of findings

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: It is estimated that approximately $350,000 to $400,000 will be necessary to accomplish the objectives stated in Section III.

Research Period: A period of 12 to 18 months from project inception to completion of the final report is estimated.

VI. URGENCY AND POTENTIAL PAYOFF

Within the past few months, the new commuter rail system planned for the Austin, Texas area has had to indefinitely postpone its scheduled date for the initiation of revenue service due to start-up problems related to the operations and maintenance contractor. Even more recently, the Los Angeles commuter rail system, Metrolink, has received written notification from their current contractor that provides the operating crews that it was not willing to enter into the five year option clause contained in the contract governing these services. This notification has left the agency responsible for the Metrolink service with little more than 13 months to decide how to have its trains operated.

Meanwhile, in at least three cities in the U.S. new commuter rail services have started, or are about to start, using operating personnel from the freight railroads over which the service operates. In yet another "recent development", one of the three services, as well as one other new service, have started using employees of the public agency sponsoring the service to provides some or most of the day-to-day functions.

There are no guidelines and/or generally recognized standards to consider in determining how to provide a city or a metropolitan region with commuter rail service. There is no "How to", "What to look for" or "What to avoid" set of instructions for service planners and service architects. There is a clear need for a presentation of the approaches, an evaluation of the models, and guidance on how and when to apply the models to existing and new services.

The intent of this research project will be to begin to address this shortcoming and start to fill this void be in what has become a dynamic, fast-growing segment of the public transportation industry in North America, commuter rail service.

VII. RELATIONSHIP TO FTA STRATEFIC GOALS AND POLICY INITIATIVES AND TCRP PRIORITIES

The proposed research supports the FTA's Strategic Goals and TCRP's Strategic Policies in the following ways:

FTA Strategic Goals

(1) Support Increasing Transit's Market Share – This research directly addresses the FTA's desire to help transit agencies improve methods to contain the cost of maintaining and expanding transit facilities and services.

(2) Support Improving the Conditions of Transit Operations and Systems – Again, this research would direct address FTA's desire to promote sustainability through the provision of more efficient and effective transit services.

TCRP Strategic Priorities:

I. Place the Transit Customer First – Two key elements of operating transit services is to 1) provide an on-time service and 2) provide a safe service. Two of the areas that would be researched are how agencies address the on-time performance and safe operation of their trains in the operating agreement.

II. Enable Transit to Operate in a Technology Advanced Environment – How technology factors into the contracting of the service is an area that the researchers would need to consider in their evaluation of the service delivery model.

III. Continuously Improve Public Transit – By providing a handbook or guide on the various service delivery models, this research will help agencies currently considering commuter rail service with a tool to make better decisions.

IV. Flourish in the Multimodal Environment – The operation of commuter rail services is funded entirely by state and local entities. The agencies that provide commuter rail service need to work in partnership with the providers of other transit services in their service area (including other divisions within their own organizations) to provide a truly multimodal system. This research could identify approaches that are appropriate for providers of other rail (light rail, rapid transit) or bus modes to consider in the delivery of their services.

V. Revitalize Transit Organizations – Many of the commuter rail service delivery models utilize partnerships with the private sector. The drive behind contracting out services has been to find a less costly, better way to work (provide) the service

VIII. RELATED RESEARCH

There are several related relevant efforts including:

1. The Transportation Research Board's Commuter Rail Transportation Committee (AP070) has issued a call for papers for the 2010 meeting on the same topic.
2. The problem statement authors (see Item IX below) offered a presentation of the background information at TRB's 2009 Annual Meeting titled *Best Practices in Contracting Commuter Rail Services: Call for Research* (P09-0429 TRB Session 311 January 2009).
3. The General Accounting Office (GAO) published a report titled *Commuter Rail Issues Should Be Considered in Debate over Amtrak* (GAO-06-470) in April 2006; this report primarily addressed commuter rail service reliance on Amtrak's infrastructure but it did tangentially address Amtrak's role in the contract operation of commuter rail services.
4. The General Accounting Office (GAO) published a report titled *Many Factors Influence Liability and Indemnity Provisions, and Options Exist to Facilitate Negotiations* (GAO-09-282) February 24, 2009; this report primarily addressed the liability and indemnification issues associated with access to rail lines owned by freight rail companies. These issues however are intertwined with the contracting of commuter rail operations.

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

This problem statement has been prepared by two individuals, David Wilcock and James Stoetzel, on behalf of TRB's Commuter Rail Transportation Committee (AP070). Mr. Wilcock and Mr. Stoetzel developed a presentation titled*Best Practices in Contracting Commuter Rail Services: Call for Research* (P09-0429 TRB Session 311 January 2009). This presentation provided an overview of the problem statement background, service delivery models, and metrics for measuring success. This problem statement was reviewed by select members of the TRB Commuter Rail Transportation Committee and other commuter rail transportation professionals selected by the preparers. The Committee voted in support of submitting this statement to TCRP at their mid-year meeting held June 13, 2009.

XI. DATE AND SUBMITTED BY

Submitted by: David C. Wilcock and James R. Stoetzel on June 12, 2009.

10-G-05

TCRP Problem Statement

I. PROBLEM TITLE

A General Managers' Guide – Using ITS Data to Improve Internal Business Practices

II. RESEARCH PROBLEM STATEMENT

The TCRP Program has published a number of excellent studies on the procurement and use of Intelligent Transportation Systems (ITS) in the transit industry. However, in many transit agencies, these systems are still procured and used in stand-alone modes by the individual business unit that sponsored the deployment. This practice limits the ability of a broad range of business areas to benefit from the acquisition of data that were previously unavailable. The result of not integrating available ITS technologies into business and planning functions can lead to lost opportunities to achieve operating and capital cost savings, and can even lead to additional expense of duplicating data collection efforts.

TCRP Report 126 described a number of reasons for the lack of integration, including:

- Lack of budget
- Lack of information technology (IT) tools, such as databases
- Problems integrating proprietary ITS systems
- Lack of expertise and technical support
- Systems that are not capable of organization wide data sharing
- Poor or undeveloped relationships and communication between IT departments and other departments
- Business practices and structures that have not adapted to the emerging ITS environment and lack direction

Some agencies, however, have succeeded at integrating systems and sharing data. In general, those agencies are ones in which the top management had the vision to require planning for ITS systems and directed the various departments to cooperate in sharing data. In short, overcoming the resistance to change inherent in many transit agencies requires leaders who understand the importance of ITS to the future of the industry.

III. OBJECTIVE

The purpose of this project is to develop a brief high-level guidebook for general managers that shows the benefits of integrating and sharing ITS data and provides a framework that a GM can hand to his or her chief technology officer to use in developing a technology plan and agency architecture to guide the procurement of new systems, upgrade of existing legacy systems and the creation of data archiving, analysis and communication tools. The guidebook also would explain how all departments in the agency need to participate in developing and implementing the plan and architecture.

IV. RESEARCH PROPOSED

This project would conduct research on the existing status and best practices of ITS data integration within the planning and other business functions of transit agencies. It would survey both transit agencies that have demonstrated successful integration of ITS systems, and vendors of ITS technologies, to develop case studies and guidance. The research would develop tools that transit agencies can use to inventory the data resources created by their ITS technologies and effectively incorporate the needs of the planning and other business functions into planned replacement and/or upgrading of various technologies. This project continues recent TCRP efforts in the area of technology implementation and intelligent transportation systems (ITS) data with development of user friendly, self-guiding tools for both technical and non-technical ITS users.

The research should examine the relationship between agencies' policy/management/operational goals and objectives and ITS technologies deployment. The outcome of this research could provide three main

deliverables. First, the research should provide a guide to best practices in ITS data collection and integration with internal transit planning and other business functions. Selected agencies, both domestic and foreign, would be surveyed show how data from ITS deployments are being used in customer research, service planning and capital project planning. This research would be used to allow agencies to develop agency-wide architectures for the exchange, archiving, analysis and communication among various systems and various planning applications. Second, a checklist should be developed for use as a guide to inventorying existing systems and data resources and specifying data capture and exchange for the procurement of new or upgrades to legacy systems. Third, a list of references should be produced to guide transit agencies to improve their weak areas of the use of ITS technologies identified in the inventory, compared to best practices.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD
Recommended Funding: $350,000-$400,000
Research Period: 24 months

VI. URGENCY AND PAYOFF POTENTIAL
This research is urgently needed because transit agencies are rapidly acquiring new and costly ITS technologies. It has the potential to achieve significant savings in the procurement of new technologies and in the costs of acquiring data by various business and planning functions within the agencies. Actual savings are expected be documented for case studies.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES
This project responds to FTA Strategic Research Goal 1: Provide National Transit Research Leadership Objective 1.1 Provide vision and prepare the nation for transit advancements, Goal 3: Support Improving the Performance of Transit Operations and Systems Objective 3.1 Perform research to improve capital and operating efficiencies (capital, operating, and maintenance costs), Objective 3.2 Perform research to improve transit planning and forecasting (e.g., operations, linking transportation systems, transit-oriented development and land use, solving the last mile) and Objective 3.4 Investigate the use of high-efficiency technologies and alternative energy sources (vehicles and facilities)

It responds to TCRP strategic priorities: II. Enable Transit to Operate in a Technologically Advanced Society, III. Continuously Improve Public Transportation, and V. Revitalize Transit Organizations.

VIII. RELATED RESEARCH
This project continues recent TCRP efforts in the area of technology implementation and intelligent transportation systems (ITS) data. Refer to TCRP Report 126: Leveraging ITS Data for Transit Market Research: A Practitioner's Guidebook, TCRP Report 84: E-Transit: Electronic Business Strategies for Public Transportation Volume 8 – Improving Public Transportation, TCRP Report 113: Using Archived AVL-APC Data to Improve Transit Performance and Management, TCRP Synthesis 73: AVL Systems for Bus Transit: Update

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

This problem statement was initiated the three individuals identified above and was developed and refined through a collaborative effort of a sub-committee of TRB Committee AP025 Public Transportation Planning and Development

XI. DATE AND SUBMITTED BY

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10-G-06

TCRP Problem Statement

I. PROBLEM TITLE

Understanding and Managing Public Transit Contracts: Assessing the efficiency and effectiveness of Service Delivery

II. RESEARCH PROBLEM STATEMENT

The 1998 Transportation Equity Act for the 21st Century (TEA-21) called for the Transportation Research Board (TRB) to conduct a study on contracting by recipients of federal transit grants. This resulted in the publication of the most comprehensive research on contracting practices in transit industry – TRB special report # 258 "Contracting for Bus and Demand Responsive Transit Services: A survey of US Practice and Experience." The study included a two-part survey and interviews with local officials, transit managers, and labor representatives. This seminal study revealed details on the frequency of contracting out and how agencies obtain and manage contractual services. The study also provided important insights about the effects of transit contracting on various aspects of transit services. The study suggested that different circumstances produced different levels of efficiency and effectiveness when contracting out services. However, further follow-up research has yet to be conducted on identifying these particular circumstances.

Due to the current fiscal crisis facing all levels of government, it has never been so critical for agencies to identify which contracting out arrangements are the most efficient and effective for different types of functions and different types of agencies. In addition to this, we plan to building on the previous study, and identify how contracting practices in the transit industry during the past 10 years, and alert agency officials to any new innovations and best practices.

III. OBJECTIVE

The main objective of this research is to identify and disseminate the best contracting practices among demand response and bus service providers. The project will also be able to track the changes and improvements in the industry over the past 10 years, focus on how the practice of contracting out has evolved and whether transit industry experience with contracting has changed and produced new innovations. This research will help decision-makers to approach contracting decisions in a more scientific way by identifying the particular circumstances that maximize performance and enhance agency efficiency.

IV. RESEARCH PROPOSED

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

- Identifying current contracting out practices through a large-scale contracting out survey of transit industry with the subsequent selection of several in-depth case studies;
    - The original survey design will replicate the most important questions about contracting from the previous TRB contracting study to track the changes and practices over time. However, the survey will add some questions that were not answered before to enhance the overall study design. The first part of the

questionnaire will focus on the reasons for contracting, while the second part of the questionnaire will focus on the structure of contracting itself.
    - The survey will be administered through the Internet using survey share, which might positively affect the response rate to the survey
    - The case studies will be selected based on the survey data to identify the cases that are most typical for large and small contractors, the most typical large and small agencies that do not contract out, and examples of atypical cases that both contract out and perform only in-house operations. The benefit of this design is in the possibility to identify the reasons why some agencies contract out only for a portion of their services.
- Identifying how the extent and practice of transit service contracting has changed over the past 10 years
    - Comparing current research results with the TRB special report #258
    - Tracking literature and various studies on the topic to see how the literature attitude toward contracting has changed over the past 10 years.
- Estimating how contracting and partial contracting affect customer service, operating costs, safety and other aspects have changed.
- Focusing on developing various scenarios that can help transit agencies to select particular aspects of operations to be contracted out or under what circumstances contracting out is the best option.

There are two major benefits to the transportation research community in the proposed outline: the possibility of tracking transit contracting out over time as well as the triangulation of the larger survey data with case studies and interviews.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

The project is estimated at approximately 350,000 for the time period of 22 months to cover the expenses of large transit survey, case studies, interviews, and pilot tests of recommendations.

Research Period: The estimated time period required to complete this project is approximately 22 months which includes 3 months for preparing and pre-testing a survey, 7 months of actually conducting survey with up to three different follow ups, preparation of interim report and further selection of case studies based on the data collected (3 months), 1 month for interim report review, 4 months for detailed case studies preparation, 2 months of follow up interviews with transit industry to pre-test recommendations, and 2 months for the review of the final report and revisions of the final draft.

VI. URGENCY AND PAYOFF POTENTIAL

Current economic conditions affect both agencies and customers. As more people have to rely on public, agencies have to come up with some alternative and innovative ways to bring in more revenue or save funds in some way. This study will help to identify whether contracting out can be helpful to some of the agencies in current economic conditions by identifying practices in transit which bring savings at the same time as quality.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

Our proposed research topic focuses on both FTA strategic goals and TCRP strategic priorities. Contracting out is an integral part of transit operations. By assessing the best strategies and current accepted practices, we can improve the performance and efficiency of transit operations and systems, enhance customer relationships, and revitalize transit organizations.

VIII. RELATED RESEARCH

There is an abundant literature on contracting in general, but large empirical studies of this scale are rare. The previous special report #258 is the baseline for this research. Also, there has been a growing body of literature connecting institutional forms with efficiency and effectiveness in transit contracting such as articles by Leland and Smirnova (2007), Smirnova, Leland, and Johnson (2008), Leland and Smirnova (2009).

References:

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Leland, Suzanne and Olga Smirnova. Forthcoming, "Reforming Government through Contracting: Critical Issues and Implications," *Public Administration Review*.

Smirnova, Olga, Suzanne Leland, and Gary Johnson. 2008. "Popular, but More Influential? A Test of Whether Special Purpose Governments Impact Federal Transit Financing," accepted for a publication in *The Municipal Finance Journal*.

Transportation Research Board. (2001). *Special Report 258: Contracting for bus and demand response services: a survey of U.S. practices and services.*

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

This problem statement has been developed as the result of many years of collaborative work between Suzanne Leland and Olga Smirnova.

XI. DATE AND SUBMITTED BY

Submitted on June 15, 2009 by Olga Smirnova, Ph.D. (East Carolina University) and Suzanne Leland, Ph.D. (University of North Carolina at Charlotte).

10-H-04

FY2010 TCRP RESEARCH PROBLEM STATEMENT

I. PROBLEM TITLE

Transit Capacity and Quality of Service Manual, 3rd Edition

II. RESEARCH PROBLEM STATEMENT

The Transit Capacity and Quality of Service Manual (TCQSM) was initially published in 1999 through the TCRP A-15 project. The TCQSM serves as a comprehensive resource document presenting information on principles and practices of transit capacity for all transit modes, and of transit quality of service from the passenger's point-of-view. The TCQSM supplements the Highway Capacity Manual, which focuses on presentation of highway capacity and quality of service principles and practices. A subset of the material in the TCQSM 1st Edition serves as the basis for the transit chapters in the Highway Capacity Manual 2000 (HCM2000).

Subsequent to the publishing of the HCM2000, a 2nd Edition of the TCQSM was published in 2003 through the TCRP A-15A project. Whereas the 1st Edition was primarily a synthesis effort of previous transit capacity research, with the quality-of-service section being its primary new contribution, the 2nd Edition focused on filling gaps in previous research, updating capacity and quality-of-service procedures, and incorporating feedback from users of the 1st Edition. The 2nd Edition, TCRP Report 100, has subsequently become TCRP's best-selling document.

A 2010 edition of the Highway Capacity Manual is currently under development. The 2010 HCM will have a more multimodal focus than before, but given the existence of the TCQSM, the increasing page count of the HCM as a result of new research, and the difficulty of keeping the two manuals' content in synch with each other, the 2010 HCM will present a more streamlined presentation of transit. The HCM project's intent is to have a strong TCQSM continue to be the primary source for basic information on transit capacity and quality of service. Given a new HCM 2010, there is strong feeling that an update of the TCQSM, a 3rd Edition, is required to reflect refined highway and multimodal analysis procedures, and to incorporate the substantial research related to transit capacity and quality of service that has occurred since 2003.

The TCQSM is a cornerstone of the TCRP report series. It is used by numerous universities as a basic transit education tool, was previously the subject of a National Transit Institute course, and was used by one large transit agency as an educational tool for their transit board in a series of workshops on transit quality of service, performance measurement, and service standards. An Internet search by the AP015 committee found numerous examples of usage of the TCQSM by transit agencies, metropolitan planning organizations (MPOs), and state DOTs. The manual's transit level of service measures are the most commonly applied portion of the document, particularly in long-range transit plans and transit development plans, although they have also been applied to corridor studies, alternatives analyses, and environmental impact statements. The state of Florida developed a guidebook for transit agencies and MPOs on ways to apply the TCQSM's transit LOS measures. The manual's documented capacity applications have particularly focused on BRT operations, although one example of a light rail application was also

found in the committee's Internet search, along with examples of the manual being used as a source of comparative modal capacities. In addition, the manual is often used as a source of transit definitions and transit capacity and quality of service concepts, even when the manual's specific procedures are not required or used for a particular application.

The TCQSM has also become known and applied throughout the world, with the Chinese and French governments already having translated the 2nd Edition. Research papers presented at TRB Annual Meetings on the usage of, and proposed improvements to, the TCQSM have come from Ireland, Netherlands, Brazil, Mexico, South Korea, and India, among other countries. Because of its international usage at this time, there is interest to have the TCQSM expanded to include data on transit capacity characteristics outside North America, and truly become an international document. Needed improvements that have been identified for the TCQSM include:

- An assessment of the acceptability to the transit industry of the A-F level-of-service (LOS) system used to describe quality of service and, if necessary, refinements to the LOS system. Although the quality of service concept itself seems to be well-received, anecdotal evidence suggests that agencies are reluctant to use the letter grades because of their perceived link to school grades and/or because of a belief that transit is fundamentally different from the auto mode and should not have a similar type of measurement scale.
- Expanded guidance on using quality of service measurement techniques in real-world applications.
- Substantial expansion of the section on bus rapid transit, drawing from recent FTA and TCRP reports, along with various papers in the literature.
- Expansion of the Ferry Capacity and Stops, Stations, and Terminals chapters, which were assembled based on limited data and provide no guidance on alternative analysis tools that can supplement the TCQSM's procedures.
- An evaluation of enhanced TCQSM analysis techniques and performance measures from the literature and, if appropriate, incorporating the findings into the 3rd Edition.
- Updating transit capacity statistics to current values.

III. OBJECTIVE

The objective of the research is to develop a 3rd Edition of the TCQSM, to reflect the latest transit capacity and quality of service applications and research, the new multimodal focus and procedures in the 2010 Highway Capacity Manual, and interest in the international community to expand the manual to reflect transit conditions outside North America. The TRB Committee on Transit Capacity and Quality of Service (who has submitted this research problem statement) has as its major mission the maintenance and updating of the Transit Capacity and Quality of Service Manual.

IV. RESEARCH PROPOSED

The specific research proposed will include:

- Outreach to the transit industry on TCQSM usage and desired improvements and/or changes;
- A detailed review of transit capacity and quality of service research and applications produced since the 2nd Edition;
- A series of mini research projects to address identified gaps or needed content updates;
- Collection and synthesis of updated transit capacity data for different transit modes, both within and outside North America; and
- Production of the 3rd Edition of the TCQSM.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding:

A total of $400,000 is proposed to prepare the 3rd Edition of the TCQSM. This compares to 2.5 times that amount being awarded through NCHRP to develop the 2010 HCM, not including several million dollars in funded research to update specific HCM methods.

Research Period:

It is proposed that the research period for the 3rd Edition be set at 24 months. If approved by the TOPS panel this year, and contractor selection in 2010, the document could be completed by sometime in 2012 and published no later than 2013, which would be 10 years after the 2nd Edition was published.

VI. URGENCY AND PAYOFF POTENTIAL

This research is critical to conduct given the development of many new transit systems and much research on transit capacity and quality of service related topics since the 2nd Edition of the TCQSM was published in 2003. There is also a critical need for the TCQSM to keep pace with the Highway Capacity Manual's evolution, and its new 2010 document, given the cross-referencing between the two documents and presentation of consistent data and analysis procedures. There also is much interest internationally, as reflected through the World Bank and other contacts, of the TCQSM evolving into an international tool. Many transit agencies, local/state/federal governments and consultants are now using the TCQSM on a daily basis in helping those plan and design new or improved transit systems. Universities also see the TCQSM as a cornerstone teaching tool as they expand curriculum into the transit planning and operations areas for students.

Certainly given that the TCQSM has been TCRP's best selling publication, a 3rd Edition would have much demand.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES AND TCRP STRATEGIC PRIORITIES

FTA:

The preparation of a 3rd Edition to the TCQSM is consistent with FTA's strategic research goals of: (1) Support Increasing Transit's Market Share and (2) Support Improving the Conditions of Transit Operations and Systems. The new manual will provide enhanced tools to identify which transit operational and facility improvements can best meet capacity needs, and provide insights on better decision making and cost-effectiveness associated with the planning and design of transit investments. The 3rd Edition of the TCQSM, through an updated set of transit quality of service principles, measures, and analysis procedures, will provide a road map for assessing how transit service and facility improvements can best serve passenger desires and thus have an impact ultimately on transit ridership.

TCRP:

TCRP's first strategic priority to Place the Transit Customer First, can be directly influenced by the development of enhanced transit quality of service assessment principles, measures, and analysis procedures – from the passenger's point-of-view, in the 3rd Edition to the TCQSM. Also provision of updated data and analysis procedures related to transit capacity will allow for more informed transit investment decisions related to application of the most appropriate transit mode and service characteristics given the particular environment.

VIII. RELATED RESEARCH

There are several CRP research efforts completed over the past five years or now underway that will provide input related to the development of modified and expanded transit capacity and quality of service information in the TCQSM 3rd Edition. These include:

- TCRP A-23: Implementation Guidelines for Bus Rapid Transit Systems
- TCRP A-23A: Cost and Effectiveness of BRT Components
- TCRP A-31: Guidebook for Assessing & Improving Performance of Demand Response Transportation
- TCRP B-38: Guidelines for Providing Access to Public Transportation Stations
- TCRP D-13: Guidelines for Implementing Bus-on-Shoulder (BOS) Systems
- TCRP H-40: Guidelines for Ferry Transportation Services – A National Overview
- NCHRP 3-70: Multimodal Arterial Level of Service
- NCHRP 3-92: Development of the 2010 Highway Capacity Manual

In addition, the World Bank is planning to conduct a minor research effort to prepare international transit capacity data which could be incorporated into the TCQSM 3rd Edition.

IX. PERSON DEVELOPING THE PROBLEM

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June 12, 2009
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10-H-05

TCRP Problem Statement

I. Computer model for rail noise predictions

II. RESEARCH PROBLEM STATEMENT

Current studies of rail noise that must be performed as part of the environmental assessment usually are based on noise prediction procedures that are defined in the Federal Transit Administration manual *Transit Noise and Vibration Impact Assessment* or the Federal Railroad Administration manual *High Speed Ground Transportation Noise and Vibration Impact Assessment*. These procedures are suitable for implementing with spreadsheets and do not incorporate the more advanced noise prediction procedures that require computer programs. For example, the TNM (traffic noise model) uses detailed predictions of sound propagation and barrier attenuation that substantially increase the accuracy of the noise predictions.

One of the hurdles limiting the development of a rail noise prediction model similar to the INM for airports and the TNM for highways is the expense of developing any detailed computer model. Proper evaluation and control of noise impacts requires implementing accurate estimation techniques that are applicable to the full spectrum of rail projects, especially in urban and suburban areas where people are exposed to transit noise. Because the physics of noise propagation do not change for various rail vehicle types, it is feasible to include a wide variety of rail noise sources into a single model. This has been accomplished by the new computer model, the Florida Rail Model. However, to fully advance the model to be state-of-the-art, substantial modifications and expansions are needed.

III. OBJECTIVE

The objective of this research would be to expand the Florida Rail Model to use state-of-the-art algorithms for sound propagation and barrier analysis similar to the algorithms used in INM and TMM. Of note is that this would not require starting from ground zero but only advancing components as needed.

This would result in a publically available computer noise model that could be used for all forms of rail transportation and by multiple agencies.

IV. RESEARCH PROPOSED

Because the fundamental model logic has been successfully implemented in the Florida Rail Model, this research would consist of modifying and expanding the current version of the Florida Rail Model. Features that would be added include (but are not limited to):

- Using 1/3 octave bands to calculate propagation effects instead of the overall A-weighted technique now used.
- More definition of noise sources in terms of height, directivity, and frequency. Rail noise sources include both moving and stationary sources. The moving sources include wheel/rail noise, train horns and bells at grade crossings, wheel squeal, locomotive engine and exhaust noise, and aerodynamic noise for high-speed trains. Stationary sources include bells at grade crossings, wheel impacts at special trackwork, and wayside horns.
- Implementing state-of-the-art procedures for sound attenuation and reflections by walls and other obstructions especially in urban and suburban areas. This is of particular importance for the commuter, passenger, and freight rail systems that must follow FTA rules for sounding horns at grade crossings. The noise impacts from train horns often extend a considerable distance from the grade crossing and accurate prediction of the impacts require accounting for factors such as how the source height, ground impedance, and buildings affect sound propagation. If these factors are not accounted for, the resulting impacts may be substantially overstated.
- Improved graphics. The improved graphics would simplify the data entry procedure, provide tools that users could use to identify verify the consistency and accuracy of input data, and would provide presentation tools to help illustrate the predicted noise impacts and the benefits of different mitigation strategies.
- Further validation. A key factor in the proposed research is to validate the model and to provide users with guidance on how to apply the model results.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: The recommended funding for this project is $350,000. This includes the effort to update and expand the current Florida Rail Model and various measurement efforts to determine reference levels for the noise sources to be included in the model, and at least preliminary validation of the model. Full implementation of the model and noise source identification may require additional funding.
Research Period: 2.5 years

VI. URGENCY AND PAYOFF POTENTIAL

The need for a rail-noise computer program has been widely recognized and discussed for at least 15 years by those involved in assessing rail noise impacts. By building on the work that has already been performed to develop the Florida Rail Model, it will take substantially less effort to develop a program that can be widely applied to a variety of rail projects than would be the case if starting from scratch. The committee preparing this problem statement believes that this is an opportunity worth pursuing. The outcome of the project would be a computer program that incorporates sophisticated models of noise source definition, sound propagation, noise barriers, and other important acoustical effects. With this model, it should be possible to perform a more detailed evaluation of mitigation options than is feasible with the current tools.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

This problem statement falls under FTA's strategic research goal 4, "Protecting the Environment and Promoting Energy Independence." Noise is often a major source of concern for the communities that proposed rail transit lines pass through and a source of complaints that operating agencies and maintenance personnel must address. An improved prediction model would allow better understanding of potential noise impacts and would provide analysts with better tools for investigating the benefits of different mitigation approaches. This combined with improved graphics could be used aid understanding of the noise issues in presentations to transit agency boards and in public meetings.

VIII. RELATED RESEARCH

The research most closely related to the proposed project is newly completed Florida Rail Model that is mentioned in this problem statement as the starting point and the ongoing efforts at the Volpe Center to update the airport and highway-noise models. There also is ongoing research sponsored by the European Union and other countries related to predicting noise from rail transit systems. Review of this research would be part of the proposed research project.

IX. PERSON(S) DEVELOPING THE PROBLEM

This problem statement was developed by the Rail Transit Subcommittee of Committee ADC40, Transportation-Related Noise and Vibration. Those contributing to and supporting the problem statement include:

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In addition, the AR055, Rail Transit Infrastructure Committee, has stated that they support the goals of this project and endorse funding of the project.

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

The problem statement is based on the work of the TRB ADC40 Transit Subcommittee that has been conducting workshops as part of the TRB Winter meetings for the past three years on issues related to transit noise and vibration. The subcommittee has found that a stumbling block to quantifying transit and rail noise impacts and identifying adequate mitigation measures has been the lack of more detailed modeling tools.

The idea of developing a rail-noise model has been discussed for over 10 years and was discussed in the January 2009 meeting of the ADC40 Rail Transit Noise and Vibration Subcommittee. Following a presentation on the Florida Rail Model by Roger Wayson, there was considerable discussion about what would be required before the model could be generally applied to predicting noise from rail projects. There was consensus that the Florida Rail Model would be a good starting point and that a rail noise model would be widely applied by the participants in the subcommittee meeting. This problem statement is a direct outcome of that discussion.

XI. DATE AND SUBMITTED BY

Provide the specifics (see Section IX) of the person(s) who submitted the problem and the date of submission.

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10-H-06

TCRP Problem Statement

I. PROBLEM TITLE

Transit at the land Use Decision-Making Table

II. RESEARCH PROBLEM STATEMENT

Transit agencies often are excluded from decision-making on land use issues that can significantly affect ridership and operations. New developments are planned and constructed without any consideration of how transit would serve them. In some cases, developers have an "anti-transit" attitude and deliberately relegate bus stops to remote and less visible locations. Often developments are planned without sidewalks or have street patterns that do not allow buses to circulate efficiently. In many instances, transit agencies are reluctant to participate in the land use planning and approval process because they lack staff resources or even more significantly, because they lack the budget and resources to serve new developments. Also, when transit agencies need to develop new facilities such as intermodal terminals and maintenance facilities, they can run into significant problems with local land use planning agencies, delaying or even stopping needed projects.

III. OBJECTIVE

This research will produce a guidebook on what transit agencies should know about the land use planning process and how they can become involved in land use decisions that impact ridership, operations and the ability of the transit agency to serve the community. The guidebook would include information on typical planning and zoning approval processes, a set of recommended physical guidelines for incorporating transit services and facilities into development projects, information on how the transit agency should be involved in the land use planning and zoning process and a description of the technical, staffing and budgetary resources that would be needed to support a transit agency's involvement. The guidebook also should include strategies that transit agencies can use to frankly discuss the issues of constrained resources with the other stakeholders involved in the land use planning and approval process. It should include examples of instances in which transit agencies have negotiated agreements with developers and tenants, or found other ways to subsidize new facilities and services.

IV. RESEARCH PROPOSED

The research would survey transit agencies and develop information on current practices and experiences. A number of agencies have produced useful documents such as design guidelines and standards for transit modes, for joint development and transit oriented development. The research team would collect and review these documents and would prepare a set of recommended guidelines that represent best practices. The research team also would identify and document case studies demonstrating successful examples of transit agencies: becoming involved in the land use planning and zoning process, working with developers to integrate transit services into new projects, obtaining the resources to participate in the process and support new services, and working successfully with local planning and zoning boards to obtain approvals for new passenger facilities and maintenance facilities.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: $350,000-$400,000
Research Period: 24 months

VI. URGENCY AND PAYOFF POTENTIAL

There are significant imminent changes that add to the urgency of this project. The currently stalled development market is likely to turn around within the next couple of years. Reauthorization of the surface transportation act is likely to require increased coordination between transit investments and land use planning. Increased demands will be placed on the transit industry to increase service as a means to improve livability and sustainability of our communities. The transit industry needs to prepare for these changes. By improving the ability of transit agencies to participate in the land use planning process it will be possible to increase ridership and improve operations.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

This research supports FTA's strategic research goals as follows: Goal 1: Provide National Transit Research Leadership through achieving Objective 1.3 Synthesize research results to provide useful bodies of knowledge for transit industry decision makers and to shape the national transit research agenda; Goal 3. Support Improving the Performance of Transit Operations and Systems - Objective 3.2 Perform research to improve transit planning and forecasting (e.g., operations, linking transportation systems, transit-oriented development and land use, solving the last mile)

It also supports three of the five TCRP research goals: I. Place the Transit Customer First: III. Continuously Improve Public Transportation: IV. Flourish in the Multimodal Environment

VIII. RELATED RESEARCH

TCRP Synthesis 76, Bus Transit Service in Land Development Planning identified many of the issues discussed in this problem statement and pointed to the need for the kinds of guidebook described in Section III above. Other research on Transit Oriented Development has been conducted by TCRP (e.g. TCRP reports, 102, 128, and legal research digest 12.) The American Public Transit Association (APTA) has a committee working on Sustainable Urban Design Standards (SUDS) that can contribute to this research.

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

This problem statement was developed in draft form by an individual and was reviewed and revised through a collaborative effort with members and friends of TRB Committee AP025 Public Transportation Planning and Development

XI. DATE AND SUBMITTED BY

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10-H-07

TCRP Problem Statement

I. PROBLEM TITLE

Rail Transit Corridor Analysis: Planning and Retro-fitting for Community Development

II. RESEARCH PROBLEM STATEMENT

The effect of Transit Oriented Development (TOD) on housing, parking, travel, and trip generation has been explored in previous studies (See TCRP Report 128), though the station or "node" as a unit of analysis neglects the role of development patterns between stations. Unlike highway corridor analysis, where access is as easy as a curb cut and connecting roads can be frequent, rail transit access is limited by station spacing.

A series of questions need to be addressed about the historic patterning of a community along a rail line: the mix of residential, commercial, industrial uses; the pedestrian and road networks linking these uses; the effects of the rails as an organizer of this patterning both historically and presently.

- To what extent can these communities and their transit be mutually retrofitted and grown not merely at one node but along a corridor originally defining the community?
- What is the importance of stop spacing to the economic health of the community?
- What transit corridor level strategies may be employed to promote economic growth? And what is the best approach for this in a multi-jurisdictional setting?
- What would an ideal spatial patterning of land uses be along a rail transit corridor? What types of regulations and model ordinances help promote the desired strategy?
- Do individual TODs limit the effectiveness of other proximate TODs?
- What are the appropriate measures of corridor health and how may these be used in planning at the regional level?

III. OBJECTIVE

This research will produce a guidebook on how rail transit lines, both existing and proposed, can be used to revitalize older urban corridors. The project would examine successful examples of urban areas that have benefitted from planning and economic development initiatives, infrastructure improvements and implementation of new urban amenities using rail transit corridors as the organizing spine. The research would document how these programs were initiated, the planning processes used, underlying design principles, the role of the transit agency and improvements to the transit infrastructure, financing and implementation strategies, and the benefits that can be achieved.

IV. RESEARCH PROPOSED

This study would explore the transit corridor as a unit of analysis influencing and being influenced by the rail service with which it is intertwined. This is germane to transit lines with close station/stop spacing around which the surrounding community or communities have developed; mixed-use corridors that are walkable, bikeable, and rideable, and where the transit line acts as a spine for a cohesively-developed whole and shared sense of place. Special attention should be placed on the revival and retrofitting of older railroad or streetcar/trolley communities who have been experiencing waning fortunes. By examining the rail corridor as the unit of analysis, one seeks to better determine the relationship between rail service and land use policy, and to explore issues of urban redevelopment and the community consensus building process at a corridor, often multi-jurisdictional scale.

The study would assess the opportunities in enhancing surrounding land uses along existing transit corridors and determine not only to what extent a specific patterning of development in a rail transit corridor supports ridership, but to what extent the rail service promotes patterning. This corridor level study integrates transportation analysis (ridership, parking, access, grade crossings, double tracking, etc.), with land use (residential, commercial, zoning),

safety concerns, and economic development/impacts in service of preserving and enhancing transit service and supporting land use.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: $350,000-$400,000
Research Period: 24 months

VI. URGENCY AND PAYOFF POTENTIAL

Transportation Secretary LaHood has named "sustainability" and "livability" as two of the priorities of the Obama administration. Reauthorization of the surface transportation act is likely to require increased coordination between transit investments and urban economic redevelopment. Increased demands will be placed on the transit industry to increase service as a means to improve livability and sustainability of our communities. The currently stalled development market is likely to turn around within the next couple of years. This research will develop a body of knowledge that transit agencies can use to meet the challenges posed by these impending changes.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

This research supports FTA's strategic research goals as follows:
Goal 1: Provide National Transit Research Leadership through achieving Objective 1.3 Synthesize research results to provide useful bodies of knowledge for transit industry decision makers and to shape the national transit research agenda;
Goal 3. Support Improving the Performance of Transit Operations and Systems through achieving Objective 3.2 Perform research to improve transit planning and forecasting (e.g., operations, linking transportation systems, transit-oriented development and land use, solving the last mile)

It also supports four of the five TCRP research goals:

I. Place the Transit Customer First: The importance of the transit rider as well as the community at large as the customer was a principal outcome of the TCRP Future Search. The American consumer society is demanding; no industry can prosper that does not place the customer first.
II. Enable Transit to Operate in a Technologically Advanced Society: TCRP will support public transportation to integrate state-of-the-art technology in all aspects of its business so that mobility needs can be served as communities change and customer needs evolve.
III. Continuously Improve Public Transportation: The TCRP will support communities throughout the United States to continuously improve public transportation.
IV. Flourish in the Multimodal Environment: More authority for transportation investment decisions is now in the hands of state and local decision-makers. The transit industry must work harder and smarter to realize the intermodal flexibility and community-based planning opportunities offered by federal and other programs.

VIII. RELATED RESEARCH

TCRP Report 102 and TCRP Report 128 are both landmark publications on Transit-Oriented Development. Also, TCRP Report 22 The Role of Transit in Creating Livable Metropolitan Communities addressed case studies that were location specific, but none of these efforts examined urban revitalization at the corridor scale.

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

This problem statement was developed in draft form by an individual and was reviewed and revised through a collaborative effort with members and friends of TRB Committee AP025 Public Transportation Planning and Development

XI. DATE AND SUBMITTED BY

Joana Conklin, VHB, Watertown Mass. jconklin@vhb.com, Chair Research Sub-committee TRB Committee AP025.

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10-H-09

TCRP PROBLEM STATEMENT

I. PROBLEM TITLE

Intergovernmental Review (IGR) Transit Traffic Impact Study (TIS) Best Practices

II. RESEARCH PROBLEM STATEMENT

Traffic Impact Studies (TIS) are required for assessment of the transportation impacts of local development. They drive professional planners and engineers to develop measures that mitigate the increases in trips generated. They also lay the foundation and determine the amount of investment needed. However, most current TIS guidelines have deficiencies because they lack strong transit components. There is an overwhelming need to analyze existing TIS guidelines to determine best practices, gather necessary data, and then develop a TIS guide transit addendum for state agencies, developers, and responsible agencies. This project will provide the tool necessary to determine and justify pro-transit mitigation measures. Its methodology will clarify a process that considers multimodal solutions to offset the increase in trips that would otherwise occur. The goal is to produce an analysis methodology that considers the existing and potential impact of transit in relation to proposed development projects.

This effort will produce a multimodal tool that benefits the overall transportation system by; 1) facilitating a reduction in Vehicle Miles Traveled (VMT), 2) increasing person throughput (opposed to vehicle throughput) along congested corridors 3) improving roadway Level of Service (LOS), 4) enhancing transit LOS, and 5) maximizing the transportation system investment. The methodology will be incorporated into TIS guides and be a product that can be utilized by diverse communities across the nation.

III. OBJECTIVE

The purpose of this study is to analyze existing TIS to determine how to incorporate transit improvements and amend the current TIS document to provide states, developers, and responsible agencies the tools to determine and justify mitigation measures. The final product will be a traffic analysis methodology that incorporates transit performance and improvements that can be added to Traffic Impact Study Guidelines and used across the U.S. in a variety of types of communities.

IV. RESEARCH PROPOSED

Analyze existing TIS documents for transit deficiencies, review transit analysis methods, and create transit assessment strategies that can be incorporated into TIS guides. A TIS Transit Addendum is vital for studying all potential transportation improvement options to ensure the most appropriate solutions are pursued and that limited transportation resources are not wasted on ineffective projects.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: $250,000

Research Period: 2 years

VI. URGENCY AND PAYOFF POTENTIAL

The current TIS guidelines only focus on highway improvements to address circulation of automobiles. A document which reflects transit will factor in the benefits of transit to better manage interstate and regional traffic and develop best practices towards reducing congestion and reflecting the benefits of transit. Focusing primarily on improving the movement of automobiles is short sighted and ultimately limits potential benefits. Expanding the analysis methods to effectively assess the benefits and impacts of transit will aid in the development in truly multimodal communities.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

Support Increasing Transit's Market Share:*This project will provide transit agencies the necessary tools to compete with traditional highway investments. Without such a tool lead agencies will not be able to compare the value of requiring transit mitigation measures and the investments recommended will most likely go to automobile dependent transportation solutions.*

Support Improving the Conditions of Transit Operations and Systems:*Tools to assess transit's value in the transportation system areas necessary for transit providers to be able to compete for scarce resources. Better information will improve the competitiveness of transit providers when planning and programming decisions are made.*

I. Place the Transit Customer First

The importance of the transit rider as well as the community at large as the customer was a principal outcome of the TCRP Future Search. The American consumer society is demanding; no industry can prosper that does not place the customer first. *The information from this study will finally allow transit users the same benefits automobile users have when advocating for improving their mode. The study will create a tool that allows the transit customers voice to be included in transportation decisions.*

II. Enable Transit to Operate in a Technologically Advanced Society

TCRP will support public transportation to integrate state-of-the-art technology in all aspects of its business so that mobility needs can be served as communities change and customer needs evolve. *Transit analysis tools are very much needed, especially those that can compare impacts with other modes such as those supporting single occupant vehicles. Technological advancement to improve transit cannot be employed until we are able to compare modes effectively. This tool is vital for transit providers to acquire sufficient funding to be more technologically advanced.*

III. Continuously Improve Public Transportation

The TCRP will support communities throughout the United States to continuously improve public transportation. *Transit is necessary for not only commuters to get to work with the least congestion and pollution, but also for a large segment of the population with no alternative transportation options. If transit benefits cannot be compared to automobile benefits, transit users will continually have inferior facilities that do not meet their needs.*

IV. Flourish in the Multimodal Environment

More authority for transportation investment decisions is now in the hands of state and local decision-makers. The transit industry must work harder and smarter to realize the intermodal flexibility and community-based planning opportunities offered by federal and other programs. *Local developer investment can provide incredible improvements to the multimodal system, but*

only if appropriate analysis tools, such as a transit addendum to the TIS, are developed. Creating a multimodal environment is impossible without tools such as a TIS transit addendum because decision makers will not have the appropriate data to make accurate and informed choices.

V. Revitalize Transit Organizations
Information technologies, changes in the work force, and new roles and partnerships are revolutionizing the workplace. By reinventing themselves, transit organizations can "Work Better--Cost Less." *Better and more effective partnerships between transit providers, lead agencies, and developers will greatly improve the planning and funding of transit.*

VIII. RELATED RESEARCH

Unknown.

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

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XI. DATE AND SUBMITTED BY

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10-H-17

TCRP PROBLEM STATEMENT

I. PROBLEM TITLE

Trip Generation and Parking Demand at Employment-Focused TODs

II. RESEARCH PROBLEM STATEMENT

This research project would document automobile trip generation rates and parking demand at employment-focused Transit-Oriented Developments (TODs) – developments located in close proximity to transit stations or routes and consisting mainly of office, R&D, commercial/retail, and similar land uses. The emphasis of this research would be on developments constructed more recently (within the past few decades), not on traditional Central Business Districts.

We think it is important to focus on the employment/attraction end of commute trips because it has not been studied as much as the residential/production end in recent studies of this type, and because we believe significant gains can be achieved by making more efficient use of land, lowering the cost of development, and ultimately generating more ridership in these areas.

We believe that this research would be of great interest to transportation and land use planners, policymakers, researchers, and advocates. The trip generation data could be collected in such a way that it could be aggregated with other studies to help ultimately revise the Institute for Transportation Engineers (ITE) Trip Generation Manual, or parking publications by the Urban Land Institute (ULI) or other organizations. This effort would build on other recent efforts such as those summarized in TCRP Report 128 and could help influence local land use and transportation policy to achieve great benefits, as described further below.

III. OBJECTIVE

Objectives of the research project:

1. Quantify the rates of automobile trip generation at employment-focused TODs, and the extent to which they are different from employment-focused land uses in general
2. Quantity the level of parking demand at employment-focused TODs and the extent to which it is different from employment-focused land uses in general
3. Develop recommendations for changes to local government policies for transportation impact analyses and mitigation requirements based on the trip generation estimates in #1
4. Develop recommendations for changes to local government policies based on the parking demand estimates in #2.
5. As appropriate, provide input on trip generation rates and parking demand rates to national/industry organizations that compile and publish standards, such as the Institute of Transportation Engineers and the Urban Land Institute.

IV. RESEARCH PROPOSED

This research project would document and analyze automobile trip generation and parking demand at employment-focused Transit-Oriented Developments in a variety of contexts around the United States. Our proposed approach would be to use a combination of vehicular volume counts, parking utilization observations, and perhaps employer surveys to document: (1) the rate of automobile trip generation at these locations during the peak hour, peak periods and over the course of a day; and (2) the level of automobile parking demand at these locations during similar periods. These trip generation and parking demand figures could then be compared to figures employment-focused land uses in general (such as those distributed by the ITE or ULI) to determine what reductions, if any, are typically achieved by TODs. Ultimately, recommendations would be developed for how local government land use and transportation policies should be changed to reflect the research findings. This study could also provide data to help revise standards published by national/industry organizations.

We envision that this project would consist of the following general tasks:

1. Project initiation
2. Literature review/review of recent and ongoing research
3. Identification of case studies/development examples
4. Data collection and analysis

5. Development of findings and recommendations
6. Draft documentation
7. Review and revision of final report
8. Final Report

We envision that the data collection in this study could be achieved through a combination of new primary data collection (funded under the study), complementary data collection by other parties at the same time (for instance, through in-kind contributions by agencies), and reliance on other recent research projects and publications.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: Based on the TCRP-supplied figure of roughly $200,000-$250,000 per professional staff-year, we estimate that this project would require a budget of approximately $300,000 to $500,000. The actual budget would depend in part on how much primary data collection is included in the TCRP project budget and how much is conducted in other ways.

Research Period: We estimate that that this research project could be completed in approximately 18 to 24 months. This assumes roughly 3 months for project initiation, review of other research, and identification of case studies; 9 to 12 months for data collection and analysis on the case studies; 3 to 6 months for development of recommendations and draft documentation; and 3 months for review and revision of the draft final report.

VI. URGENCY AND PAYOFF POTENTIAL

We believe that this research is very timely and has a particular urgency for several reasons. First, most transit systems in the United States have experienced significant ridership gains in the past several years, so the benefits of transit on nearby development (in terms of reduction of automobile trips, or reduction in parking demand) have likely increased over the past few years; it would be helpful to document these benefits to shape policy. Second, the cycle of the real estate market is such that a substantial amount of TOD activity occurred in the real estate boom in the earlier part of this decade, while considerably less TOD (and less overall development activity) is currently happening. This lull in the cycle presents an important opportunity to influence land use policy in a more transit-supportive way, in preparation for the next upturn in the real estate cycle.

The magnitude of payoff from this research project, as well similar studies, is enormous. Revising land use policies to allow more flexible and progressive transportation impact requirements and parking requirements could allow substantially more TOD to be constructed near transit systems, at greater density and at a reduced cost. This would yield substantial benefits in terms of transit ridership, reductions in automobile trips and VMT, and reductions in greenhouse gas emissions.

Institutional and political barriers to implementation of more progressive transportation impact and parking requirements do exist. Even when there is support, however, the lack of hard data, such as new trip generation rates, may limit the ability to make the desired policy changes., This research is exactly the kind that is needed to help convince decision-makers at the local, regional and state levels to revise their policies, and provide the guidance on what the changes should be.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

This research project would address FTA Strategic Research Goal #2, Support Improving the Conditions of Transit Operations and Systems – particularly the question of how land use policies can support more efficient and effective provision of transit services. This work would also address TCRP Strategic Priority IV, Flourish in the Multimodal Environment, by helping shape local government policies in a way that creates transit-supportive communities and builds further support for transportation investment at the local, regional and state level.

VIII. RELATED RESEARCH

The proposed research project would build on the recently-published TCRP Report 128, Effects of TOD on Housing, Parking and Travel. In fact, it would help implement several of the recommendations in this report (on page 56) including "Research into the parking demand and trip generation characteristics of office, retail, and mixed-use in TOD" and considering the parking demands of these land uses over different periods. Other ongoing work in this area that we are aware of includes NCHRP Project 08-66, "Trip Generation Rates for Transportation Impact Analysis of Infill Development", a current study by the University of California Transportation Center, and the California Urban Infill Trip

Generation Study led by Caltrans. While there are a number of related efforts happening, we are not aware of a project looking specifically at trip generation and parking demand at employment-focused (attraction-end) TODs. If such a study is occurring at a state or local level, we hope that this TCRP project would help synthesize and broaden these results for the national level (much as TCRP Report 128 did for residential-focused TOD).

IX. PERSON(S) DEVELOPING THE PROBLEM

This problem statement was developed by:

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

This problem statement was developed based on input from VTA staff including transportation planners, transit planners, and modelers, as well as several transportation planners at consulting firms with experience in this area of planning and research.

XI. DATE AND SUBMITTED BY

Submitted on June 15, 2009 by:

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10-H-19

AASHTO STANDING COMMITTEE ON RESEARCH

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

TCRP Research Problem Statement

I. PROBLEM TITLE

Institutional Barriers to Improving Physical Conditions for Pedestrians Along Existing Roads

II. RESEARCH PROBLEM STATEMENT

Conditions for pedestrians along existing roads have wide-ranging impacts on whether public transportation services are used, whether students walk to school, whether people walk to local services; and, perhaps most importantly, whether people walk for general health. With the almost exclusive reliance on the automobile for decades, pedestrian accommodations were not given a high priority. Under that perspective, pedestrians did not belong on higher speed roads and, often, sidewalks for local roads were not pursued. These and other factors resulted in a lack of pedestrian accommodations on a large portion of the road network in the United States. In addition, road segments with sidewalks are often not connected; i.e., the sidewalk network is fragmented. The absence of sidewalks along existing roads is the most obvious missing accommodation. Further examples are missing accommodations for safe crossings, for those waiting for transit services, for students walking to school, etc.

When needs are addressed with limited resources (which is always the case), the basic steps to fulfilling these needs include identifying the problem, quantifying the problem, identifying cost-effective solutions, prioritizing needs, securing funding, and ensuring implementation. These steps are well established for highway improvements on the federal, state, and local levels, where well-developed methodologies, processes, and dedicated funding sources exist to address problems with the highway network to serve vehicular traffic. Such processes and funding are rarely in place for improving conditions for pedestrians. In addition, walking and biking needs are often considered together and frequently the same group or professional deals with both modes within an organization. This means that pedestrian issues do not have an exclusively dedicated champion.

III. LITERATURE SEARCH SUMMARY

A literature search showed a significant level of research with regard to safe movements for pedestrians, improved conditions for transit users, and various other related issues. However, most of this research is focused on accommodations for pedestrians along newly constructed roads and operational issues for existing pedestrian facilities. For

example, TRB Research Circular E-C084 presents the top 16 pedestrian research problem statements. These are prioritized from a list of approximately 100 research problem statements prepared by TRB's Technical Activities Division Committee on Pedestrians. Although the research statements do address pressing pedestrian issues, the issue of systematic problems with providing safe accommodations for pedestrians does not receive any attention, even though it may be one of the most critical issues for safe and efficient pedestrian circulation.

Although these systematic issues may be the most critical pedestrian issues, such a statement cannot be made without proper justification. Justification could come from related facts, e.g.:

- mileage of needed sidewalks and other missing accommodations for pedestrians
- amount of money spent on constructing missing pedestrian accommodations vs. amount that would be needed
- quantified benefits of constructing missing pedestrian accommodations
- cost/benefit analysis of constructing missing pedestrian accommodations vs. other mobility improvements.
-

However, data for quantifying these and similar facts are lacking. The hypothesis underlying this research proposal is that the absence of data and of comprehensive pedestrian-focused improvement plans relate to institutional issues, i.e., that there is no exclusive institutional ownership for pedestrian issues on the federal, state, and local levels.

Frequently, the media report the poor conditions for pedestrians, including missing sidewalks. On June, 25, 2007, Amy Hybels reported on WTOP Radio, in Washington, D.C., that "a fight to install sidewalks in a neighborhood packed with kids has parents on edge." A parent was quoted as saying that "he has been waiting nearly six years for sidewalks to be built along Old Dominion Drive." The neighborhood was still years away from getting sidewalks. On July 16, 2007, The Washington Post reported that "A survey of 840 miles of roads in Loudoun found that only 14 percent had sidewalks, according to a bicycle and pedestrian mobility plan county supervisors adopted in 2003." The subtitle of the article was: "Loudoun Residents Blaze Their Own Risky Trails Where Sidewalks and Bike Paths Are Lacking."

These stories are not unique. The absence of safe pedestrian accommodations is widespread in the United States. The following questions arise: Is the magnitude of the pedestrian problem known? What is being done to analyze the issues? What is needed to ensure the level of funding that is appropriately proportional to the magnitude of the problem?

The results of a survey by Ilona Kastenhofer of the Virginia Transportation Research Council of practices to address pedestrian needs showed that a full inventory of missing pedestrian accommodations is rare at state and local transportation organizations. Improving any network requires having data about the network. Not only do full

inventories not exist, but most of the responding states and almost half of the localities also did not keep a "wish list" of needed pedestrian improvements. Most wish lists that did exist were created through citizen involvement. Survey respondents recognized that the absence of inventories was a problem.

Survey respondents reported almost 30 different types of funds they had used for constructing missing sidewalks and other accommodations for pedestrians but only 2 were dedicated to this purpose. As with all other funds, there was significant competition. Most respondents believed that the construction of missing sidewalks was greatly under-funded in their jurisdiction. Most localities, particularly cities, had well-developed prioritization methods, but only 5 of the 26 responding state DOTs reported such a method for the construction of missing sidewalks.

IV. RESEARCH OBJECTIVE

The objective of this research is to identify and analyze institutional barriers to improving physical conditions for pedestrians along roadways. In the first phase of the research, the most critical institutional arrangements relating to improving pedestrian accommodations will be identified and described. Key topics include:

- ownership of pedestrian issues at the federal, state, and local levels
- methods to identify problems with pedestrian accommodations
- methods to prioritize needs
- frameworks for funding and implementation.

The second phase of the research will evaluate how effective current practices are in addressing conditions for pedestrians. In this phase, the magnitude of the problems will be quantified. In addition, best practices will be identified and documented. Finally, recommendations for improving institutional environments to support improved accommodations for pedestrians will be developed.

V. ESTIMATE OF PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: $300,000-$500,000, depending on level of research details, particularly amount of data collected.

Research Period: 18 months

VI. URGENCY, PAYOFF POTENTIAL, AND IMPLEMENTATION

There is pressing urgency to improve conditions for pedestrians. Poor conditions for pedestrians decrease both safety and accessibility for transportation system users. With the quickly increasing demand for public transportation services, providing acceptable conditions for walking to those services is essential.

The payoff potential of this research is very high, since an improved institutional environment will greatly contribute to better conditions for pedestrians, which will support an increased number of walking and transit trips and will result in a reduced number of automobile trips.

VII. PERSON(S) DEVELOPING THE PROBLEM

Ilona Kastenhofer, Virginia Transportation Research Council

VIII. DATE AND SUBMITTED BY

Virginia DOT

10-H-20

PROPOSED TCRP PROBLEM STATEMENT – FY 2010

I. PROBLEM TITLE

Developing Partnerships between Transit Agencies and the Disability and Underrepresented Communities

II. RESEARCH PROBLEM STATEMENT

Many U.S. transit agencies, particularly those serving urban areas, find that they serve a diverse population, and that a significant portion of their patronage is from minority and the disability communities. Most transit agencies have established customer advisory committees, have diversity programs and various community outreach efforts to involve these segments of their community in the planning and improvement of their service. It is less frequent, however, that transit agencies have been able to establish true partnerships with these communities and organizations representing them.

With the establishment of true partnerships, customers and other representatives of these communities can better appreciate the costs and challenges the agency faces and can become informed advocates at the local, state and national level in support of the services they need. Representatives of these communities can suggest to the transit agencies new methods, tools, and avenues for services provision, marketing and general communication to their communities, that may even improve the efficiency and cost effectiveness of operations.

III. OBJECTIVE

The objective of this research effort is to assemble a guidebook of best practices in developing and maintaining productive partnerships and collaborations between transit agencies and underrepresented minority and disability communities they serve. The research would help to include the disabilities and underrepresented minority communities more visibly within transit agencies by: 1) Providing data and statistics that validate the assumptions that the transit industry is diverse; 2) Compiling "best practices" in engaging the disabilities and underrepresented minority communities to improve outcomes, whether in legislation, funding, processes, or service. These best practices can be used to explain the importance of establishing synergistic relationships between the transit industry and these communities.

IV. RESEARCH PROPOSED

It is suggested that the research tasks include:

- Conduct a search of the literature to identify any prior work in this area, which can be updated or tailored to the needs of transit providers.
- In order to make the business case for such collaborations, collect information at the national level on the percentage of transit patrons from the disability and minority communities, both current and projected.
- Survey a representative sample (geographic, size, modes) of transit systems in order to identify best practices in collaborations with these communities, or with organizations representing them, as well as the benefits to both partners that were the outcome of these collaborations. If feasible, survey community partners as identified by the transit system, for their viewpoint on the success of the effort and anticipated ongoing benefits of the partnership.
- Based on the survey information, select agencies and/or specific projects/partnerships to highlight best practices identified.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: The proposed funding for this effort is $75,000
Research Period: 6 months

VI. URGENCY AND PAYOFF POTENTIAL

Incorporating the perspectives of disability and minority communities can result in more efficient and effective service and procedures, as well as better leveraging of resources and funding that provides synergistic benefits to the transit industry and organizations representing these communities. Beyond the benefits of improved customer and community relations and potential for improved service to a core transit market for most systems, it is anticipated that this effort will assist transit agencies in recognizing the disability and underrepresented communities as key stakeholders and potential grassroots advocates for improved transit. In light of the current financial crisis facing most transit systems, due in many cases to reductions in local and state funding sources, as well as the impending transportation authorization efforts at the national level, it is felt that this proposed research effort is timely.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

This research proposal supports the FTA strategic goals of increasing ridership, and improving capital and operating efficiencies. It also supports the TCRP strategic goals to: Place the Customer First, Continuously Improve Public Transportation, and Revitalize Transit Organizations.

VIII. RELATED RESEARCH

The study should build on existing TCRP, TRB related studies:

- *Diversity Training Initiatives: A Synthesis of Transit Practice* (TCRP Synthesis 46) 2003.
- *Corporate Culture as the Driver of Transit Leadership Practices: A Synthesis of Transit Practice* (TCRP Synthesis 47) 2003.
- *Transit Markets of the Future--The Challenge of Change* (TCRP 28)
- *Strategies for Influencing Choice of Urban Travel Mode* (TCRP 27)

IX. PERSON(S) DEVELOPING THE PROBLEM

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XI. DATE AND SUBMITTED BY

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July 6, 2009

10-H-21

TCRP PROBLEM STATEMENT

I. PROBLEM TITLE

An Evaluation of Warrants for Major Capital Investment Projects; An Update of "Urban Rail in America"

II. RESEARCH PROBLEM STATEMENT

The Federal Transit Administration, American Public Transportation Association, the New Starts Working Group and various other advocacy groups (e.g., Smart Growth America) have held a number of working sessions to re-think how New Starts projects are evaluated and rated. One proposal that is likely to be enacted during the SAFETEA-LU reauthorization is a requirement that FTA apply a "warrants-based" approach to project evaluation and rating. A warrants-based approach would provide that, if a specific project or corridor meets specific population density, employment density, existing transit use, congestion levels, or other criteria, the project would be warranted and a "medium" rating would be assigned. Currently, there is little available research to determine the appropriate "warrants" for various transit modes and corridor conditions, based upon the characteristics of existing, successful transit systems.

In November 1980, UMTA (now FTA) published a landmark report titled "Urban Rail in America; An Exploration of Criteria for Fixed-Guideway Transit" which was authored by Boris Pushkarev and Jeffrey Zupan. The purposes of that study were: to explore what range of travel volume is sufficient to warrant a certain level of fixed-guideway investment; to indicate the location of urban corridors where such travel volumes may be found; to offer a rough, tentative assessment of the national market for fixed guideway facilities; and to aid in focusing local planning on the most promising locations. Based on operating experience with existing systems at the time, functions were developed relating variables such as population density, development density, service frequency and speed to travel volumes, and minimum travel volume criteria or thresholds for fixed guideway were formulated.

An update of "Urban Rail in America" would contribute substantially to this discussion, and provide a framework for warrants for project evaluation.. The update would offer new criteria for fixed guideway transit updated using current data for the many such major transit projects that have been put into operation in the past 25 years. The update would add bus rapid transit (BRT) to the modes considered, and might drop downtown people movers, a technology whose popularity has waned.

III. OBJECTIVE

To provide an analytical framework for simplifying the New Starts evaluation process by analyzing the characteristics of the setting, the operation, the cost, and the performance of existing fixed guideway transit lines.

IV. RESEARCH PROPOSED

The research is expected to consist of the following tasks:

1. Determine the criteria or warrants most likely to simplify the evaluation of proposed major transit projects and direct Federal investments into good projects, by reviewing the original "Urban Rail in America," the procedures used by the World Bank and by other countries in making major transit investment decisions, and any other past research on this subject.

2. Gather data on cost, performance, surrounding land use, socio-economic characteristics of surrounding communities, transit operations, and any other data needed to develop and test the criteria or warrants identified in Task 1 on existing fixed guideway transit lines or systems in the United States. The objective is to come up with general criteria or warrants applicable across the country, so very precise data on cost, ridership, population density, and other variables should not be necessary. Reasonable estimates may suffice in most cases.

3. Analyze the data to determine if criteria or warrants or threshold conditions for investment in various transit modes can be established.

4. Write a report on the results, and make recommendations on criteria or warrants or threshold conditions that would be useful in major transit investment decisions.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: $400,000

Research Period: 18 months.

VI. URGENCY AND PAYOFF POTENTIAL

Early drafts of the legislative text for the SAFETEA-LU re-authorization published on House of Representatives Transportation and Infrastructure Committee website require FTA to apply a warrants-based approach to project evaluation. Thus, it is necessary to complete basic research to identify potential thresholds for a warrant-based rating approach before this requirement is enacted into law.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

The proposed research relates specifically to FTA objective 2.2, "Investigate methods to reduce the time needed to plan and build infrastructure (systems and facilities)." It relates more generally to all of FTA Goal 2, "Support Increasing Transit's Market Share" and FTA Goal 3, "Support Improving the Performance of Transit Operations and Systems."

The research proposed would support communities throughout the United States in continuously improving their public transportation. Although the proposed research is presented here in the context of Federal investment decisions, local investments in transit can also be guided by the criteria and warrants produced by this research. It therefore relates directly to TCRP Strategic Priority III, "Continuously Improve Public Transportation."

VIII. RELATED RESEARCH

Not available. Task 1 should identify.

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

The research proposal emerged from meetings between FTA and stakeholder groups, the legislative text in the SAFETEA-LU re-authorization bill, the FTA Policy Council, and discussions of how to streamline the New Starts process with the FTA Executive Management Team.

XI. DATE AND SUBMITTED BY

Resubmitted by Joseph Ossi on Dwayne Weeks on June 26, 2009.

Submit to:

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10-H-28

OUTLINE FOR TCRP PROBLEM STATEMENTS

I. PROBLEM TITLE

Social, environmental and economic benefits of mixed income housing near transit

II. RESEARCH PROBLEM STATEMENT

By locating mixed income housing near transit, urban development leaders are seeking to address many of society's most pressing needs at once. They hope that mixed income housing developments will challenge income segregation; de-concentrate poverty; increase multiple levels of integration (i.e., class, race, ethnicity, age, educational attainment level, profession); create more livable, sustainable neighborhoods; and improve the life chances of low- and moderate-income residents. They also hope that residents – especially those who are transit dependent and those who are more likely to take transit – will benefit from access to transit, and that transit will generate a better return on investment due to increased ridership and more efficient use of the system during non-peak hours.

While it may make intuitive sense to co-locate mixed income housing developments and public transportation, the concept could benefit from research and clarification. Key stakeholders want and need more concrete information about the social, environmental and economic benefits they might generate by co-locating these two types of major infrastructure.

Policymakers need to know if there are compelling reasons to craft policy that preserves and increases the supply of mixed income housing near transit. Developers, builders, investors and government officials need to know if there are compelling reasons to invest precious resources in planning and implementing mixed income housing developments near transit.

III. OBJECTIVE

This research seeks to develop a deeper and more detailed understanding of the social, environmental and economic benefits of the co-location of mixed income housing developments and public transportation.

The results will enable a wide range of stakeholders, including policymakers, developers, builders, investors and government officials, to make responsible, effective and efficient decisions about co-locating these two types of major infrastructure.

In addition, this information will help Federal agencies and Congress manage high-visibility interagency collaborations (e.g., the partnership between the US Department of Transportation [DOT] and the US Department of Housing and

Urban Development [HUD]; the Federal Transit Administration [FTA]/HUD interagency working group; the cooperative agreement between FTA and the Center for Transit Oriented Development [CTOD]).

IV. RESEARCH PROPOSED

Research question:
When persons live in mixed income housing developments within ¼ mile of major public transportation stations and/or corridors, are there statistically significant social, environmental and economic benefits? If so, what are they?

Research approach:
Researchers would collect both quantitative and qualitative data, in order to responsibly reflect the experiences of a wide variety of mixed income housing development residents, including those who are very young or very old, those who have limited English proficiency or low literacy or educational levels, those who are differently-abled, etc. In other words, researchers would collect statistics as well as anecdotal evidence (e.g., photographs, drawings, stories).

Similarly, researchers would glean data not only from widely recognized and respected sources (e.g., US Census, American Community Survey, transit agency rider surveys), but also from formal and informal surveys, and residents' self-reports.

Researchers would select a nationally representative sample of mixed income housing developments that are located within ¼ mile of public transportation stations and/or corridors. When thinking about national representation, it would be important for researchers to define a minimum frequency of transit service, and to select mixed income housing developments based on a range of factors including:

- transit mode
- geographical/regional location
- size of jurisdiction
- urban vs. suburban locale
- infill vs. Greenfield development
- previous site of public housing for low-income residents or not
- age of development

Dimensions of inquiry might include: (list of dimensions would need to be narrowed)

Degree to which the co-location of mixed income housing developments and public transportation:

<u>Social indicators</u>

- Changes the level of crime (e.g., vandalism) for neighborhood in which mixed income housing development is erected
- Changes residents' "sense of community"
    - Feelings of belongingness, inclusion and hope
    - Feelings of safety and security
    - Levels of citizen participation
    - Sense of psychological empowerment
    - Sense of quality of life
- Creates a "sense of place"
    - Shared stories, legends, anecdotes
    - Shared mental maps / feeling of orientation
- Changes levels of health for residents of the development (according to public health indicators)
    - Walking behaviors
    - Bicycling behaviors
    - Other exercise behaviors (e.g., children playing at parks, skating)
    - Visits to the doctor and emergency room
    - Rates of obesity
    - Rates of depression and anxiety
    - Collision, injury and fatality rates
- Changes social networks and social interaction between persons of different income levels
    - Number of and attendance at community events and meetings
    - Frequency of spontaneous meetings between neighbors
- Changes low- and moderate-income earners' "rights to the city," specifically their access to diverse neighborhoods, use of the city, participatory space, and other social, political and economic space'
- Changes number and/or effectiveness of neighborhood-based institutions
- Changes educational "life chances" and outcomes
    - At the neighborhood level
        - Test scores
        - Attendance
        - Funding levels
        - High school graduation rates
        - Higher education graduation rates
    - At the student level
        - Attendance
        - Grades
        - Behavior
- Changes residents' employment status and professional "life chances"
    - At the Census block level
        - Rates of employment / unemployment
        - Average time of commute to work
        - Jobs-housing mismatch
    - At the individual level
        - Professional networks

        - Job opportunities
- Changes residents' mindsets re: class, race and ethnicity
- Increases occurrences of innovation in the workplace, in the community, etc.
- Changes recreational behaviors
    - Visits per month to:
        - Open spaces (e.g., parks, plazas, playgrounds)
        - Nearest public library
        - Nearest community center
        - Nearest swimming pool

Environmental indicators

- Changes level of air quality
- Changes level of noise pollution
- Changes level of traffic congestion
- Creates a grid of complete streets for pedestrians, bicyclists, others
- Changes level of blight/state of good repair and disinvestment/investment
    - Housing
    - Retail
    - Commercial
    - Transportation infrastructure
        - Sidewalks
        - Transit stops and stations
        - Roads
    - Public space
- Changes carbon footprint by household and by Census block
    - Level of single occupancy vehicle ownership per household
    - Vehicle miles traveled
    - Sustainable practices

Economic indicators

- De-concentrates poverty
- Meets percentage of jurisdiction's pent-up demand for affordable housing
- Changes low- and moderate-income earners' levels of economic self-sufficiency
- Revitalizes neighborhood (changes specific economic indicators)
    - Commercial
        - New firms attracted
        - Existing firms retained
        - Existing firms improved
    - Retail
        - New firms attracted
        - Existing firms retained
        - Existing firms improved
    - Residential
        - New development attracted
        - Existing development retained

        - § Existing development improved
    - o Green infrastructure / open space
        - § New space created
        - § Existing space retained
        - § Existing space improved
- Generates new revenues (e.g., property taxes, sales taxes)
- Changes transit ridership
    - o Peak and off-peak travel totals
    - o Entrances: peak and off-peak
    - o Exits: peak and off-peak
- Reduces infrastructure costs (for infill development)

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: Taking into account the extent of data and prior reports available, it is estimated that the cost for this study should be no more than $250,000 per professional staff year ($500,000 total).

Research Period: The research, analysis, writing, review and editing process, including the production of the final report, should take no more than 24 months.

VI. URGENCY AND PAYOFF POTENTIAL

This research is needed right away because:

- Congress has directed FTA and HUD to work together to increase the supply of affordable housing near transit
- The Secretaries of US DOT and HUD recently announced a partnership – the "Sustainable Communities Initiative" – that is designed to:
    - § harmonize DOT and HUD policies, programs and outreach
    - § address transportation and housing affordability issues
    - § research, define and measure Secretary LaHood's goals of livability, sustainability, economic growth, and safety
- The Federal Transit Administration and the Center for Transit Oriented Development are partners in a cooperative agreement to educate the public about the social, environmental and economic benefits of preserving and increasing the supply of mixed income housing developments near transit.

The results of this research will identify whether there are benefits to preserving and increasing the supply of mixed income housing near public transportation, and thereby help stakeholders make effective, efficient use of limited transportation, housing and urban development dollars.

This research is best done on the national level; local communities would encounter socioeconomic barriers to undertaking a project of this size and scope.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

Members of Congress and the Administration believe that co-location of mixed income housing and transit is an effective and efficient way to meet goals of national significance, including livability, sustainability, economic growth, and safety.

Locating mixed income housing near transit also addresses key TCRP strategic priorities by:

- Placing the transit customer first, especially customers who earn a low- to moderate-income and are heavily burdened by disproportionate transportation and housing costs
- Helping transit agencies meet ridership goals
- Increasing transit's market share
- Realizing community-based planning opportunities
- Strengthening transportation, housing and urban development partnerships to revitalize transit agencies and revolutionize the workplace
- Continuously improving public transportation

VIII. RELATED RESEARCH

While there is some research about *affordable* housing near transit, there is limited research about *mixed income* housing near transit.

Deakin, Elizabeth. 2001. "Sustainable Development and Sustainable Transportation: Strategies for Economic Prosperity, Environmental Quality and Equity." California Futures Network. *Identifies Mixed Income Housing as a Demand Management/Land Use and Transportation strategy.*

Duke, Joanna. 2009. "Mixed income housing policy and public housing residents' 'right to the city.'" Critical Social Policy, Vol. 29, No. 1, 100-120.

Fraser, Jim. 2007. "The promise of mixed-income housing for poverty amelioration." Center for Poverty, Work and Opportunity, University of North Carolina. References state, market and civil

Kochera, Andrew. 2002. "Serving the affordable housing needs of older low-income renters: a survey of Low Income Housing Tax Credit properties." AARP Public Policy Institute. *"…could be harder for LIHTC housing in suburbs, and particularly in nonmetropolitan areas, to draw economically on community services (for instance, public transportation…)."*

Schwartz, Alex and Tajbakhsh, Kian. 1997. "Mixed Income Housing: Unanswered Questions." Cityscape: A Journal of Policy Development and Research." Vol. 3, No. 2. "*Housing located in areas with…limited transportation access…is less attractive to higher income residents….it underscores the difficulty of converting a significant amount of the Nation's public housing into mixed-income housing."*

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

Problem statement was developed by an individual and is the product of policy and program review, academic study, and interagency discussions.

10-H-30

OUTLINE FOR TCRP PROBLEM STATEMENTS

I. PROBLEM TITLE

Adapting Public Transportation to the Effects of Climate Change

II. RESEARCH PROBLEM STATEMENT

Climate-related changes are already observed in the United States, according to the U.S. Federal government's Global Change Research Program. These include increases in heavy downpours, rising temperature and sea level, and thawing permafrost. These changes are projected to grow even if aggressive action is taken to reduce greenhouse gas emissions because of the level of emissions already in the atmosphere. Climate changes are already affecting transportation. According to the U.S. Federal government's Global Change Research Program:

- Sea level rise and storm surge will increase the risk of major coastal impacts, including both temporary and permanent flooding of airports, roads, rail lines, and tunnels.
- Flooding from increasingly intense downpours will increase the risk of disruptions and delays in air, rail, and road transportation, and damage from mudslides in some areas.
- The increase in extreme heat will limit some transportation operations and cause pavement and track damage. Decreased extreme cold will provide some benefits such as reduced snow and ice removal costs.
- Increased intensity of strong hurricanes would lead to more evacuations, infrastructure damage and failure, and transportation interruptions . . .
- Permafrost thaw in Alaska will damage infrastructure . . .

Climate change has particular impacts on public transportation. Extreme heat can cause deformities in rail tracks, at minimum resulting in speed restrictions and, at worst, causing derailments. The Washington Metro for instance has had to disrupt service on rail lines on extremely hot summer days because of heat-induced deformities on rails. This problem could become more common with the number of days over 100 degrees Fahrenheit predicted to increase with climate change. Subway tunnels, busways, rails, and roads are vulnerable to flooding from sea-level rise, storm surge, and more intense rain storms. Public transportation infrastructure and operations will need to be adapted to perform under changing conditions. Public transportation is also called upon to provide evacuation services during the type of extreme weather emergencies that are predicted to become more common with climate change.

Public transit agencies manage billions of dollars worth of infrastructure and provide critical transportation services to millions of Americans. The Federal Transit Administration is responsible for the stewardship of billions of dollars in taxpayer funds directed towards transit infrastructure. Knowledge of the impacts of climate change on transit and information on how best to respond to the challenge is critical to protecting these assets, the mobility they provide, and the safety of travelers during extreme weather events and evacuations.

III. OBJECTIVE

The objective of the research project is to provide information to transit agencies on the predicted impacts of climate change on public transportation and strategies for responding to these challenges. The anticipated product will be a TCRP research report and dissemination activities such as webinars and workshops.

IV. RESEARCH PROPOSED

The specific research proposed includes:

- Analysis of predicted climate change impacts on public transportation. Impacts will vary by region, such as coastal, areas of intense rain or drought, and areas with permafrost. Impacts will also vary by transit system type. Finally, impacts will vary based on the level of global emissions reductions achieved. The National Oceanic and Atmospheric Administration (NOAA), the U.S. Geological Survey (USGS), and other science agencies and organizations are conducting research on climate change but do not often have the resources to focus research on regional level information tailored to

meet the needs of particular sectors and actors such as transportation and transit agencies. There may be opportunities for research partnerships.

- Analysis of strategies for responding to the effects of climate change on public transportation infrastructure and services. This includes but is not limited to engineering analysis of rail and road materials and infrastructure construction/retrofitting to withstand climate change impacts such as heat and flooding, transportation and land use planning, emergency evacuation, and operations in extreme weather conditions.
- Risk management tools for transit agencies, information on costs and benefits of strategies, impacts on state of good repair, implementation considerations, and case studies.

The proposed research should be refined upon completion of initial background research to develop methodology.

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding: Recommended funding for this project is $500,000.

Research Period: The estimated time period needed to complete the research is 2 to 3 years, including 3 months for review and revision of a draft final report.

VI. URGENCY AND PAYOFF POTENTIAL

Research on adapting public transportation to the effects of climate change carries with it the urgency of protecting billions of dollars worth of infrastructure and valuable transportation services against climate impacts that area already underway and will grow in the future. It also carries the urgency of providing critical information to protect the safety of travelers during extreme weather events and evacuations. In addition, many communities are building new transit systems or major extensions through FTA's New Starts and other grant programs. These new systems should be built to withstand the future environment they will face. Understanding climate impacts and how to adapt to them will be crucial to bringing transit assets up to a state of good repair. A barrier to implementation of the anticipated research is funding.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS AND POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

This problem statement meets FTA's strategic research goal #1, "Provide National Transit Research Leadership" by providing vision, preparing the transit industry for important trends it faces, and providing a useful body of knowledge on the climate change challenge facing the industry.

This problem statement also meets FTA's strategic research goal #3, "Support Improving the Performance of Transit Operations and Systems" by performing research to ensure the continued integrity of infrastructure and operations under changing conditions and to improve safety, security, and emergency preparedness under changing climate conditions.

The problem statement meets TCRP strategic priority #1, "Place the Transit Customer First," by providing research to ensure transit agencies are able to provide high quality transit services in a changing environment. It also meets strategic priority #2 by supporting public transportation so that mobility needs can be served as communities change. Finally, it meets TCRP strategic priority #3, "Continuously Improve Public Transportation" because it can improve transit by enabling it to respond to current and future challenges of climate change adaptation.

VIII. RELATED RESEARCH

Research that is closely relevant to the proposed problem includes:

U.S. Global Change Research Program, *Global Climate Change Impacts in the United States*, June 2009. (Completed)

U.S. Department of Transportation, *Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: Gulf Coast Study*, 2008. (Completed)

U.S. Department of Transportation, *Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: Gulf Coast Study Phase II.* (In Progress).

U.S. Department of Transportation, *Coastal Sensitivity to Sea Level Rise: A Focus on the Mid-Atlantic Region,* 2009. (Completed)

Transit Cooperative Research Program (TCRP) Project J-7, Synthesis Topic SH-09, *Current Practices in Greenhouse Gas Emissions Savings from Transit.* (In Progress) The synthesis explores transit's ability to mitigate climate change by reducing greenhouse gas emissions through providing a low emissions alternative to driving. The research proposed in this problem statement would complement the TCRP Synthesis by providing the adaptation side of the climate change mitigation / adaptation picture.

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

This problem statement was developed in response to interest from stakeholders. For instance, the Senate Commerce, Science, and Transportation Committee requested a briefing with U.S. Department of Transportation staff regarding adaptation of transportation infrastructure and operations to the effects of climate change. Senate staff were very interested in research specific to transit. In addition, transit agencies that are part of the American Public Transportation Association (APTA) Climate Change Standards Working Group have discussed the need for more information on adaptation during working group meetings. Executive Director Matt Welbes, in conversation with Associate Administrators Susan Borinsky and Susan Schruth, suggested that FTA submit a problem statement on adapting transit to the effects of climate change. In response to that direction, and drawing from knowledge of previous discussions with stakeholders on the topic, I have drafted this problem statement.

XI. DATE AND SUBMITTED BY

August 4, 2009

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10-H-31

OUTLINE FOR TCRP PROBLEM STATEMENTS

I. PROBLEM TITLE

Public Transit in the 21st Century: Changing Institutional and Business Models

II. RESEARCH PROBLEM STATEMENT

Transit systems of all sizes throughout the United States and North America are being fundamentally challenged to strategically think, plan, operate (alternative business and financial models), and manage in different ways, including expectations for greater efficiency/effectiveness, increased transparency and public accountability.

Today, MARTA is just one of many transit systems embarking on this "transformation" process with very few concrete guideposts. While not necessarily to a level of "best practice, there are very useful industry examples and case studies that should be thoughtfully documented and potentially replicable initiatives identified and made readily available to the industry. This would be immensely useful information to transit managers and policymakers in transit systems of all sizes and complexity.

The forces of change were well-documented in the New Paradigms work completed for the transit industry in the late 1990s. At that time, the study team recognized a bigger mobility management role, profound demographic shifts and consumer expectations; the riveting impact of new technology; and the multi-jurisdictional/regional context of the challenges facing communities--well beyond the traditional silos and institutional structures of existing transit agencies and their partners/key stakeholders.

III. OBJECTIVE

As a Phase 1 effort, information would be compiled across the following areas with a focus on documenting concrete examples of new or changed institutional structures/arrangements and business models implemented at public transit systems in particular response to regional and multi-jurisdictional challenges/opportunities.

1) Notably successful multi-jurisdictional visioning and planning initiatives, i.e., Envision Utah, the Sacramento Blueprint
2) The Institutional Context
    a. Agency Authority(ies)
    b. Board Composition, Size, Appointment Authority & Process, Terms, Meeting Requirements, Voting Provisions
    c. Alternative Service & Business Arrangements and Relationships (service & transfer agreements, cost allocation models & sharing agreements, system expansion & contraction provisions, proportional representation/voting arrangements, differential pricing (handling customers outside of the transit service area)
    d. Federal, MPO & State /Regional Partner Arrangements
3) Transit Project Prioritization Criteria (multi-jurisdictional setting)
4) Performance Management & Reporting
5) Public-Private Partnership Arrangements (i.e., CIDs,TADs, TMAs)
6) Labor-Management Initiatives
7) Transit Supportive State Legislation & Regional/Local Initiatives

IV.RESEARCH PROPOSED

This first level of effort would be tantamount to a "super" synthesis effort – "who/where" is doing "what"; "why" and "how" – with "what reported results". The work would be accomplished utilizing

the following approaches: (a) start upfront with "known" industry examples, available rep orts (secondary information scrub); (b) canvass and survey Transit CEOs, Transit Board Members, BMBG Board of Governors, the APTA Legal Affairs Committee, and Transit Labor (ATU and TWU Internationals); (c) solicit information from FTA Regional offices and MPOs. Prepare the report with supporting documentation based on results of this review – including perspectives on Lessons Learned.

Depending upon the extent of information found in Phase 1, a useful phase 2 level of effort may be the development of a "Transit Transformation Toolkit".

V. ESTIMATE OF THE PROBLEM FUNDING AND RESEARCH PERIOD

The recommended funding level is $300,000 including provisions for industry surveys and follow-up discussions. An 18-month period of time is anticipated for the completion of Phase 1.

VI, URGENCY AND PAY-OFF

Increasingly, transit systems are being challenged today to "think" and "act" differently. There is little readily available information on institutional and business arrangements/models. It simply doesn't make sense to replicate this type of information multiple times or unnecessarily reinvent the wheel. To my knowledge, there is a small study currently underway looking at a very limited aspect of this review.

At a minimum, the following events are setting the stage for more radical re-thinking of how we fundamentally organize and do our business: the increasing emphasis on metro areas, regions, and mega-regions; the growing linkage of transportation/transit with other core policy considerations and beginning erosion of longstanding bureaucratic silos; demands for greater governmental efficiency and effectiveness; the focus on public-private partnerships and alternative business models.

VII. RELATIONSHIP TO FTA STRATEGIC GOALS and POLICY INITIATIVES and TCRP STRATEGIC PRIORITIES

This proposed project relates directly to FTA's goal of developing simpler and smarter transportation solutions and TCRP's Strategic Priority

VIII. RELATED RESEARCH

See above.

IX. PERSON(S) DEVELOPING THE PROBLEM

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X. PROCESS USED TO DEVELOP PROBLEM STATEMENT

Individual. Over the past several years, I have personally had to work through some aspect of these major institutional framework (governance, funding, management), alternative business model scenarios with virtually no readily available industry information. Not surprisingly, I have not been alone as various of my counterparts have been involved in similar efforts. Needless to say, we've gratefully shared information ad contacts.

XI. DATE AND SUBMITTED BY

See IX above.

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