

Summary of Approved Research Projects

Project A-36A *Transportation Emergency Response Application (TERA): Migration Options Beyond 2020*
Research Field: **Operations**
Allocation: **\$25,000 (Additional funding from ACRP and NCHRP will be requested)**
TCRP Staff: **Stephan Parker**

TERA was designed to leverage the utility of existing, robust, scenario-based, emergency preparedness training and exercise software designed under the name Emergency Management Staff Trainer (EMST, found at <https://train-emst.com>). The EMST platform had more than \$10 million in National Guard Bureau investment, upon which the ACRP, TCRP, and NCHRP have built the TERA application at a combined cost of slightly over \$2.5 million over 10 years. The goal of TERA has been to enable more effective learning and practicing of **Emergency Operations Center (EOC) response** by personnel using EMST loaded with specialized transportation scenarios. These scenarios allow for transportation-specific roles, interactions, emergency tasks, and other relevant context to be easily “played” by transportation emergency management personnel who may be assigned with various degrees of training and experience to an EOC that is managed using various levels of planning. To date, and as a result of previous NCHRP, TCRP and ACRP funding, TERA now includes 21 different transportation emergency scenarios and over 1,300 simulated emergency management interactions for use by airport, state DOT, and transit EOCs. A key feature of TERA is its ability to allow a mix of onsite, socially distanced, and quarantined staff to participate collaboratively in tabletop exercises and training in real time.

The objective of this research is to identify migration options for the core features, training capabilities, scenarios, and content of TERA onto a modern platform. The scenario learning objectives, scripts, injects, and artifacts created under ACRP, TCRP, and NCHRP are valuable resources for tabletop exercises.

Project D-20 *Insulated Joint Failure Investigation Mitigation*
Research Field: **Engineering of Fixed Facilities**
Allocation: **\$250,000**
TCRP Staff: **Stephan Parker**

Transit agencies that use electrical traction (overhead catenary or third rail) generally use the running rails as part of the circuit to return the negative power to substations. Insulated rail joints (IJs) are special devices in the track that separate train control circuits and traction power segments. Some agencies have experienced significant failures of IJs related to arcing of the traction power negative return currents. With higher currents resulting from AC propulsion, IJ failures have become even more problematic and more frequent across many transit properties. In some locations, the same IJs have failed multiple times in a short span of time. These failures result in unplanned delays to passengers and additional expenses related to repairs and damage to the track, train control systems, and traction power systems, and can contribute to stray currents that damage other infrastructure. As such, there is a great research need into IJ failures with possible mitigation guidelines.

IJs are often designed for the freight railroads, with low-voltage/low-amperage train control systems, and may not perform well in a high-voltage/high-amperage (traction power negative return) transit environment. With higher currents resulting from AC propulsion, the failure of current designs needs to be investigated and new guidelines developed, leading to modified existing IJ practices or AC vehicle design. In addition, guidelines are needed as to how to locate and diagnose problematic IJs.

The objectives of this research will include (1) identifying potential causes of IJ failures, especially those under high currents resulting from AC propulsion and (2) developing guidelines for maintenance personnel to diagnose these failures and determine the best mitigation of the root causes.

Project D-21 *Planning for Innovation & Emerging Mobility Futures at Intermodal Passenger Facilities*
Research Field: **Engineering of Fixed Facilities**
Allocation: **\$100,000 (Additional funding has been requested from the ACRP and NCHRP programs)**
TCRP Staff: **Dianne Schwager**

The introduction of innovative and emerging mobility technologies (e.g., transportation network companies [TNCs], shared automated vehicles, micromobility/active transportation, etc.) has the potential to influence first- and last-mile connections to intermodal passenger facilities, congestion at station/terminal curbside and roadways, and long-range capital planning considerations. Reduced parking demand (due to mode shift) also has the potential to affect revenues and capital financing of intermodal facilities.

Transit centers and mobility hubs are increasingly becoming intermodal passenger hubs (increasingly complex multimodal facilities that can include any combination of public transportation, metro rail, commuter rail, shared mobility, micromobility, active transportation, and airports). While other CRP research has attempted to look at the effects of TNCs and changes on modal access, this research was not intermodal and did not include/emphasize innovative and emerging mobility technologies that could affect airports, such as automated and connected vehicles (AVs/CVs) and urban air mobility (UAM). This topic addresses both of these gaps by building on this earlier work while simultaneously focusing on planning for emerging transportation technologies by drawing on best practices from transit stations, rail stations, mobility hubs, airports, harbors, and other intermodal passenger facilities for long-range planning considerations for first- and last-mile access.

The objective of this research is to understand the impacts, opportunities, and challenges of innovative and emerging mobility on intermodal passenger facilities (including rail and bus transit stations, mobility hubs, water transit, and airports) and to identify best practices for short-, medium-, and long-range planning considerations. This research will expand understanding of the effects of innovative and emerging modes on ridership, infrastructure planning and design, operations, revenue, and greenhouse gas emissions.

Project F-29 *Mental Health, Wellness, and Resilience for Transit System Workers*
Research Field: **Human Resources**
Allocation: **\$300,000**
TCRP Staff: **Mariela Garcia-Colberg**

The world is experiencing a pandemic caused by the novel coronavirus, SARS-CoV-2. As a result, the President of the United States declared a National Emergency and all 50 states received a Disaster Declaration under the Stafford Act. Most governors put into place stay-at-home orders, with exceptions for essential services. Transit, in all its forms, is an essential service. Transit workers in general have risk for exposure to traumatic incidents in the workplace. Some workers exposed to such incidents may develop post-traumatic stress disorder (PTSD) symptoms, which can lead to absenteeism and workers compensation insurance claims. The pandemic poses a new set of challenges to transit agencies. There have been media reports about transit workers exposed to the virus and falling ill, and several hundred have died. The mental health implications of the stress of exposure, illness, and potential death has not been widely examined. Neither has the relationship between employee mental health and the viability of transit systems and the effect of these issues on the recruitment and retention of employees.

The pandemic compounds the chronic stressors with a unique set of acute stressors that are amplified by the volatile, uncertain, complex, and ambiguous (VUCA) nature of the pandemic. These include potential personal exposure to the virus, as well as the potential to expose family members; the shortage or lack of personal protective equipment (PPE); and the problems associated with social distancing, job uncertainty, despair, workplace violence, extended or shortened hours, and disruption of work schedules and tasks. The most effective and efficient way to provide relevant and actionable information to transit systems on these topics would be to study the mental health, wellness, and resilience of transit workers. This will require looking at the chronic stressors and outcomes in normal times and then exploring the acute issues of trying to survive in a highly exposed profession, amid a pandemic.

The objective of this project is to research the factors that promote transit employee mental health, well-being, and resilience. This research will result in the identification of protective measures that transit organizations and individual workers can use to address both chronic and acute stressors. The project will address both internal (e.g., organizational changes and uncertainty) and external factors (e.g., lack of childcare and in-person school uncertainty, known victims, constantly wearing PPE) that contribute to the stress and mental health challenges.

Project F-30/ NCHRP 23-13(02) *Ensuring the Health and Safety of Transportation System Operators and Others in the Transportation Workforce*
Research Field: **Human Resources**
Allocation: **\$350,000 (This will be a joint project of the NCHRP and TCRP Programs)**
TCRP Staff: **Dianne Schwager**

Transit operators, shared-mobility drivers, truck drivers making deliveries, roadside assistance operators, tow truck drivers, toll booth collectors, law enforcement, and first responders who address roadway crashes interact with the public, who may be infected and are at higher risk of contracting a virus during a pandemic. Beyond personal protective equipment, it is important to understand the range of issues faced and the strategies that can be implemented, along with their effectiveness, costs, and implications.

Additionally, for many workers identified as “essential” during the COVID-19 pandemic, using public transportation is the most feasible option for several reasons (e.g., lack of car ownership, limited financial means). However, COVID-19 has made public transit a less desirable mode of transportation in many cases due to the health risks and the inability to protect oneself adequately. Transit service responds to ridership and fewer riders means reduced funding to operate systems. If this mode becomes less available due to service changes or interruptions, essential workers must have access to other transportation options without taking on additional burdens such as car ownership, extended travel time, and risks to their own safety and health, including that of others (e.g., family, customers).

The social distancing guidelines developed by the Centers for Disease Control and Prevention (CDC) during the COVID-19 pandemic have highlighted the potential for unsafe work environments. It is essential to understand how to make work environments safe for employees and system users. In some situations, such as emergency response, it is often required that people be in close proximity to one another. Although other transportation functions such as construction and maintenance may not interact directly with the public, employees typically work in small teams or crews that may place workers at risk. Truck drivers need open rest stops or facilities to ensure their safe ability to travel. Initial understanding, established protocols, and general guidance will assist transportation agencies in responding during COVID-19 as well as preparing for future pandemics.

This research will identify effective practices to help ensure the health and safety of transportation system operators, and the transportation workforce involved in construction, maintenance, and operations of the system.

Project H-59 *Racial Equity, Black America and Public Transportation*
Research Field: **Public Policy and Planning**
Allocation: **\$250,000**
TCRP Staff: **Stephan Parker**

In the United States, the gap between Black Americans and White Americans in terms of wealth, health, and social equity is disproportionately wide. Many historians and social experts in the fields of sociology, social justice, and now transportation are beginning to understand the magnitude of the role transportation policy, urban planning, and public infrastructure construction as well as both private and public financing have played in a century-long unraveling of a Black American middle class dating back to the post-civil war reconstruction era.

The objective of this research will be to develop the following:

1. An enhanced and more inclusive approach to transit planning that takes into account and acknowledges that transit systems of the 21st century must have a critical role in addressing and correcting many of the problems caused by a historically racially biased 20th century transportation industry that destroyed Black communities in the building of today's transportation systems and network.
2. Policies on social equity for the planning of transit systems, the operations of transit systems, and for technologies used in the operations of transit systems to ensure that each and every citizen and their communities receives the same benefit.
3. Policies, principles, recommendations, and guidelines for the funding of transportation projects that includes projects focused on the reversal of damage done in the last century through public funding of infrastructure projects that destroyed historically Black communities or through the practice of "Redlining" by private financial institutions.

Project H-60 *Addressing Disproportionate Share of Health, Economic, and
Transportation Impacts for Lower Income Households and Communities of
Color*

Research Field: **Public Policy and Planning**

Allocation: **\$350,000**

TCRP Staff: **Dianne Schwager**

It is well documented that minority and low-income populations have had a significantly higher incidence of COVID-19 than others. Low-income households and communities of color represent a higher portion of frontline workers in grocery stores, healthcare providers, meat-processing industries, and other service industries where workers cannot work from home. At the same time, many of these workers are transit-dependent and may face challenges accessing their jobs, as well as vital needs such as access to food, due to cuts in transit service. Although the COVID-19 pandemic has caused a notable decrease in transit ridership and service, essential workers and those with limited transportation options will continue to need public transit for some travel. While ensuring transit is available during a pandemic, agencies must identify reasonable levels of service and how to adjust from the typical service in a specific area. As a result, these groups are experiencing a disproportionate share of the impacts. This research would address ways for transportation agencies, service providers, and policymakers to help address needs during the current pandemic and into the future.

This research will examine the disproportionate share of COVID-19 impacts on lower income households and communities of color, particularly in relation to transportation needs. The research will also identify how to address these needs effectively during the pandemic, including balancing the supply of transit for essential workers when there is reduced overall transit demand.

Project J-11/Task 41: *The Opportunities and Challenges Associated with Virtual Public Engagement in Transportation Decision Making*

Research Field: Special Projects
Allocation: \$100,000
TCRP Staff: Dianne Schwager

In the last decade, the use of virtual public involvement tools to supplement in-person outreach has grown significantly. More recently, the COVID-19 pandemic and public health guidelines halting in-person gatherings have pushed agencies to move the entirety of their public process to a virtual setting. Agencies such as the Iowa Department of Transportation (IowaDOT), Massachusetts Department of Transportation (MassDOT), Maine Department of Transportation (MaineDOT), and Metropolitan Atlanta Rapid Transit Authority (MARTA) have begun to adopt Standard Operating Procedures (SOPs) that include the use of online tools such as online comment forms, online meetings, and multimedia messaging during project development.

Public participation is an essential part of the project development process because it provides the public a voice in the decisions that dictate how transportation systems in their communities are designed, operated, funded, and maintained. Effective public outreach occurs when everyone, regardless of demographic, has the full and fair opportunity to participate. Conducting all outreach in a virtual setting may inadvertently exclude certain demographics (e.g., those in rural areas, low-income families, those with limited English proficiency, those who are elderly, and those with disabilities) from the public process due to technological barriers and internet accessibility. Conversely, some demographics may be more likely to participate in a virtual public process, compared to a traditional in-person process, given the convenience, flexibility, availability, and low-cost of using online tools.

The extent to which moving outreach to a virtual environment, through agency's SOPs and virtual public involvement best practices, affects community engagement has not been quantitatively or qualitatively measured. Research into which populations are attending online meetings and engaging with online tools, and how that compares to traditional in-person meetings and tools, will have far-reaching implications for how transit agencies conduct outreach moving forward.

The purpose of this research is to measure the degree to which virtual public involvement affects community engagement during project development. This research will build on current TRB and transit agency efforts to identify and establish virtual public involvement best practices by using case studies to measure how virtual public processes compare to traditional in-person processes. Research findings will provide insight into how demographics have responded to virtual engagement tools (including online meetings, online polling and comment forms, and social media) and consider effective practices to more broadly engage the public and recognize potential disparities in access to virtual engagement opportunities. Findings could determine how agencies conduct their outreach in the future, even after public health guidelines allow for in-person gatherings to resume.

Project J-11/Task 42:*Maintaining Transportation Services for People with Disabilities, Paratransit, and Other Service Needs During a Pandemic*

Research Field: Special Projects

Allocation: \$100,000

TCRP Staff: Dianne Schwager

The COVID-19 pandemic has greatly affected public transportation service availability. Many people rely on public transportation, now seen as an unsafe option. Besides identifying the best approaches to maintain transportation services generally, specific consideration must be given to people with unique needs who rely on public transportation options. This group comprises those with disabilities, seniors who no longer drive, people to whom only demand-response transportation is available, and others with unique needs.

This research will determine ways to maintain paratransit and other transportation services for people with disabilities or other special needs during the pandemic.