TRANSIT ADVISORY COMMITTEE FOR SAFETY (TRACS)

2022–2024 Charter

REDUCING BUS COLLISIONS REPORT

ENSURING SAFETY FOR PEDESTRIANS AND CYCLISTS

REPORT 22-02

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Executive Summary

The Federal Transit Administration (FTA) tasked the Transit Advisory Committee for Safety (TRACS) with developing practical recommendations that detail how to effectively reduce bus collisions.

TRACS members from large and small transit operators, state safety oversight agencies, academia, labor unions and other transit focused organizations worked together over the past year to discuss recommendations for FTA to pursue to effectively reduce bus collisions. These recommendations address overall system safety and a variety of problems within the industry that contribute to bus collisions. The report begins with an overview of the Committee, its goals, and the current state of practice with respect to bus collision prevention. It then moves on to research and recommendations related to the reduction of bus collisions.

The recommendations focus on FTA establishing and promoting elements that support strong safety management activities in transit agencies. Recommendations discussed in this report include the following:

TRACS Recommendation for FTA	Implementation Suggestions
Recommendation 1: Establish a Baseline Training Curriculum Focused on Operational Safety	1. Develop the training curriculum for bus transit managers and supervisors to include the topics of hazard management and understanding organizational accidents and trends. 2. Develop baseline training guidance for transit operators related to procedures identified to reduce bus collisions.
Recommendation 2: Establish Minimum Standards for Fatigue Risk Management	1. Establish regulations for hours of service. 2. Establish oversight guidance for advanced service management. 3. Require a fatigue risk management program.
Recommendation 3: Develop Baseline Standards for New Bus Design and Research Best Practices for Retrofitting	1. Research and promote a standard of design, or multiple depending on the type of vehicle, that would enhance visibility and driver awareness around the entirety of the bus. 2. Research and develop template procurement language to achieve specific safety standards.

TRACS Recommendation for FTA	Implementation Suggestions
Recommendation 4: Prioritize Federal, State, Local, and Agency Financial Resources Towards Safety Improvements	1. Support marketing around funding requirements or guidelines to help transit agencies understand what they can pursue related to safety within the grant funding they receive. 2. Consider tying more safety work requirements to grant programs. 3. Guide agencies on how to successfully utilize fund sources to assist in the management of unsafe behavior.
Recommendation 5: Increase Marketing and Communications Related to Safety for Internal and External Use	1. Create a safety marketing toolkit that transit agencies can adapt for their use. 2. Provide guidance about conducting effective community outreach. 3. Direct additional funding for safety campaigns.
Recommendation 6: Establish Guidance on Service Management	1. Establish best practices around route design, stop design, and route changes. 2. Support agencies with using and establishing a telematics system to assist in monitoring routes and positively coaching behaviors that have been identified as key performance indicators. 3. Emphasize the Public Transportation Agency Safety Plan (PTASP) Safety Management System (SMS) management of change requirement to help break down silo-like environments.
Recommendation 7: Establish Guidance to Assist Agencies with Developing a Robust Organizational Safety Culture	1. Assist agencies with establishing a safety culture, including one that provides effective feedback channels for staff and strong safety leadership.

As a whole, the recommendations detailed in this report represent a comprehensive review of the tools FTA can use to help transit agencies reduce bus collisions. By following these recommendations, FTA can promote effective safety strategies and reach its goal to reduce bus collisions and achieve greater system safety.

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Introduction

The United States Department of Transportation (U.S. DOT) Federal Transit Administration (FTA) is committed to ensuring the safety of the Nation's public transportation riders and workers. FTA works to increase transit safety through policy development, hazard investigation, data collection, risk analysis, oversight programs, and information sharing.[1]

In 2009, the U.S. Transportation Secretary authorized the establishment of the Transit Advisory Committee for Safety (TRACS).[2] TRACS is a federal advisory committee comprised of professionals representing a variety of stakeholders and interests focused on addressing transit safety issues. By convening a balanced panel with a variety of viewpoints, the Committee facilitates the identification of potential problem areas and possible corrective actions for FTA to pursue. TRACS recommends solutions based on agreed upon facts; however, TRACs does not determine federal policy.

The TRACS Reducing Bus Collisions Subcommittee focuses on reducing injuries and deaths as a result of bus collisions. The panel consists of representatives from large and small transit operators, academia, and labor unions, with members from rural communities and from America's most populous cities. The subcommittee is tasked with developing recommendations that define best practices to prevent bus collisions and identify how FTA can support agencies with developing and implementing mitigation strategies.

After meeting several times throughout the course of a year, the TRACS Reducing Bus Collisions Subcommittee has developed seven recommendations related to the topic of reducing bus collisions, which are detailed in depth in their corresponding sections in this report.

Background on FTA's Tasking of Reducing Bus Collisions to TRACS

The Reducing Bus Collisions Subcommittee is tasked with researching mitigations and best practices for reducing bus collisions and submitting one report with the findings of its discussions. The subcommittee has explored this issue thoroughly through personal expertise and external research.

Buses are now one of the safest modes of transportation when compared to other types of vehicles. However, bus collisions can still lead to injuries and fatalities—of passengers, of vulnerable road users, and of drivers of struck vehicles.

With respect to a variety of vehicles, in 2020, the National Safety Council reported the following passenger fatalities by vehicle type:

- **Passenger vehicles**: 0.56 passenger fatalities per 100 million passenger miles traveled
- **Passenger trains**: 0.004 passenger fatalities per 100 million passenger miles traveled

[1] "Transit Safety & Oversight (TSO)," Federal Transit Administration. Accessed: Nov. 21, 2023. [Online]. Available: https://www.transit.dot.gov/regulations-and-guidance/safety/transit-safety-oversight-tso

[2] "Transit Advisory Committee for Safety," Federal Transit Administration. Accessed: Nov. 21, 2023. [Online]. Available: https://www.transit.dot.gov/regulations-and-guidance/safety/transit-advisory-committee-safety-tracs

- **Buses**: 0.001 passenger fatalities per 100 million passenger miles traveled[3]

In terms of risk, passengers are 560 times more at risk of fatality in a passenger vehicle than they are in a bus.

However, bus collisions can be much more dangerous for roadway users outside of the transit vehicle, including vulnerable roadway users such as pedestrians, as well as operators of other vehicles such as cars or motorcycles. Data from the National Transit Database (NTD) indicates that between 2008 and 2021, there were approximately 7,300 bus-to-person collisions, with persons including pedestrians, cyclists, and operators of microtransit devices.[4] According to the 2021 Bus Safety Data Report, there are 1.31 person fatalities per 100 million vehicle revenue miles and 1.53 fatalities involving users of other vehicles per 100 million vehicle revenue miles, both three orders of magnitude greater than bus passenger fatality rates.[5] Expanding on this data point, collisions with persons made up only 8 percent of all bus collisions but 35 percent of bus collision fatalities.[6] This indicates that reducing bus collisions can have a significant impact on reducing fatalities associated with pedestrians and similar roadway users and occupants of other vehicles.

While the causes of these collisions are varied, the Subcommittee identified several underlying reasons for bus collisions, including the following:

- A variation in bus design, where the large vehicle is related to an increase in the volume of roadway that a driver cannot see[7]
- A lack of situational awareness on behalf of both the driver[8] and pedestrian[9]
- External factors in the bus environment, such as other roadway users, intersection design, and external distractions[10]

The Subcommittee met ten times throughout 2023 to discuss personal knowledge and experience from its industry related to bus collisions. The Subcommittee also had the opportunity to hear from various researchers studying the topic. Specifically, the Subcommittee reviewed bus collision research under the

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[3] "Deaths by Transportation Mode - Injury Facts," National Safety Council (NSC). Accessed: Dec. 18, 2023. [Online]. Available: https://injuryfacts.nsc.org/home-and-community/safety-topics/deaths-by-transportation-mode/

[4] Subcommittee discussion during March 2023 meeting.

[5] "Bus Safety Data Report: Bus Transit Safety Data 2008-2018," Federal Transit Administration, Sep. 2021. [Online]. Available: https://www.transit.dot.gov/regulations-and-programs/safety/bus-transit-safety-data-report-2008-2018

[6] Ibid.

[7] P.-S. Lin, C. Lee, A. Kourtellis, and M. Saxena, "Evaluation of Camera-Based Systems to Reduce Transit Bus Side Collisions," Center for Urban Transportation Research (CUTR), BDK85 Two 977-08, Mar. 2010. [Online]. Available: https://www.nctr.usf.edu/wp-content/uploads/2011/04/77905.pdf

[8] R. Griffin, C. Huisingh, and G. McGwin, "Prevalence of and factors associated with distraction among public transit bus drivers," *Traffic Inj Prev*, vol. 15, no. 7, pp. 720–725, 2014, doi: 10.1080/15389588.2013.867482.

[9] D. C. Schwebel, D. Stavrinos, K. W. Byington, T. Davis, E. E. O'Neal, and D. de Jong, "Distraction and pedestrian safety: How talking on the phone, texting, and listening to music impact crossing the street," *Accident Analysis & Prevention*, vol. 45, pp. 266–271, Mar. 2012, doi: 10.1016/j.aap.2011.07.011.

[10] King, S., Cesic, L., Brodeur, A., Mallet, M., Young, J., Gabree, S., & Fisher, D. (2023). *Interactive PowerPoint Training to Improve Safety Driver Awareness while Operating a Transit Vehicle Equipped with Driving Automation Features. (FTA Report No. 0248).* Washington, DC: Federal Transit Administration]. Available: https://www.transit.dot.gov/research-innovation/interactive-powerpoint-training-improve-safety-driver-awareness-while-operating

Safety Research Demonstration (SRD) program with Roy Wei Shun Chen, general engineer with FTA's Office of Infrastructure and Asset Innovation. Dr. Donald L. Fisher, Principle Technical Advisor for Surface Transportation Human Factors at U.S. DOT's Volpe National Transportation Systems Center, attended to discuss causal factors related to trucks and buses involved in crashes with vulnerable road users. Frank Hackett, Safety Risk Management Program Manager with FTA, provided a review of the Office of Transit Safety and Oversight—Safety Risk Management and Assurance Division's (TSO-11) activities on bus-to-person collisions and discussed NTD data trends. Amy Volz from the Office of Program Management (TPM) at FTA presented on bus safety funding sources at the federal level. In addition to meeting with and listening to subject matter expert presenters, the Subcommittee worked to gather relevant research documents related to the topic.

Given this, the goals of the of the Subcommittee are to assist FTA with identifying the most critical hazards associated with bus collisions with privately operated vehicles (POVs), pedestrians, and bicycles, and to provide FTA with thoughtful, actionable, and reasonable recommendations. Using its subject matter expertise, the Committee has identified critical hazards and come up with reasonable countermeasures related to each topic. The research and discussions detailed in this report can steer FTA's Safety Risk Management (SRM) program towards analyzing the most pressing hazards and feasible mitigations associated with bus collisions.

Reducing Transit Bus Collisions

Beyond the baseline data related to bus collisions, there are several additional factors for transit agencies and FTA to consider when addressing the problem of bus collisions. On a national level, U.S. DOT has a zero deaths vision with the goal of zero roadway fatalities nationwide.[11] This approach acknowledges that even one death in the transportation system is unacceptable and utilizes a Safe System Approach, which incorporates safer vehicles, safer people, adequate post-crash care, safer roads, and safer speeds.

According to the Large Truck and Bus Crash Facts 2020, in 2020, 4,986 large trucks and buses were involved in fatal crashes nationwide.[12] Historically, there was a 34 percent decrease in fatal crashes involving large trucks or buses between 2005 and 2009; however, this was followed by an increase of 31 percent between 2010 and 2020. In recent years, between 2020 and 2021, the number of fatal crashes increased again by 3 percent. With the support of FTA, transit agencies can take the appropriate actions to ensure that this upward trend in fatalities is reversed.

Federal Activities Related to Reducing Bus Collisions

U.S. DOT has adopted a Safe System Approach to roadway safety.[13] The Safe System Approach works by building and reinforcing multiple layers of protection to prevent crashes before they occur. By designing

[11] "Zero Deaths and Safe System," Federal Highway Administration. Accessed: Nov. 21, 2023. [Online]. Available: https://highways.dot.gov/safety/zero-deaths
[12] "Large Truck and Bus Crash Facts 2020," Federal Motor Carrier Safety Administration. Accessed: Nov. 21, 2023. [Online]. Available: https://www.fmcsa.dot.gov/safety/data-and-statistics/large-truck-and-bus-crash-facts-2020
[13] U.S. Department of Transportation. "What Is a Safe System Approach?" Accessed December 13, 2023. https://www.transportation.gov/NRSS/SafeSystem.

a system with many redundancies, people can be more successful in protecting road users from human error. When seeking to reduce bus collisions, a Safe System Approach can be incorporated into each initiative related to this goal.

FTA has a variety of programs and policies in place to help local agencies achieve goals related to safety. For example, FTA administers the Office of Transit Safety and Oversight (TSO) to provide a nationwide transit safety program and compliance oversight.[14] Specifically, TSO works to increase transit safety through policy development, hazard investigation, data collection, risk analysis, oversight programing, and information sharing. There are three program offices within TSO, which include the Office of System Safety, the Office of Safety Review, and the Office of Program Oversight. One example of a recent TSO action related to bus collisions is the issuance of Safety Advisory 23-1, which is a recommendation that transit agencies consider mitigation strategies to reduce bus-to-person collisions.[15]

Additionally, FTA manages the NTD under the Office of Budget and Policy and the Office of Strategic Planning and Analysis.[16] Congress established NTD to be the primary source of information and statistics on transit systems in the United States. Recently, NTD adopted changes to the type of data collected on bus-impact fatalities, which includes implementing a new Safety and Security reporting form[17] (S&S-60) to collect data related to collisions with pedestrians, vehicles, and other objects, and reportable injuries and fatalities. By collecting nationwide data from transit agencies, FTA can use this NTD data to help identify hot spots, primary causes of collisions, and other trends related to bus collisions at a national level.

Federal funding distributed through FTA may have requirements related to safety. For example, FTA currently has language for agencies that receive funding through the Urbanized Area Formula Funding program (49 U.S.C. 5307) to devote 0.75 percent of the funding to safety improvements or projects.[18] Additionally, agencies receiving these 5307 funds with a population of 200,000 or more must have updated their Agency Safety Plans to comply with Bipartisan Infrastructure Law requirements, and must establish safety committees in their agencies that consist of both frontline employees and management

[14] "Transit Safety & Oversight (TSO)," Federal Transit Administration. Accessed: Nov. 21, 2023. [Online]. Available: https://www.transit.dot.gov/regulations-and-guidance/safety/transit-safety-oversight-tso

[15] "Bus-to-Person Collisions Safety Advisory 23-1," Federal Transit Administration. Accessed: Nov. 21, 2023. [Online]. Available: https://www.transit.dot.gov/regulations-and-programs/safety/bus-person-collisions-safety-advisory-23-1

[16] "What is the National Transit Database (NTD) Program?" Federal Transit Administration. Accessed: Nov. 21, 2023. [Online]. Available: https://www.transit.dot.gov/ntd/what-national-transit-database-ntd-program

[17] "National Transit Database Safety and Security Reporting Changes and Clarifications," Federal Register. Accessed: Nov. 21, 2023. [Online]. Available: https://www.federalregister.gov/documents/2023/02/23/2023-03789/national-transit-database-safety-and-security-reporting-changes-and-clarifications

[18] "Bipartisan Infrastructure Law changes to Public Transportation Agency Safety Plan requirements [49 U.S.C. 5329d]," Federal Transit Administration. Accessed: Dec. 13, 2023. [Online]. Available: https://www.transit.dot.gov/funding/grants/bipartisan-infrastructure-law-changes-public-transportation-agency-safety-plan

representatives.[19] If the agency desires, any of these safety requirements may address bus collisions, though they may also relate to other safety initiatives within the agency.

FTA also provides education opportunities related to transit safety through three primary channels.[20] The Transportation Safety Institute (TSI) provides economical, timely, state-of-the-art training and educational opportunities related to safety to the transit industry. The National Transit Institute (NTI) provides a variety of courses on public transportation and quality of life in the United States. Finally, FTA issues entry-level driver training regulations to provide regulatory structure to training curriculum for individuals obtaining or upgrading their Commercial Driver's License (CDL) for the first time.

By collecting data and providing guidance, regulatory oversight, policy development, and training curriculums, FTA can influence transit safety on a national level. The Committee has taken these channels into account when providing recommendations related to the reduction of bus collisions.

[19] "Transit Safety & Oversight (TSO)," Federal Transit Administration. Accessed: Nov. 21, 2023. [Online]. Available: https://www.transit.dot.gov/regulations-and-guidance/safety/transit-safety-oversight-tso
[20] "FTA-Sponsored Training Courses," Federal Transit Administration. Accessed: Nov. 21, 2023. [Online]. Available: https://www.transit.dot.gov/regulations-and-guidance/safety/fta-sponsored-training-courses

TRACS Recommendations for FTA

The following sections provide in-depth information on each recommendation developed by the Committee.

Recommendation 1: Establish a Baseline Training Curriculum Focused on Operational Safety

Background of Committee Findings

There is a need for additional training for transit managers, administrators, and operators. Not all agencies have equal resources with respect to funding or people dedicated to understanding what makes a training program effective. FTA can assist agencies in determining components needed for a baseline training curriculum for a variety of transit employees.

For transit administrators, there are currently no requirements for hazard management in the Public Transportation Safety Certification Training Program (PTSCTP) run by TSI. TSI is one of the most commonly used training platforms for transit agencies. The PTSCTP Final Rule establishes a uniform curriculum for safety training, which consists of several minimum requirements meant to enhance the technical proficiency of safety personnel.[21] This includes two different required individual training plan tracks, one of which is for State Safety Oversight Agency personnel who conduct safety audits of rail transit systems. The other category is for rail transit agency personnel who are directly responsible for safety oversight. Additionally, bus personnel, including bus transit system personnel with direct safety oversight responsibility, and State DOTs overseeing safety programs for sub-recipients of federal financial assistance under 49 U.S.C. Chapter 53 have a voluntary training program that they are encouraged, but not required, to complete.

Common core courses under each of these tracks are focused on Safety Management Systems (SMS). According to TSI, course content for the SMS framework includes executive leadership and accountability for safety, creating a positive safety culture, preventive risk analysis, and building an effective employee safety reporting program.[22] However, there are currently no requirements or courses focused on assessing organizational accident trends within an agency to prevent collisions. Hazard management training enables individuals to identify, predict, and avoid hazards in the

[21] Federal Transit Administration. “Safety Training.” Accessed November 21, 2023. https://www.transit.dot.gov/regulations-and-guidance/safety/safety-training.

[22] Found in course description for SMS principles for Transit at:
Transportation Safety Institute. “U.S. DOT Transportation Safety Institute.” Accessed November 21, 2023. https://tsi-dot.csod.com/client/tsi-dot/default.aspx?ReturnUrl=https%3a%2f%2ftsi-dot.csod.com%2fLMS%2fcatalog%2fWelcome.aspx%3ftab_page_id%3d-67%26tab_id%3d20000325.

workplace.[23] The Occupational Safety and Health Administration (OSHA) currently has some good examples of courses related to hazard management.

In addition to a lack of hazard management training for transit administrators, there is also a lack of training and training standardization for bus operators and bus supervisors, specifically on the topic of operational hazard analysis. Many agencies across the country lack standardization and certain baseline elements in their operator training programs. For instance, the State of California has minimum guidelines for operator trainers; however, not all States or transit agencies adhere to these guidelines.[24] The Committee noted that the American Public Transit Association (APTA) has some guidelines around best practices for operator training that would be useful to incorporate into nationwide training standards.[25] Additionally, there are several commercial entities that produce core training programs that transit organizations use to build out their individual training programs. Resources from these training platforms can be identified and built into a national training standard.

The Committee identified several use cases where bus operators might benefit from additional training or standardization. Since most bus accidents are intersection or mid-block based, and the majority of those accidents occur when the bus is turning left,[26] many transit operators would benefit from training related to making vision or turn adjustments when approaching curves in the road.[27] Additionally, many operators are not confident in making seat or mirror adjustments in the bus, which can lead to limited line of sight on the road.[28] Another consideration is that many transit agencies are incorporating additional sensors into their fleets that may aid the driver in detecting pedestrians or other objects. However, these tools are often new and unfamiliar to many transit operators. Operators could benefit from additional training related to new and emerging technologies used on buses. Transit agencies can also benefit from specifically training their drivers and supervisors to identify hazards with respect to the Safety Management System (SMS). If operators are more familiar with the information that SMS is built to collect, then they can better assist their agency with identifying those specific hazards.

[23] "Hazard Management versus Safety Risk Management Guide." Federal Transit Administration. [Online]. Available: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/regulations-and-programs/safety/public-transportation-agency-safety-program/134711/hazard-management-versus-safety-risk-management-guide.pdf

[24] "Bus Driver Instructor Selection Guidelines - Training," California Department of Education. Accessed: Dec. 13, 2023. [Online]. Available: https://www.cde.ca.gov/ls/tn/im/instrguidelines.asp

[25] "Recommended Practice for Transit Bus Operator Training." American Public Transportation Association, 2007. [Online]. Available: https://www.apta.com/wp-content/uploads/Standards_Documents/APTA-BTS-BO-RP-001-07.pdf

[26] F. Hackett, "Review of TSO-10 Safety Risk Management (SRM) Activities on Bus to Person Collisions," presented at the Transit Advisory Committee for Safety (TRACS) Subcommittee Meeting: Reducing Bus Collisions, Mar. 22, 2023.

[27] Subcommittee discussion during March 2023 meeting.

[28] Subcommittee discussion during April 2023 meeting.

Implementation Suggestions

1. Develop the training curriculum for bus transit managers and supervisors to include the topics of hazard management and understanding organizational accidents and trends.

FTA needs to expand baseline training for transit managers to cover hazard management and understanding organizational accidents and trends. This could be accomplished through a variety of training platforms. One commonly used platform is TSI, U.S. DOT's current training platform to provide safety, security, and environmental training to federal, state, and local government, and private and foreign transportation professionals. All transit agencies have specific requirements to complete courses with TSI. Due to this broad reach, the Committee suggests first looking at expanding the baseline training under TSI, specifically the SMS course. However, due to the limitations of recommending only looking at one training provider, the committee also recommends that FTA look into other avenues for dispersing the training as well.

2. Develop baseline training guidance for transit operators related to procedures identified to reduce bus collisions.

FTA should establish baseline training guidance for transit operators. This baseline training should include the topics of safe left-hand turns, mirror adjustments for optimal visibility, operator seat adjustments, and working with and understanding hazard detection sensors that may be incorporated into a bus. FTA should also incorporate training for operators in identifying hazards and relating the identified hazards to information collected by the agency's SMS. Finally, FTA should develop training about procedure policies related to service interruptions. See Appendix A: Basic Training Requirements for a more detailed outline of the Committee's minimum basic requirements of a "standard" Fixed Route Transit Operator Training Course.

Recommendation 2: Establish Minimum Standards for Fatigue Risk Management

Background of Committee Findings

Operator fatigue is one of the leading contributors to road crashes, accounting for an estimated 15-30 percent of all road traffic crashes globally.[29] Sleepiness can impair a driver and lead to decreased attention levels, slower reaction times, and an overall decrease in performance. Additionally, the

[29] K. A. Miller, A. J. Filtness, A. Anund, S. E. Maynard, and F. Pilkington-Cheney, "Contributory factors to sleepiness amongst London bus drivers," *Transportation Research Part F: Traffic Psychology and Behaviour*, vol. 73, pp. 415–424, Aug. 2020, doi: 10.1016/j.trf.2020.07.012.

National Transportation Safety Board (NSTB) investigates a variety of accidents in transit and has identified fatigue as one of the causal or contributing factors to fatal events.[30]

The reasons for driver fatigue may vary; however, with transit operators, this fatigue may be generated by structural aspects of work, such as scheduling, and the accumulation of stress.[31] Driving in complex city environments and under mental overload from external factors such as passenger behavior can lead to additional stress for the driver. Fatigue may also be more of an issue for inexperienced drivers, which indicates a need for guidance around managing fatigue for new operators.

In addition to fatigue, individuals who feel rushed and pressured due to limited time are subject to a number of behavioral and psychological consequences, including additional stress, impaired inhibition, and negative impacts to decision making.[32] These cognitive consequences can then negatively impact an individual's driving abilities and performance. Advanced service management can be applied to routes that chronically run late, thus reducing the impact of feeling rushed on the drivers.

Currently, there are no federal hours-of-service (HOS) rules in the transit industry.[33] The Federal Motor Carrier Safety Administration (FMSCA) does regulate HOS for carriers and drivers operating commercial motor vehicles (CMVs); however, these regulations do not extend to the transit industry.[34] This means that if a driver is fatigued or has been operating a vehicle for an extended period of time, there are no federal rules preventing additional driving time.

By directly implementing minimum standards related to fatigue risk management such as hours-of-service rules, transit agencies can protect their workers from excessive fatigue and, in turn, protect vulnerable road users from collisions that may be a result of fatigued operators.

While all members of the Reducing Bus Collisions subcommittee agree on this recommendation and wish to move forward with it, it must be noted that the TRACS committee member from ATU does not support this recommendation. While ATU does concur with the other recommendations in this report, ATU opposes FTA proceeding with the rulemaking entitled "Transit Workers Hours of Service and Fatigue Risk Management," docket no. FTA-2023-0018. As such, ATU cannot support Recommendation 2.

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[30] Staes, Lisa, Jodi Godfrey, Rino Saliceto, Roberta Yegidis, and Diana Byrnes. "FTA Standards Development Program: Medical Fitness for Duty and Fatigue Risk Management." Federal Transit Administration, June 2022. https://www.transit.dot.gov/sites/fta.dot.gov/files/2022-07/FTA-Report-No-0223.pdf.

[31] H. Biggs, D. Dingsdag, and N. Stenson, "Fatigue factors affecting metropolitan bus drivers: a qualitative investigation," *Work*, vol. 32, no. 1, pp. 5–10, 2009, doi: 10.3233/WOR-2009-0810.

[32] R. F. Sussman and R. Sekuler, "Feeling rushed? Perceived time pressure impacts executive function and stress.," *Acta Psychologica*, vol. 229, p. 103702, Sep. 2022, doi: 10.1016/j.actpsy.2022.103702.

[33] "Transit Worker Hours of Service and Fatigue Risk Management," Federal Register. Accessed: Dec. 12, 2023. [Online]. Available: https://www.federalregister.gov/documents/2023/10/30/2023-23916/transit-worker-hours-of-service-and-fatigue-risk-management

[34] "Hours of Service (HOS)," Federal Motor Carrier Safety Administration. Accessed: Dec. 12, 2023. [Online]. Available: https://www.fmcsa.dot.gov/regulations/hours-of-service

Implementation Suggestions

1. Establish regulations for hours of service.

Currently, there are no nationwide rules related to hours of service; however, as of the writing of this report, FTA has released an advanced notice of proposed rulemaking entitled Transit Worker Hours of Service and Fatigue Risk Management.[35] The Committee recommends that FTA pursue the implementation of these regulations, specifically focusing on hours-of-service rules that effectively manage driver fatigue. Many states already have regulations related to medical fitness for duty, and fatigue management can expand upon this. FTA should also put regulations in place to account for whether a driver is working for a transportation network company (TNC) or any other company in their off-hours. Additionally, if an individual is assessed by the agency as being too fatigued for duty, an agency should have the option to pull them out of service, similar to current FTA rules related to being under the influence of alcohol.

2. Establish oversight guidance for advanced service management.

Advanced service management can contribute to operators feeling less rushed, which can help reduce accidents.[36] For example, effective headway management is an important component of advanced service management. This topic is expanded upon in Recommendation 6: Establish Guidance on Service Management, however, is still worth mentioning under the topic of fatigue risk management since advanced service management can be used to effectively reduce driver fatigue.

3. Require a fatigue risk management program.

In addition to FTA implementing hours-of-service rules, agencies need effective programs that will help them manage fatigue risk. Transit operators should feel safe to report to their supervisors when they are feeling fatigued or rushed, and appropriate corrections to the route structure, operator assignment, or route timetables should be made. Without a program dedicated specifically to managing fatigue risk, transit agencies may not be able to adequately address this concern.

Recommendation 3: Develop Baseline Standards for New Bus Design and Research Best Practices for Retrofitting

Background of Committee Findings

There is a lack of standardization of design for transit vehicles, and there are specific areas on a bus that can benefit from increased design standards to help reduce bus collisions. For example, data shows that

[35] "Transit Worker Hours of Service and Fatigue Risk Management," Federal Register. Accessed: Dec. 12, 2023. [Online]. Available: https://www.federalregister.gov/documents/2023/10/30/2023-23916/transit-worker-hours-of-service-and-fatigue-risk-management

[36] Subcommittee discussion during February 2023 meeting.

the majority of roadway intersection bus-to-person collisions occur when the bus is turning left.[37] Furthermore, through anecdotal evidence and industry knowledge, many committee members attest that the left turn is a high-risk maneuver due to a variety of factors, such as limited visibility on the left side of the bus, roadway intersection design, and changing risks like pedestrians and oncoming vehicles. Objects located near the rear of the bus also present a challenge for operators to see and maneuver safely around. However, there are no design standards related to increased visibility around the bus.

Additionally, bus mirrors are not designed consistently, and many drivers adjust them inconsistently. Many bus mirrors must be adjusted manually by stepping out of the vehicle, which means that if a driver does not set them properly before going out, adjusting them while on the road is difficult. Research suggests that if a mirror is shifted even slightly, a driver's vision may expand from 7 feet to 47 feet.[38] Mirror manufacturers also design mirrors inconsistently, which means that transit agencies may have to retrofit buses or come up with mirror adjustment and design standards to achieve safe mirror visibility.[39] For example, Los Angeles County Metropolitan Transportation Authority (LA Metro) used a mirror vendor that had designed a mirror with blind spots, which had to be corrected. If design standards related to mirrors are implemented, this will help reduce the need for corrections.

Another factor to consider with respect to design standards is the increased use of sensors by transit agencies. Many transit agencies may look to sensors to detect things that drivers are not able to see easily, such as curbs or other physical presences near the bus as it navigates the environment. Cameras can contribute to better visibility around the entirety of the bus, as demonstrated by FTA's Bus of the Future 360-degree camera mirror pilot.[40] To better understand how to incorporate sensors, the Pierce County Public Transportation Benefit Area Corporation (Pierce Transit) in Tacoma, WA, conducted a closed-course "alpha testing" using 30 Pedestrian Avoidance Safety Systems (PASS) installed on its buses.[41] Pierce Transit has also been using cameras to track near misses and better understand what types of events may be causing a near miss. Based on these tests, Pierce Transit concluded that sensor and camera location is critical and that retrofits present challenges, both in terms of accuracy and warranty issues. This suggests that it is crucial to include bus manufacturers early in the process when retrofitting cameras and other sensors on transit vehicles.

[37] F. Hackett, "Review of TSO-10 Safety Risk Management (SRM) Activities on Bus to Person Collisions," presented at the Transit Advisory Committee for Safety (TRACS) Subcommittee Meeting: Reducing Bus Collisions, Mar. 22, 2023.
[38] Ibid.
[39] Ibid.
[40] J. Clark, "'Bus of the Future' Redesign of Transit Bus Operator Compartment to Improve Safety, Operational Efficiency, and Passenger Accessibility Program," presented at the Bus Compartment Redesign Program (BCP) and Bus of the Future listening session, Jun. 22, 2023. Accessed: Dec. 15, 2023. [Online]. Available: https://www.transit.dot.gov/research-innovation/bus-future-redesign-transit-bus-operator-compartment-improve-safety-operational
[41] Subcommittee discussion during April 2023 meeting.

Implementation Suggestions

1. Research and promote a standard of design, or multiple depending on the type of vehicle, that would enhance visibility and driver awareness around the entirety of the bus.

FTA should conduct research related to procurement design standards that will improve the operator's information about objects and people located outside of the vehicle. All transit vehicles should have minimum standards of design to address current inconsistencies across bus models and manufacturers. The Committee identified several specific areas that FTA can focus on. First, standards of design that increase visibility on the left side and rear of the bus can help drivers anticipate objects coming from those directions. In addition, transit operators would greatly benefit from design standards related to mirror placement and mirror adjustment. Bus manufacturers also need to be held to certain mirror placement standards to avoid the need for additional adjustments once the bus is procured by the agency. Finally, FTA should research and promote a standard of design related to camera systems or other sensors that are added to vehicles by agencies.

2. Research and develop template procurement language to achieve specific safety standards.

When procuring buses and components for buses, transit agencies can benefit from incorporating safety-specific language into the procurement contracts. Some procurement departments may benefit from templates containing language that should be incorporated into a contract to achieve necessary safety requirements.[42] FTA can conduct research on agencies that currently have effective procurement language and incorporate this language into templates designed for certain use cases.

Recommendation 4: Prioritize Federal, State, Local, and Agency Financial Resources Towards Safety Improvements

Background of Committee Findings

There are currently no mandatory statutory requirements to direct funds towards reducing bus-to-person collisions. Additionally, there are minimal federal funding programs that specifically address safety, making it difficult for agencies to focus financial resources on initiatives like reducing bus collisions. FTA's 2023 Safety Advisory 23-1: Bus-to-Person Collisions[43] recommends that transit agencies providing bus service consider mitigation strategies to reduce bus-to-person collisions to help reduce the likelihood and severity of bus collisions with pedestrians, bicyclists, and micromobility users. To support safety advisories such as this, one mitigation strategy transit agencies might consider is allocating additional funding towards safety initiatives.

[42] Subcommittee discussion during October 2023 meeting.

[43] "FTA Safety Advisory 23-1: Bus-to-Person Collisions." Federal Transit Administration. Accessed: Nov. 21, 2023. [Online]. Available: https://www.transit.dot.gov/regulations-and-programs/safety/fta-safety-advisory-23-1-bus-person-collisions

Formula funding distributed by FTA has requirements related to safety; however, the definition of "safety" is often broad. For instance, the Bus Formula Program 5339(a) provides funding for purchasing buses and related equipment.[44] New equipment and updated buses can directly contribute to safety outcomes. The State of Good Repair Grants Program 5337 provides capital assistance for maintenance, replacement, and rehabilitation projects to help transit agencies maintain assets in a state of good repair in urbanized areas.[45] These two programs directly distribute money to transit agencies to help them maintain their assets, which can, in turn, lead to benefits related to safety. With respect to direct funding allocation for safety projects, FTA currently has language for agencies that receive Urbanized Area 5307 formula funds to devote 0.75 percent of the funding to safety improvements or projects.[46] However, this funding allocation is relatively small and may not necessarily provide agencies the resources needed to address bus collisions. Transit agencies may also be unaware of or uninformed about the language related to safety in these funding programs.

In addition to formula funding, FTA competitive grant programs also have limited language around utilizing funds for safety. There are two competitive grant programs that FTA oversees for transit agencies: the Grants for Buses and Bus Facilities Program 5339(b) and the Low- or No-Emission Vehicle Program 5339(c). The Buses and Bus Facilities competitive program 5339(b) can fund the replacement or rehabilitation and purchase of buses. Safety is also a component when assessing the potential benefits of distributing the award to an applicant. The Low-No competitive program 5339(c) is meant to fund purchases of new low-emissions buses. This program includes requirements that 5 percent of the award should be for workforce development, which can include, but is not required to include, improvements to safety culture. The requirements of these two competitive grant programs demonstrate that while there is some incentive to incorporate certain safety initiatives, there are no direct requirements. Neither of these two discretionary grant programs directly addresses safety as a priority or gives agencies financial resources to direct towards safety projects.

Implementation Suggestions

1. Support marketing around funding requirements or guidelines to help transit agencies understand what they can pursue related to safety within the grant funding they receive.

As discussed above, there are a variety of federal grant programs with components that relate to safety; however, some agencies may not be aware of such options within the grant program. FTA should

[44] "Grants for Buses and Bus Facilities Formula Program - 5339(a)," Federal Transit Administration. Accessed: Nov. 21, 2023. [Online]. Available: https://www.transit.dot.gov/funding/grants/busprogram
[45] "State of Good Repair Grants - 5337," Federal Transit Administration. Accessed: Nov. 21, 2023. [Online]. Available: https://www.transit.dot.gov/funding/grants/state-good-repair-grants-5337
[46] "Bipartisan Infrastructure Law changes to Public Transportation Agency Safety Plan requirements [49 U.S.C. 5329d]," Federal Transit Administration. Accessed: Dec. 13, 2023. [Online]. Available: https://www.transit.dot.gov/funding/grants/bipartisan-infrastructure-law-changes-public-transportation-agency-safety-plan

support marketing around funding that can be used for safety projects or initiatives to help transit agencies better understand how to use this funding.

2. Consider tying more safety work requirements to grant programs.

The majority of grants provided by FTA do not have direct requirements related to safety; rather, the grant recipient has an option to use funding for safety projects. FTA needs to consider including requirements to implement safety work into its grant programs, with a focus on projects that reduce collisions and move agencies towards the goal of zero roadway deaths. FTA should also ensure that these types safety priorities are made clear to applicants when they are applying for funding.

3. Guide agencies on how to successfully utilize fund sources to assist in the management of unsafe behavior.

At a local level, many transit agencies do not directly reserve money for conducting safety campaigns or other safety initiatives. This is due to a complex set of funding rules and a variety of formula fund sources. Due to these funding complexities, many agencies focus on operations and do not reserve money for safety initiatives. With the recent rulemaking around implementing Public Transportation Agency Safety Plans (PTASP) and requirements to include elements related to implementing a Safety Management System (SMS),[47] many agencies are seeking funding sources to help with implementation. Agencies would benefit from additional sources of funding or guidance on how to maximize funding sources, which can come in the form of discretionary or formula funding for safety work.

Recommendation 5: Increase Marketing and Communications Related to Safety for Internal and External Use

Background of Committee Findings

Increasing the public's awareness of safety hazards posed by transit vehicles is a critical component of reducing bus collisions. Through the PTASP rule, FTA requires the implementation of certain SMS principles, one of which can be safety promotion.[48] Transit agencies that have directed resources towards such campaigns have seen direct benefits. For instance, Metro Transit located in Minneapolis and St. Paul, Minnesota, created a framework of education and outreach starting in 2009 following two fatal bus-to-person collisions.[49] The agency conducted outreach to the public to help them better understand hazards associated with transit vehicles. As part of this, it conducted outreach with bicyclists that allowed them to sit in the operator's seat to understand what the operator can and cannot see while driving. This framework directly led to improvements in customer perceptions of safety, a 6.5

[47] "Public Transportation Agency Safety Plans," Federal Transit Administration. Accessed: Nov. 21, 2023. [Online]. Available: https://www.transit.dot.gov/PTASP
[48] Ibid.
[49] S. Conlon, B. Feiner, and M. Himrich, "System Safety Approach to Collision Reduction," Mass Transit. Accessed: Nov. 21, 2023. [Online]. Available: https://www.masstransitmag.com/home/article/11149670/system-safety-approach-to-collision-reduction

percent annual reduction in collisions, and a $582,282 annual savings in risk management claim payments.[50]

The Committee also highlighted several other agencies currently doing a good job at marketing campaigns related to safety, shown in Appendix B: Effective Safety Campaigns. For example, the King County Metro Transit Department (King County Metro) in Washington State has a webpage with safety tips and videos aimed at a variety of transit users, including pedestrians, wheelchair users, and cyclists.[51] It also produced posters and other visuals to be used inside or near transit buses. The Metropolitan Transit Authority of Harris County (Houston Metro) in Houston, Texas has developed similar content for its riders, including a webpage and posters aimed at customers.[52]

An example of a national marketing campaign is FMCSA's Our Roads, Our Safety Campaign.[53] This outreach effort involves marketing and outreach toolkits related to transit safety and is intended to support FMCSA's mission of reducing crashes, injuries, and fatalities in large trucks and buses. FHWA has also promoted the nationwide Vision Zero Campaign, which seeks to achieve zero deaths in the transportation system.[54] Many cities and agencies across the country have adopted this campaign; for example, the City of Philadelphia used a visual campaign with the slogan "We meet in the street" to give drivers context and awareness of the dangers pedestrians and cyclists face on the road.[55]

Implementation Suggestions

1. Create a safety marketing toolkit that transit agencies can adapt for their use.

Given the basis for effective marketing campaigns at a local level, as well as a precedent for safety initiatives at a national level, FTA can provide support to transit agencies to help pursue these types of marketing campaigns. Template marketing materials can include general safety habits such as maintenance personnel wearing protective eye equipment, vehicle operators properly entering a turn, maintenance personnel working properly under the vehicle, and marketing materials targeted towards the public to promote greater awareness of transit vehicles. FTA can also incorporate into the marketing toolkit case studies from community outreach campaigns from transit agencies across the country.

2. Provide guidance about conducting effective community outreach.

Community partnerships and targeted relationships with key community members can be extremely effective, and FTA can help transit agencies identify and implement best practices. FTA should research

[50] Ibid.
[51] "Rider safety," King County Metro. Accessed: Nov. 21, 2023. [Online]. Available: https://kingcounty.gov/en/dept/metro/rider-tools/rider-safety
[52] "Safety for Passengers, Pedestrians, Cyclists and Drivers," Houston Metro. Accessed: Nov. 21, 2023. [Online]. Available: https://www.ridemetro.org/riding-metro/safety-security/your-safety
[53] "About the Our Roads, Our Safety Campaign," Federal Motor Carrier Safety Administration. Accessed: Nov. 21, 2023. [Online]. Available: https://www.fmcsa.dot.gov/ourroads/about-campaign
[54] Federal Highway Administration. "Zero Deaths and Safe System." Accessed November 21, 2023. https://highways.dot.gov/safety/zero-deaths.
[55] "Case Study: Vision Zero - Reducing Pedestrian Fatalities through Driver Education," Message Agency. Accessed: Nov. 21, 2023. [Online]. Available: https://www.messageagency.org/work/vision-zero

which transit agencies are conducting effective community outreach related to safety initiatives and identify common themes to the outreach.

3. Direct additional funding for safety campaigns.

There are currently no federal sources of funding dedicated to safety campaigns or safety outreach. This makes it difficult for agencies to reserve money for this purpose. FTA can assist agencies with conducting more safety outreach by providing dedicated sources of funding for such activities.

Recommendation 6: Establish Guidance on Service Management

Background of Committee Findings

There are multiple factors tied to effective service management that can have an impact on bus safety. For instance, the design and planning of routes can impact a driver's ability to operate a bus safely and effectively. If a bus is routed through an area that is high risk or has a high number of near misses, this increases the possibility of a collision, and thus service planners might consider a reroute.[56] Other metrics that agencies can look at when deciding to adjust a route might include the number of rear-end collisions at a bus stop or number of near misses of pedestrians.

Additionally, if a route is planned poorly and does not run on time, this increases stressors for drivers and passengers, which can increase the likelihood of a collision. The environment where a vehicle is operated can also contribute to safety risks, so routes should be assessed for potential environmental hazards, such as street lanes and widths.

Systemic practices around route assignment can also contribute to safety risks. The most difficult routes in the system are often assigned to drivers with the least experience or tenure because lower-seniority drivers have less flexibility to pick routes based on their preference. In developing or updating route plans, transit agencies should consider on-time performance, headways, blocking, and adequate relief breaks with an eye towards the quality of the overall vehicle operator assignments and system performance delivery.

In addition to addressing the above hazards, service managers can benefit from new technologies to help monitor their fleet; however, understanding and adopting this new technology can sometimes be challenging. Transit agencies such as Pierce Transit have seen reductions in risky behavior after implementing video telematics systems in their fleet.[57] While effective, the complexities of implementing this type of technology can present barriers to agencies that might be addressed through additional service management guidance.

[56] Subcommittee discussion during June 2023 meeting.
[57] "Pierce Transit's Bus Safety Program Named One of Best in Nation," Pierce Transit. Accessed: Nov. 21, 2023. [Online]. Available: https://www.piercetransit.org/news-releases?id=473

Implementation Suggestions

1. Establish best practices around route design, stop design, and route changes.

External factors along a bus route can contribute to an operator's ability to operate the bus safely. To address this, FTA should establish guidance about what indicators to track to determine if a route should be rerouted or not. For example, if an intersection has a high rate of pedestrian strikes or near misses or has an unmetered left-turn lane, these factors should be considered when implementing or changing a route.

Local governments also collect data on various congestion scenarios and roadway levels of service. Transit agencies should be notified when this data changes to be able to incorporate it into service planning. Guidelines related to trip planning software such as HASTUS can also be considered, with a focus on on-time estimates generated by the software and the level for which on-time performance estimates become unacceptable.

Finally, a variety of departments should be involved in the route planning process, including the safety department.

2. Support agencies with using and establishing a telematics system to assist in monitoring routes and positively coaching behaviors that have been identified as key performance indicators.

To assist with route planning and safety performance, FTA should provide support to transit agencies to establish a telematics system to help monitor routes. Telematic systems utilize GPS and other sensors such as cameras to provide fleet managers with data about the transit operator and vehicle, and how to adjust the environment to be more comfortable for the operator. These systems can help managers better understand harsh braking, seat belt usage, fuel consumption, potential vehicle faults, and other engine data.[58] They can also help monitor system behaviors where hotspot analyses may be lacking. These systems can be used to positively coach operators about behaviors that they might be unaware of, and thus avoid potential accidents in the future.

FTA can assist agencies by identifying systems that can meet their needs and releasing guidance on how to effectively manage such systems. The Committee specifically recommends that telematics systems be used to positively coach operators and not be used to harass operators based on the resulting data. An example of successful anti-harassment rulemaking can be found in the Electronic Logging Device (ELD) rule from FMCSA.[59]

[58] "Transit Asset Management Plan." Pierce Transit, Oct. 2018. [Online]. Available: https://www.piercetransit.org/file_viewer.php?id=3916

[59] "General Information about the ELD Rule," Federal Motor Carrier Safety Administration. Accessed: Dec. 15, 2023. [Online]. Available: https://www.fmcsa.dot.gov/hours-service/elds/general-information-about-eld-rule

3. Emphasize the Public Transportation Agency Safety Plan (PTASP) Safety Management System (SMS) management of change requirement to help break down silo-like environments.

Under the Public Transportation Agency Safety Plan (PTASP) regulation 49 CFR Part 673, transit agencies other than small public transportation providers have requirements to conduct management of change activities.[60] This includes implementing and operating a Safety Management System (SMS). FTA can continue to educate transit agencies on how to best implement this requirement and encourage them to work across the departments within their agency to do so, with a focus on involving service management in the process.

Recommendation 7: Establish Guidance to Assist Agencies with Developing a Robust Organizational Safety Culture

Background of Committee Findings

A strong safety culture is essential to successfully implementing agency-wide safety initiatives, such as reducing bus collisions. The Federal Highway Administration (FHWA) defines safety culture as "the shared values, actions, and behaviors that demonstrate a commitment to safety over competing goals and demands."[61] For a safety culture to be successful, it must be implemented across all areas of an agency, and not just with the safety department.

One example of a strong safety culture can be found with Pierce Transit, located in Washington State. The American Public Transportation Association (APTA) recently identified Pierce Transit's bus safety program as a top innovator in bus safety.[62] Pierce Transit supports a Safety Committee consisting of employees from across the agency to address safety hazards, conduct proactive safety planning, and work to install new technology to support safety, and it has refined its bus operator training program, amongst other initiatives.

In addition to Pierce Transit, many transit agencies have benefited greatly from an extensive system of listening to operators and working collaboratively with them to address safety issues. Operators are the primary group engaging with transit vehicles on a daily basis and can often provide valuable insight into safety concerns across the agency. Without a successful culture of safety in an organization, any other safety initiative is difficult to implement.

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[60] "Management of Change," PTASP Technical Assistance Center, Aug. 27, 2020. [Online]. Available: https://www.transit.dot.gov/sites/fta.dot.gov/files/2020-08/Webinar-Mgt-of-Change-20200827.pdf

[61] "Safety Culture," Federal Highway Administration. Accessed: Dec. 15, 2023. [Online]. Available: https://highways.dot.gov/safety/zero-deaths/safety-culture

[62] "Pierce Transit's Bus Safety Program Named One of Best in Nation," Pierce Transit. Accessed: Nov. 21, 2023. [Online]. Available: https://www.piercetransit.org/news-releases?id=473

Implementation Suggestions

1. Assist agencies with establishing a safety culture, including one that provides effective feedback channels for staff and strong safety leadership.

FTA can provide guidance and resources related to implementing a safety culture through reports, best practices, case studies, and technical resources. For example, FHWA currently has a website dedicated to traffic safety culture that provides resources and case studies related to the topic. In particular, these resources should focus on providing staff feedback channels that are effective and adequately address any safety concerns that they may have. In addition, FTA could benefit many transit agencies by assisting with developing strong safety leadership. This can include courses about how to become an effective leader or case studies about agencies with this topic in mind.

Conclusion

In summary, in order to successfully reduce bus collisions, FTA must take action to assist transit agencies with addressing the problem using a multifaceted approach. Each of the Committee's recommended actions must be used in conjunction with each other to create an effective and safe system.

A baseline training curriculum for operational safety will provide transit agency staff across the nation with the necessary tools to take actions to increase safety, regardless of the size or scale of their agency. Minimum standards for fatigue risk management will address issues of driver fatigue and lack of hours-of-service rules in the transit sector. In addition, baseline design standards for all buses will ensure that transit agencies are able to acquire a minimum baseline of safety with each new purchase of fleet vehicles. Financial resources for safety improvements will help transit agencies across the country implement a new standard of safety within their organizations. Support from FTA with respect to safety marketing and communications will help transit agencies implement successful safety campaigns aimed at reducing bus collisions. Guidance on service management will help transit agencies across the country avoid system practices that can contribute to collisions. Finally, assisting transit agencies with establishing an organizational safety culture will ensure that all departments within a transit agency are committed to best practices that increase safety and reduce bus collisions.

By taking action on the Committee's above recommendations, FTA can take steps towards reducing bus collisions across the country.

Appendix A: Basic Training Requirements

This outline represents a DRAFT attempt to portray the minimum basic requirements of a "standard" Fixed Route Transit Operator Training Course. Each transit agency can use the basic training requirements, and then add on required additional components based on a transit operation's:

- Scope of work
- Diversification of fleet (how many models of vehicles are present to be trained on)
- Current technology
- Specific service area characteristics.

Excluded from this list are "non-sensitive" training classes such as farebox, schedule procedures, and specific communication procedures (although emergency radio and communication procedures should be a part of standard program). If training program standards developed by FTA are adjusted to include additional service and equipment specific classes, it is likely that baseline training hours would increase.

Other considerations include student-to-instructor ratios, minimum hours of classes, behind-the-wheel (BTW) minimum hours per student, training to a certain level of proficiency, and total minimum training hours per student.

Topic	Course	Class Type
ADA	ADA Classroom Instruction	CLASS
	ADA Sensitivity and Awareness Field Trip	ROAD
	Field Trip Debrief and Mentorship Briefing	CLASS
	Mobility Aid Securement	CLASS/ROAD
	Ramp Use and Safety	CLASS/ROAD
Compliance Training	Drug and Alcohol Awareness and Program	CLASS
	Hazard Communication/Bloodborne Pathogens	CLASS
	Hours of Service Requirements	CLASS
	Heat Stress Management	CLASS
	Wellness/Fitness for Duty	CLASS
Behind the Wheel Training	Bus Orientation, Seat, and Mirror Adjustment	LOT
	Transit Bus Operation - On Site	LOT
	PM Driving/Night Operation	ROAD
	Pre/Post Trip Procedures	LOT

Topic	Course	Class Type
Behind the Wheel Training	Commentary Driving	LOT
	CDL Backing Practice	LOT
	Use of Accelerator	ROAD
	Use of Brakes and Anticipating Stops	ROAD
	Straight Forward Driving	ROAD
	Following Distance	ROAD
	Defensive Driving LLLC	ROAD
	Use of Signal and Horn	ROAD
	Lane Changing	ROAD
	Route Training	ROAD
	Roundabouts (Traffic Circles)	ROAD
	Transit Bus Operation Hands-on BTW	ROAD
	Final Drive Evaluations	ROAD
Defensive Driving (Classroom and Road)	Safety Best Practices	CLASS/ROAD
	LLLC Defensive Driving System	CLASS/ROAD
	Preventing Driver Distraction	CLASS/ROAD
	Air Brake System For Buses	CLASS/ROAD
	CDL Pre-Trip Video	CLASS/ROAD
	PT Pre-Trip Video	CLASS/ROAD
	Anatomy of Right Turns	CLASS/ROAD
	Following Distance	CLASS/ROAD
	Crossing Intersections	CLASS/ROAD
	Hill Stops	CLASS/ROAD
	Straight Backing On Public Roadways	CLASS/ROAD
	Crossing Railroad Tracks	CLASS/ROAD
	Crosswalks	CLASS/ROAD
	Traffic, Merging, Freeway Operations	CLASS/ROAD

Topic	Course	Class Type
Defensive Driving	Overtaking and Passing	CLASS/ROAD
	Pedestrian and Bicyclist Awareness	CLASS/ROAD
	Post Trip Inspection	CLASS/ROAD
	Performing Service Stops	CLASS/ROAD
	Accident, Incident, and Event Procedures	CLASS/ROAD
	Bridges, Underpasses, Restricted Heights	CLASS/ROAD
	Seat and Mirror Adjustment	CLASS/ROAD
	Vehicle Securement	CLASS/ROAD
	Limited Visibility, Adverse Driving Conditions	CLASS/ROAD
	Right-Side Clearance	CLASS/ROAD
	Wheelchair Securement	CLASS/ROAD
	Avoiding Passenger Falls	CLASS/ROAD
	Emergency Radio Communication	CLASS/ROAD
	Space Management, Stopping, and Following Distance	CLASS/ROAD
	Inclement Weather Driving/Operations	CLASS/ROAD
	Proper Speed Limit Adherence	CLASS/ROAD
	High Visibility Clothing	CLASS/ROAD
	Railroad Crossings (Review)	CLASS/ROAD
	Curb Clearance, Service Stops, Vehicle Interlock	CLASS/ROAD
	Proper Vehicle Backing	CLASS/ROAD
	Head and Eye Movements	CLASS/ROAD
	School Bus and Zone Awareness	CLASS/ROAD
Security Awareness	Security Awareness Class	CLASS
Fatigue Awareness	Introduction, Scenarios	CLASS
	Assess sleep IQ, Statistics, Sleep Cycles	CLASS
	Effects of Medications, Sleep Disorders, Risks	CLASS

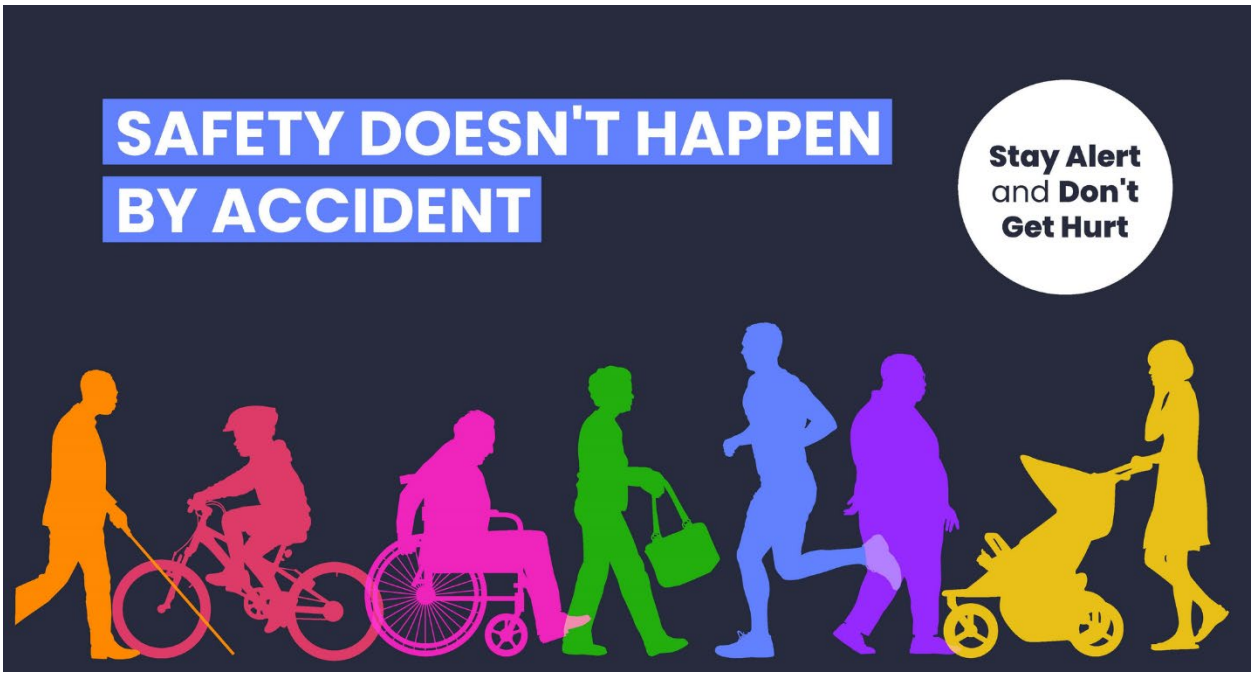
Topic	Course	Class Type
Customer Service	Conflict De-escalation	CLASS
	Art of Customer Service	CLASS

Appendix B: Effective Safety Campaigns

Examples of effective safety marketing campaigns include the following:

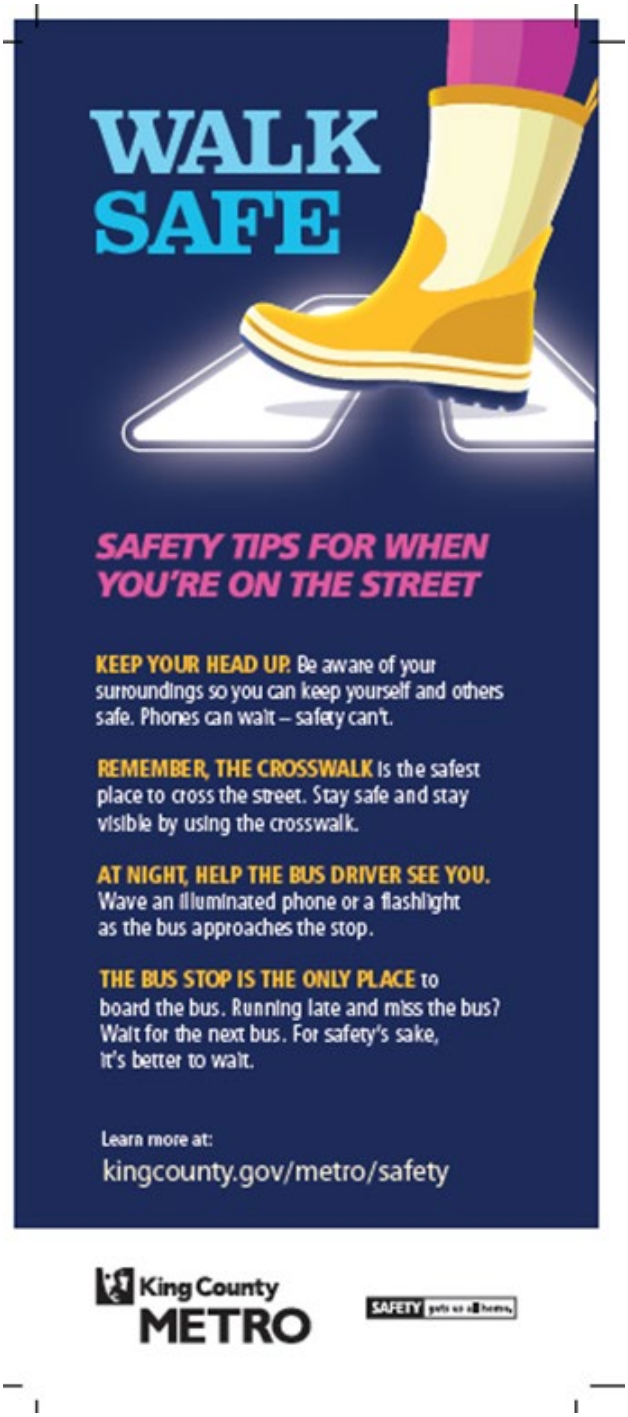
- **Houston Metro,** https://www.ridemetro.org/riding-metro/safety-security/your-safety
- **King County Metro,** https://kingcounty.gov/en/dept/metro/rider-tools/rider-safety
- **FMCSA Our Roads, Our Safety,** https://www.fmcsa.dot.gov/ourroads/about-campaign
- **City of Philadelphia, We Meet in the Street** https://www.phila.gov/2018-07-11-we-meet-in-the-street-vision-zero-launches-first-educational-campaign/

Houston Metro:



King County Metro:

King County Metro contd.



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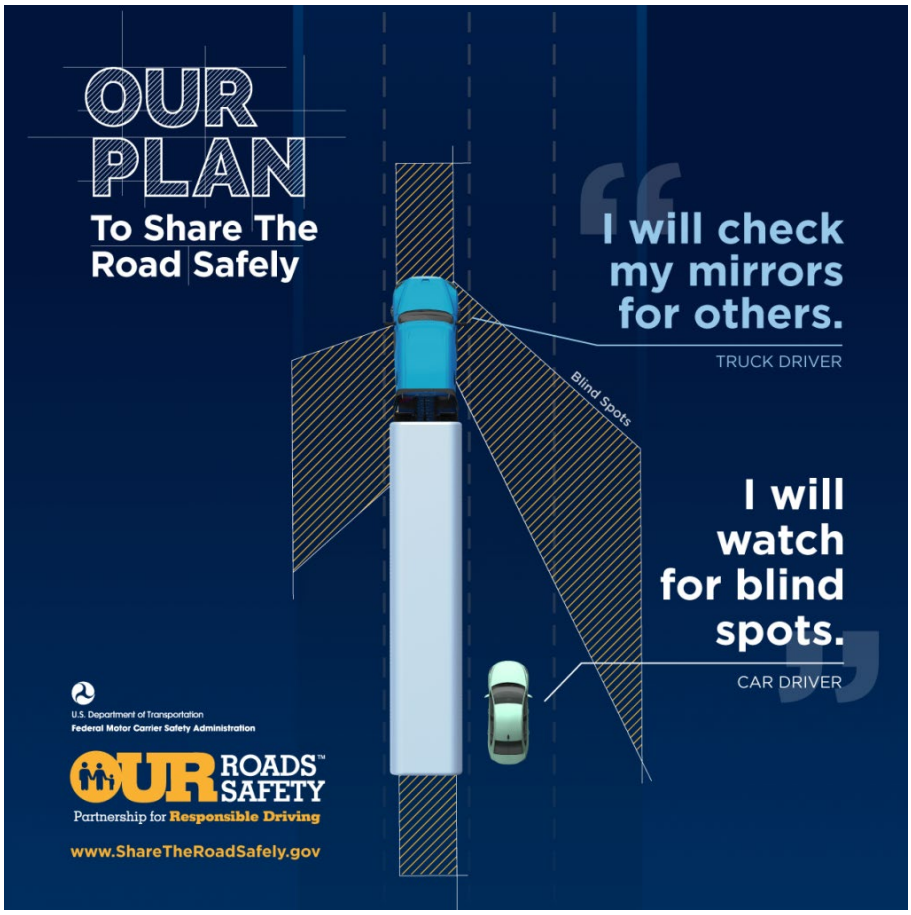
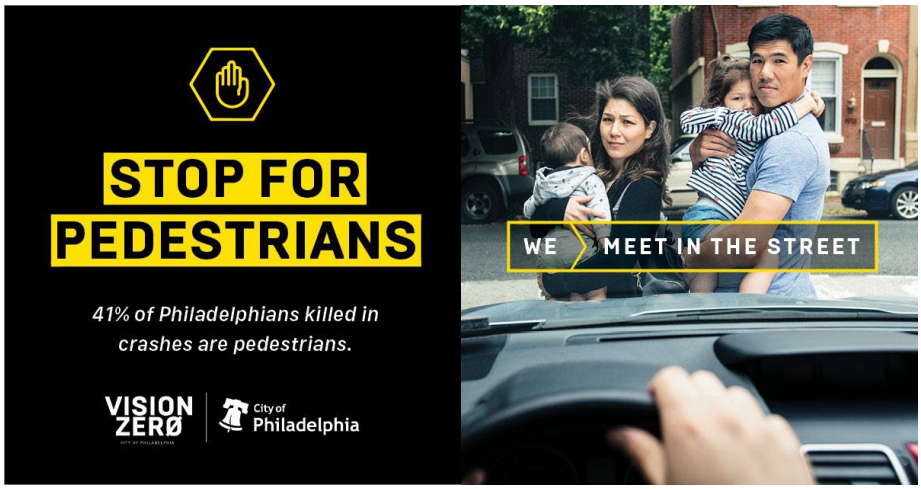


City of Philadelphia:



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