Bus Transit Safety

Quarterly Newsletter

Mike Flanigon, FTA Director, Office of Safety and Security

On August 20, 2008, Susan Schruth, Associate Administrator for Program Management, announced that Mr. Mike Flanigon had been selected as FTA's next Director of Safety and Security. Mike joined the Office of Safety and Security from FTA's Office of Research, Innovation and Demonstration where he was the Director of the Office of Technology. He has been involved in the transportation industry for over thirty-five years, and began his career as a brakeman on the Southern Pacific Railroad where he also worked as a switchman, conductor, locomotive engineer and operating rules instructor.

From his first days with Southern Pacific, Mike developed a keen interest in system safety and security that has continued to grow over his career. He first became involved with safety issues as a safety steward in United Transportation Union Local 100. He also gained unique insight into the industry's many safety issues working in both the private and public sectors and at local, state and Federal government levels. Prior to his federal career, Mike held responsibility in the California Public Utilities Commission (CPUC) rail safety oversight program, and worked as both the Environmental Health and Safety Manager and Light Rail Way Power & Signal Maintenance Superintendent for the Valley

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Transportation Authority (VTA) in San Jose, California. He also served as the Chief Safety Officer for San Francisco's Bay Area Rapid Transit (BART.)

Mike entered federal service in 2001 with the National Transportation Safety Board (NTSB) where he served as Investigator-in-Charge on several high-profile railroad and rail transit investigations. In 2003 he was recognized by NTSB as the Regional Investigator of the Year for his work in improving transportation safety. He is a Senior Associate with the Transportation Safety Institute and has taught courses in Rail System Safety and Rail Accident Investigation since 1993. In addition, Mike holds a Bachelor's Degree in Anthropology from California State University in Los Angeles and a Master's Degree in Public Administration from Golden Gate University in San Francisco.

The following interview was conducted on March 9, 2009 to learn more about Mike and the Office of Safety and Security's priorities for the coming year.

What do you feel are the top priorities for the Office of Safety and Security over the coming year?

Mike Flanigon (MF): The goal of FTA's Safety and Security Program is to achieve the highest practical level of safety and security for all modes of transit. Where Congress has given us a specific task, as in the Drug/Alcohol and State Safety Oversight programs, we are responsible for ensuring that we are carrying it out as effectively as possible. In safety, this means trying to help the state oversight agencies and the industry identify and resolve issues before they result in accidents or other losses. Recent fatalities among right-of-way workers remind us that we can and must do better to resolve hazards before they impact employees, passengers or the system itself.

What is the Office of Safety and Security doing to achieve these priorities?

MF: First, we want to get good data to determine the effectiveness of our programs and projects. To support this effort, we recently began a data management project to answer a number of key questions including:

- *What types of data do we collect?*
- *What purpose does the data serve?*
- *How timely and accurate is the data?*
- *How does it support our annual and five-year strategic plan goals and objectives?*
- *How can it be improved?*

Through this task we're seeking to prove to ourselves and to others that our programs add value and are meeting their intended purposes. If the data indicates otherwise, we will make the necessary changes to ensure improved performance.

How will your background and experiences serve you in this new position?

MF: At accident scenes with NTSB, I have witnessed first-hand the catastrophic results of failures in the systems that are meant to assure safety. As a result, I'm driven towards a proactive approach that seeks to improve systems before accidents can occur. Throughout my career, working as a unionized front-line employee as well as in management, training, safety, operations, and maintenance roles, I've been fortunate to have the opportunity to view the transit industry from several perspectives and believe I can positively impact a number of

projects. I feel that my background has given me the ability to communicate and work well with the industry and its employees. I look forward to the challenges ahead.

What changes do you see occurring in the industry and how are they impacting safety and security?

MF: An area that continues to grow is Bus Rapid Transit (BRT). Transit agencies that operate BRT are recognizing that their bus operations are becoming more like those of rail transit with dedicated rights-of-way, reduced headways between buses, increased passenger loads, and greater passenger occupancy at stations. Each of these factors increases exposure and accident potential and necessitates that we ensure that strong system safety and security practices are being implemented. Each new challenge is an opportunity to improve.

The stimulus package will also impact the safety and security of the industry in several ways. First, with increased funding, there may now be opportunities to support projects that improve transit safety and security. Second, the stimulus package may also help the industry to move forward with its State of Good Repair initiatives. As transit agencies begin to repair and upgrade their systems and facilities, and as state and local governments work to do the same to improve infrastructure, transit agencies will need to remain cognizant of the impact of extensive renewal projects have on their operations. This could place an additional burden on the industry's safety systems and programs, and will require greater awareness and oversight to avoid accidents.

Bus Rapid Transit

As indicated above through our interview with Mike Flanigon, FTA Director, Office of Safety and Security, the popularity of Bus Rapid Transit (BRT) systems has continued to grow over the past decade. BRT systems, which combine the flexibility of buses with the efficiency of rail systems, provide significantly faster operating speeds, greater service reliability, and increased customer convenience, and require far less capital investment to design and construct as compared to other public transit alternatives. As a result of these benefits, BRT systems now operate in eighteen major cities across the US including Chicago, IL, Los Angeles, CA, Pittsburgh, PA, Miami, FL, Boston, MA, Cleveland, OH, and Las Vegas, NV.

In 2003, the Transit Cooperative Research Group (TCRP), sponsored by FTA, published **TCRP Report 90: Bus Rapid Transit.** This two-volume publication was developed to better understand the benefits BRT systems offer over other transit alternatives and how these benefits are achieved. The report also identifies lessons learned from past BRT projects that can be used by transit agencies today to support the design and construction of their own BRT systems. Volume 1 of the report includes case studies of 26 BRT systems located across the US and abroad. These case studies provide the background information necessary for planning and implementing BRT systems, and describe the distinct operating and performance elements of such systems. Volume 2 discusses the main components of BRT including the key issues, concepts and planning considerations that should be made by transit agencies exploring BRT options. Copies of TCRP Report 90 are available for

download from the Transportation Research Board's website at: www.trb.org/news/blurb_detail.asp?ID=1698.

As detailed in TCRP Report 90, the improvements offered by BRT systems over traditional bus and rail transit systems are gained through various means. These include:

- **Dedicated bus lanes reserved for exclusive or near exclusive use by buses**. This can include bus streets or transit malls created in urban centers by dedicating all lanes of a city street to exclusive use of buses. It can also include shoulder lane or fully grade-separated transitways.
- **Intelligent Transportation Systems (ITS)** designed to provide preferential treatment of buses at intersections through extensions of green time or actuation of green lights at signalized intersections upon detection of an approaching bus. This may also include advanced communication systems, automated scheduling and dispatch systems, and/or real-time information at stations and on vehicles to allow for faster and more convenient trips.
- **Traffic management improvements** through low-cost infrastructure elements such as bus turnouts, bus boarding islands, and curb realignments to increase the speed and reliability of bus service.
- **Alternative fare collection practices** at stations designed to collect fares and verify proof of payment prior to bus arrivals through the use of ticket vending machines and electronic fare cards.
- **Modified service and operations plans** to allow BRT systems to provide more frequent service than traditional bus services. This could include all-day service spans and greater spacing between stations.
- **Distinctive branding and marketing campaigns** for vehicles and facilities designed to help develop the system's identity.

While each of the above elements contributes to the overall performance and success of BRT systems, they can also present unique challenges and potential hazards never before faced by the transit agency. Dedicating city streets to serve as exclusive busways for example, may require making significant changes to existing traffic patterns that can confuse or distract motorists. Early and continuous communication with the traveling public is therefore necessary to heighten public awareness of the intended changes; traffic signs and signals will be required to redirect traffic flows; and law enforcement may be needed to enforce new traffic patterns. Likewise, using ITS to provide traffic signal preference to buses and making traffic management improvements to support BRT operations can also change existing traffic flows and patterns. Implementing such systems therefore requires a high degree of coordination between traffic engineering and service planning. Finally, implementing alternative fare collection practices and modifying service and operations plans requires transit agencies to train both their passengers and their employees with regards to the new system and its unique operational characteristics.

Safety Considerations for BRT Systems – A Case Study of the Greater Cleveland Regional Transit Authority Euclid Corridor Project (Health Line)

Special thanks given to Ms. Pamela McCombe and Ms. Sheryl King Benford for their support and cooperation in developing this article.

On November 21, 1995, the Greater Cleveland Regional Transit Authority (GCRTA) Board selected a "Rapid Transit System" BRT alternative as their Locally Preferred Alternative (LPA) for improving transit in Cleveland. The BRT option was determined to be nearly one-half the cost of the cheapest rail alternative, and about a quarter of the cost of the most expensive rail alternative. Preliminary engineering and environmental reviews for the selected project, originally known as the Euclid Corridor Transportation Project, began in 2000. Construction of the system began in 2004 and partial operations began in 2008.

The completed system, which is now known as the "Health Line" operates in an exclusive center median busway beginning in Public Square. The system then transitions to the curb at University Circle where it continues into neighboring East Cleveland. Other system elements include:

- Exclusive bus lanes;
- One lane in each direction for auto traffic;
- Pedestrian zone enhancements which encourage transit usage (new sidewalks, passenger shelters at center median stations, pedestrian lighting, street trees and tree lawns);
- Roadway reconstruction and design to create consistent curb lines and numbers and widths of travel lanes, upgraded street lighting, and crosswalks at intersections designed to clearly identify pedestrian zones;
- Traffic signal equipment installation on Euclid Avenue and on intersecting streets, as necessary, to provide priority to GCRTA vehicles operating on Euclid Avenue;
- The elimination of on-street parking and relocation of loading zones where possible, and installation of pedestrian and vehicular signage to clearly identify the availability of transit service; and
- Minor modifications between University Circle and the Stokes Station at Windermere in East Cleveland through coordination with the proposed Euclid Avenue rehabilitation project in East Cleveland.

To learn more about the safety considerations that must be made during the design, construction and operation of a BRT system, we contacted Ms. Pamela McCombe, Director of Safety, Greater Cleveland Regional Transit Authority (GCRTA), and Sheryl King Benford, Chief Counsel (GCRTA) who oversaw the design and construction of GCRTA's Euclid Corridor BRT system. Excerpts from this conversation are provided below.

From a system safety perspective, what was the most challenging part of designing and constructing the Health Line?

Pamela McCombe (PM): Initially, the most difficult step was preparing the preliminary hazard

analysis and mitigating identified hazards during the design process. Some of the design team members such as the city of Cleveland were unfamiliar with this process and our overall safety certification approach. A formalized safety certification committee was established and included members of the executive management team to help address these issues. This committee served as an effective means of opening communication channels between all of the project stakeholders so that issues and identified hazards could be discussed and resolved quickly. We also conducted through design reviews at the 30% and 60% design stages.

Sheryl King Benford (SKB): I believe the project was so successful because we conducted a comprehensive preliminary hazard analysis and identified hazards mitigated them before they could have a negative impact. This also allowed us to avoid using procedures to mitigate hazards, which are far less effective in practice. To do this we conducted thorough design reviews at the 30% and 60% design stages.

What special safety considerations had to be made during the design and construction of the project?

PM: Buses, whether they be 60 foot rapid transit vehicles such as those operated in our system, or regular 40 foot buses used in our other operations, must be docked at the platform in a certain manner to meet American with Disability Act (ADA) requirements. To meet the ADA requirements, the gap between a bus and a platform can't be any larger than three inches. While our operators are capable of docking the bus in a manner that meets this requirement, what we found was that the bus mirrors extend beyond the platform edge when the bus pulls into a station. Because of this passengers were at risk of being struck by the mirror.

After evaluating a number of alternatives that included audible and visual warning systems for passengers, we instituted an operating rule that requires bus operators to use the horn when entering a station. We choose this approach because currently passenger levels at stations are not dense enough to require or justify the additional costs that would be required to install a different system.

We also had to be concerned with jaywalkers. Cleveland once operated a streetcar system and many pedestrians were used to running to station platforms mid-block. This was a practice that we wanted to halt with the BRT system.

How did GCRTA ensure all safety requirements were achieved during design and construction?

PM: We adopted the safety certification approach recommended in FTA's Handbook for Transit Safety and Security Certification. Although this handbook is directed more towards rail systems, we found the process to be directly applicable to this project. As such, we identified a full list of safety certifiable elements to demonstrate and ensure specification compliance; we conducted an extensive preliminary hazard analysis and thorough design reviews and tracked identified hazards and open issues until they were fully resolved; we implemented a testing program and used the results in the certification program to verify system readiness for operation; and we extended the certification program into the activation phase to continue close out of any open items or workarounds. As a result of our robust

safety certification program, we've encounter very few issues or surprises since the system has been in operation.

How did GCRTA prepare for the start of operations of the Health Line?

SKB: To prepare for the start of operations, GCRTA instituted an extensive training program for all operators, mechanics, and management staff. In keeping with full safety and security certification, we also conducted a full-scale drill that included local emergency response personnel.

GCRTA also used a tiered approach to opening the system. This approach meant that as each segment opened we were able to build off of what we had learned in the previous segment. While this approach was effective, it did however present a few issues because it meant that not all systems would be fully operational. As a result we had to issue permits for each segment as it came on line that included workarounds. These workarounds then had to be tracked through completion through the safety certification program.

Has the new BRT system presented any new or unexpected hazards or issues? What types of hazards has GCRTA had to address?

PM: Things have gone very smoothly since operation of the system began. Because we opened the system in segments, we were able to identify unexpected design flaws. For example, the City of Cleveland required that we maintain and 18 inch buffer around our station platforms. But to maintain this buffer between the stations and the platform edge to keep patrons out of the area. We found that after revenue operation began, these barriers actually became trip hazards and were difficult to see during times of heavy snow. As a result, we've since installed barriers and have had no further incidents.

We also experienced an issue with our rapid transit vehicles. These vehicles are equipped with a docking arm that is intended to help operators dock the bus at the platform edge to minimize the gap and comply with the ADA requirements. When operations began however, we had several instances in which our operators pulled too close to the platform edge and some docking arms were damaged. We are now also using an audible alarm to help operators dock the buses.

Another consideration we had to make was how to best delineate the BRT lane from other adjacent traffic lanes. We explored several options such as the use of pavement striations in the BRT lane, but ultimately found that this design could cause long term pavement maintenance issues as well as ride quality issues. We ultimately decided on using 6 to 10 inch wide ridges in the pavement along with paint to signal other motorists that they've entered the BRT lane.

Has the new system had any unexpected benefits?

SKB and PM: The most significant and most visible impact has been made to the Euclid corridor. Stations are very well-lit and the system is designed to be very inviting. As a result, the project has begun revitalizing the area. It has thoroughly improved the street-scape and improved the underground infrastructure.

We've also seen much higher throughput on our

BRT system. This improvement has been gained in part through signal prioritization and by applying lessons learned from other projects such as that of Houston. We also followed the practices identified in the **TCRP Report on Bus Rapid Transit**.

Another important consideration to note is that BRT buses require a much shorter stopping distance that rail vehicles. Early on, we had one incident in which a patron fell in front of an oncoming rapid transit vehicle. Had this happened on our light rail system, she could have been seriously injured or killed. But because the BRT required less distance to stop, she escaped without injury.

What has been the most challenging part of ensuring the operational safety of the Health Line?

PM: Currently, there have been very few mishaps or problems and the system has generally exceeded our expectations. During the winter months, we noticed that at first, motorists had difficulty staying out of the BRT lane. This was a result of motorists' unfamiliarity with the system and pavement markings covered with snow. This issue has since been resolved, however, as motorists paid closer attention to the overhead signage and became familiar with system.

Have you been able to adapt any best practices from your rail transit systems to be used on the Health Line?

SKB: The safety certification process which we've used repeatedly on our rail systems proved to be very effective for managing our safety program for this project. In particular, the safety certification committee was very productive and allowed us to discuss and resolve issues very quickly. I would strongly recommend that other systems take this same approach.

Developing a Transit Agency Safety, Security, and Emergency Preparedness Plan (SSEPP)

Safety, security, and emergency preparedness planning is hardly a new idea, but its importance has increased over the recent past. Historically, safety has always been a top transit priority. Criminal activity and terrorist attacks at home and abroad have underlined the security responsibilities placed on transit providers. The destruction wrought by various acts of nature brings a new awareness of the role that public transportation can play in emergency preparedness. Hazards, threats, and emergencies challenging the transit industry include accidents and serious incidents, acts of nature, attacks on infrastructure, exposure to hazardous materials, criminal activities, and domestic or international terrorism. It is clear that all transit systems, large and small, rural and urban, must plan for these challenges.

The planning process is the first step in reducing transit vulnerabilities and creating an organization that is able to effectively respond to internal and external emergencies. Plans need to be developed that focus on internal safety and security priorities and external community or regional emergencies. These plans can address safety, security, and emergency preparedness policies and procedures

in separate documents or in a single document entitled a Safety, Security, and Emergency Preparedness Plan (SSEPP). The critical issue is not the structure and format of the plans, but rather that they exist. It is important that these plans have been developed in conjunction with internal experts, external emergency management and first responders, and that the procedures and protocols contained in the plans are clearly communicated to all transit staff.

Effective safety, security, and emergency preparedness planning includes:

- A definition of transit agency safety and security mission;
- An identification of transit agency critical assets;
- An evaluation of potential hazards and threats to the transit agency and the environment in which it operates;
- Strategies for reducing transit agency safety, security, and emergency preparedness vulnerabilities;
- Methodologies for reacting to transit agency internal and external emergencies;
- Initiatives to prepare transit staff to proactively prevent crises from occurring and to manage those crises that cannot be prevented; and
- A structure for documenting all transit agency safety, security, and emergency preparedness activities and events.

Safety, security, and emergency preparedness concerns affect every aspect of public transportation life. Therefore transportation providers must create plans to meet these concerns and ensure that these plans are carried out both on a daily basis and as critical events may require. This planning process is the foundation on which transit excellence is built.

Safety Tip: Safe Driving Habits; Head and Eye Movement

Recognizing hazards early and maintaining awareness of the ever-changing traffic picture requires superior perception and proactive thinking. Professional drivers with active head and eye movement habits gain an advantage in seeing potential problems develop and in accident prevention. Some drivers claim they can see everything they need to see just by moving their eyes, but these drivers are wrong. Why is turning the head so important? Turning the head expands peripheral vision making head and eye movements more effective and increasing awareness to a nearly complete 360-degree circle. This kind of awareness separates true professionals from average drivers. FTA offers the following checklist of head and eye movement habits that should be used by professional drivers:

- **Look left-right-left before moving**: After every stop, drivers should reactivate their vision before putting their vehicle in motion. This includes a scan of mirrors.
- **Check blind spots**: Whenever the transit vehicle has been standing for more than a few seconds, (when picking up passengers, for example), the environment around the vehicle is subject to change. In addition to checking left-right-left and scanning mirrors, drivers should

turn their heads and look over their shoulders to confirm that blind spot areas are clear.

- **Scan mirrors every 5 to 8 seconds**: It is important to know what is happening up ahead, but it is equally important to know what is happening alongside and what might be coming up from behind. Turning the head along with the eyes expands a driver's field of vision to the sides.
- **Look left-right-left when approaching intersections**: A transit vehicle's first exposure to conflict in an intersection will usually come from the left. If the intersection can't be seen clearly, drivers should reduce speed accordingly and be prepared to stop.
- **Check pivot points and clearances on turns**: Drivers need to check the sides of the vehicle when turning and make sure the rear wheels clear any obstacles.
- **Check overhang swing**: This is important for buses or vans with a long rear overhang. On a right turn, the left rear corner of the vehicle will swing out slightly to the left, and on a left turn, the right rear corner will swing out slightly to the right. A quick look in the left mirror before starting a right turn, or the right mirror before starting a left turn, will confirm that the rear overhang swing area is clear.
- **Check interior mirrors**: Drivers should never forget to keep an eye on their passengers and wait for them to be seated before moving. Passenger behavior and activity should be regularly monitored for any ongoing behavior issues and to keep drivers aware of passengers preparing to exit.

We Want Your Feedback

To provide feedback pertaining to this issue of the FTA Bus Transit Safety Quarterly Newsletter; to obtain additional information pertaining to any of the topics discussed in this issue; or to request that a specific topic of interest to your organization be discussed in upcoming issues, please contact:

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About the Newsletter

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