Volpe
National
Transportation
Systems
Center

Volpe Center Highlights

Cambridge, Massachusetts April 2000

Director's Notes

Dr. Richard R. John

Celebrating a Quarter Century Partnership with the FRA

This year marks the 25th anniversary of the Volpe Center's successful partnership with the Federal Railroad Administration (FRA). Through Research and Development (R&D), regulatory, and enforcement activities, the FRA addresses all phases of railroad operations to ensure that the railroads in the United States continue to be among the world's safest and most productive. The Volpe Center has been instrumental in supporting this mission by developing innovative technologies and procedures that are technically and economically sound. By supporting the FRA's safety mission, the Volpe Center works to enhance the railroad system as a national transportation resource.

In 1975, the FRA's R&D emphasis shifted from the technical feasibility of advanced high-speed ground transportation to stimulation of the economic recovery of the nation's then-troubled freight railroads. The Volpe Center's early work for the FRA

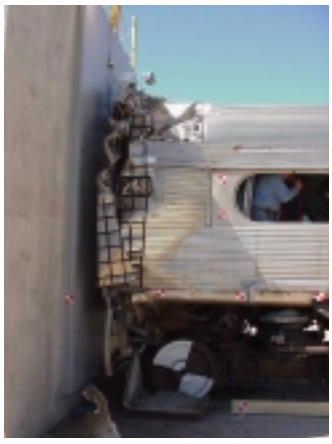
Continued on page 11

Focus

Full-Scale Two-Railcar Crash Test Emphasizes Passenger Safety (FRA)

On April 4, 2000, DOT Secretary Rodney E. Slater addressed an audience of industry professionals attending a full-scale crash test of two coupled commuter railcars at the Transportation Technology Center in Pueblo, Colorado. Mr. Steven Ditmeyer, Director of the Federal Railroad Administration's (FRA) Office of Research and Development, which funded the test, delivered the welcoming address and introduced several speakers.

Ms. Kristine Severson of the Volpe Center's Structures and Dynamics Division gave a presentation highlighting the results of the full-scale single car test that was conducted on November 16, 1999. That test involved a single car traveling at 35 mph and colliding with a rigid concrete wall. The concrete wall provides a consistent means for validating predictive models. Ms. Severson's presentation also gave an overview of the results of recent computer simulations of the full-scale two-car collision test.



The full-scale crash test on April 4, 2000, involved two coupled commuter railcars traveling at 26 mph and colliding head on with a concrete wall.

(Photos courtesy of Ms. Kristine Severson)

Inside...

Safety 3
Mobility 9
Economic Growth and Trade 10

The two-car crash test on April 4 used two coupled Pioneer Cars, also known as SEPTA Silverliners, that were built by Budd Co. The railcars traveled at 26 mph and collided head on with a concrete wall. Ms. Severson and Mr. David Tyrell also of the Division assisted in directing and conducting the crash test.

The Silverliners, which are built to a 1957 design and are the type of railcars in service today, were instrumented with strain gauges and accelerometers. In addition, various passenger seat designs were used to test the effectiveness of passenger protection on crash test dummies. All original interior seats were removed and several M-Style commuter seats manufactured by Coach and Car Equipment Co. were installed for both forward- and rear-facing unrestrained occupant tests. Two pairs of traditional Amtrak intercity seats, one modified to accept lap and shoulder belts, also were tested.

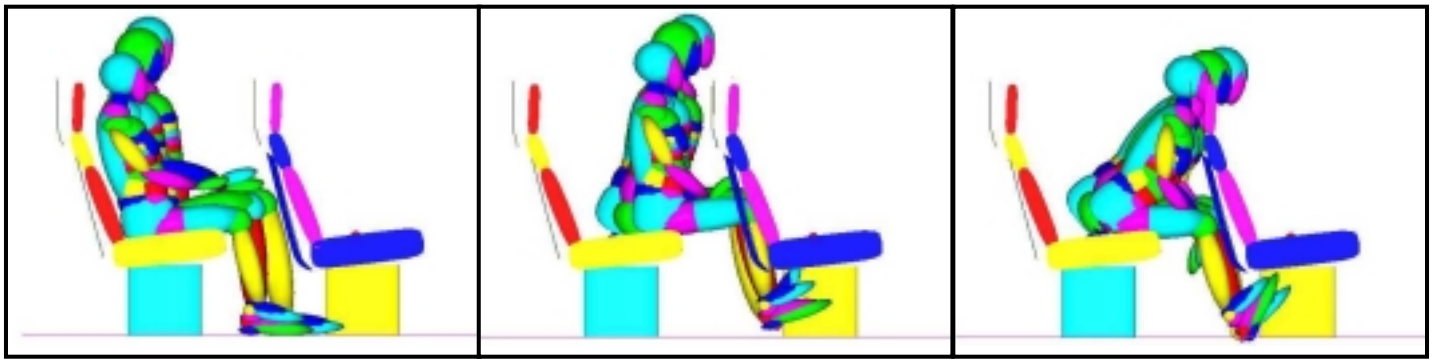
Instrumented dummies were used to measure the injury hazard conditions to passengers inside the railcars. The dummies used were standard Hybrid II and Hybrid III dummies that also are used by the airline and automotive industries. In all, more than 200 channels of data regarding displacements, accelerations, and strains were collected. High-speed video cameras were installed to record the dynamic response of the seats and dummies.

Instrumented Hybrid II and Hybrid III dummies were used to measure the injury hazard conditions to passengers inside the railcars.

(Photos courtesy of Ms. Kristine Severson)

Preliminary visual analysis of the crash test results indicates that both unrestrained and restrained dummies remained compartmentalized between the rows of seats during the crash, although the restrained dummies experienced less movement. Recently, the television news magazine, *NBC Dateline*, aired a segment that included the results of the single-car test as part of a larger story on rail vehicle crashworthiness. In the single-car test, some of the seats failed and were detached from their pedestals causing the dummies to fly over the seats. Because of the lower speed of the two-car test and associated forces, all of the seats in the two-car test remained attached. Injury data for the two-car crash test has not yet been analyzed.

The FRA's Office of Research and Development assembled and supervised the technical team that performed the test. The members of this team included the Volpe Center which provided test requirements and analytical support, and will coordinate the final report; the Transportation Technology Center, Inc. which installed the crash wall, instrumented the railcars, and coordinated and performed the crash test; and Simula Technologies, Inc. which installed the passenger seats and instrumented test dummies to study the responses of the test dummies and crashworthiness of interior equipment. In addition, Amtrak provided two seat pairs; the National Highway Traffic Safety Administration provided several test dummies; the Federal Aviation Administration provided some of the



The results of recent computer simulations of the full-scale two-car collision test showed that unrestrained dummies remained compartmentalized between the rows of seats.

(Computer simulations courtesy of Ms. Kristine Severson)

load cell instrumentation; the Southeastern Pennsylvania Transit Authority (SEPTA) provided the cars; Bombardier provided engineering drawings of the cars; and the American Public Transportation Association provided technical advice.

This series of crash tests is a response to comprehensive standards issued by the FRA on May 12, 1999, to improve the safety of America's railroad passenger equipment. The final rule, Passenger Equipment Safety Standards, marks the first time that the United States has issued comprehensive safety standards for rail passenger equipment. The rule establishes standards for crashworthiness, fire safety, emergency systems, power brake and mechanical inspections, safety planning, and high-speed equipment.

When developing this rule, the FRA acknowledged that many technical issues related to occupant protection had to be determined through computer simulations and a review of actual collision scenarios because of a lack of engineering data. The Volpe Center is performing those simulations. The collision tests are being conducted in order to validate and improve the computer simulations which then will be used to simulate a wider range of collision conditions.

Future collision tests using modified railcars will measure the effectiveness of improved crashworthiness of cab car and coach car structural designs, and improved occupant protection strategies. The testing of conventional and modified railcars will be used to improve the FRA's safety regulations resulting in safer passenger trains.

Promote public health and safety by working toward the elimination of transportation-related deaths, injuries, and property damage.

New Research Areas Identified in Highway-Rail Grade Crossing Safety (FRA)

On March 3, 2000, Mr. Robert Ricci, Director of the Volpe Center's Office of Safety and Security, presented data in support of the Federal Railroad Administration's (FRA) initiative in Research and Development (R&D) investment analysis. The presentation was made to the Transportation Research Board's Committee that is involved in the review of FRA's allocation of R&D funding. The data included a fault-tree analysis of highway-rail grade crossing collisions from 1991 to 1997. This analysis was performed by the Volpe Center to support the identification of potential new grade crossing research topics in the areas of human factors, technology, data collection techniques, and federal resource allocation for highway-rail grade crossing improvements. Research topics are ranked based on their likelihood of success and impact on safety or regulatory actions.

The information obtained from the analysis will be used in the FRA's fiscal year 2002 budget submission to the U.S. Congress. Volpe staff who performed the fault-tree analysis included: Ms. Anya A. Carroll and Mr. Ashish Aggarwal of the Accident Prevention Division, and Dr. Jordan Multer of the Operations Performance and Safety Analysis Division. Mr. Jeffrey Gordon of the Structures and Dynamics Division directed the analysis.

Commuter Rail Systems Receive Support on Safety Issues (FRA)

At the request of the Federal Railroad Administration (FRA), Ms. Stephanie Markos and Mr. James Lamond of the High Speed Ground Transportation Division are providing technical assistance to commuter rail operations.

As part of a review of the Long Island Railroad's (LIRR) fire safety requirements for new car procurement, Ms. Markos attended a meeting at FRA's headquarters on February 18, 2000, in Washington, D.C. The meeting discussion focused on the fire safety analysis approach being used by Bombardier, the manufacturer of the LIRR's railcars. Representatives of the LIRR, the FRA, and Bombardier also attended.

On March 8, 2000, Ms. Markos and Mr. Lamond participated in a field test of the newly activated Train-Approach Monitoring System (TAMS) at the Hyde Park commuter rail station near Boston, Massachusetts. Representatives of the FRA Region I, Amtrak, and the Massachusetts Bay Transit Authority (MBTA) were in attendance. TAMS is a visual and audio warning system that alerts people on the platform when a train is approaching. The field test began as an electric high-speed Amtrak Acela Regional Service train en route from New York City to Boston approached the station at 110 mph. The system, which was activated 5,700 feet away from the station, worked as designed with audio and visual warnings of "Please Stand Back" repeated three times.

The TAMS field test began as the electric high-speed Amtrak Acela Regional Service train approached the MBTA Hyde Park station at 110 mph.

(Photo courtesy of Mr. James Lamond)

TAMS is a visual and audio warning system that alerts people on the platform when a train is approaching.

(Photo courtesy of Mr. James Lamond)

Volpe staff and other participants at the testing made suggestions on how to improve the TAMS' Hyde Park operating system and station safety. Recommendations included increasing the number of audio warnings until the train enters the station. They also recommended widening the safety line at the edge of the platform so that people waiting for local service trains are standing far enough back.

FRA Delegation Visits Germany to Discuss Maglev Technology (FRA)

From March 15 to 17, 2000, Mr. Robert Dorer, Chief of the High Speed Ground Transportation Division, Mr. Ronald Mauri, Chief of the Center for Transportation Information, and Dr. Paul Valihura of the Environmental Engineering Division visited the Magnetic levitation (Maglev) test facility in the Emsland region of northwest Germany as part of a Federal Railroad Administration (FRA) delegation. The German Maglev technology is being developed by Transrapid International (TRI). The purpose of the trip was to gain a better understanding of how this technology has evolved over the last seven years relative to operational and safety issues, and what the prospects are for its potential commercial deployment in the United States. In 1993, the Volpe Center assisted the FRA in a safety review of Transrapid's application potential for the state of Florida.

Maglev is an advanced technology in which magnetic forces lift, propel, and guide a vehicle over a guideway. Using electric power and control systems, this system eliminates contact between vehicle and guideway and is envisioned for applications with cruising speeds from 240 to 300 mph. These speeds are considerably faster than French and Japanese passenger trains that currently achieve 186 mph in commercial service. Because of its higher speed, Maglev can offer competitive trip times compared to the automotive and aviation modes in the 100- to 600-mile travel markets.

The TR-08 three-section Transrapid train at the test facility in the Emsland region of northwest Germany.

(Photo courtesy of Mr. Robert Dorer)

While in Germany, the Volpe staff also participated in discussions in Berlin on the status of Transrapid applications in Germany with German Railways (Deutsche Bahn AG or DB), the German Federal Railway Administration (Eisenbahn-Bundesamt or EBA), TRI, and ThyssenKrupp, one of TRI's technology partners. Participants discussed how Germany is determining where to use the technology and how they have and will continue to ensure the safety of the technology. In addition to ThyssenKrupp, TRI's partners also include Siemens and ADtranz (a division of Daimler-Benz). These companies contribute different elements of the technology and are sharing in the cost of development. The German government also has contributed funding for this effort.

TRI recently deployed a new three-section train at the test facility (the TR-08). This train is essentially the same vehicle that would be used in any commercial applications in Germany or the United States. The TR-08 technology is being proposed for six of the seven projects that currently are under consideration as part of the FRA's Maglev Deployment Program in the United States. The seven projects are located in California, Florida, Georgia, Louisiana, Maryland, Nevada, and Pennsylvania.

Aviation Industry Feedback Received on Electronic Flight Bags Document (FAA)

On March 20, 2000, Dr. Divya Chandra of the Operator Performance and Safety Analysis Division attended a meeting of the Air Transport Association Digital Data Working Group in Denver, Colorado. Dr. Chandra is working with Battelle contractor staff to support the Federal Aviation Administration's (FAA) Office of the Chief Scientific and Technical Advisor for Human Factors. In Denver, Dr. Chandra and Ms. Sue Mangold, a Battelle contractor from Columbus, Ohio, received comments on the structure, scope, and content of the first draft of their document, "Human Factors Design Considerations for Electronic Flight Bags," from representatives of the airlines, the FAA, and companies that currently manufacture or plan to manufacture Electronic Flight Bags (EFBs).

Electronic Flight Bags are portable electronic devices that can be customized to support flight deck tasks.

(Photo courtesy of Northstar Technologies)

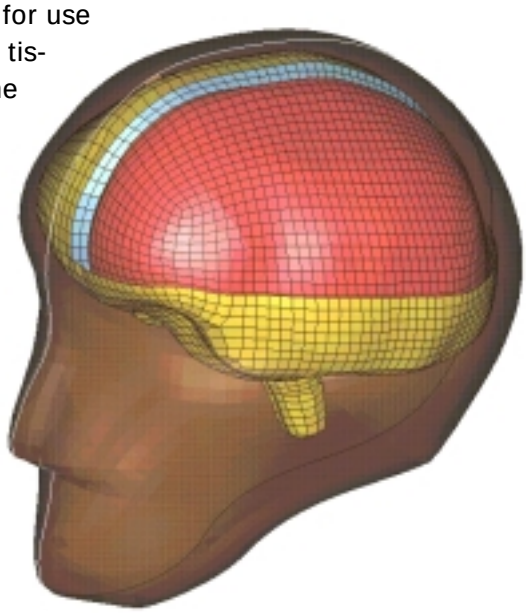
EFBs are portable electronic devices that can be customized to support flight deck tasks such as completing aircraft checklists, calculating flight performance

variables, or checking information from references such as the Pilots Operating Handbook or the Flight Operations Manual. EFBs might eventually support other functions such as electronic messaging and receiving live weather reports.

Dr. Chandra's and Ms. Mangold's document, which addresses human factors issues related to the use of EFBs for electronic documents, electronic checklists, and performance calculations, will be used by the FAA to create a policy for the approval of EFBs. It also will be used by designers of EFBs and by users. The comments that were received will be incorporated into a revised document to be presented at the working group's next meeting in June 2000.

New Brain Model Developed for Analyzing Crash Test Results (NHTSA)

The Volpe Center has created a finite element model of the human brain for use in crash simulations to estimate the effects of angular kinematics on soft tissue injuries to the brain. The model, developed by Mr. Frank DiMasi of the Vehicle Crashworthiness Division, is intended to be coupled with LS-Dyna3d finite element software. The software will run on a desktop computer and will simulate crash tests using actual crash data processed and downloaded from the National Highway Transportation Safety Administration's (NHTSA) database via the Internet. The objective of this field operational model is to aid in the development of a new Brain Injury Criteria by providing a package that contains the basic anatomic model and computational methodology required for evaluating soft tissue or closed head injuries. The new criteria would supplement the current Head Injury Criteria, which do not consider angular kinematics and are a better predictor of skull fracture and contusion. Distribution of the model and methodology is seen as a way to involve the automotive safety research community in the development and finalization of new soft tissue injury criteria.



Simplified anatomic brain model with soft tissue component (red) embedded in a rigid cranial (yellow) and facial skull (brown, shown in transparency). Other components, not fully visible, include brain stem, falx anatomic partition, and a simple representation of the saggital sinus (blue).

(Computer simulation courtesy of Mr. Frank DiMasi)

The new model is currently under evaluation by the Volpe Center and NHTSA, and progress was last reviewed at a March meeting with Dr. Faris Bandak, manager of the head modeling and simulation work at NHTSA's National Transportation Biomechanics Research Center. The Volpe Center also is developing similar models and methods for evaluating chest and leg injuries. Volpe staff members who attended this meeting and were involved in these activities include: Mr. DiMasi, Mr. Joseph Canha, Dr. David Jeong, and Mr. Peter Kwok all of the Vehicle Crashworthiness Division; and Dr. Calvin Zhou of EG&G Technical Services, Inc. (a Volpe Center contractor).

Papers Presented At SAE 2000 World Congress (NHTSA/FHWA)

The Volpe Center is providing research support to the National Highway Transportation Safety Administration (NHTSA) and the Federal Highway Administration (FHWA). As part of this work, Volpe staff presented several papers at the March 9th Society of Automotive Engineers (SAE) 2000 World Congress in Detroit, Michigan.

Mr. John Hitz, Chief of the Accident Prevention Division, presented a paper on the results of a Volpe Center study. This paper was entitled "Safety Evaluation of an Intelligent Cruise Control System" and was co-authored by Dr. Wassim Najm and Mr. Andy Lam both of the Division, Mr. Joseph Koziol formerly of the Division and now of the Technology Applications and Deployment Division, and Ms. Suzanne Chen of the Operations Assessment Division. In addition to controlling a vehicle's speed, the Intelligent Cruise Control (ICC) system maintains a minimum

headway with a preceding vehicle. The Volpe Center study concluded that the ICC system would result in net safety benefits if widely deployed. This ICC work is sponsored by NHTSA.

Mr. Marco daSilva also of the Accident Prevention Division presented "Estimation of Crash Injury Severity Reduction for Intelligent Vehicle Safety Systems," which was co-authored by Dr. Wassim Najm also of the Division and Mr. Christopher Wiacek, formerly of the Division. This paper introduced a methodology for estimating the safety benefits of intelligent vehicle safety systems in terms of reductions in the number of collisions and in the number and severity of crash-related injuries. Mathematical models and statistics also were presented to support the estimation of the crash injury factors in rear-end, lane-change, and single vehicle roadway departure collisions.

Dr. Tom Trella of the Vehicle Crashworthiness Division, whose work supports NHTSA's Crashworthiness Research Division, presented "A Moving Deformable Barrier with Dynamic Force and Deflection Spatial Measurement Capabilities for Full Scale Tests," which was co-authored by Ms. Randa Radwan Samaha of NHTSA. This paper describes the design and development of an advanced instrumentation Moving Deformable Barrier with dynamic force and deflection measurement capabilities. It was designed for use in full-scale dynamic tests for research crash testing of passenger cars, light trucks, sport utility vehicles, and vans. It also was designed, in particular, for studies of aggressiveness and compatibility. These studies investigate the factors that influence occupant injury potential in vehicle-to-vehicle side and front impacts.

Mr. Joseph Canha also of the Vehicle Crashworthiness Division, whose work supports the NHTSA National Transportation Biomechanics Research Center, presented "Development of a Finite Element Model of the THOR Crash Test Dummy." This paper was co-authored by Mr. Frank DiMasi and Ms. Yim Tang also of the Division, Mr. Mark Haffner of NHTSA, and Mr. Tariq Shams from Gesac, Inc. The paper describes the development of a finite element model of a new advanced crash test dummy, named Thor, that NHTSA has designed. The paper presents the modeling methodology and validation scheme with details on the testing, simulation, and validation processes.

Volpe Staff Member Supports Alcohol Countermeasures (NHTSA)

The Volpe Center continues to provide support to the National Highway Traffic Safety Administration's (NHTSA) Office of Traffic Injury Control Programs by studying techniques for measuring alcohol on the breath and in the blood of suspected drunk drivers. On March 15, 2000, Dr. Arthur Flores of the Safety and Environmental Technology Division visited Phoenix, Arizona, to give expert testimony in support of the testing procedures for breath alcohol that are used by Phoenix's Office of the Prosecutor. The testimony was provided by Dr. Flores at a pre-trial hearing at the Phoenix Municipal Court and is similar to testimony previously given at Mojave County District Court in Kingman, Arizona. Dr. Flores' testimony defended the record keeping practices and testing program of the Arizona Department of Public Safety and the Phoenix Crime Laboratory, which have been challenged by the Arizona defense law community.

Evidential breath testers are used to measure alcohol on the breath of suspected drunk drivers.

(Photo courtesy of Dr. Arthur Flores)

FAA and Airlines Implement Collaborative Initiatives to Tackle Delays (FAA)

In a widely publicized press conference on March 10, 2000, President Bill Clinton told the nation that the Federal Aviation Administration (FAA) and the airlines were implementing new collaborative initiatives to tackle the problem of airport ground delays during the upcoming spring and summer severe weather season. DOT Secretary Rodney E. Slater and FAA Administrator Jane Garvey also participated in the press conference.

The FAA has taken a number of steps to improve system performance to deal with the numerous aviation delays and disruptions that occurred during the summer of 1999. Several of these steps are based on automation aids provided by the Volpe Center.

Ground stops are one of the tools that the FAA uses to deal with congestion at an airport. On April 3, 2000, the Volpe Center started providing new data to the FAA that allows ground stops to be used in a more precise and controlled way so that excess delays can be avoided. Also on April 3, the Volpe Center started providing air carriers with detailed predictions on departures at an airport for fifteen hours into the future. These predictions allow a carrier to see how its flights fit into the larger picture at an airport , and to plan accordingly.

President Bill Clinton is applauded by Delta Airlines CEO, Mr. Leo Mullin, center, and DOT Secretary Rodney E. Slater, left, during a White House meeting with FAA and airline officials.

(Photo courtesy of AP/Wide World Photos)

In May 2000, the Volpe Center will be deploying a new centralized reroute database to promote a common situational awareness between the FAA's Air Traffic Command Center in Herndon, Virginia, the air traffic control field facilities throughout the country, and the air carriers. This database will allow all those involved to know exactly what reroutes are in effect and how long they will remain in place.

These enhancements are provided by the Volpe Center's Automation Applications Division as part of the Enhanced Traffic Management System, the primary computer system that the FAA uses for dealing with congestion problems. This system was developed by the Volpe Center to provide the FAA with a real-time operational computer system for predicting, detecting, and handling airspace congestion problems.

Volpe Staff Member Participates in the IEEE Position Location and Navigation Symposium 2000

The Volpe Center participated in the Institute of Electrical and Electronic Engineers (IEEE) Position Location and Navigation Symposium 2000 that was held from March 14 to 16, 2000, in San Diego, California. Ms. Karen Van Dyke of the Center for Navigation chaired a session at the symposium: "The World after Global Positioning System Selective Availability (SA): Implications for Safety, Accuracy, Integrity, Utility, Galileo, and the Wide Area Augmentation System." The White House policy statement on the Global Positioning System (GPS), which was presented in a Presidential Decision Directive, and released on March 29, 1996, stated that it is the intention of the Department of Defense to turn off SA within a decade. The President of the United States will make an annual determination beginning this year on the continued implementation of SA. Ms. Van Dyke presented a paper in this session entitled "The World After SA: Benefits to GPS Integrity." This paper describes the increase in the availability of GPS for aviation applications if SA is turned off.

Ms. Van Dyke also chaired a session on "Differential Global Positioning System Augmentations: European Geostationary Navigation Overlay Service, Local Area Augmentation System, Multifunction Satellite Augmentation System, and Wide Area Augmentation System." These systems are designed to improve the accuracy and availability of GPS for aviation applications.

The symposium covered a wide variety of GPS applications and focused on the integration of navigation information for air, land, marine, and space systems. The meeting also covered issues pertaining to GPS integrity, Differential GPS, navigation, interference issues, and electronic charting. Papers that were presented at this meeting directly impact work that the Volpe Center is performing for the Federal Aviation Administration, the Office of the Secretary of Transportation, the Department of Defense, Airservices Australia, the German Aviation Authority (DFS Deutsche Flugsicherung), the Chilean Aviation Authority (Direccion General de Aeronautica Civil), the U.S. Coast Guard, and the St. Lawrence Seaway Development Corporation.

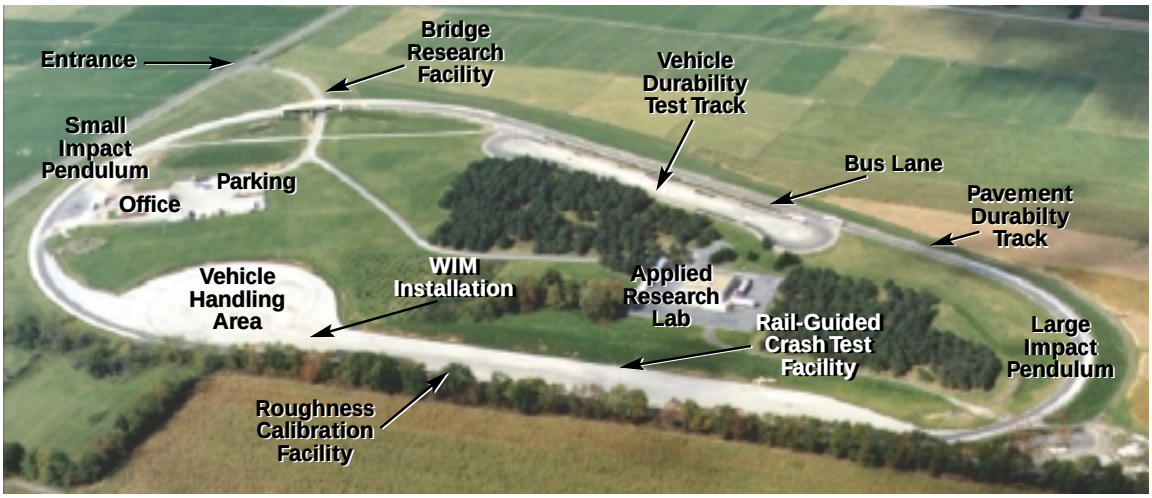
Ensure that the transportation system is accessible, integrated and efficient, and offers flexibility of choices.

Results from Electric Bus Testing Presented (FTA)

From March 1 to 3, 2000, Mr. David Spiewak of the Advanced Vehicle Technologies Division participated in the Electric Bus Users Workgroup meeting in New Orleans, Louisiana. This bi-annual event, hosted by the Electric Power Research Institute, brings together transit operators, manufacturers, and others interested in electric bus issues. Mr. Spiewak presented findings from the Altoona Bus Testing Management Oversight Study that he performed for the Federal Transit Administration (FTA).

All new model buses must undergo testing as part of a federally mandated program prior to purchase with federal funds. The testing program is administered at the Altoona Bus Research and Testing Center in Altoona, Pennsylvania. Additional facilities are located at the Bus Research and Testing Facility of the Pennsylvania Transportation Institute in State College, Pennsylvania. Last year, the FTA and industry agreed upon a new test regime for electric buses. Because the test process is new to electric bus users, many of the participants at previous meetings expressed an interest in learning more about the mandated program.

Only one electric bus has completed testing at Altoona, and the bus manufacturer, Mr. Rick Hitchcock of Advanced Vehicle Systems of Chattanooga, Tennessee, discussed the test results of that vehicle. The next workgroup meeting is slated from September 19 to 21, 2000.



The Bus Research and Testing Facility of the Pennsylvania Transportation Institute in State College, Pennsylvania

Advance America's economic growth and competitiveness domestically and internationally through efficient and flexible transportation.

Friends of Volpe Discussion Series Debuts

The Friends of Volpe series, which held its first session in late February, will consist of half-day, informal discussion forums on the themes of workforce/education, technology scanning, and security. At the end of 2000, a full-day forum will be held to tie together the themes and conclusions from the preceding sessions, and to examine what these findings mean for the work of the Volpe Center.

Each of the half-day conversations sessions will include two outside technical experts, one or two researchers, and one or two "friends of Volpe." Dr. Richard R. John, the Director of the Volpe Center, will facilitate the discussion at each of the conversation sessions.

The objectives of the Friends of Volpe discussion sessions are to:

- Increase the ability of the Volpe Center to help and to provide cutting edge information for its clients;
- Provide the Volpe Center with new ideas for program development and with an organizational update;
- Provide increased opportunities for the Volpe Center to host, on a continuing basis, an interactive forum for Friends of Volpe and others.

Dr. Peter Manning of the Transportation Strategic Planning and Analysis Office organized the first session on February 29, 2000. This session, which included local experts, was designed to address how the Volpe Center can build innovation into transportation learning along with ways that the participants can develop workforce/education partnerships with Tufts University and the Massachusetts Technology Collaborative. In addition to Dr. Manning and Dr. John, participants included Ms. Maureen Walsh-Sakakeeney, Program Director for Engineering and Technology at Tufts University's Graduate School; Mr. Robert Kispert, Director of Federal Programs for the Massachusetts Technology Collaborative; Mr. Bernard Blood, Chief of the Transportation Strategic Planning and Analysis Office; and Ms. Judith Yahoodik of Battelle (a Volpe Center contractor).

The second meeting of the Friends of Volpe was held on April 13, 2000, to discuss "Advances in Automation and Robotics: Prospects for Transportation." Opening remarks were made by Dr. John and Ms. Kelley S. Coyner, Administrator of the Research and Special Programs Administration. Participants were Dr. Alberto Guzman, Director of Applied Advanced Technologies at the Carnegie Mellon Research Institute; Dr. Gérard Meyer, President and CEO of Carnegie Mellon Driver Training and Safety Institute, Inc.; and Dr. Ronald Mourant, Professor in the Department of Mechanical, Industrial, and Manufacturing Engineering and Director of the Virtual Environments Laboratory at Northeastern University. The next session of Friends of Volpe will take place in early May. The topic will be "Information Systems Security."

Director's Notes continued from page 1

focused on rail equipment and track safety including projects on tank car puncture resistance and rail- and track-caused derailments. FRA's safety focus coupled with a significant industry reinvestment and Volpe participation resulted in a reduction in the number of derailments or reportable accidents by more than 70 percent.

In 1989, in recognition of the renewed interest in high-speed ground passenger transportation by state and local governments, the FRA's R&D scope expanded to include the safety and economic feasibility of new emerging high-speed systems. This emphasis led to the Volpe Center's involvement in support of the FRA in the Florida Transrapid Maglev project and the Texas TGV (Train à Grande Vitesse) project. Our early work focused on the safety implications of these foreign technologies and the development of a systems-based regulatory approach, and was continued with work on the National Maglev Initiative and the subsequent study of high-speed ground transportation alternatives appropriate for U.S. markets.

In 1994, the Swift Rail Development Act established the FRA's Next Generation High-Speed Rail Technology program to carry out technology demonstrations to foster the development of new high-speed passenger corridors. Currently, a number of states—California, Florida, Georgia, Illinois, Indiana, Louisiana, Michigan, Minnesota, Mississippi, North Carolina, New York, Ohio, Oregon, Pennsylvania, Virginia, Washington, and Wisconsin—are planning high-speed rail systems and making improvements necessary for high-speed rail. The technologies that these states are planning to use typically involve upgrades of existing rail lines. The Volpe Center's participation in this program is manifested through R&D efforts such as economic analyses to examine ridership, fare structure, capital cost, operation and maintenance, and methods for improving the system as well as helping to set minimum safety standards for mixing high-speed passenger and freight operations.

For the past 10 years, the Volpe Center has continued to support the FRA in realizing its goal of improved safety by conducting research to evaluate new and innovative systems for grade crossing safety and equipment crashworthiness, as well as advanced track inspection tools. The Volpe Center recently completed a detailed evaluation of the risks associated with high-speed rail grade crossings on Amtrak's Empire Corridor in New York State.

The Volpe Center also has provided support to the FRA in railway operating equipment safety and has addressed vehicle crashworthiness and occupant protection, including issues of accident avoidance/survivability, locomotive cab crashworthiness, crash-energy management, and passenger seat safety. A recent set of tests designed by the Volpe Center and managed with the FRA involved full-scale crash tests of commuter railcars by the FRA. These tests were designed to support FRA's efforts to improve the safety of America's railroad passenger equipment. For a more complete discussion of these tests, see the *Focus* article in this issue of *Highlights*.

The Volpe Center is looking forward to its continued partnership with the FRA in R&D efforts supporting safe rail transportation through the 21st century. The key issues for the future will include: advanced train control systems; changes in tank car design; higher speeds and heavier axle loads; crashworthy passenger and crew space designs; safe high-speed corridor designs; onboard and wayside detection systems for track and rolling stock failures; increases in mixed freight and passenger operations; intelligent track/train system diagnostics; and improvements in the safety of hazardous materials transport and grade crossing safety.

Volpe National Transportation Systems Center

55 Broadway
Cambridge, MA 02142-1093

FOR MORE INFORMATION

Call: 617.494.2225
Fax: 617.494.2370

e-mail: MurrayL@volpe.dot.gov
www.volpe.dot.gov

In This Issue...

Full-Scale Two-Railcar Crash Test Emphasizes Passenger Safety.