Research and Innovative Technology Administration

the VOLPE center

National Transportation Systems Center

HIGHLIGHTS

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Director's Notes

35 Years of Creating Innovative Transportation Systems Solutions

This year, the Volpe Center is celebrating its 35th anniversary. In 1970, the Center was established in response to increasing national awareness of the need to improve the nation's transportation system. Effecting these improvements required the application of a wide range of technical disciplines and an understanding of the ramifications of technology deployment in transportation. From the start, the Center has embodied a system-level perspective, with broad-based research one of its primary activities. A crossmodal, multiclient approach has made the Center an important resource for information, concepts, and solutions.

The Center has evolved in response to transportation advances and changing national priorities. Its strength lies in this ability to anticipate change, articulate

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Inside

Focus

Human factors researchers at the Volpe Center analyze the relationship between human behavior and transportation safety and productivity, applying a systems approach. Developments in knowledge and procedures are successfully transferred across modes to resolve a range of transportation problems.

Factoring in Human Behavior

Human error is thought to contribute to 60 to 80 percent of all transportation accidents. One of the greatest challenges in transportation, therefore, is designing technology and procedures that reduce the probability of such error by taking human behavior into account. Meeting this challenge requires a comprehensive approach to determine where an "error" may occur: in the cockpit, in the control room, on the drawing board, or in the boardroom.

The Volpe Center's Human Factors Division applies knowledge of human capabilities and limitations to the design of technological and organizational systems. Human factors researchers apply analytical and technical skills to address the complex environments in which crews, dispatchers, traffic controllers, and maintenance workers perform their jobs, as well as challenges faced by the traveling public. This comprehensive

perspective provides a framework for investigation on various scales, from the design of handheld devices to the impacts of sign color and placement, to an organization's safety culture. Addressing emerging issues such as fatigue and distraction, as well as ongoing trouble spots such as airport runways and highway-rail grade crossings, the Division demonstrates the Volpe Center's systems approach to problem solving.

Operator Fatigue and Alertness

Fatigue may produce mental decrements that impact operator vigilance, judgment, and decision making thereby increasing the risk of human error and, potentially, injuries and fatalities. Although fatigue is increasingly recognized as a critical safety factor, the incidence of fatigue is underestimated in virtually every transportation mode because it is difficult to measure and quantify. The Volpe Center's Fatigue Monitoring and Countermeasures Research team—co-led by Dr. Heidi Howarth and Dr. Stephen Popkin, Chief of the Human Factors Division—explores issues of measuring and managing fatigue and alertness issues in all modes.

Drowsy Driver Warning System

Drowsy drivers are considered by some to be responsible for well over 100,000 automobile crashes each year. As part of DOT's Intelligent Vehicle Initiative, the Volpe Center is evaluating a commercially available drowsy driver warning system for the National Highway Traffic Safety Administration and the Federal Motor Carrier Safety Administration. The device monitors eye closure and alerts a vehicle operator when its predicted driver drowsiness exceeds a threshold. This Volpe team, led by Dr. Bruce Wilson, is evaluating device performance, safety benefits, driver acceptance, and deployment prospects.

DOT's Operator Fatigue Management Program

Fatigue management requires changes in organizational culture and operator behavior. Accordingly, the Operator Fatigue Management (OFM) Program brings together government, labor, and industry-developed tools to aid in understanding and managing fatigue in a nonprescriptive fashion. Dr. Stephen Popkin co-chairs this multimodal DOT initiative, whose recent products include tools such as software to help schedulers design ergonomic work schedules that promote on-duty alertness, fatigue model validation procedures, and the Fatigue Management Reference Guide. For more on the OFM Program, see *http://scitech.dot.gov/research/human/ofm.html*.

Driver Distraction

NHTSA estimates that driver distraction and inattention contribute to 20 to 30 percent of police-reported vehicular crashes—about 1.5 million crashes a year, and the level of driver distraction is expected to increase. As more

The Human Factors Division supports all modes of transportation. Crosscutting research areas include:

- *Human/systems interface and habitability*
- *Human-centered automation*
- *Human performance assessment*
- *Information management and display evaluation*
- *Organizational behavior*

complex controls, displays, communications devices, and entertainment systems appear in cars, human factors research is vital to understanding not only how and why drivers become distracted, but what countermeasures work best in the increasingly dynamic driving environment. NHTSA's Crash Avoidance Research Division is exploring in-vehicle technologies that help ensure that the demands imposed on drivers' attention do not overwhelm their capability to process and respond to information. The Volpe Center provides program management and technical support to a high-priority NHTSA project using a test vehicle called SAVE-IT (Safety Vehicle Using Adaptive Interface Technology). The goal of SAVE-IT is the development of a central monitoring system that integrates data from in-vehicle technologies and controls the flow of information to the driver through an adaptive driver-vehicle interface. Dr. Mary Stearns leads the Volpe Center SAVE-IT team. For more on SAVE-IT, visit *www.volpe.dot.gov/opsad/saveit/index.html.*

The right information—at the right time so that it can be processed and applied properly—is vital to safe, efficient transport in any mode.

Information Communication and Display

Several Volpe Center projects address human factors considerations in the design and evaluation of communications and display technologies in aviation and rail operations.

Flight-Deck Displays

Any new electronic display introduced into an operator's environment could have negative consequences if it is not implemented appropriately. On the flight deck, the consequences are particularly serious. An increasing number of electronic displays, ranging from small handheld displays for general aviation to installed displays for commercial air transport, show navigation information such as symbols representing navigational aids. The wide range of technologies and functions makes it difficult to design symbols that are easily recognizable across platforms. For the Federal Aviation Administration, Dr. Michelle Yeh and Dr. Divya Chandra developed a method to design and evaluate symbology that takes into account the different media (e.g., paper vs. electronic) and platforms on which they will be displayed. This report is available at *www.volpe.dot.gov/opsad/pubs.html.*

The Center is also investigating human factors issues related to head-up displays (HUDs). An HUD projects imagery on a transparent screen that overlaps the pilot's forward field of view so a pilot can quickly shift attention between flight information shown on the display and the outside view. This allows pilots of civil air transport to conduct manual approaches, landings, and takeoffs in especially poor visibility. However, the displayed imagery can interfere with the outside view, creating visual "clutter." The Volpe Center's Dr. Michael Zuschlag is conducting research on clutter effects in order to provide FAA with certification guidelines for HUDs.

Electronic Flight Bags. *Instead of traditional flight bags loaded with paper documents such as checklists, operating manuals, and navigation publications, many flight crews are bringing aboard electronic flight bags (EFBs) in the form of handheld, laptop, or tablet computers, as shown above. In support of FAA, the Volpe Center has performed significant research related to EFBs and has developed guidelines for their design and evaluation. Details on the Center's EFB work are available at* www.volpe.dot.gov/opsad/efb. *(Photo courtesy of Teledyne Controls)*

Intelligent Railroad Systems

For the Federal Railroad Administration, Dr. Jordan Multer and Dr. Thomas Sheridan led two studies related to communications equipment. The first involved the design of a wireless handheld computer; the study gauged user acceptance and identified human factors design issues for workers and dispatchers as the design evolved. Another study focused on safety, efficiency, and productivity issues associated with the introduction of a visually based (graphical and textual) data link interface for dispatchers. The reports are available at *www.volpe.dot.gov/opsad/pubs.html.*

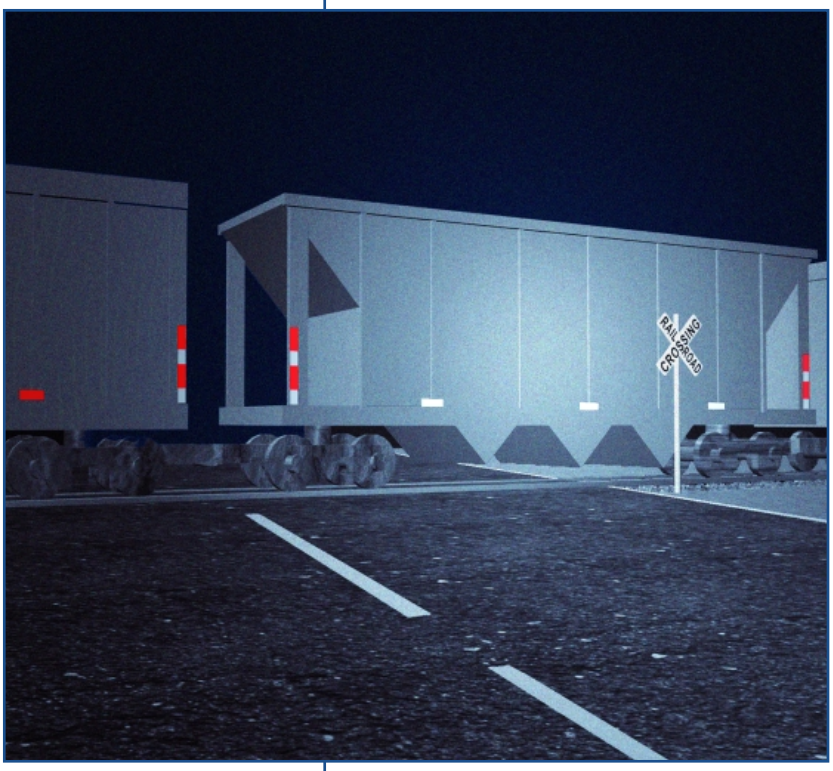
Voice Communication Among Transportation Workers

Building on significant Volpe Center research into voice communication between pilots and air traffic controllers, new work at the Center is analyzing voice communication among train dispatchers, crews, and maintenance workers. In addition to supporting the design of communications systems, these studies can shed light on factors that contribute to operational errors.

Teaming human factors specialists with the designers and prospective users of a system enables early identification of potential problems when they are easier and less costly to fix.

Visual and Acoustic Warnings at Grade Crossings

A significant portion of collisions at grade crossings can be tied to human behavior. Volpe Center human factors experts help designers develop systems with the right balance of passive (e.g., signs and markings) and active (e.g., technology) warnings. The research discussed below also contributed to federal rules regarding visual and acoustic methods to improve motorist perception of trains at grade crossings.



The Volpe Center investigated the effectiveness of several train-mounted reflector patterns to improve motorist recognition of a train. Four patterns were evaluated in two experiments, using a driving simulator.

The exterior of the typical freight car is painted in dark colors and frequently dirty; it absorbs the light from motor vehicle headlights, making it hard to see at night. Retroreflective materials reflect light from motor vehicle headlights back to the motorist. Volpe Center experiments on retroreflective materials have considered human factors issues such as the complexity of the visual environment faced by motorists and the relative visibility of various patterns of materials. This work, led by Dr. Jordan Multer, contributed to the development of a federal rule, effective March 2005, requiring retroreflective materials on locomotives and freight cars.

For more than a decade, researchers at the Volpe Center have been investigating how to improve motorist perception of train location with optimal

acoustic warning systems. The Center's recent work, led by Ms. Gina Melnik, built upon earlier train horn research conducted in the 1990s to optimize the sound quality and effectiveness of horns for use on locomotives or in wayside horn systems. In addition to meeting the primary goal of improved safety at grade crossings, this sound quality research also focuses on minimizing noise pollution in surrounding communities. The Volpe team has contributed significantly to the development and issuance of the Final Rule for Use of Locomotive Horns at Highway-Rail Crossings.

Emergency Rail Passenger Evacuation

During an emergency, the safe and efficient evacuation of rail passengers may depend on train designs that take into account human behavior under stressful conditions. The Center's Human Factors Division is supporting the Railroad Systems Division in investigating issues relating to passenger rail car evacuations during various emergency scenarios. Specific areas being explored include the number and configuration of emergency exits as well as their markings and instructions, and emergency lighting. As part of this research, Ms. Stephanie Markos of the Railroad Safety Division and Mr. John Pollard of the Human Factors Division recently conducted a series of commuter rail car passenger egress tests to obtain human factors data related to the length of time necessary for passengers to exit under both normal and emergency lighting conditions. This work is part of ongoing emergency preparedness research performed for FRA.

Runway Safety

When an aircraft or ground vehicle inadvertently taxis or drives onto an active runway without authorization, this incursion can present a serious hazard to aircraft that are taking off or landing. Runway incursions have been blamed in several major accidents; accordingly, FAA and the National Transportation Safety Board both list the prevention of runway incursions among their highest priorities. The Volpe Center is engaged in several FAA technical efforts to reduce runway incursions. In addition to lending human factors expertise to technical projects, members of the Human Factors Division have created educational materials for pilots and controllers.

A Volpe-developed booklet, *Runway Safety: It's Everybody's Business,* first published in 2002 and now in its third printing, presents detailed examples of scenarios that lead to incursions. Aimed at clarifying the roles and responsibilities of pilots and controllers, it addresses problems from both perspectives and provides tips on how pilots and controllers can improve their performance and help each other work together more effectively. The booklet is available at *www.faa.gov/runwaysafety/handbook.cfm.*

Based on this booklet, the same Volpe Center team, led by Dr. Kim Cardosi and Dr. Daniel Hannon, developed a prototype tool for training tower

The Volpe Center Human Factors Lab

The Volpe Center's onsite human factors lab, the Center for Human Factors Research in Transportation, is operated under a Cooperative Research and Development Agreement with the Massachusetts Institute of Technology. Lab facilities and equipment include: a railroad dispatcher simulator, a high-fidelity locomotive simulator, three flight simulators, an electronic display development lab, an air traffic control communications laboratory, a sound attenuation room, and a navigation/workload room.

An example of work performed at the lab is research for FRA that examines the use of train control technology in the locomotive cab. One study addressed what tasks the human should perform, and what tasks should be shared. Another evaluated the impact of various decision-support aids. To learn more about the lab, visit www.volpe.dot.gov/opsad/labrtory.html.

controllers. This interactive CD contains "learn-by-doing" modules that cover topics such as:

- Limitations of short-term memory and the effects of distractions
- Effects of expectation and selective attention on information processing
- Common errors in controller-pilot communications
- Teamwork strategies for mitigating the effects of individual errors
- Avoiding and managing the effects of fatigue.

New Approaches to Improving Safety Culture

The Volpe Center is engaged in the implementation of two approaches to gathering and analyzing safety-related data that hold promise for preventing rail accidents and reducing injuries: close-call analysis and behavior-based safety.

Accidents are often preceded by "close calls," which can provide warnings about unsafe conditions. Studying close calls can help identify safety hazards and develop solutions that prevent accidents. But implementing a reporting system that encourages employees to disclose safety-critical information requires a sense of trust as well as a voluntary and confidential reporting system. Dr. Jordan Multer leads a Volpe Center team that manages an FRA program designed to demonstrate the effectiveness of a Confidential Close Call Reporting System for the railroad industry.

Behavior-based safety (BBS) is a proactive process that identifies and observes safety-critical behaviors and provides positive peer-to-peer feedback. It can also be used to identify and mitigate organizational barriers to safe behavior, such as work environment, policies, and procedures. A variety of BBS approaches have been used to reduce at-risk behaviors and injury rates in other industries. Dr. Joyce Ranney leads the Volpe Center team that supports FRA in assessing BBS for use in railroading. The goal of this work is twofold: to evaluate individual demonstration projects that apply specific BBS methodologies, and to investigate broader issues, such as implementation, cost, and feasibility, that could influence industry-wide BBS application.

The Future of Transportation

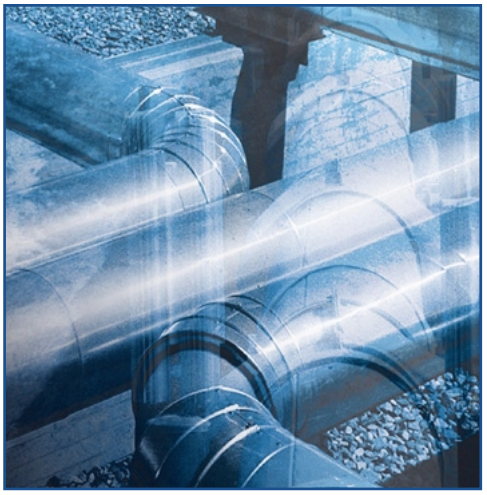
Emerging technologies will continue to alter the transportation enterprise, increasing the amount of information available to operators, and changing the knowledge, skill, and abilities required of them. Advances in the understanding of individual and organizational behavior will help shape the transportation community's response to these challenges. The Volpe Center's Human Factors Division—with an interdisciplinary work style that enables the cross-fertilization of ideas—will help to ensure that safety risks are fully addressed, and that advances in one area don't compromise safety or efficiency in another.

Safety

Pipeline Safety Monitoring and Reporting Tool Released (PHMSA)

As the federal safety authority for the nation's pipeline transportation system, the Pipeline and Hazardous Materials Safety Administration's Office of Pipeline Safety (PHMSA/OPS) is responsible for the safe, reliable, and environmentally sound operation of 2.3 million miles of natural gas and hazardous liquid pipelines. The Volpe Center helps OPS meet this challenge by developing automated systems that enhance its regulatory and enforcement capabilities. As part of this support, the Center's Aviation Safety Division developed an Intranet application, the Safety Monitoring and Reporting Tool (SMART). SMART provides structure to the enforcement process with workflow technology, and standardizes headquarters and region best practices, enabling OPS to more effectively use enforcement tools such as compliance orders, which require pipeline operators to correct underlying safety violations.

On October 27, 2005, the first production version of SMART was released to OPS users. This version includes the initial release of the OPS Enforcement Tracking module, which automates the management of pipeline enforcement cases, allowing users to add, retrieve, and update enforcement records, as well as attach and retrieve documentation associated with the enforcement case. This production release also implements some of the changes identified at the User Acceptance Test in July 2005 and fixes problems identified in the beta release. A series of releases is planned to implement additional functionality over the course of the next year.



The Volpe Center developed an Intranet application that helps OPS more effectively regulate pipeline operations across the nation.

Mobility

Systematic Study of Transportation and Land Use (Baltimore City DOT)

The recent rapid pace of development in southeast Baltimore has raised concerns among residents and businesses about the ability of the existing transportation infrastructure to handle projected demands. In response, the Baltimore City DOT (BCDOT) engaged the Volpe Center to systematically study transportation issues in southeast Baltimore and to identify recommendations that would be comprehensive yet still address specific local conditions. In contrast to a site-specific traffic impact study, the

Center's approach has taken into account the interplay of many factors in the entire southeast area.

Phase I of the study recently concluded with a draft report based on the Volpe Center team's observations, research, analyses, and discussions with internal city representatives and external stakeholders from neighborhoods, businesses, and developers in the southeast. This report outlines specific short-term and long-term recommendations that together form a coordinated program for addressing southeast Baltimore's transportation issues and that can serve as a template for examining similar issues in other parts of the city. The recommended program is intended to help 1) increase capacity, e.g., relieve bottlenecks, increase parking; 2) decrease demand for roads, e.g., unify transportation demand management, improve transit, support nonmotorized transportation and pedestrian-oriented streets; and 3) rethink the system, e.g., collect and use data more strategically, expand outreach and interagency coordination, and reconfigure responsibility for traffic mitigation.

Phase II of the study, underway since fall 2005, addresses truck-related concerns in the far southeastern area of Baltimore, an important location for the Port of Baltimore and associated businesses as well as some residential communities. Volpe Center team members have met with business and neighborhood representatives to collect a range of quantitative and qualitative information on the most pressing truck-related issues in the study area. For businesses, the quality of site access is essential, while residents focus on minimizing the negative impacts of trucks passing through their neighborhoods. Analysis and validation of the information will provide the foundation for reconciling different viewpoints, promoting constructive problem solving among stakeholders, and, ultimately, implementing the most viable solutions through BCDOT. The Volpe Center team includes Dr. David Damm-Luhr and Ms. Rachael Barolsky of the Planning and Policy Analysis Division and Dr. Scott Smith and Ms. Frances Fisher of the Service and Operations Assessment Division. Ms. Hannah Rakoff, formerly of CASE, LLC, supported Phase I of the study.

Effective outreach to a variety of stakeholders is key to the approach taken by the Baltimore City DOT and the Volpe Center team. Tools and activities designed to help share information and gather input include a stakeholder participation plan, interviews and facilitated meetings, educational materials, and a dedicated website (www.ci.baltimore.md.us/SEstudy/index.html).

Volpe Center Oversees Removal of Contaminated Rail Track (EPA)

Adverse health effects in Libby, Montana, are associated with asbestos contamination from the former W.R. Grace vermiculite mine located approximately five miles from town. For more than 60 years until the mine closed in 1990, contaminated vermiculite was mined at Libby and shipped

to locations throughout the country. For the past four years, in support of the U.S. Environmental Protection Agency (EPA), the Volpe Center has performed environmental analyses and assessments at more than 3,500 locations in the Libby area, and directed contractors in the cleanup of more than 550 commercial and residential properties. In addition, the Volpe Center has provided removal assessment and remediation support at "sister sites" that received shipments of vermiculite from Libby.

Mined vermiculite was transported in bulk rail shipments from Libby to approximately 122 processing plants in the United States. One such sister site is in Denver, Colorado, where the Burlington Northern Santa Fe (BNSF) Railroad was ordered by EPA to remove a track structure that had been contaminated with asbestos during unloading of vermiculite shipments from Libby. EPA requested that Mr. Paul Kudarauskas of the Volpe Center's Environmental Engineering Division perform the required federal government oversight of this remedial action during August and September 2005. The remediation included removal of 1,250 feet of rail, ties, and ballast as well as 3,500 cubic yards of contaminated soil within BNSF's property boundaries. Mr. Kudarauskas ensured that the contractor performed the scope of work and followed their health and safety plan as approved by EPA. (See "Awards" on page 10 for a related story.)

Processing plants located in EPA Region 8 and Region 9 received asbestos-contaminated vermiculite from Libby, Montana. The Volpe Center has provided removal assessment and remediation oversight in Libby and other sites.

Supporting Aviation Security with Data Collection and Analysis (NASA)

Working with NASA's Aviation Safety and Security Program, the Volpe Center is collecting, reviewing, and analyzing data from public sources about aviation security incidents (i.e., hijackings). The Center's Infrastructure and Protection Operations Division developed an Aviation Security Incident Database covering a 10-year time span (1995 to 2005). Now the Division's task is to determine the vulnerabilities and security gaps in the aviation infrastructure based on this historical data, and to provide input on recommended security countermeasures.

This work supports efforts of the Transportation Security Administration and the U.S. Commercial Aviation Partnership (US CAP), a public/private partnership formed to identify and evaluate impacts of security threats and solutions on the air transportation industry. Mr. Kevin Harnett of the Division recently presented a summary of key findings at a monthly US CAP meeting. NASA's Aviation Safety and Security Program addresses safety and security research and technology needs of the National Airspace System; its research and technology planning activities are conducted in

close coordination with the Federal Aviation Administration and the Department of Homeland Security.

Organizational Excellence

Sustaining the Life-Cycle of Boats and Cutters (Coast Guard)

The U.S. Coast Guard has implemented efforts to document its requirements and to tie these requirements to critical missions and to boat and cutter readiness. In support of these efforts, the Volpe Center recently completed a Life-Cycle Recapitalization Plan, which involved performing an engineering analysis of boats and cutters currently in the Coast Guard fleet, and defining the requirements to keep them running until they are replaced under the Integrated Deepwater System (Deepwater program). As the Deepwater program is scheduled to take 25 years, keeping the legacy assets running is essential.

Coast Guard Cutter Hawser *steams up the East River near lower Manhattan during a homeland security patrol in March 2005. The Volpe Center is supporting the recapitalizing of the Coast Guard's aging fleet to help ensure cutter readiness. (USCG photo by PA1 Mike Hvozda)*

Based on engineering data, manufacturing data, and data collected from the cutters, Center staff analyzed more than 600 systems on more than 400 vessels and developed a 30-year plan that would cost $2.2 billion to keep the fleet running until the replacements are commissioned. Messrs. Robert Pray, Dave Crawford, Joe Koziol, Mario Caputo, and Chris Murray, all of the Technology Applications and Deployment Division, contributed to the study and wrote the report.

The Volpe Center is currently performing an economic analysis of the plan to determine the most economical time to perform the individual system recapitalizations. This involves the review of more than 27,000 data entries on system failure and repair costs. Ms. Sarah Dammen of the Economic and Industry Analysis Division is assisting in this effort.

Awards

- **American Academy of Environmental Engineers.** On October 27, 2005, the Volpe Centers' Environmental Engineering Division and the U.S. Environmental Protection Agency's (EPA) Region 8 Team were awarded the 2005 Honor Award for Libby Asbestos Project Operations/ Management by the American Academy of Environmental Engineers. For the past four years, the Center has supported EPA's time-critical removal action in Libby, Montana, and associated sites. (See page 8 for a related story.)

Published & Presented

- **Aviation Technology, Integration, and Operations.** September 26-28, 2005, Volpe Center staff participated in the American Institute of Aeronautics and Astronautics Aviation Technology, Integration, and Operations Conference in Crystal City, Virginia.
  - Mr. Steve Creaghan of the Airport Surface Division and Mr. Alan Fuchs of the Telecommunications Division presented a Volpe Center/NASA paper, "Safety Assessments of Air Traffic Management Research and Development Projects," summarizing the safety assessment methodology developed for NASA's Advanced Air Transportation Technologies Project.
  - Mr. Chris Daskalakis of the Surveillance and Assessment Division presented "Assessing Wide Area Multilateration and ADS-B as Alternative Surveillance Technology."
- **Wake Vortices.** Dr. James Hallock, Chief of the Aviation Safety Division, co-authored, with Dr. David Burnham of Scensi, Inc., "Measurements of Wake Vortices Interacting with the Ground." The paper was published in the September-October 2005 issue of the *Journal of Aircraft,* published by the American Institute of Aeronautics and Astronautics.
- **Integrated GPS and Loran-C Tracking.** Dr. James Carroll of the Surveillance and Assessment Division presented "Performance Analysis of an Integrated GPS/Loran-C Tracking System" at the 34th Annual Convention and Technical Symposium of the International Loran Association held in Santa Barbara, California, October 17-20, 2005. The analysis is part of a program sponsored by the Federal Aviation Administration (FAA) to enhance Loran-C performance.
- **Transit ITS.** Dr. Scott Smith of the Service and Operations Assessment Division and Mr. Kevin Gay of the Motor Carrier Safety Assessment Division developed "Representation of Transit Intelligent Transportation Systems (ITS) in Network-Based Travel Models" for the Federal Transit Administration Office of Planning with support from the ITS Joint Program Office. The report provides guidelines for incorporating the impacts of transit ITS improvements into current planning models and techniques. The executive summary is available at *http://tmip.fhwa.dot.gov/clearinghouse/docs/transit_its/*.
- **Automated Decision Support.** For FAA, the Volpe Center published *How Much Decision Support? Ideas, Research and Experience Relevant to Automated Decision Support for FAA Aviation Safety Oversight,* October 2005. DOT-VNTSC-FAA-05-12. The report was co-authored by Mr. Lawrence Berk of the Aviation Safety Division and Dr. James Hallock, Division Chief.
- **Noise Control Engineering.** Dr. Judith Rochat of the Environmental Measurement and Modeling Division co-authored two papers presented at the National Conference on Noise Control Engineering in Minneapolis, Minnesota, October 17-19, 2005: "FHWA Roadway Construction Noise Model (RCNM)" with Mr. Clay N. Reherman of the Division, and "Variability of Pavement Noise Benefit by Vehicle Type" with Mr. David R. Read of the Division. Dr. Rochat also presented "Pavement Influence on Noise Mitigation Strategies" at the 8th International Conference on Concrete Pavements in Colorado Springs, Colorado, August 14-18, 2005.

A recent Volpe report focuses on the impacts of four widely deployed transit ITS technologies: advanced fleet management, transit signal priority, electronic fare collection, and improved traveler information. Above, a dynamic message sign provides traveler information on the Washington, D.C. transit system. (© iStockphoto)

Human Factors–Related Reports and Presentations

To complement the Focus article on page 1, this subsection highlights recent publications and presentations by members of the Human Factors Division.

- **Human Factors in Railroad Operations.** On behalf of the Federal Railroad Administration (FRA), the Volpe Center published *Preview Information in Cab Displays for High-Speed Locomotives,* July 2005, DOT-VNTSC-FRA-04-06, DOT/FRA/ORD-04/12. Dr. Thomas Sheridan and Dr. Jordan Multer co-authored the report with Dr. Jay Einhorn of the Massachusetts Institute of Technology. See *www.volpe.dot.gov/opsad/pubs.html.*
- **Human Factors in Aviation Traffic Flow Management.** For FAA, the Volpe Center published *Human Factors Integration Challenges in the Traffic Flow Management (TFM) Environment,* August 2005, DOT-VNTSC-FAA-05-08, DOT/FAA/AR-05/40. This report by Dr. Eric Nadler was written to benefit the current FAA TFM Modernization. See *www.hf.faa.gov/Workbench/techrptdetails.aspx?id=1644.*
- **Effect of Simulator Motion Cues.** Dr. Judith Bürki-Cohen presented "The Effect of Simulator Motion Cues on Initial Training of Airline Pilots" at the American Institute of Aeronautics and Astronautics Modeling and Simulation Technologies Conference in San Francisco, California, on August 16, 2005.
- **Human Factors and Ergonomics Society.** The Volpe Center participated in the Human Factors and Ergonomics Society Annual Meeting in Orlando, Florida, September 26-30, 2005.
  - Dr. Thomas Sheridan presented the kickoff address titled "A Brief History of Normative Models of Human Behavior" for a new technical group on Human Performance Modeling. He also presented "Allocating Bits to Dynamic Displays: When More is More and When More is Less" in a session on Principles for Display Design, and served as a panelist in a session on Levels of Automation.
  - Dr. Jordan Multer co-authored, with Dr. Emilie Roth of Roth Cognitive Engineering, "Fostering Shared Situation Awareness and On-track Safety Across Distributed Teams in Railroad Operations," presented at a symposium titled "Large-Scale Coordination."
- **Navigation Symbology.** Volpe Center researchers Dr. Michelle Yeh and Dr. Divya Chandra, on behalf of FAA, published *Designing and Evaluating Symbols for Electronic Displays of Navigation Information: Symbol Stereotypes and Symbol-Feature Rules,* September 2005, DOT-VNTSC-FAA-05-16, DOT/FAA/AR-05/48. See *www.volpe.dot.gov/opsad/pubs.html.*
- **Violations of Restricted Airspace.** For NASA's Langley Research Center, Dr. Michael Zuschlag prepared *Potential Interventions by Government and Industry to Minimize Violations of Temporary Flight Restrictions,* September 2005, NASA/CR-2005-213924, and *Violations of Temporary Flight Restrictions and Air Defense Identification Zones: An Analysis of Airspace Violations and Pilot Report Data,* September 2005, NASA/CR-2005-213923. See *http://ntrs.nasa.gov/.*

Director's Notes

Continued from page 1

transportation issues, and focus on the applications—and implications—of new technologies and systems. The past decades have been characterized by wide-ranging accomplishments in support of DOT's modal administrations. This work will continue, and will be strengthened by our position as part of the Research and Innovative Technology Administration (RITA). In its Report to Congress, RITA defines its role as a resource for coordinating and advancing research efforts within DOT.

To further its mission, RITA will implement a number of crosscutting strategies to facilitate solutions to America's transportation challenges. One such strategy is the creation of new crossmodal working groups in areas such as hydrogen technology, remote sensing, and human factors. The Volpe Center is particularly well suited to support a crosscutting approach. For example, the Center has been a key player in DOT's Human Factors Coordinating Committee, one of the first crossmodal working groups. This committee is developing and implementing a national strategic agenda for intermodal human factors research and application, and providing a significant information resource for the transportation community.

This year, we celebrate our people and their accomplishments. Future challenges will involve new modalities, technologies, and energy sources that must be subjected to careful scrutiny to ensure their safety and effectiveness. As part of RITA, the Volpe Center will support the strategic goals of DOT as it faces new and continuing challenges with flexibility and innovation.

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