VOLPE center

Volpe National Transportation Systems Center

Points of Pride 2007

U.S. Department of Transportation

Research and Innovative Technology Administration

For more information on any of the projects described in this document,
please contact Lynn C. Murray at (617) 494-2224 or MurrayL@volpe.dot.gov.

TABLE OF CONTENTS

Introduction

Points of Pride highlights the annual accomplishments of the Volpe Center and illustrates its vital role as a unique federal resource within the U.S. Department of Transportation's (U.S. DOT) Research and Innovative Technology Administration (RITA). These accomplishments demonstrate the many different ways that the Volpe Center supports the U.S. DOT and the broader transportation community in achieving their goals. Center staff members are trusted advisors on long-term projects and are often called upon to support rapid-response, high-visibility tasks. With a systems perspective and awareness of relevant issues, the Center provides innovative solutions to transportation problems.

The projects presented here represent a snapshot of the Center's overall portfolio, but they exemplify the Center's ability to offer pragmatic solutions and to respond quickly to new or continuing requirements. Each accomplishment is aligned with the U.S. DOT's national transportation objectives of safety; reduced congestion; global connectivity; environmental stewardship; security, preparedness, and response; and organizational excellence. For the purpose of this document, activities are listed under one strategic area; however, many projects, programs, and initiatives benefit the objectives of more than one strategic goal.

The Fiscal Year (FY) 2007 Points of Pride exemplifies the Volpe Center's tradition of providing outstanding support to DOT; other federal, state, and local government agencies; and a number of international entities.

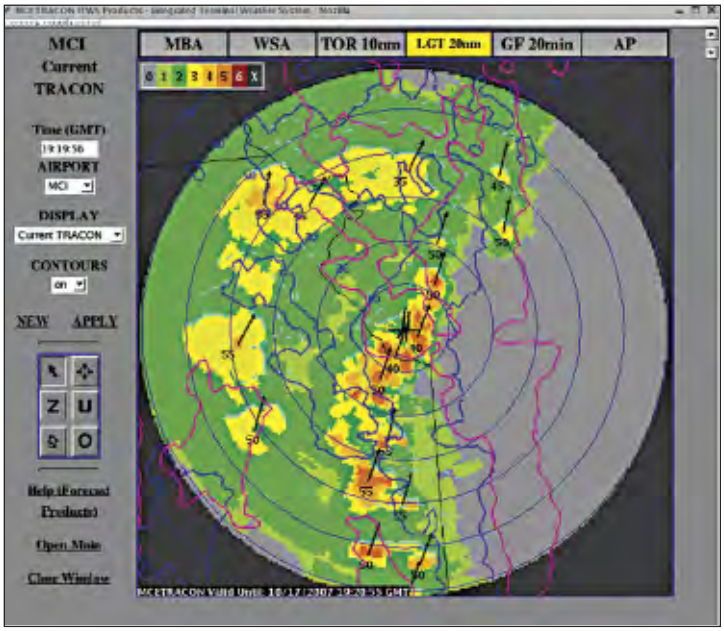
Dr. Eileen Ennis
Acting Director
Volpe National Transportation Systems Center and
Associate Administrator for Administration
Research and Innovative Technology Administration

Safety

Enhance public health and safety by working toward the elimination of transportation-related deaths and injuries

AVIATION

Integrated Terminal Weather System: Technical Enhancements to Improve Display and Distribution



Screenshot of the Integrated Terminal Weather System developed by the Volpe Center, showing a lightning storm over the Kansas City International Airport.

The Integrated Terminal Weather System (ITWS) is a high-resolution weather information system designed to operate within the Terminal Radar Approach Control (TRACON) centers surrounding the country's major airports. It combines data from a number of sensors into an integrated picture of the weather situation surrounding an airport. For the Federal Aviation Administration (FAA), the Volpe Center hosts the ITWS website and distributes the data to air carriers and other information users. The availability of the enhanced weather information means that system users now will be able to employ these products in their flight planning and that FAA will be better equipped to manage the nation's air traffic.

In FY 2007, the Volpe Center completed a successful technical refresh of the ITWS hardware, which provided the ITWS web with the necessary processing power to display the Terminal Convective Weather Forecast (TCWF) data. The ITWS web data products now include a 60-minute forecast of weather conditions in the terminal area.

Prior to the ITWS web, ITWS data were displayed solely on very expensive Situation Displays (SD). FAA has been able to save money by eliminating SDs at non-FAA sites and hosting the ITWS data on the ITWS web. Non-FAA users now have an inexpensive means of viewing ITWS data on the ITWS web. The Volpe Center works closely with Lincoln Laboratory and FAA (in Washington, DC, and in Oklahoma City, Oklahoma) on all aspects of this project.

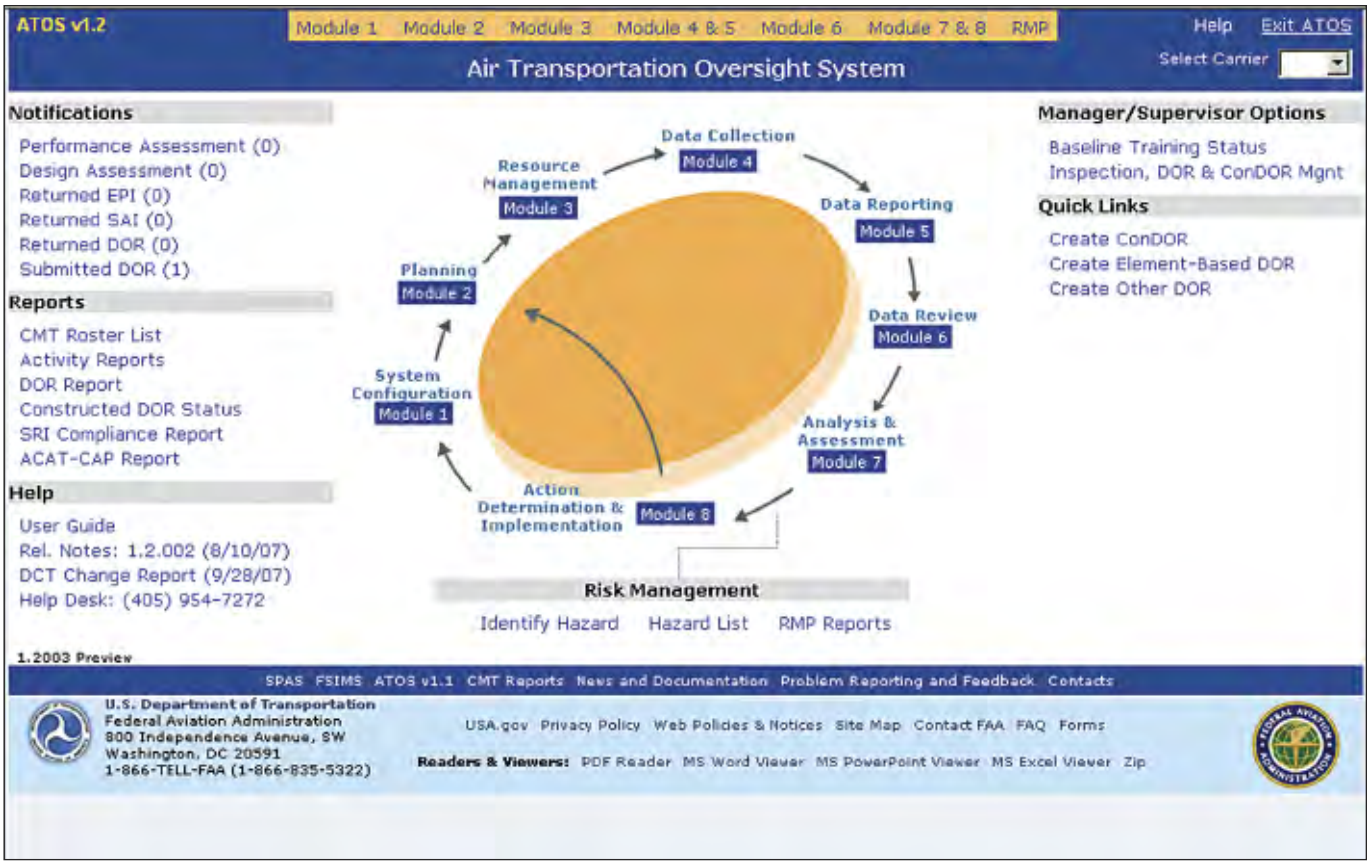
The customer base for the ITWS web grew significantly during the year. The current ITWS web users are FAA's Air Traffic Control System Command Center (ATCSCC), Delta Airlines, Northwest Airlines, Federal Express, Continental Airlines, American Airlines, Southwest Airlines, Dallas-Fort Worth International Airport, and the Atlanta Regional Operating Center. *(Sponsored by DOT/FAA)*

Safety Performance Analysis System: Critical Enhancements

The Volpe Center is working closely with the FAA Associate Administrator for Aviation Safety staff in performing ongoing analysis and developing information systems to enhance, expand, and integrate its aviation safety decision support systems that monitor the performance of aviation entities. Aviation Safety Inspectors (ASI) use the systems to organize and support their inspection activities in four areas: air operators, aircraft, air agencies, and air personnel. As part of this effort, the Volpe Center has developed the Safety Performance Analysis System (SPAS), which accommodates ASI information needs by:

- Highlighting potential problem areas for inspector consideration, using measures of safety performance
- Ensuring that inspectors are able to access aviation-safety-related data in a reliable, time-saving, and effective manner
- Assisting inspectors in identifying certificate holders that may present a greater safety risk, thus warranting further surveillance

In 2007, the Volpe Center developed and released major enhancements to the SPAS to provide FAA inspectors with critical analytical capabilities needed to assess the safety performance of large commercial air carriers. Specifically, the new capabilities combine planning and assessment data packages with an integrated set of analysis tools needed to conduct system safety processes. With SPAS data packages, FAA inspectors have rapid access to multiple disparate systems, from which they may retrieve key information to make oversight decisions, evaluate safety risk, develop surveillance plans, or assess the safety performance for a given air operator certificate holder. The SPAS data packages represent the latest step for FAA in establishing SPAS as the primary data analysis tool for the organization's oversight of air operator and air agency certificate holders. These new SPAS capabilities are part of FAA's continuing effort to improve aviation safety and reduce the number of air carrier accidents and incidents. *(Sponsored by DOT/FAA)*



Screenshot of the Air Transportation Oversight System developed by the Volpe Center.

Air Transportation Oversight System: Reengineered to Improve Effectiveness

The Air Transportation Oversight System (ATOS) supports FAA aviation safety inspector surveillance of air carriers certified under Title 14 (Aeronautics and Space) Code of Federal Regulations Part 121 (commercial air carriers). Based on system safety concepts, ATOS determines safety trends in order to identify and correct a problem at its root cause before an accident occurs. FAA inspectors now view an airline in its entirety to see how the many elements of its operations (including aircraft, pilots, maintenance facilities, flight dispatch, and cabin safety) interact to meet federal standards. ATOS enables FAA to create a targeted, more effective surveillance plan.

In FY 2007, in order to keep pace with the changes in the aviation industry, ATOS was reengineered to improve its agility, scalability, and effectiveness. The Volpe Center worked closely with the FAA Associate Administrator for Aviation Safety staff to design, develop, and deploy the reengineered system. Central to the changes are enhanced business processes, which strengthen FAA's ability to provide effective oversight and to expand its capacity to incorporate additional air carriers. The reengineering effort is part of FAA's congressionally mandated initiative to implement ATOS and standardize system safety oversight for all air operators certified under 14 CFR Part 121. *(Sponsored by DOT/FAA)*

Flight Standards Information Management System: Redesigned to Add Functionality

The primary performance goal of the FAA Flight Standards Service is the safety of operational and airworthiness entities worldwide. The Volpe Center assists the FAA Office of Aviation Safety in achieving this goal by providing ongoing support in the analysis, development, and dissemination of aviation-safety-related policies, guidance, standards, and work instructions to effect compliance and accident prevention. As part of this effort, the Volpe Center has developed and deployed the Flight Standards Information Management System (FSIMS). FSIMS provides FAA safety inspectors and other safety professionals with a fully searchable and cross-referenced electronic library of aviation-safety-related publications.

In 2007, the Volpe Center, on behalf of the FAA Flight Standards Service, made significant changes to FSIMS. FSIMS was redesigned to accommodate the consolidation and reorganization of the FAA airworthiness, operations, and general aviation inspector handbooks into a single electronically managed system. FSIMS uses intelligent metadata to alert aviation inspectors of critical safety bulletins and notices and to assist in tailoring information searches and retrievals to match an inspector's specific aviation job category or operational specialty. In addition, a public version of FSIMS was deployed to provide the aviation industry and professionals with access to the policy and guidance maintained in the FSIMS library. *(Sponsored by DOT/FAA)*

Next-Generation Air Transportation Systems: Airportal Safety Analysis

The Volpe Center developed an innovative approach to provide safety analysis of new air traffic control concepts for the National Aeronautics and Space Administration's (NASA) Airportal Project. The Airportal Project is a NASA research and development (R&D) effort to investigate Next-Generation Air Transportation Systems (NextGen) concepts, as defined by the Joint Planning and Development Office (JPDO). It will make precision satellite-based navigation and landing independent of ground-based aids at any U.S. airportal. This will open thousands of small airports to very light jets and bring air service to more communities. The Center proposed a systems engineering approach, including a functional analysis, to coordinate research ideas. The analysis represents the first time a complete functional/end-to-end representation of airport and terminal research ideas had been unified to understand resultant interactions. By linking these ideas to an integrated set of functions, the Volpe Center team was able to address safety and systems issues that were not apparent previously. In addition, the functional analysis represents the first time a set of detailed terminal and surface functions has been developed for next-generation air traffic control capabilities. The analysis lays the groundwork for systems and safety analysis of NASA and FAA research and development agendas for years to come. *(Sponsored by NASA)*

Memphis, Tennessee, International Airport: Safety of Simultaneous Aircraft Approaches

The Volpe Center has provided safety risk management support to Air Traffic Organization, Terminal Services Unit (ATO-T) since 2003. ATO was created as the air traffic operations arm of FAA by executive order of President Clinton in December 2000 to apply businesslike practices to the delivery of air traffic services. In FY 2007, ATO-T asked the Center to lead a critical study on safety of simultaneous approaches to the Memphis, Tennessee, International Airport. Simultaneous approaches allow aircraft to approach independently on adjacent parallel or perpendicular runways. At Memphis, a recent "close call" during simultaneous approaches to perpendicular runways raised concerns by air traffic control personnel and FedEx, which uses the Memphis airport as its main package-sorting hub. The Center assembled a team of subject-matter experts and stakeholders and led the panelists, with different viewpoints, to arrive at an alternative that was accepted as both safe and efficient by all. The report generated by the Volpe Center was approved in record time and is now seen as a model for future safety studies. *(Sponsored by DOT/FAA)*

Airspace Simulation and Analysis Tool Capability Development

The Volpe Center is developing a Monte Carlo-based computer simulation capability to enable rigorous analysis and certification of terminal procedures, equipment, and airspace in the National Airspace System (NAS) for the FAA Flight Standards Office. This simulation capability will play a critical role as FAA seeks to safely implement new terminal arrival procedures based on Automatic Dependent Surveillance-Broadcast (ADS-B) technology, to meet the expected capacity gains anticipated for the Next-Generation Air Transportation System. Unique elements of this capability are the stochastic (i.e., random, but with known probability distributions) models of almost every component of NAS — mechanical, electronic, and human — including navigation aids, surveillance systems (such as ADS-B), pilots, aircraft, air traffic controllers, and weather combined with known, discrete artifacts such as runway size and configuration and obstacles. Due to the complexity and aviation-safety-critical nature of the simulation development effort, the Center consulted with FAA, industry, and Massachusetts Institute of Technology experts to plan the development effort. During FY 2007, the Volpe Center team completed models for surveillance, aircraft, and air traffic control as well as overall design for the simulation tool. *(Sponsored by DOT/FAA)*

Pittsford, New York, railroad bridge with Trespass Detection System. (Left: Photo by Marco daSilva; right: Still from videostream recorded by trespass detection system)

RAIL

Railroad Infrastructure Trespass Detection Systems Research

In FY 2007, the Volpe Center published a final report on the design, installation, and three-year demonstration evaluation of a prototype system for trespass prevention on railroad rights-of-way (ROW) conducted for the Federal Railroad Administration (FRA) Office of Safety. The report, *Railroad Infrastructure Trespassing Detection Systems Research in Pittsford, New York* (DOT/FRA/ORD-06/03), is a major milestone in a multiyear research effort. This research was spurred by a June 1997 incident in which two teenagers were fatally injured by a train on a railroad bridge in Pittsford.

The Volpe Center conducted a demonstration of an automated prototype railroad infrastructure security system on a railroad bridge. This commercial-off-the-shelf (COTS) technology system was installed at the bridge in Pittsford, where the two teen fatalities occurred. This prototype system potentially saved an estimated five lives during three separate trespass incidents over the three-year evaluation period.

The interactive system can serve as a model for infrastructure security applications at other railroad ROW or bridges prone to intrusion. After the evaluation period was completed, FRA and the Volpe Center formalized a technology transfer agreement with CSX Transportation and handed over control of the wayside system to the railroad.

The project demonstrated the Volpe Center's multidisciplinary approach and our ability to design a prototype COTS system and work collaboratively with the client, local community users, and private-sector railroads. *(Sponsored by DOT/FRA)*

Confidential Close Call Reporting System (C^{3}RS)

DOT is working toward eliminating transportation-related fatalities and injuries in the United States. Nearly all transportation incidents are preceded by a chain of events or circumstances, any one of which might have prevented the accident if it had gone

another way. In many of these cases, operators are aware of these "close calls" or "near misses" and may have information that could prevent future mishaps. Volpe Center staff worked with railroad industry stakeholders from FRA, RITA's Bureau of Transportation Statistics, railroad carriers, and labor organizations to develop a demonstration program that evaluates the effectiveness of a close-call reporting system. Consensus among the key stakeholders was critical to the project moving forward because close-call reporting only succeeds when stakeholders volunteer information. The development of this system will enable the railroad industry to take action to prevent hazardous events before they occur.

Currently, two freight railroads (Union Pacific Railroad and Canadian Pacific Railroad) have volunteered to participate in this project. The project seeks two additional railroads to participate. The system began accepting close-call reports in February 2007. *(Sponsored by DOT/FRA)*

Structural Analysis of Talgo Passenger Car Tower Supports

Amtrak operates its Cascades service in the Pacific Northwest, linking the cities of Vancouver, British Columbia; Seattle and Tacoma, Washington; and Portland and Eugene, Oregon. The trains operate in push-pull mode with a locomotive on one end and a cab car (a nonpowered locomotive) on the other. The 13 passenger cars (coaches) in each of the five trainsets are produced by Talgo and are the only cars manufactured by that company in operation in the United States. The cars are designed to passively tilt into curves, allowing the train to pass through them at higher speeds. Despite a maximum design speed of 124 mph, current track and safety requirements limit the train's speed to 79 mph.

Talgo coach car tower support structure with locations of cracking identified.

The Talgo trainset is articulated; each passenger car shares a single pair of wheels with the next such that they cannot be decoupled without lifting one car onto a support. This design can also reduce jackknifing in a derailment. In order to share a single wheelset, the articulation scheme involves a pair of tower supports on the trailing car and a pair of weight-bearer bars that support the rear of the leading car. These elements are connected to the tower support structure on the forward end of the trailing car.


Talgo coach car tower support structure (circled). (Photos courtesy of Richard Clark of Raul V. Bravo & Associates, Inc., Reston, VA.)

In 2005, cracks were discovered at two locations on the tower support structure. Amtrak voluntarily removed the five trainsets from service pending investigation of the cracking and implementation of repairs. At the request of FRA, the Volpe Center participated in the review of the computer modeling conducted to determine the cause of the cracking and to evaluate the effectiveness of the proposed repair scheme. Volpe Center staff also participated in an over-the-road test with an instrumented trainset, which was conducted in February 2006, to measure loads and stresses in the tower support structure in order to validate the predictions made by computer models. Repairs to all trainsets at the two crack locations were completed by May 2007.

In August 2007, cracking was discovered in a third location in the tower support structure. Amtrak again removed all trainsets from service while the cause of the cracking was investigated and plans for repairs were realized. FRA requested that the Volpe Center participate in the structural analysis to determine the cause of the cracking and why the third crack-prone location was not identified in previous analyses. Volpe Center staff identified deficiencies in the computer model used to conduct the original analysis of the cracking at the original two locations and worked with Amtrak, Talgo, and contractors to develop a higher-fidelity model. The results from the improved model revealed a high likelihood of cracking at the third location. In addition, at the Center's request, the over-the-road test data were reexamined and additional sources of load applied to the tower support were identified. When applied to the improved model, this additional loading proved to be the cause of extremely high stress concentrations in the tower support structure. The increased understanding of the behavior of the tower support under the operating conditions present in the Pacific Northwest led to the development of a repair procedure for the third crack location. Repairs are ongoing, and Amtrak expects to return the first trainset to service in early October. *(Sponsored by DOT/FRA)*

Railroad Tank Car Structural Integrity Research

Rail transportation of hazardous materials in the United States is recognized as the safest method of moving large quantities of chemicals over long distances. Recent statistics show that the rail industry's safety performance as a whole is improving. In particular, the vast majority of hazardous materials shipped by rail tank car arrive safely and without incident. In general, the railroads have an outstanding record in moving shipments of hazardous materials safely.

The safe transport of hazardous materials by railroad tank cars is a key concern to FRA. Moreover, the objective of FRA-sponsored research is to maintain tank integrity over a wide range of conditions, from the normal operating environment to rare and extreme circumstances, such as impact loads from an accident.

In FY 2007, the Volpe Center has provided technical support, not only to FRA in its safety mission but also to an industry research-and-development effort called the Next Generation Rail Tank Car (NGRTC) project. The goal of the NGRTC project is to develop and implement new designs for railroad tank cars carrying hazardous materials. The industry sponsors of the project are Dow Chemical Company, Union Pacific Railroad, and Union Tank Car Company. In January 2007, FRA signed a Memorandum of Cooperation with the industry sponsors to share research information.

As part of the NGRTC project, two full-scale tests were performed at the Transportation Technology Center in Pueblo, Colorado, to evaluate the safety performance of tank cars under impact-loading conditions. The Volpe Center developed plans to implement the tests and conducted analyses to predict the outcomes. In the first impact test, which was conducted on April 26, 2007, a ram car traveling at 14 miles per hour impacted and dented the side of a stationary tank car. The pre-test calculations made by the Volpe Center were in

excellent agreement with the test data. For example, the predictions were within 10 percent of the peak forces measured in the tests. A second test was conducted on July 11, 2007, with a smaller indenter than used in the previous test. In this test, the ram car traveling at 15 mph impacted and punctured the side of a stationary tank car. The failure of the tank car in the second test had been predicted in the Volpe Center analysis.

The analysis tools used by the Volpe Center to design, implement, and predict the outcomes of the tests will be used to develop alternative designs to enhance the safety performance of railroad tank cars. *(Sponsored by DOT/FRA)*

TRANSIT

Drug and Alcohol Management Information System

The Omnibus Transportation Employee Testing Act of 1991 mandated that the Secretary of Transportation issue regulations to combat prohibited drug use and alcohol misuse in the transportation industry. For that portion of the transportation industry involved with the provision of and service to the public of "mass transportation," the Federal Transit Administration (FTA) was delegated with the responsibility for issuing the implementation rules.

Drug and alcohol testing compliance audit/oversight is an ongoing function that supports DOT's Safety Strategic Goal by monitoring the drug- and alcohol-testing programs for safety-sensitive employees of agencies that receive FTA Section 5309 Capital Investments, Section 5307 Urbanized Formula, and Section 5311 Non-Urbanized Formula program funds.

The Volpe Center developed a compliance audit software application called the Substance Abuse Management Oversight (SAMO) system. SAMO was released for use by FTA compliance audit teams in FY 2006. The SAMO design was a result of collaboration between the Center, FTA, and FTA contract personnel. SAMO is a Windows-based desktop application developed with Visual Basic 6, Microsoft Access, and a wide range of third-party components, including ChartFX, Grid Tools, Active Reports, and TX Text Control, which is used in parallel with the hands-on audit process. SAMO is a mechanism for (1) recording audit results, (2) aggregating and collating interview and record review results, (3) generating a final audit report while onsite, (4) creating a final report PDF for distribution, and (5) creating the audit response file and medium. SAMO also contains functions such as DOT and FTA regulatory lookup, an interview response tracking system, canned audit responses, and extensive help files. Software refinements continued in FY 2007. *(Sponsored by DOT/FTA)*

MOTOR VEHICLE

Technology to Prevent Alcohol-Impaired Crashes

Alcohol-impaired drivers contribute to a substantial proportion of traffic crash fatalities and injuries. Courts can mandate the use of breath alcohol ignition interlock devices for people convicted of driving under the influence of alcohol, but actual imposition of this mandate is low. Breath alcohol concentration (BrAC) analyzers, or "breathalyzers," developed in the 1950s, have become the main proof of intoxication in prosecutions, but they cannot currently be installed in a vehicle. Recent advances in unobtrusive and miniaturized detection technology offer the potential for vehicle-based monitoring of a driver's blood alcohol concentration (BAC) and/or driving performance for signs of impairment and, if necessary, for either preventing vehicle ignition or taking other actions to prevent a crash.

The National Highway Safety Administration (NHTSA) asked the Volpe Center to identify vehicle-based technologies with the potential to detect driver BAC and monitor driver impairment and to assess their practicability and effectiveness. The Volpe Center surveyed the most promising available and emerging technologies capable of detecting alcohol-impaired driving and ranked them using multiple assessment criteria and taking into account feasibility, public acceptance, privacy, and legal issues.

Presentations about these promising technologies were given to the Blue Ribbon Panel for the Development of Advanced Alcohol Detection Technology (composed of leaders from NHTSA, the Insurance Institute for Highway Safety, Mothers Against Drunk Driving [MADD], and the automotive and insurance industries) in both 2006 and 2007, and to the 2007 annual meeting of the International Council on Alcohol, Drugs, and Traffic Safety (ICADTS). The final report for this project, *Review of Technology to Prevent Alcohol-Impaired Crashes* (DOT HS 810 827), was published by NHTSA in September 2007. *(Sponsored by DOT/NHTSA)*

Crash Avoidance Research: Defining Pre-Crash Typology for Light-Vehicle Crashes

A number of crash typologies have been developed over the years in support of vehicle safety research. Crash typologies provide an understanding of distinct crash types and scenarios and explain why they occur. They serve as a tool to identify intervention opportunities, set research priorities and directions in technology development, and evaluate the effectiveness of selected crash countermeasure systems.

In FY 2007, the Volpe Center completed a three-year study that defined a new pre-crash scenario typology for crash avoidance research, based on national motor vehicle crash data. This typology establishes a common foundation for vehicle safety research for public and private organizations that will allow researchers to determine which traffic safety issues

should be of first priority to investigate and to develop concomitant crash avoidance systems. The study identified common pre-crash scenarios of all police-reported crashes involving at least one light vehicle (i.e., passenger car, sport utility vehicle, van, minivan, and light pickup truck); quantified their severity in terms of frequency of occurrence, economic cost, and functional years lost; portrayed each scenario by crash contributing factors and circumstances in terms of the driving environment, driver, and vehicle; and provided nationally representative crash statistics that can be annually updated using national crash databases. The typology is currently under consideration by NHTSA as a basis for a New Crash Assessment Program (NCAP) that provides star ratings for safety standards of new vehicle models deploying crash avoidance technologies. At a recent government-industry meeting in May 2007, the U.S. automotive industry advocated the use of this crash typology, which is described in a final report, *Pre-Crash Scenario Typology for Crash Avoidance Research,* and can be downloaded from the NHTSA website (*www-nrd.nhtsa.dot.gov/departments/nrd-12/pubs_rev.html*). *(Sponsored by DOT/NHTSA)*

Crashworthiness Studies: Frontal Offset Crash Tests

To reduce deaths and serious injuries to motor vehicle occupants, NHTSA has been conducting research to assess harm-reducing concepts. Crash statistics indicate that 79 percent of injuries in frontal crashes are from frontal offset crashes. Frontal offset crashes are dangerous because they cause structural damage that can penetrate the cabin or occupant compartment. Frontal offset crashes result in the deformation of one side of the vehicle's front end, which produces passenger compartment intrusion. This intrusion generates different force levels on the front-seated occupant. Frequently, the occupant's lower legs sustain severe injuries. Frontal offset tests are more demanding on the vehicle structure and less demanding on the passenger restraint; the opposite is true for the full frontal tests. NHTSA is developing and refining advanced dummies and associated injury criteria. To better measure the resultant injury forces, NHTSA has developed specialized advanced crash dummy lower extremities, Thor-Lx (50th percentile male) and Thor-FLx (5th percentile female), which incorporate improved biofidelic features and significantly expanded instrumentation. Since 1982, the Volpe Center has supported NHTSA efforts in the areas of vehicle crashworthiness studies, testing, data analysis, and biomechanics research.

A vehicle-to-deformable-barrier frontal offset test managed by the Volpe Center.
(Photo courtesy of Transportation Research Center, East Liberty, Ohio)

In FY 2007, the Volpe Center completed a series of 11 vehicle-to-deformable-barrier frontal offset tests in order to evaluate and compare vehicle and occupant responses in support of NHTSA's Offset Frontal Program. The reports, data, and video obtained from these tests

were evaluated for quality control to ensure utility to NHTSA. The results of this effort will help NHTSA to determine the feasibility of developing a 35 mph frontal offset test procedure to complement the Federal Motor Vehicle Safety Standard (FMVSS 208). These federal safety standards are regulations that present minimum safety performance requirements for motor vehicles or items of motor vehicle equipment. *(Sponsored by DOT/NHTSA)*

Safety Roadmap for Future Plastics and Composite-Intensive Vehicles

The U.S. Congress directed NHTSA in FY 2006 to "begin development of a program to examine the possible safety benefits of lightweight Plastics and Composite-Intensive Vehicles (PCIV)" to develop a foundation for cooperation with the Department of Energy (DOE), industry, and other automotive safety stakeholders. NHTSA tasked the Volpe Center to conduct a research study in cooperation with the American Chemistry Council — Plastics Division (ACC-PD) industry partners. This project supports the national policies of achieving energy independence by developing and deploying fuel-efficient vehicles with equal or better safety performance by 2020. The study identified promising, high-leverage research partnerships and composite materials standards development efforts relevant to PCIV safety, as well as major knowledge gaps and barriers to PCIV deployment. The study also identified R&D priorities for the development and deployment of lightweight PCIVs, which would meet NHTSA crashworthiness requirements and overcome vehicle compatibility challenges by 2020. The PCIV Safety Research Roadmaps define major R&D activities for the near term (three years), mid-term (three to five years), and longer term (to 2020) and identify milestones to enable the design, development, and deployment of lightweight, fuel-efficient, and environmentally sustainable PCIVs that will meet or exceed NHTSA crash-safety standards. In FY 2007, the study was delivered to NHTSA, and it is currently in final agencywide (policy and regulatory) review.

Continued congressional interest and NHTSA funding will allow the Volpe Center to undertake follow-up research in FY 2008 that will broaden, deepen, and implement key near-term PCIV Safety Roadmap priorities, consistent with NHTSA's integrated safety strategy and in support of national fuel economy goals. *(Sponsored by DOT/NHTSA)*

NHTSA Support for Crash History Data

Each year since 1997, NHTSA's National Center for Statistics and Analysis (NCSA) has selectively collected data and produced statistical summaries and individual case histories of crashes that occur on the nation's highways. Detailed information on nearly 50,000 crash cases has so far been made available to researchers and policy makers in the federal government as well as to various state governments, the automobile industry, academia, and private research groups. Consumers of the data have always recognized its uniqueness and

great value but have consistently lobbied for a way to make it easier to use. In 2007, NCSA introduced a web-based capability to retrieve 2004 and 2005 data. That capability was developed by the Volpe Center and was based on the use of eXtensible Markup Language (XML) — the emerging standard for information interchange. The new capability provides a more enhanced way to view and analyze data from the web and, even more significantly, allows a direct download of data into the growing number of third-party tools that accept data in XML format. This XML capability has been praised by members of the Alliance of Automobile Manufacturers, representatives of the automobile industry, and researchers from private advocacy groups. NCSA and the Volpe Center are now moving to meet the demand of making all crash case data available in XML. *(Sponsored by DOT/NHTSA)*

MOTOR CARRIER

Household Goods National Consumer Complaint Database

While safety remains the Federal Motor Carrier Safety Administration's (FMCSA) top priority, the regulation of interstate household goods (HHG) movers is one of FMCSA's key programs. As part of the Household Goods Program, FMCSA focuses on educating the American public about how to find and employ reputable HHG movers as well as on reviewing the operations of HHG movers for compliance with federal regulations. One of the primary sources of information about HHG movers is complaints submitted to FMCSA by the public.

Roadside truck inspection. (Photo by Julie Nixon)

The Volpe Center worked with FMCSA to design and develop a web-based information system for recording and reporting HHG complaints, the National Consumer Complaint Database (NCCDB). The system became fully operational in April 2007. The NCCDB allows the public and FMCSA staff to submit HHG complaints using an online form that includes individual violations with straightforward descriptions. While previous systems relied on a free-form narrative to describe the nature of the complaints, users of the NCCDB simply select a violation from a standardized list. This system has streamlined the process of submitting an HHG complaint while also allowing for more standardized reporting and analysis. FMCSA investigators are able to run reports tallying the number of complaints by violation and by category. These reports improve the process of identifying unscrupulous HHG movers for review. The NCCDB is integrated with an FMCSA-developed website, *www.ProtectYourMove.gov,* to assist consumers moving across state lines. Consumers are able to search the NCCDB for a specific carrier and view the carrier's safety data, license, and insurance information as well as the number of complaints submitted against the carrier. *(Sponsored by DOT/FMCSA)*

Motor Vehicle Comprehensive Safety Analysis

FMCSA is developing a new operational model through its Comprehensive Safety Analysis 2010 (CSA 2010) initiative. The goal of CSA 2010 is to develop and implement more effective and efficient ways for FMCSA, its state partners, and industry to reduce commercial motor vehicle (CMV) crashes, fatalities, and injuries. CSA 2010 will help FMCSA and its state partners to use continually improving data to better identify high-risk carriers and drivers and to apply a wider range of interventions to correct high-risk behavior.

In FY 2007, the Volpe Center continued to help FMCSA identify the blueprint for a comprehensive safety program for 2010. The team determined the attributes and components of a model for safety oversight that it considered to be ideal. Such an innovative model would be flexible, efficient, and equitable. The CSA 2010 program is designed to respond to unsafe behavior before it becomes chronic and habitual, utilizing a range of safety interventions beyond the current enforcement process to increase effectiveness and make better use of resources. The Volpe Center is part of a technical team that developed the concept for a new operational model that will employ new safety improvement tools for drivers and motor carriers. The conceptual operational model for CSA 2010 features continuous monitoring and tracking of entities' safety performance. Entities may be either carriers or drivers. All entities found to have problematic safety behavior will be subject to the newly developed intervention process. The model is planned to be tested in the beginning of 2008, prior to national deployment scheduled for 2010. *(Sponsored by DOT/FMCSA)*

Motor Vehicle Comprehensive Data Quality Program: Development and Implementation

The Volpe Center is assisting FMCSA in raising awareness of the importance of accurate, complete, and timely state-reported data by developing a comprehensive data quality program to evaluate states' safety data quality and to provide states with the expertise and assistance they need to improve the quality of the data.

Through the state partnership in the Motor Carrier Safety Assistance Program (MCSAP), FMCSA shares a safety goal with the states: to reduce the number and severity of crashes involving large trucks and buses on our nation's highways. To meet this common goal, it is essential that uniform, complete, accurate, and timely information on crashes and inspections be collected and reported to FMCSA. The Volpe Center made significant strides in helping to improve the quality of crash and inspection data by supporting FMCSA in the development of a comprehensive program. This program includes raising the awareness of the importance of complete, accurate, and timely crash and inspection state safety data; developing a means of measuring the state safety data quality; and working directly with the states, either through the state onsite review process or the Volpe Center's technical assistance role.

During FY 2007, the Volpe Center developed new performance metrics for measuring incomplete reporting of large-truck crash data. These measures indicate areas of improvement for state reporting of crash data and elevate the awareness of states to sustain quality data reporting. The Center conducted four onsite Data Quality Reviews in Tennessee, Louisiana, Indiana, and Massachusetts, which included reviewing the states' processes and identifying specific steps that could be taken to improve the quality of state-reported data. The Center implemented a technical assistance program to help states monitor their data quality, identify specific data quality needs, and direct them to other resources such as grant programs and educational tools. The results of these combined efforts are being used to develop "best practices" to assist states in improving the quality of state-reported crash and inspection data.

The quality of data submitted by states has shown marked improvement since the inception of the program in 2004. These program components — evaluating state data, developing improvement tools for states, and assisting individual states as they work toward improving their data collection processes — combine to form an effective and comprehensive approach to improving the quality of state safety data. This also translates into more effective use of FMCSA's safety programs. (*Sponsored by DOT/FMCSA)*

Commercial Vehicle Safety Plan Training: Development and Delivery

The primary mission of FMCSA is to reduce crashes, injuries, and fatalities involving large trucks and buses. To support this mission, FMCSA's MCSAP provides financial assistance to states to reduce CMV crashes, fatalities, and injuries through consistent, uniform, and effective CMV safety programs. To be eligible for MCSAP grant funding, states must submit a performance-based Commercial Vehicle Safety Plan (CVSP) that includes targeted safety strategies with performance goals.

The Volpe Center has worked with FMCSA for the past four years in the design and delivery of the CVSP Training Program. The program is designed to support the states in conducting data analysis to develop performance-based CVSPs and is delivered by the Volpe Center team to the nation's FMCSA field and state staff in the spring of each year. In FY 2007, the training was enhanced to include (1) a series of webinars delivered prior to the on-site training to over 360 participants, (2) the delivery of a state-specific analysis report to each state that provided an interpretation of available state-reported crash and inspection data, and (3) the development of a new analysis tool, the CVSP Toolkit. The toolkit resides on the Analysis and Information (A&I) Online website (*http://ai.fmcsa.dot.gov*) and provides online assistance and customized reports designed to assist FMCSA and state partners in developing, measuring, monitoring, and evaluating state-specific safety objectives. Each state's safety data are also available on the website. The Center also works directly with the states in onsite half-day training sessions. The onsite training provides states with a step-by-step process to conduct data analysis in the development of a state safety objective. The training focuses on FMCSA's fiscal year priority CMV improvement areas, including crash location,

driver, and data quality. The training continues to evolve, and the results have been realized in improvement of the quality of performance-based plans. *(Sponsored by DOT/FMCSA)*

FMCSA Support for Existing Systems

The Volpe Center is FMCSA's strategic partner for information technology support. As such, the Center was charged with enhancing and maintaining a suite of safety information systems and rapidly responding with system changes resulting from congressional legislation and administration requirements. In 2007, a major accomplishment was the completion and deployment of a software code to address the opening of the Mexican border to long-haul motor carriers. This was accomplished while providing FMCSA with the tools to ensure the safety of Mexican trucking operations and to closely monitor their performance. In addition, and almost simultaneously, a major release was made to FMCSA's suite of information systems to address enhanced functionality and user-desired features. The coordination of these two significant efforts was technically complex and was accomplished on time and within project budgets. *(Sponsored by DOT/FMCSA)*

FMCSA Support for COMPASS

Two years ago, FMCSA initiated a business process improvement and information modernization effort called COMPASS. The Volpe Center was instrumental in the formative and planning phases of this effort and has been playing a critical technology support role to FMCSA in the COMPASS development effort. As a first step, the Center designed and implemented the FMCSA Integrated Configuration Management (CM) Plan. This CM plan encompasses the entire agency and all its service providers for COMPASS as well as its existing systems. In FY 2007, several major milestones were achieved. In August 2007, COMPASS Release 1 was implemented. A Service-Oriented Architecture (SOA) platform for the COMPASS environment was created. This allows FMCSA to build its Enterprise Architecture plan modeling COMPASS. Finally, the Center implemented the e-Authentication program into the COMPASS pilot on time, as directed by DOT. *(Sponsored by DOT/FMCSA)*

FMCSA Support for System Infrastructure and Security

In addition to enhancing and maintaining a suite of existing safety information systems for FMCSA, the Volpe Center provides infrastructure and security support for these systems to ensure that they are operating 24/7 and their security is not jeopardized. In 2007, the Volpe Center successfully migrated both the application and database of the MCMIS, the Enforcement Management Information System (EMIS), and the Licensing and Insurance (L&I) systems from an outdated suite of Compaq Tru64 servers into the Sun Solaris V890 servers, which have higher performance and more software and hardware-supported products. By implementing these changes into a load-balancing and failover environment,

FMCSA minimizes costs for database administration and increases server availability to 99.9 percent uptime. From a security perspective, the Center has successfully performed a disaster recovery test restoring FMCSA's MCMIS, EMIS, A&I, Data Quality System (DataQs), NCCDB, and L&I within 24 hours. In addition, the Center performed system tests of the prescribed functionalities at the Mexican border in Arizona. *(Sponsored by DOT/FMCSA)*

PIPELINE

Pipeline Safety Monitoring and Reporting Tool

Trans-Alaskan oil pipeline.
(© 2007 istockphoto.com)

The Pipeline and Hazardous Materials Safety Administration's (PHMSA) Office of Pipeline Safety (OPS) administers the national pipeline regulatory program to ensure the safe and environmentally sound transportation of natural gas, petroleum products, and hazardous liquids. The primary mission of OPS is to ensure the safe operation of pipelines while protecting the public and the environment through a comprehensive pipeline safety program that includes effective risk management, compliance with regulations, quality training, and a balanced federal/state partnership. The Volpe Center was tasked by OPS with creating an enterprise-wide information system that would improve its safety analysis and reporting capability while integrating pipeline inspection, monitoring, and enforcement business processes. The resulting solution, the Safety Monitoring and Reporting Tool (SMART), was developed by the Volpe Center as a web-based knowledge-management tool for collection, analysis, and reporting of pipeline information. SMART provides PHMSA with an integrated information source to identify pipeline safety trends, target solutions, and measure performance. SMART transforms the current environment of standalone systems and isolated databases into an integrated internet-based portal enabling cross-database query and analysis. SMART directly supports PHMSA's mission by providing a collaborative tool with integrated business processes for analysis of pipeline information to meet the needs of a wide range of stakeholders.

The SMART application is being developed in three distinct phases. The first phase, Start-up, provided a new enforcement application leveraging workflow and laid the foundation for document management and query applications. Start-up was completed in December 2004.

SMART Phase 2, referred to as the Initial Operating Capability (IOC), includes the first production release of enforcement and inspection functionality. The primary objective of Phase 2 is to provide an integrated tool for collaborative research, analysis, and reporting of pipeline information. In September 2007, the Volpe Center conducted a User Acceptance Test (UAT) to validate Phase 2 inspection functionality and integration with enforcement actions. The UAT was a complete success, and the system was approved for deployment

to all PHMSA regions. Currently, SMART is the system of record for pipeline compliance actions and safety-related condition processing. By December 2007, it will also be the system of record for pipeline inspection information. Work on Phase 2 will be completed by February 2008.

SMART Phase 3, referred to as the Final Operating Capability (FOC), represents functionality focused on enhancements related to expanded stakeholder access (e.g., pipeline operators and state agents), performance measurement, safety trend analyses, data visualization, integrated business processes, and service to citizens. Phase 3 is scheduled to be completed by September 2009. *(Sponsored by DOT/PHMSA*)

Low-Stress Pipeline Mileage Study

In 2006, two major petroleum spills involving low-stress pipelines (LSP) on the North Slope of Alaska elevated public and congressional attention to these unregulated pipelines. The term "low-stress pipeline" means a hazardous liquid pipeline that is operated in its entirety at a stress level of 20 percent or less of the specified minimum yield strength of the line. With this heightened awareness, Congress enacted Section 3 of the Pipeline Inspection, Protection, Enforcement, and Safety Act of 2006, which requires that regulations be issued subjecting all LSP to the same standards and regulations as other hazardous liquid transmission pipelines. Since data on unregulated rural LSP had not been collected previously, PHMSA's preliminary evaluation of the potential compliance costs of regulatory options was based on an estimate of LSP mileage, which was later questioned during public comment.

To address the LSP data gap and obtain a more accurate and reliable understanding of existing, unregulated LSP mileage, the Volpe Center has been working with PHMSA to conduct a two-phase request for information on unregulated LSP to confirm and/or modify LSP mileage estimates. A survey approach was selected as the most efficient method for collecting these data since resource, technical, and logistical (e.g., geographic distribution) constraints prohibited collecting them in the field. Phase I (completed in FY 2007) involved surveying the nine largest interstate oil pipeline companies (as determined by the total number of pipeline miles they own and/or operate). Phase II (currently underway) consists of obtaining Office of Management and Budget (OMB) approval of the survey so that it might be administered industrywide. Both surveys seek information on the mileage, diameter, products transported, and geographic location by state of rural LSP. This information will be critical to PHMSA in developing feasible regulations to increase the safety of LSP. *(Sponsored by DOT/PHMSA)*

Federal-State Grant Tracking and Reporting Systems: Development and Maintenance

In FY 2007, the Volpe Center continued to operate, maintain, and enhance the Federal-State Tracking and Reporting (FedSTAR) systems, which streamline the integration of Grants.gov (mandated for grant applications throughout the federal government) for the PHMSA State Pipeline Safety grant program. The Center developed and conducted training programs to aid the grantees in meeting this requirement while continuing to assist the PHMSA OPS in processing pipeline safety grants in an efficient manner. FedSTAR is a web-based system that integrates the information necessary to support the State Pipeline Safety offices as well as PHMSA in its management of those interfaces with state organizations.

In 2007, PHMSA was sufficiently pleased with support of the Grants.gov integration for Pipeline Safety Grants that the Volpe Center was asked to support the Office of Hazardous Materials Safety (OHMS) Hazardous Materials Emergency Preparedness (HMEP) grants program in its transition to Grants.gov for applications. As with the Pipeline Safety grants program, no previous HMEP grantees left the program due to this major shift in the grant application process. FedSTAR continues to operate, with the Volpe Center providing end-user hotline support, program and policy support, operations, and maintenance while also developing enhancements and improvements to existing functionality. *(Sponsored by DOT/PHMSA)*

Reduced Congestion

Reduce congestion and other impediments to using the nation's transportation system

Air Traffic Flow Management: Modeling and Predictions

FAA air traffic flow management (TFM) decision making is based primarily on a comparison of predictions of traffic demand and available capacity at various National Airspace System (NAS) elements such as airports and en-route sectors. FAA uses the Enhanced Traffic Management System (ETMS) to predict traffic demand and available capacity, identify congestion, and alert NAS elements when the predicted demand exceeds capacity. Based on predicted severity and duration of congestion, the Air Traffic Control System Command Center (ATCSCC) makes a decision on triggering an appropriate Traffic Management Initiative (TMI), such as a Ground Delay Program (GDP), Ground Stop (GS), or Miles-in-Trail (MIT), to bring traffic demand to the level of available capacity. Although predicted demands and capacities are uncertain, ETMS treats them deterministically and does not take into account the errors in subsequent prediction updates that may cause errors in identifying alert status of NAS elements. That is why it is crucial to increase accuracy of air traffic demand predictions and improve accuracy, stability, and reliability of the ETMS Monitor/Alert functionality.

JFK International Airport. (© 2007 istockphoto.com)

The Volpe Center is conducting a TFM Concept Engineering project for FAA to research this issue. Preliminary results were presented at the American Institute of Aeronautics and Astronautics (AIAA) Guidance, Navigation, and Control Conference and Exhibits (Hilton Head Island, South Carolina, August 2007) in the paper *A New Model to Improve Aggregate Air Traffic Demand Predictions*. This paper proposed a regression model for

improving aggregate traffic demand predictions in ETMS. This approach acknowledges the uncertainty in these predictions and uses ETMS demand count data in a novel way to make improved predictions (in terms of both accuracy and stability). The model was calibrated and validated using data from nine airports and 13 en-route sectors on traffic demand predictions for various lookahead times, ranging from 30 minutes to six hours. The regression model reduced the standard deviation of demand prediction errors by 14 to 16 percent for airports and by 11 to 16 percent for sectors in comparison with the current ETMS predictions for all lookahead times. The new prediction model for airports also showed an improvement in stability of demand prediction compared with the current ETMS predictions. When capacity was set equal to average demand, the number of changes in alert status that characterize stability in Monitor/Alert functions decreased by 35 to 48 percent, depending on the airport.

These improvements in the accuracy and stability of demand predictions from the new regression model provide significant benefits for Monitor/Alert functions, mainly in cases when predicted demand counts are in the vicinity of airport or sector capacity, when the instability and high fluctuations of successive demand predictions may cause significant instability and fluctuations (flickering) in detecting alert status. *(Sponsored by DOT/FAA)*

Automatic Dependent Surveillance-Broadcast

There is widespread recognition that the NAS requires a major restructuring to achieve the projected doubling or tripling of flights by 2025. There is further consensus that Automatic Dependent Surveillance-Broadcast (ADS-B) — whereby aircraft broadcast their identity, position, intent, and other information to air traffic control facilities on the ground as well as to nearby aircraft — will be a key enabling component of the future NAS.

FAA's Air Traffic Organization (ATO) created the Surveillance and Broadcast Services (SBS) Office to define and manage agencywide resources in the development and implementation of (1) ADS-B; (2) Flight Information Services-Broadcast/Traffic Information Services-Broadcast (FIS-B/TIS-B), utilizing Ground-Based Transceivers (GBTs) that also receive and broadcast surveillance messages and weather information; and (3) integration of these three new services/systems into the NAS. Initial application regions include Juneau, Alaska, for ADS-B and Wide Area Multilateration (WAM), another new surveillance technology; Western Colorado for WAM, in conjunction with the Colorado Department of Transportation (CoDOT); the Gulf of Mexico (GoMex) for ADS-B as well as air/ground communication and automated weather systems; the Louisville, Kentucky, area for air-to-air applications; the Philadelphia, Pennsylvania, area for terminal area surveillance; and the U.S. East Coast and selected other regions for FIS-B/TIS-B services.

The Volpe Center has supported the SBS Office since its inception in December 2005. During FY 2007, the Center was responsible for 11 technical tasks as well as for managing most of the contractor workforce (approximately 40 full-time equivalent positions) that supports the SBS Office. The technical tasks performed by the Volpe Center include study-

ing the impact of ADS-B/broadcast services on systems now using the 1030/1090 MHz frequencies; acting as lead system engineer for the Juneau WAM deployment and certification as well as for the Gulf of Mexico; developing a system coverage tool; acting as lead for deployment of six ground sites in Oregon; conducting surveys of three East African counties; and developing/deploying a prototype ADS-B monitoring system in the Midwest that is being used to reduce risks associated with the production/operational system.

The major accomplishment achieved by the ADS-B team during FY 2007 was the award of the prime system development contract, for $1.8 billion, to ITT Corporation in late August. This was the largest and most important contract awarded by FAA in FY 2007, and Volpe Center personnel and contractors played a major role in this significant accomplishment. (*Sponsored by DOT/FAA*)

Tower Information Display System

Airports constitute a major bottleneck in the National Airspace System. One of the limiting factors in increasing air traffic levels to and from an airport is the lack of surveillance during night and low-visibility conditions and the lack of integration of Air Traffic Control Tower (ATCT) systems and functions. Today, arrival and departure aircraft are controlled using an "out-the-window" paradigm and decision-making based on information from several different sources. This generally results in a decreased total number of operations during low-visibility and night conditions and necessitates significantly increased controller workloads during those times.

Tower Information Display System: Large flat-panel displays for local and ground controller positions, developed by FAA.

To address this issue, FAA is developing the Tower Information Display System (TIDS). TIDS is currently an R&D initiative with the objective of providing technical aids to ATCT controllers. TIDS eliminates dependencies on out-the-window visual observations, consolidates information from multiple current sources, and provides additional air traffic flow information to the tower controllers.

During FY 2007, the Volpe Center was tasked to conduct a TIDS Quick-Look Operational Feasibility Analysis. A prototype TIDS was designed and implemented using large flat-panel displays for the local and ground controller positions. These positions integrated data from Airport Surface Detection Equipment, Model X (ASDE-X), and Electronic Flight Strip (EFS) and also included prototypes of possible new controller aids.

The prototype TIDS was tested at FAA's Airways Facilities Tower Integration Laboratory (AFTIL) in Atlantic City, New Jersey. Controller performance using TIDS and out-the-window was compared for various visibility and lighting conditions. Generally, TIDS was found to be comparable to out-the-window in good visibility conditions but provided better performance in poor visibility conditions. Controller workload was consistent over all visibility conditions with TIDS and was generally lower than for the out-the-window operations. *(Sponsored by DOT/FAA)*

Part of Volpe Center-installed instrumentation for wake measurement at Lambert-St. Louis Airport. Left: Pulsed LIDAR installation. (Photo by Dave Burnham) Right: Windline. (Photo by Kevin Clark)

St. Louis Airport Parallel Runway Approach Procedure

Congestion-induced delays are a major source of frustration to both operators and users of the U.S. air traffic system. One cause of delay is the set of rules governing use of parallel runways. Current regulations require that, under reduced ceiling or visibility conditions, aircraft must be separated as though approaching a single runway when approaching parallel runways spaced less than 2,500 feet apart — i.e., forming a single stream of traffic. The restriction (to one traffic stream) results in arrival capacity being essentially half the capacity than it would be under visual conditions (when two similar streams are permitted). This causes delays when traffic is heavy, as flights are scheduled based on capacity during visual conditions. FY 2007 saw the culmination of more than three years of work resulting in approval of new procedures for parallel runways.

The Volpe Center, as part of a team involving FAA and Federally Funded Research and Development Centers (FFRDC), devised and investigated the level of safety of a new procedure that would permit two arrival streams under instrument conditions at Lambert-St. Louis International Airport (STL), where the primary runways are parallel and spaced 1,300 feet apart. The intent was to regain a significant fraction of the capacity lost under low-visibility conditions. The overriding constraint was that any recommended new procedure must be as safe as or safer than the existing procedure. If successful, the new procedure could be extended to other airports with similar runway geometries.

A measurement campaign was planned at STL to collect wake, weather, and aircraft data. A plan for the campaign was prepared by the Volpe Center and reviewed by the full team. The plan was then presented to stakeholder organizations and revised based on their comments. Beginning in June 2003, the Volpe Center progressively deployed a wake measurement suite comprising three pulsed LIDARS (laser radars), three SODARS (acoustic radars), and two anemometer Windlines (line arrays of propeller anemometers oriented perpendicular to the runway). A meteorological tower, instrumented to measure wind speed and direction, temperature, and relative humidity, was deployed to aid in

understanding the effect of the atmosphere on wake behavior. Additionally, several aircraft measurement systems were deployed. This was the most heavily instrumented wake measurement campaign ever conducted. The wake, weather, and aircraft data were collected over a three-year period, with wake data being collected at six aircraft altitudes (ranging from 100 to 1,200 feet).

Data collected at STL over three years were checked and analyzed in great detail (e.g., for proper operation of the instruments, consistency with available theories, and consistency among the instruments). The findings were reviewed several times by the Volpe Center and presented to stakeholders. Ultimately, these findings formed the core of the Safety Risk Management Document (SRMD) that accompanied the request for a new arrival procedure at STL.

As a result of their efforts and accomplishments, the Volpe Center received approval from the FAA Air Traffic Safety Oversight Service, for a two-year period, of the proposal for a new procedure enabling two traffic streams to approach the parallel runways at STL under instrument conditions. In the 35 years of the program, this is the first time that a new STL approach procedure has been approved. This will improve both the safety and capacity of any airport. Following completion of controller training, the procedure will be used in operational service at STL and evaluated in terms of its effects on safety and airport efficiency. It is planned to extend the new procedure to other airports with similar runway geometries, such as Cleveland-Hopkins International Airport, Boston-Logan International Airport, and Philadelphia International Airport. *(Sponsored by DOT/FAA)*

National Airspace System Performance Analysis System: Web-Based Version

In support of the FAA Air Traffic Organization, National Airspace System (NAS) Quality Assurance and Performance Team, the Volpe Center developed the National Airspace System Performance Analysis System (NASPAS) to support operations and maintenance within the NAS. NASPAS is a computer-based repository for NAS facility and equipment performance data and contains statistical and analytical tools for converting these data into management reports. NASPAS is used to track service performance at air traffic facilities, analyze facility outages, compare facility performance with national averages, and identify equipment problems. The system was originally developed as an FAA headquarters-only information system in 1983. Since then, it has undergone major changes in equipment platforms and software. During FY 2007, the Volpe Center developed a web-based version of NASPAS, to be deployed nationally in January 2008. *(Sponsored by DOT/FAA*)

Non-Motorized Transportation Pilot Program

There is a need to increase bicycling and walking as alternative transportation solutions to address issues of congestion, energy, and public health. Section 1807 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) established a Non-Motorized Transportation Pilot Program that authorizes $100 million to four communities (Columbia, Missouri; Marin County, California; Minneapolis, Minnesota; and Sheboygan County, Wisconsin) for infrastructure projects and educational and promotional programs, to increase the amount of bicycling and walking. The purpose of the pilot program is to demonstrate the extent to which bicycling and walking can carry a significant part of the transportation load within selected communities and represent a major portion of the transportation solution.

SAFETEA-LU calls on the Secretary of DOT to collect data on changes in travel behavior in the four communities and to assess how these changes decrease congestion and energy use and promote a healthier and cleaner environment. The Volpe Center is assisting FHWA, the four communities, and other organizations involved in the program in developing and implementing a comprehensive technical approach to evaluate this high-profile national program. The Volpe Center played a major role, working with FHWA and the pilot communities, in writing the 2007 Interim Report on the program to Congress. Knowledge about successful projects and programs, as well as information on those that are not as successful, will be invaluable to other communities implementing programs designed to increase cycling and walking and to improve the safety of bicyclists and pedestrians. *(Sponsored by DOT/FHWA)*

Congestion Initiative Contributions

In May 2006, DOT announced a major initiative to reduce transportation system congestion. This plan, the National Strategy to Reduce Congestion on America's Transportation Network (often referred to as the Congestion Initiative), provides a blueprint for reversing the alarming trends of congestion. Part of this initiative is a series of Urban Partnership Agreements with five cities, under which the cities commit to implementing plans that incorporate tolling, improve transit, encourage telecommuting, and promote technology and operations.

In FY 2007, the Volpe Center supported this initiative in a variety of ways:

- Contributing to the framing of the Congestion Initiative, including highlighting the potential benefits of congestion pricing
- Advising the Congestion Initiative's planned evaluation effort (i.e., how to structure the evaluations so that they contribute to federal policy development and future deployments)
- Conducting focus groups and writing a report (*Exploring a New Congestion Pricing Concept: Focus Group Findings from Northern Virginia and Philadelphia)* to provide information on how the public perceives congestion pricing
- Synthesizing the experiences of London and Stockholm to provide insight into which transit service characteristics would best support the Urban Partnerships

(*Sponsored by DOT/OST*)

Southeast High-Speed Rail Study

DOT and the Transportation Research Board (TRB) have previously undertaken research that indicated that high-speed ground transportation (HSGT) systems could be a competitive alternative to highway and domestic air travel in high-density travel markets and corridors in the United States. FRA also conducted a study of total costs and benefits of implementing a range of HSGT systems, which found that high-speed rail might divert significant numbers of trips from other modes and that HSGT's total societal benefits might exceed total costs in many corridors.

The Southeast High-Speed Rail Study, sponsored by the state of Georgia, looked at high-speed rail options in a section of the Southeast corridor. In FY 2007, the Volpe Center conducted market and economic studies to evaluate rail routes and technologies that balance potential ridership and revenues with infrastructure and operating costs; forecast ridership over a 25-year time period; assessed whether operating revenues might exceed operating costs and infrastructure maintenance costs; and determined other quantifiable economic impacts of high-speed rail corridor investments. Major findings showed that all rail technologies, routings, and station-stop alternatives that were investigated will likely require an operating subsidy in the initial years but that the 125 and 150 mph diesel locomotives are projected to have an operating surplus starting after 2030. The states are considering the results of the analysis in deciding next steps for rail transportation in the corridor. *(Sponsored by State DOT of Georgia*)

Global Connectivity

Facilitate an international transportation system that promotes economic growth and development

Eurocontrol Data Exchange with Enhanced Traffic Management System

In February 2006, the Volpe Center Enhanced Traffic Management System (ETMS) team was tasked to provide the necessary technical support to make the FAA-Eurocontrol real-time exchange of flight data a reality. In subsequent months, the Volpe Center provided analysis and technical solutions to the many complex issues that arose. The Center worked with Eurocontrol in defining the specifications of the interface and the data, setting up a secure encrypted path for the data exchange over the internet, developing the software needed to ingest the European data, and providing ETMS data to Eurocontrol. ETMS data began flowing to Eurocontrol in September 2006, and Eurocontrol data have been flowing into ETMS since December 2006. The culmination of this effort was the signing of the FAA-Eurocontrol legal agreement in August 2007, permitting the European data to be used operationally in ETMS.

ETMS Traffic Situation Display screen, developed by the Volpe Center, showing sample flights with Eurocontrol departure notification, resulting in earlier, more accurate estimated time of arrival (ETA) data. A recent 30-day study showed that 32 percent of all flights from Europe (approximately 500 daily) had an overall net benefit resulting from Eurocontrol data.

Both FAA and Eurocontrol have benefited from this data exchange. The ETMS Traffic Situation Display (TSD) (graphic display of flight data) that the Volpe Center provided was featured at the opening of Eurocontrol's new headquarters this past summer. FAA in turn benefits from the European data, which provide positive notice of departure times from European airports, leading to earlier and more accurate ETA data for flights in the United States. (*Sponsored by DOT/FAA*)

Engineering, Installation, and Integration Support to the U.S. Air Force

In FY 2007, the Volpe Center continued to support the U.S. Air Force's (USAF) Electronic Systems Center (ESC) at Hanscom AFB, Massachusetts, on the Department of Defense (DoD) NAS program. This program, whose goal is to make DoD ATC facilities interoperable with FAA ATC facilities, is a long-term project to replace DoD's terminal radars, voice-switching systems, and terminal automation systems as well as to consolidate several existing informational displays.

The Volpe Center has been contributing to this upgrade through engineering and installation support for the implementation of the following major acquisitions: Digital Airport Surveillance Radar (DASR); Enhanced Terminal Voice Switching (ETVS); Standard Terminal Automation Replacement System (STARS); and Airfield Automation System (AFAS). Support for the ETVS has been completed, while support is continuing for the other systems. The Volpe Center team, skilled in areas including electrical engineering, program management, and aviation operations, participates in the deployment of these systems at more than two-thirds of the 177 USAF and Air National Guard (ANG) bases worldwide. For the past eight years, the Volpe Center has played a major role in requirements definition, system engineering, site engineering, and analysis of communications, surveillance, and automation systems for the NAS program office.

In addition to prime responsibility for the site-level engineering and integration of these systems, the Center provides input for system requirements, evaluates system performance and troubleshoots faults, and resolves interface issues. The Volpe Center establishes the site's capability to support the new equipment and engineers the removal of old equipment and the installation of the new equipment while keeping the site online. The Center also creates and maintains facility drawings. Further, it provides the government's technical oversight, conducting System Acceptance Tests (SAT) for STARS and AFAS and participating in SAT for DASR at each location. Having become an integral part of the USAF program office team, the Center's responsibilities have grown each year, from assisting in the development of Pre-Planned Product Improvements (P3I) to performing flight checks on behalf of the program office.

Despite a lengthy delay in deployment of the AFAS due to information security issues, as of mid-September 2007 the Volpe Center had completed nearly 19 AFAS installations after having installed the key site system in FY 2006. The AFAS installations included two Air

Bases (AB) within the Republic of Korea, which were completed in conjunction with the Volpe Center's support to the Pacific Air Forces (PACAF) Command for the ATC Systems Relocation (reported as a separate project in *Points of Pride*). The Center has supported the deployment of seven STARS and DASR systems this year, with substantial support for system upgrades and improvements. The Center has also led the continued development of the DASR Advanced Signal Data Processing (ASDP), with a test-bed facility established at FAA's William J. Hughes Technical Center (Technical Center). The ASDP processing will ultimately provide the DASR with capabilities that no other terminal radar in the world will have. The Volpe Center is furthering the development of requirements to deploy STARS and DASR to overseas sites, including the incorporation of Mode S into both the radar and automation systems. Finally, the Center continues to chair the joint DoD-FAA DASR-STARS interoperability working group, which has developed and refined the process for optimizing these systems as a single entity rather than as individual components, resulting in the best possible air picture for air traffic controllers. *(Sponsored by DoD/USAF)*

Relocation of the Air Traffic Control and Landing Systems at Kunsan Air Base, Republic of Korea

The modernization of USAF Air Traffic Control and Landing Systems (ATCALS) and facilities has historically been a highly complex and long-term process. Several ABs are currently building modern facilities within PACAF. All transitions of ATCALS to new facilities must occur without interrupting local and regional ATC capabilities. As such, site preparations and transition management of all ATCALS communications, radar, flight data, weather data, navigation aids, and information systems — while maintaining operational capability — are required for successful relocation. This mandates careful relocation and installation planning, process optimization, and execution management.

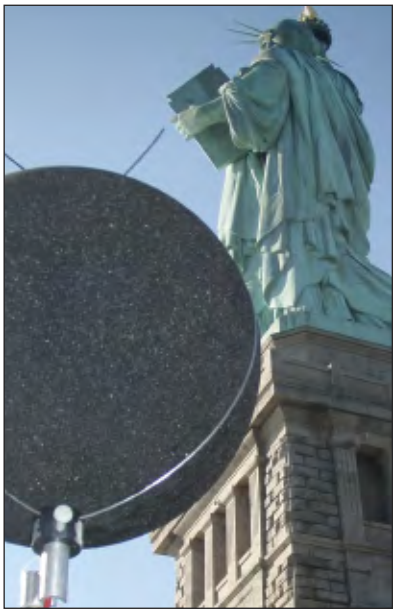
In FY 2007, Volpe Center supported PACAF in relocating the newly constructed Radar Approach Control (RAPCON) facility at Kunsan AB, Republic of Korea. This effort to relocate all ATCALS electronic systems from the existing RAPCON to the newly constructed facility included conducting a requirements survey, developing transition and relocation plans, completing three months of site preparations, and executing the relocation and cutover of ATCALS systems at the new facility. Additional tasks included systems testing and trial cutovers as well as constant coordination with the local USAF customers and PACAF sponsor. The Volpe Center's relocation team included a support contractor (SI International), Kunsan AB Communications Squadron, an electronics technician (from Tinker AFB), Radar Special Maintenance Team (from Hickam AFB), and antenna installers (from Springfield ANGB, Illinois). The ATCALS cutover was accomplished successfully during the July Fourth holiday, and the completed work was recognized by the fighter wing and base commanders. *(Sponsored by DoD/USAF)*

Environmental Stewardship

Promote transportation solutions that enhance communities and protect the natural and built environment

Transportation-Related Noise Measurement and Modeling

In 1987, the National Parks Overflight Act was passed, requiring the National Parks Service (NPS) and FAA to work together to achieve "substantial restoration of the natural quiet" in Grand Canyon National Park. In 2000, the National Parks Air Tour Management Act directed the Administrator of FAA, with the cooperation of NPS, to develop Air Tour Management Plans (ATMP). The Volpe Center has supported FAA and NPS in meeting the environmental needs of both of these directives.

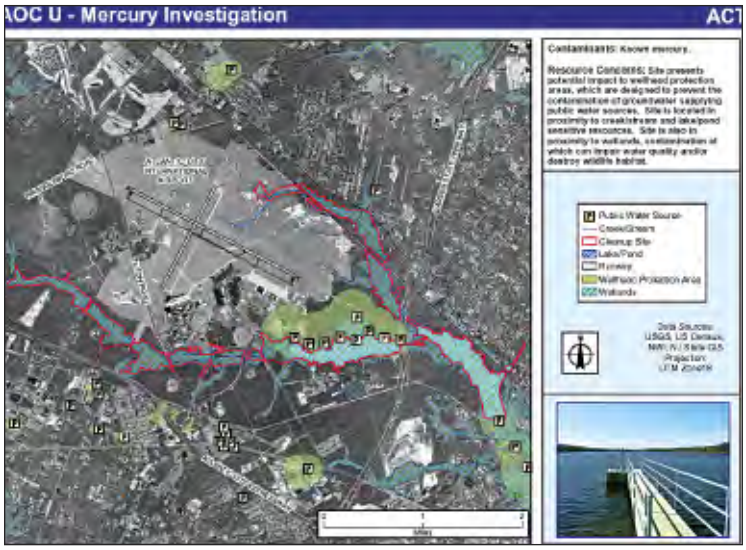


Measuring baseline ambient sound level at the Statue of Liberty and Governors Island National Monuments. (Photo by Cynthia Lee)

In FY 2007, Volpe Center staff supported the NPS natural sounds program and the FAA Western-Pacific Region and Office of Environment and Energy by (1) performing sound propagation modeling using FAA's Integrated Noise Model (INM), Version 6.2, for Yellowstone, Grand Teton, Hawaii Volcanoes, Haleakala, and Grand Canyon National Parks; (2) evaluating current methodologies and developing standards for computing ambient sound levels in national parks; (3) producing ambient maps for the analysis of aircraft audibility at Jackson Hole (Wyoming) Airport and Mesquite Airport (Nevada); (4) developing a screening spreadsheet that can be used in alternatives development, soundscape management, and impact assessment; (5) developing an NPS

and FAA guidance document of acoustic protocols for measuring and analyzing ambient noise in low-level environments, such as the national parks; (6) developing improved acoustical monitoring systems for long-term outdoor ambient measurements; (7) performing baseline ambient sound-level measurements at the Statue of Liberty and Governors Island National Monuments; and (8) providing technical guidance in the establishment of impact thresholds for aircraft noise over national parks. *(Sponsored by DOT/FAA & DOI/NPS)*

Reducing Environmental Liabilities at the FAA William J. Hughes Technical Center Superfund Site



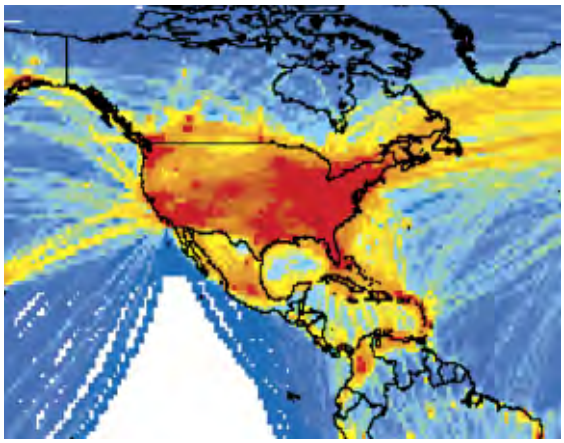
Aerial photograph of FAA's Technical Center, showing mercury clean-up sites. (Image from FAA's 2004 Environmental Site Clean-up Report, produced by the Volpe Center)

The FAA William J. Hughes Technical Center (Technical Center) near Atlantic City, New Jersey, is home to the Atlantic City International Airport, a New Jersey Air National Guard (NJANG) fighter wing, and extensive FAA facilities. Activities at the Technical Center began in 1942 with the construction of Naval Air Station Atlantic City (NASAC). In 1958, the facility was transferred to FAA, then later to the Airways Modernization Board, which has used it as an airport and aviation safety research center. Today the Technical Center is the nation's premier aviation R&D and test and evaluation facility.

The Technical Center is also FAA's only Superfund site, having earned this distinction from the U.S. Environmental Protection Agency (EPA) in 1990. Today it accounts for nearly 80 percent (or $385 million) of FAA's total estimated environmental liability. By far the most significant challenge is presented by mercury contamination found within stream and reservoir sediments and biota across the Technical Center. Fish sampled in stream and reservoir sediments had the highest levels of mercury contamination ever reported in freshwater fish in the United States, by several orders of magnitude. Frustrated by rising costs and years of investigation that failed to identify a mercury source or to determine whether FAA was responsible for the contamination, FAA asked the Volpe Center for assistance.

The Volpe Center recommended an innovative investigative approach, developed in collaboration with contamination and transport researchers at the Massachusetts Institute of Technology, which centered on a geochronological study with the goal of time-dating mercury deposition at the site. The recommended study was subsequently carried out by FAA and has yielded the strongest evidence to date that the Navy rather than FAA is responsible for the mercury contamination. Earlier in 2007, DoD took major steps towards acknowledging responsibility for mercury contamination at the Technical Center. This has the potential to release FAA from nearly $40 million in environmental liability. *(Sponsored by DOT/FAA)*

Aviation Environmental Design Tool



Aviation Environmental Design Tool System for Assessing Aviation's Global Emissions, developed by the Volpe Center.

In its 2004 Report to Congress, *Aviation and the Environment,* the Bush Administration recommended that "The nation should develop more effective metrics and tools to assess and communicate aviation's environmental effects. The tools should enable integrated environmental and economic cost/benefit analysis." As a consequence of this recommendation, FAA has launched a multiyear effort, which will result in the development of an entirely new suite of tools, including the Aviation Environmental Design Tool (AEDT).

The Volpe Center leads the management, design, and development of AEDT, which will integrate existing aviation noise, emissions, and dispersion computer modeling tools developed by FAA's Office of Environment and Energy. It is anticipated that this effort will lead to the development of an unprecedented suite of tools, which will be used by the International Civil Aviation Organization (ICAO) for the establishment of international environmental policy. It will also support the development of the Next Generation Air Transportation System (NextGen) in the United States.

During FY 2007, the AEDT was used to support several domestic and international initiatives at both the regulatory and policy levels. In support of the ICAO Committee for Aviation Environmental Protection (CAEP), AEDT was the centerpiece of a Nitrogen Oxide Stringency Sample Problem. Researchers integrated common modules and databases and implemented many concepts of the overall AEDT architecture to develop worldwide predictions of fuelburn, emissions, and noise. Model outputs compared favorably with the other tools exercised in the sample problem; AEDT was the only tool to provide CAEP with global fuelburn, emissions, and noise results. (*Sponsored by DOT/FAA)*

Analyzing Environmental Impacts from Truck and Bus Crashes

The Volpe Center is providing technical assistance to FMCSA in developing analytical methodologies and estimates of the environmental impacts associated with Commercial Motor Vehicle (CMV) collisions. Prior to the Volpe Center's research, there was limited information on the environmental impacts of CMV collisions. The Center has conducted preliminary research and adapted existing models to make an initial estimate of congestion, air quality, hazardous waste, and solid waste impacts.

Currently, the Volpe Center is performing a detailed study based on the recommendations of FMCSA and other agencies. The analysis is being refined to provide a more accurate and realistic representation of congestion conditions and driving behaviors following a CMV crash. The incorporation of idling and acceleration/deceleration conditions within a traffic queue and the estimation of the total time in congestion will better quantify fuel consump-

tion, air quality, and greenhouse gas emissions resulting from CMV crashes. The tools developed will allow policy analysts to make better estimations of congestion-induced air quality impacts under different safety and operational scenarios. FMCSA can use the study and accompanying tools to identify the types of CMV crashes that create the most congestion. In addition, this project will allow FMCSA to develop more comprehensive evaluations of proposed CMV safety regulations and will thus support the agency's regulatory and environmental compliance activities. *(Sponsored by DOT/FMCSA)*

Tire/Pavement Noise and Quieter Pavement Applications

Between 1970 and 1998, $1.8 billion was spent on the construction of highway barriers to reduce noise along U.S. roadways. Budget-conscious state DOTs and FHWA are researching innovative alternatives to barrier construction for highway noise abatement. Quiet pavements have emerged as one of the more promising approaches.

With tire/pavement interaction being the dominant source of vehicle noise at highway speeds, the use of quiet pavements as an alternative to noise barrier construction is an important area of research. Volpe Center staff have been extensively involved with national and international tire/pavement noise research and are recognized for their expertise in research planning, noise measurements, and general knowledge base.

In FY 2007, Center staff supported the Quiet Pavements Program by (1) helping to guide research plans and field measurements for several states, (2) participating in several expert panels to help guide projects for the National Cooperative Highway Research Program, (3) participating in the development of standard practices for tire/pavement noise measurements, and (4) conducting noise measurement research to help quantify the benefit of quiet pavements. (*Sponsored by DOT/FHWA)*

Planning Alternative Transportation Programs and Systems for National Parks and Public Lands

Since 1997, the Volpe Center has supported federal land management agencies (FLMA) such as NPS, both at the headquarters level and at individual sites, in assessing transportation system issues, providing policy and program assistance, articulating strategic alternatives to address transportation needs and problems, and designing and implementing action plans to achieve transportation goals and objectives. Volpe Center staff have particularly focused on analysis and development of alternative transportation systems to alleviate congestion and minimize environmental impact in parks.

The Volpe Center has provided technical assistance to many national parks and other public land units. Specific FY 2007 achievements include:

- In association with the Federal Transit Administration (FTA), prepared a manual and developed a webinar for the new Alternative Transportation in Parks and Public Lands

(ATPPL) program, to inform federal land management agencies about this new FTA discretionary grant program to provide transportation alternatives that alleviate congestion

- Conducted Transportation Assistance Group (TAG) site analyses on behalf of FTA, the U.S. Department of Interior (DOI), NPS, the U.S. Fish and Wildlife Service, the Bureau of Land Management (BLM), and the U.S. Department of Agriculture (USDA) Forest Service, at eight national parks, national forests, fish and wildlife refuges, and national recreation areas across the country

Parking area at the Mendenhall Glacier Visitor Center in the Tongass National Forest, where the Volpe Center is supporting the development of a transportation management strategy. (Photo by Frances Fisher)

- Prepared a study of transportation management strategies for alleviating traffic congestion at Mendenhall Glacier Visitor Center in Tongass National Forest, Juneau, Alaska
- Performed a fare comparability study to assist the NPS Concessions Program in determining an appropriate structure and pricing for the Alcatraz Ferry and in assessing vessel emissions of ferry operation proposals
- Assisted in reviewing an appraisal of the condition and residual value of concessionaire fleet assets used to transport visitors to and from the Statue of Liberty
- Participated in operational assessments of new alternative transportation system services in Glacier National Park, Sequoia – Kings Canyon National Park and Adams National Historical Park
- Provided a conceptual design and plan of operations for improving entry station fee collection at the Sandy Hook unit of the Gateway National Recreation Area in New Jersey
- Assisted USFS, BLM, and NPS in preparing white papers on transportation system conditions and needs to help FTA and the FHWA propose appropriate programmatic changes and/or funding levels as part of SAFETEA-LU reauthorization
- Prepared a series of fact sheets for NPS that highlight alternative transportation opportunities and accomplishments at national parks

The Volpe Center's initial effective support of NPS has led to requests from other FLMAs for assistance in planning and developing alternative transportation programs and solutions. The Volpe Center is working to promote a shared vision among FLMAs and transportation agencies. Working with FLMAs provides an excellent opportunity for Volpe Center staff to apply transportation best practices and lessons learned to help these federal partners address their transportation requirements. *(Sponsored by DOI/NPS and other FLMA agencies and transportation programs)*

Security, Preparedness and Response

Balance transportation security requirements with the safety, mobility, and economic needs of the nation and be prepared to respond to emergencies that affect the viability of the transportation sector

FTA Office of Safety and Security Five-Year Strategic Plan, FY 2008–2012

The Volpe Center is supporting the FTA Office of Safety and Security by leading a team of industry experts to develop the FTA Safety, Security, and Emergency Management Five-Year Strategic Plan (formerly known as the Safety, Security, and Emergency Management Technical Assistance Program [S2EMTAP]). The plan's comprehensive, all-hazards scope and its data-driven, continuous-improvement focus is in line with FTA's customer-oriented service approach, which incorporates the Malcom Baldridge customer and market focus excellence criteria. The strategic planning process and vision were developed in partnership with key industry stakeholders. They provide the blueprint for FTA's next-generation safety and security programs.

A key lesson learned in the last several years is the need for an all-hazards integrated approach to safety, security, and emergency management.

The plan builds on the success of the original Security Emergency Management Technical Assistance Program (SEMTAP) by incorporating an all-hazards approach to new programs and products targeted to specific needs of the transit industry. Transit agencies need technology tools that are proven to be reliable in the transit environment, justifiable from a cost-

benefit evaluation derived from a security risk assessment viewpoint, and balanced between human resources and technology applications.

The plan also defines the role of FTA in relation to its federal partners such as other DOT agencies and the Department of Homeland Security that are involved in complementary activities. *(Sponsored by DOT/FTA)*

Hazardous Materials Training for the U.S. Postal Service

Posters developed by the Volpe Center.

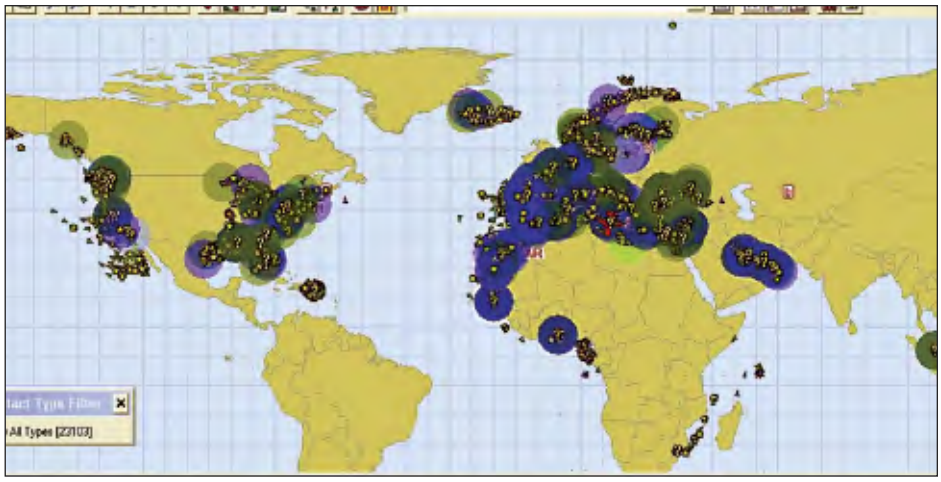
One of the greatest challenges facing the United States Postal Service (USPS) is the control of hazardous materials (hazmat) in the mail stream. For eight years, the Volpe Center has been supporting the USPS Aviation Security Group's (AVSEC) Hazmat Program in keeping the mail safe from potential impacts of hazmat and other restricted materials.

A significant portion of the Volpe Center's support includes developing and conducting hazmat awareness training as well as preparing instructional materials and standard operating procedures. The training is designed to instruct postal employees in proper procedures for both acceptance and handling of mailable hazmat as well as in procedures to identify and handle restricted and nonmailable hazmat that is improperly commingled in the mail stream. Approaches range from conducting end-user and train-the-trainer classes to employing training videos and web-based training classes.

During FY 2007, the Volpe Center developed operations-specific training for seven different USPS functional operations and conducted multiple16-hour classes, spread across the country, for Processing, Business Mail Entry, and Pricing and Classification Service Center employees. Other deliverables aimed at delivery and retail operations personnel included a 15-minute refresher training video for use in FY 2007 coupled with a 30-minute training video prepared for deployment in FY 2008. The Volpe Center also developed a 30-minute training video for Military Postal Service personnel. Separate web-based classes were developed for Executive and Administrative Schedule and Business Sales Network employees, to be released in FY 2008.

Since FY 2001, approximately 1.8 million hours of hazmat training have been completed by USPS employees, involving more than 704,000 USPS trained personnel. The Volpe Center's hazmat training support continues to respond to changing needs, ensuring the safety of USPS employees, the public, and the transportation network. *(Sponsored by USPS)*

Maritime Safety and Security Information System



Global coverage of the Maritime Safety and Security Information System, developed by the Volpe Center.

The Volpe Center has been involved in the development of Maritime Domain Awareness (MDA) networks since its groundbreaking work at the Panama Canal with the Communications, Tracking and Navigation (CTAN) system. The Volpe Center developed an MDA network known as the Maritime Safety and Security Information System (MSSIS) for the U.S. Navy Sixth Fleet, which is headquartered in Naples, Italy. The goal of the network is to enhance global maritime security through the development of a comprehensive vessel traffic situational awareness picture of Automatic Identification System (AIS)-equipped vessel traffic in the European Command (EUCOM) Area of Responsibility (AOR). A secondary goal of the network is to foster cooperation among U.S. allies by allowing them to be active partners in the MSSIS network. Currently, the system has 29 participating countries. The MDA situational awareness picture comprises real-time AIS-derived vessel traffic information gathered from both shoreside and afloat receiving stations. Data from the network are displayed on the Volpe Center-developed MDA software known as Transview. Recently, the MSSIS network provided U.S. commanders with real-time vessel traffic situational awareness during the evacuation of Americans from Lebanon. In 2007, the Volpe Center expanded the MSSIS to include the U.S. Navy Second Fleet vessel and its AOR. *(Sponsored by DoD/U.S. Navy)*

Decommissioning of *Nuclear Ship Savannah*

The *NS Savannah* was the world's first nuclear-powered cargo/passenger ship, built by the New York Shipbuilding Corporation at Camden, New Jersey. The *NS Savannah* is 600 foot long with a displacement of 22,000 tons and was designed to carry 9,400 tons of cargo, 60 passengers, and 124 crew at a design speed of 21 knots. In the early 1970s the *NS Savannah* was partially decommissioned. The *NS Savannah* is currently in a state of protective storage preservation while berthed at a ship repair facility in Norfolk, Virginia. Although all fuel assemblies, radioactive fluids, and other significant sources of radioactivity were removed from the ship during decommissioning, radiation monitoring, environmental surveillance, access control, and security measures have been established and maintained continually under the existing license as amended, to ensure that the health and safety of employees, military and civilian personnel at the shipyard, visitors, and the general public are not subjected to any undue hazard.

NS Savannah *(Photo courtesy of MARAD)*

NS Savannah's nuclear power plant control board. (Photo by Michael Buonopane)

In FY 2006 and 2007, the Volpe Center provided marine engineering, environmental engineering, naval architecture, logistics, acquisition support, and program management expertise to support the Maritime Administration's (MARAD) Office of Ship Disposal, Savannah Technical Staff (STS) in its conduct of the *NS Savannah* Decommissioning, Decontamination, and Remediation program. Specific tasks have included conducting an environmental assessment for decommissioning work, developing a fire protection plan, designing a fire alarm and detection system, designing a security monitoring system, developing a Heath and Safety Plan, developing a Vessel Security Plan, conducting an evaluation of an existing CO2 fire extinguishing system, and preparing Port Operating Plans. The Center is also part of an acquisition proposal review team and actively participates in Savannah Review and Audit Committee meetings. *(Sponsored by DOT/MARAD)*

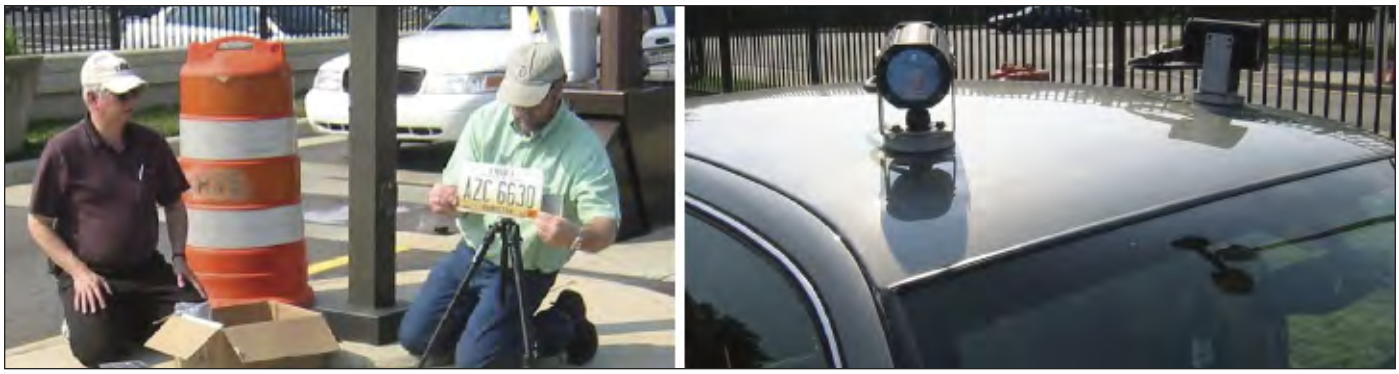
Nationwide Automatic Identification System

A nationwide vessel-monitoring system, developed for USCG by the Volpe Center.

To meet MDA objectives, United States Coast Guard (USCG) is establishing a nationwide vessel-monitoring network based on the Automatic Identification System (AIS) transponder technology. AIS is an international standard for communicating navigation- and voyage-specific information from commercial vessels. The Maritime Transportation Security Act (MTSA) of 2002 directed USCG to "implement a system to collect, integrate, and analyze information concerning vessels operating on or bound for U.S. waters." With more than 15 years of working with various vessel tracking technologies, the Volpe Center is able to provide the needed technical expertise in assisting USCG in deployment of the Nationwide Automatic Identification System (NAIS) network. In the first of three system implementation phases, the Volpe Center participated in a multidisciplinary Integrated Product Team (IPT) to design the AIS network and receiver subsystems. In validating the system design and data communications concepts, the Volpe Center also deployed and tested prototype AIS radio sites in 2006. This led the way for a full-scale Phase 1 deployment of radio sites that will provide AIS signal coverage to 100 critical ports and waterways. This first increment is expected to be in full operation by late 2007. Using the phased strategy, USCG will be able to bring usable increments to the field to meet operational needs in half the usual systems-acquisition time. *(Sponsored by DHS/USCG)*

Mobile License Plate Reader Systems Assessment

DoD's Technical Support Working Group (TSWG) tasked the Volpe Center to evaluate the current state of the art in mobile License Plate Reader (LPR) systems to determine the relative effectiveness of this emerging technology. The systems can be used by law enforcement or in combating terrorism applications. In FY 2007, the Center conducted a series of side-by-side tests of four commercial mobile LPR systems that use different



Testing License Plate Reader systems. (Photos by Daryl Song)

hardware technologies and software approaches. Tests were conducted using both fixed-site and mobile platforms (to gauge the impacts on performance when operating while in motion) and under various weather, lighting, and traffic conditions. Included were a series of known or "benchmark" license plates that were used to baseline the effectiveness of each system. The Volpe Center then interpreted the results of the testing and provided TSWG with a report that detailed how each system performed, giving it better insight into the overall effectiveness of current mobile LPR systems. *(Sponsored by DoD/TSWG)*

National Disaster/Incident Support

Following Hurricane Katrina, Volpe Center staff deployed immediately to Louisiana and played a key role in providing transportation services in response to Katrina's devastation and in planning and executing evacuation in the face of Hurricane Rita's 28-foot storm surge. More recently, in response to transportation requirements from Federal Emergency Management Agency (FEMA) Regions 1, 2, and 6, the Volpe Center has responded to flood emergencies in Maine, New Hampshire, and New York; fuel shortages in Maine; and tropical storm and hurricane threats in the Virgin Islands and Louisiana.

After Hurricanes Katrina and Rita, FEMA, for the first time, activated a new emergency support function, Long-Term Community Recovery. Volpe Center staff served as DOT's overall coordinators for this function, leading a combined field and support team that included staff from all the modal administrations and coordinating with FEMA and state and local agencies participating in the disaster recovery. For the past two years, Volpe Center staff members have continued to work with FEMA and DOT to develop the transportation scope of the long-term recovery function. The demonstrated ability of the Volpe Center to provide intermodal transportation support to the hurricane response effort through disaster planning, response, and recovery highlights its ability to support federal, state, and local governments as they undertake planning to better prepare for future emergency and disaster situations, incorporating best practices from incident management disciplines in the public and private sectors.

The Volpe Center's hands-on experience with disaster planning, response, and recovery has positioned it well to work with FHWA, the American Association of State Highway and Transportation Officials (AASHTO), and state DOTs to clarify the latter's role and to develop appropriate training for state DOT staff that will equip them to respond effectively in a disaster or other emergency incident. *(Sponsored by DHS/FEMA & DOT/FHWA)*

World Trade Center Site Master Security Plan Development

In 2006, the Volpe Center participated in the development of the Master Security Plan (MSP) for the new World Trade Center (WTC) site in New York City. The Lower Manhattan Development Corporation (LMDC) was tasked with acquiring the resources to enable the Lower Manhattan Counter-Terrorism Advisory Team (LMCAT) to develop an MSP for the new WTC site that would be applied to all phases of the project, including construction, occupancy, and operations of facilities on the site. The MSP covers a broad range of security topics, but the most significant is drafting guidelines for the development of protective measures to counter the threats of vehicle and person-borne explosives or other weapons of mass destruction, including chemical, biological, radiological, and nuclear agents.

Artist's rendition of the Freedom Tower. (© 2005 Skidmore, Owings & Merrill, LLP/dbox)

The Volpe Center served as technical consultants to LMCAT and worked with the team's contractor to provide (1) specific subject-matter expertise in the area of vehicle, personnel, and cargo screening and best-practices and (2) general oversight of the development of other topics, including access control, evacuation planning, and construction site security.

One of the responsibilities of the Volpe Center was to attend meetings between the contractor and stakeholders to identify and address security requirements and constraints. Stakeholders included the Port Authority of New York and New Jersey, the Lower Manhattan Construction Command Center (LMCCC), local law enforcement and emergency responders, architects and builders, the WTC Memorial Foundation, facility planners and managers, and impacted neighbors such as Verizon and Goldman Sachs. These meetings revealed many challenges, and the Volpe Center worked to achieve a balance in the struggle to provide security and assurance with minimal impact to normal operations.

Another important contribution of the Volpe Center was to compile best practices. These included relevant work performed by the Center, such as U.S. Capitol Police and technology surveys, as well as surveys of security in other facilities and organizations, such as the Sears Tower and Canary Wharf. These best practices served as a valuable reminder to stakeholders that screening at commercial properties is feasible and to developers that commercial interests must be taken into consideration.

A final draft of the MSP was delivered in September 2007. Its security recommendations and guidelines are being practiced to secure the construction site and to design the structures and spaces of the WTC site. *(Sponsored by LMDC)*

Digital Microwave Radio Communications Network for the Iraqi Republic Railways

Seamless railroad radio communication is essential to maintaining safe and efficient train operations as well as the safety of employees, equipment, and the public on the Iraqi Republic Railways (IRR).

The Volpe Center is supporting the Iraq Transition Assistance Office by managing the development, manufacturing, installation, integration, and acceptance of a turnkey digital microwave radio communications network for IRR between the port facilities of Umm Qasr and the Syrian border. This effort is part of the U.S.-led reconstruction relief effort to rebuild Iraq. The network will function as the railway's backbone communications link for both voice and data transmission and is an essential component of a communications-based train control (CBTC) system that is being deployed for IRR.

During the past year, the Volpe Center awarded the largest fixed-price procurement in its history and is managing this complex project. The design, manufacturing, and shipping phases are nearing successful completion, and the challenging construction phase is beginning in Iraq. When the project is completed, 33 microwave tower sites will have been constructed and IRR will be able to communicate between the Baghdad dispatching office and all locomotives and stations along the north-south right of way (ROW). *(Sponsored by U.S. DOS, Iraq Transition Assistance Office)*

Strategic Movements Review

The United Kingdom's Strike Command (UK/STC) of the Royal Air Force (RAF) requested help from the Volpe Center in evaluating how best to consolidate the strategic movements of its military forces at Brize-Norton RAF base. This task was carried out under the UK's Strategic Movements Review (SMR) process. The Volpe Center was asked to identify cost-effective alternatives for reorganizing RAF's air transport (AT) Movements (Movs) Trade to meet the UK's expeditionary air warfare (EAW) requirements for the future. The study evaluated RAF Brize-Norton, the main Ministry of Defence (MOD) Air Port of Embarkation, as a consolidation alternative to the more than 20 present bases from which the UK projects strategic transport.

Volpe Center experts proposed a cost-effective path for the UK to follow in consolidating air movements to Brize-Norton. Moreover, the Center developed a flexible and easily updated approach to risk analysis and evaluation of alternatives for consideration. In 2007, Senior RAF staff (equivalent to the U.S. Joint Chiefs of Staff) reviewed and accepted the Volpe Center's recommendations for implementation across the RAF logistics organization. Based on this success, the Volpe Center has recently been invited to carry out further risk analysis supporting STC audits of transport movements and the UK's Defence Science Technology Laboratory (DSTL). *(Sponsored by UK/MOD)*

Organizational Excellence

Advance the Department's ability to manage for results and achieve the goals of the President's Management Agenda

On Behalf of Our Clients

The Volpe Center supports our clients in meeting their organizational needs

Directing DOT's Small Business Innovation Research Program

The Volpe Center's mission is to anticipate future transportation issues and act as a catalyst for innovation. In carrying out this mission, the Volpe Center serves as a bridge for transportation expertise among industry, academia, and other government agencies.

One demonstration of this mission is the direction of DOT's Small Business Innovation Research (SBIR) program. Each year, the Volpe Center issues an annual solicitation, the purpose of which is to invite small businesses, with their valuable resources and creative capabilities, to submit innovative research proposals that address high-priority requirements of DOT. This year, all proposals were submitted electronically; there were 89 proposals, received from 33 states. All of this was accomplished with limited resources for outreach. This year's SBIR focus is on safer, smarter transportation solutions as well as system performance and 21st-century solutions. In the 2007 DOT SBIR solicitation, 17 research

topics were submitted to the DOT SBIR program office from the sponsoring organizations (FHWA, PHMSA, NHTSA, FMCSA, FTA, and FRA). The 2006 DOT SBIR solicitation included only nine topics. Also, there were nine contract awards in 2006, and in 2007 there will be 18 recommendations for contract awards.

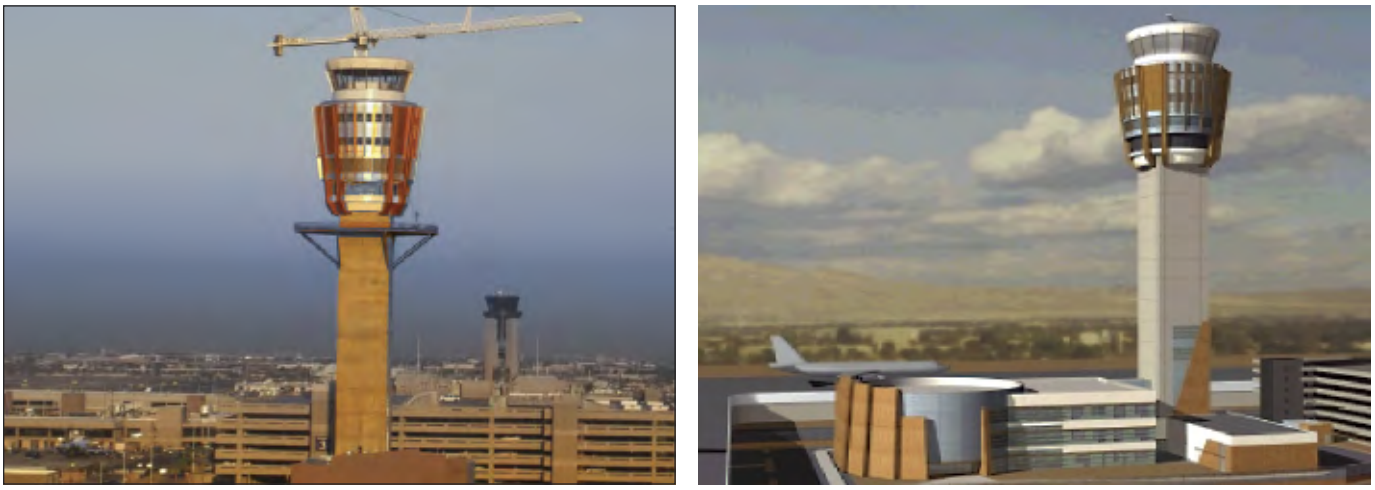
The DOT SBIR program's annual solicitation is one way that the Volpe Center assists the DOT in meeting its strategic objectives. *(Sponsored by DOT/FHWA, FMCSA, PHMSA, NHTSA, FTA, & FRA)*

FAA Terminal Facilities Support

The Volpe Center supports FAA in the areas of program management, schedule management, and systems engineering for the replacement of air traffic control towers (ATCT) and terminal radar approach control (TRACON) facilities. FAA's Terminal Facilities Sector is responsible for the establishment, replacement, and modernization of terminal ATC facilities to ensure that cost-effective infrastructure platforms exist for the control of air traffic in the NAS. In FY 2007, the Volpe Center supported the Terminal Facilities Sector in the following activities:

- It provided onsite support during January 2007 for the successful cutover and commissioning of the new ATCT/TRACON facility at Phoenix Sky Harbor International Airport.
- It played a key role in establishing baselines for new projects, including LaGuardia ATCT (New York); Memphis, Tennessee ATCT/TRACON; Dayton, Ohio ATCT; Pensacola, Florida TRACON; Islip, New York ATCT; Reno, Nevada ATCT; and Boise, Idaho ATCT.

(*Sponsored by DOT/FAA)*



Phoenix ATCT/TRACON: Construction and artist's rendering. (Photo by Skip Paschke, FAA; Artist's rendering by Jacobs Engineering Group)

Airport Security Training Evaluation

The mission of the Transportation Security Administration's (TSA) Operational and Technical Training Division (OTT) is to develop and deliver technical training that enables the TSA workforce and others involved in transportation security to perform their duties in protecting the nation's transportation systems. The Volpe Center was tasked by OTT in October 2005 to conduct a program evaluation of OTT's training development and delivery program. The evaluation is in response to the requirements of the Government Performance and Results Act (GPRA) of 1993, which was enacted to improve the confidence of the American people in the capabilities of federal agencies by systematically holding them accountable for achieving program results. In Phase 1 of the evaluation (completed in April 2006), the Volpe Center created an overall definition of OTT's program using a program logic model that defined inputs, activities, outputs, outcomes, and impacts. In Phase 2 (completed in November 2006), the Volpe Center performed an evaluation of two aspects of OTT's operations: the degree to which OTT is achieving its defined outputs and outcomes, and its internal training development and delivery processes. In Phase 3 (currently in progress), the Volpe Center is supporting OTT in several improvement areas, including implementation of a job performance survey to assess the effectiveness of TSA's transportation security officer (TSO) training program, output and outcome performance measures, an overall performance measurement management system, a training projects tracking database, and development of an OTT annual training plan. *(Sponsored by DHS/TSA)*

Public Transportation Participation Pilot Program

Soliciting and obtaining input from community members impacted by transportation decisions continues to be a major challenge. Section 3046(a)(11) of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) provides funding for a Public Transportation Participation Pilot Program to test new tools and techniques for achieving effective, informed public participation in metropolitan and statewide public transportation investment decisions.

The Volpe Center is assisting FTA in managing this important, highly visible program. In FY 2007, the Center's support has included designing and implementing a process to solicit and select pilot program participants; monitoring the progress of participants' research; and setting up frameworks to evaluate the pilot program's achievements. The Center is also helping FTA to disseminate information on lessons learned and effective practices in order to advance the state of the practice in public participation for public transportation planning. *(Sponsored by DOT/FTA)*

Automatic Dependent Surveillance-Broadcast: Acquisition Support

The Volpe Center provides research, development, and limited implementation efforts aimed at enhancing the safety, efficiency, and capacity of NAS for the Office of Surveillance and Broadcast Services (SBS) Program Office. FAA plans nationwide implementation of Automatic Dependent Surveillance-Broadcast (ADS-B) and Ground Broadcast Services (GBS) over the next decade and expects to install 400 ADS-B ground stations by 2014.

Volpe Center participation in providing ADS-B project support included efforts provided through the following Volpe Center acquisition vehicles:

- Transportation Analysis and Communications Expertise (TRACX) contract
- OMNI Contracts for Communications, Navigation, and Surveillance (CNS)

This contracting support was effective in helping the FAA SBS Program Office to successfully award its basic contract for ADS-B system development and deployment on August 29, 2007. The ADS-B contract is worth a potential $1.8 billion over 18 years.

The team effort provided for this project through the use of Volpe Center contractor support demonstrates the Center's collaboration with contractors and clients in addressing critical transportation issues. *(Sponsored by DOT/FAA)*

Development of Professional Capacity-Building Programs

The Volpe Center's Professional Capacity-Building (PCB) programs provide information, technical assistance, tools, and training to transportation professionals at all levels of government. Building on the success of the PCB program developed for the Intelligent Transportation Systems (ITS) Joint Program Office, the Volpe Center has supported the development of PCB programs in other areas, including planning, roadway safety, security and emergency management, environmental stewardship, and public-private partnerships.

The Volpe Center was also instrumental in establishing a PCB Council that brings together managers of capacity-building programs across DOT. The Council encourages managers to share experience, exchange information and best practices, identify opportunities for enhanced knowledge management, and better integrate training, technical assistance, and information dissemination among programs. By developing and leading the PCB Council and the individual professional capacity-building programs, Volpe Center staff are establishing a strong DOT leadership role in transportation workforce development, training, and technical assistance. As state DOTs and Metropolitan Planning Organizations (MPOs) strive to develop a professional workforce to support the 21st-century transportation system,

the Volpe Center is working both with them and with U.S. DOT modal agencies, AASHTO, and the Association of Metropolitan Planning Organizations (AMPO) to develop appropriate training courses and materials and to share best practices and lessons learned throughout the transportation community. *(Sponsored by DOT/FHWA)*

Iraqi Republic Railways Acquisition Support

As described in the Security section of this report, the Volpe Center provides project management and technical oversight, both in the United States and Iraq, aimed at completing the Digital Microwave Radio Communications Network (DMRCN). The network consists of a series of 33 microwave radio base stations, transmission towers, telecommunications equipment shelters, and auxiliary power systems from the Syrian border to the port of Umm Qasr. The DMRCN will serve as the backbone link to a Communications-Based Train Control (CBTC) network designed to enable the Iraqi Republic Railways (IRR) train operators to communicate with each other along the predominantly single-track railway in Iraq, thereby limiting the number of accidents and increasing the amount of traffic. When completed, this will be the longest CBTC/microwave-based system in the world.

The Volpe Center supports the DMRCN project through management of a contract award and administration, including the acquisition of equipment, inspection of materials, tracking of project deliverables, and construction efforts in Iraq. The contract, awarded in FY 2007, is a single award to a U.S. contractor with several subcontractors based outside the United States, including those in Turkey and Iraq. The total contract value including options is approximately $38 million. This project demonstrates the Center's excellence in providing management and acquisition expertise on high-risk projects and complex contract vehicles. *(Sponsored by U.S. DOS, Iraq Transition Assistance Office)*

Volpe Center Management Initiatives

The Volpe Center continued to enhance its management of human and financial resources in order to provide better service to its clients

Human Resource Management

The Volpe Center has always recognized its employees as its most critical asset since its performance in delivering a return on investment for both customers and American taxpayers directly depends on the talents and abilities of its workforce. During its strategic planning process, the Center identified the recruitment of the best and brightest from diverse talent pools and the development and retention of current employees as one of its four strategic goals. The Volpe Center's Human Resources (HR) Management Division has initiated a number of programs to further this goal. These programs include:

- **Human Capital Advisory Group (HCAG).** The Federal Human Capital Survey (FHCS), administered by the Office of Personnel Management, offers an assessment tool to measure and provide general indicators on how well an agency is managing its human capital. The Volpe Center management team tasked HCAG with reviewing the Center's results and to administer a local human capital survey. HCAG is a joint labor/management endeavor, tasked with contributing to maximizing organizational performance by recommending workforce management strategies and actions based on research and employee feedback on the Center's work environment. In FY 2007, HCAG sponsored focus groups to gain additional information from employees so it could develop clearer recommendations on how the Center can move forward in three human capital drivers: Internal Communications, Performance Management and Recognition, and Career Development and Training. Based on the focus groups, HCAG developed recommendations in three tiers; Tier 1 recommendations were determined to be the highest/most important for the Volpe Center Executive Council to consider. HCAG has a continuing role in monitoring the Center's response to these recommendations and providing future recommendations on human capital strategies based on employee feedback and research on best practices.
- **Human Resources Open House.** In FY 2007, there were "Open Houses" for the first time, which provided an opportunity to demonstrate the various programs and services available to Volpe Center federal staff. These included:
  - Recently implemented e-gov HR systems
  - Other services, such as the Employee Assistance Program, Retirement Counseling, Benefits Options, Volpe Fellows Program, and Leadership Development Program
  - Electronic Learning Management System (eLMS)
  - Demystifying the Volpe Center Merit Promotion Staffing Process (Hiring Manager)

- Electronic Official Personnel Folder (eOPF)
- Employee Express and (specifically) Federal Employee Benefits Statement (FEBS)

- **Coop Student Program.** A vibrant coop program is key to entry-level hiring. HR and Volpe Center hiring managers have maintained a large, active, and successful coop student program. From FY 2003 through FY 2007, the Center has hired 159 coop students from a wide range of colleges and universities and in the full range of occupations. From this group, 48 were converted to positions in the Center's permanent workforce. The coop program is the primary source of "entry-level" hires for the Center, necessary to maintain a pipeline for a vibrant and technically capable workforce.
- **Administrative Professional Certificate.** A certificate training program was created in FY 2007 to develop and improve administrative support skills at the division level. It is open to all division secretaries who, with supervisory approval, complete a set of ten required and six elective courses in the eLMS. Employees are expected to complete the courses in an 18-to-24-month period. The courses have been selected to address the skill areas that correspond to the Most Efficient Organization Quality Control performance elements.

Financial Management: Controlling Indirect Rates

The Volpe Center works as a 100 percent reimbursable fee-for-service organization with no appropriated funds. As such, each year — as prescribed in its Working Capital Fund enabling legislation — the Center must recover all costs incurred in the current fiscal year, including overhead costs. Accordingly, the Center establishes provisional rates at the beginning of each fiscal year that are designed to recover all overhead costs through charges to our projects, based on a combination of direct labor and direct contract obligations incurred during the year. As the year progresses, the indirect budget staff monitors progress toward indirect spending and our ability to achieve or better the provisional rates. In FY 2007, each of the overhead rates will be met, resulting in a return of approximately $1.6 million to projects. Project managers will be able to use these funds to deliver direct services to Volpe Center customers.

Improving Business Processes

- **Volpe Center Business Plan Data Collection Tool.** Since FY 2005, the Volpe Center has developed financial and performance goals for its annual business plan. The business plan describes major business opportunities and organizational, workforce, and financial goals as well as business strategies to meet them. The Business Plan Data Collection Tool was developed in early FY 2006 to monitor progress toward financial goals as well as provide input for future planning. In FY 2007, a more effective, web-based tool was developed and implemented. This enhanced tool contains the financial data necessary to measure progress toward business plan goals, to provide input to the budget, and to develop future financial performance goals as defined in the business plan.

- **Conversion to DOT-mandated systems (GovTrip and Mark View).** DOT has mandated that all Operating Administrations (OA) convert to DOT-sanctioned accounting and reporting systems in an effort to modernize and create process efficiencies. During the last year, the Volpe Center converted from its legacy travel management system to GovTrip, the DOT travel management system. The Center also implemented Mark View, the DOT electronic invoice approval system. To facilitate implementing these two systems, the Volpe Center arranged group and individual training for its employees by the Enterprise Service Center (ESC) staff. Additional training by the ESC is being scheduled for the GovTrip system early in FY 2008. After initial difficulties, the new systems are functioning as designed.

- **Implementing the new intra-agency agreement process.** DOT has undertaken several major improvements to its financial management systems to advance its ability to manage for results and achieve the goals of the President's Management Agenda. One of these improvements required a change to the policies for transferring funds within DOT through intra-agency agreements (IAA). Because customer agreements represent the Volpe Center's only source of funding, this new policy represented a significant change to the Center's business practices, affecting over 65 percent of its projects and, beginning in FY 2008, over 75 percent of its funding/financial transactions.

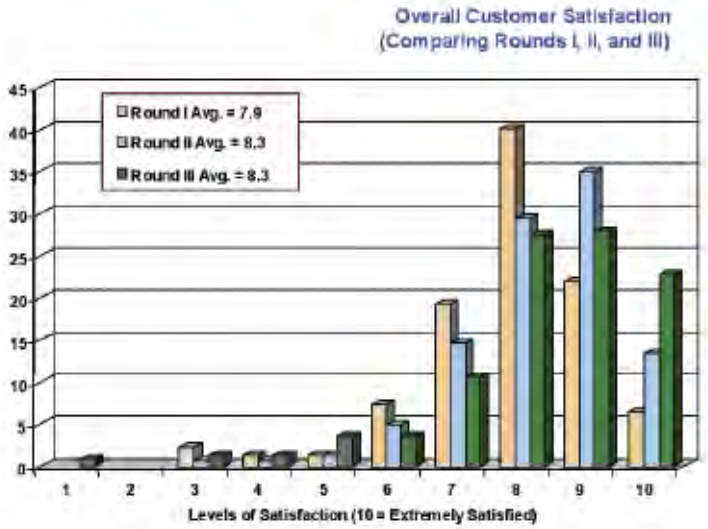
  The Center needed a proactive approach to adopt DOT's new policy, recognizing that a change of this magnitude can be difficult to implement, particularly since the Center's new procedures would need to coordinate with each of the Operating Administration's individually developed procedures for processing IAAs. A task force with dedicated resources was formed to take the necessary steps to minimize any possible disruptions to customers' projects while transitioning to the new process, all without undermining the Center's financial stability or ability to responsibly manage projects.

  Working with DOT headquarters policy staff, the Volpe Center met all affected parties within DOT during FY 2007 to ensure a shared understanding of the impact of doing business with the Center and to collaborate on developing procedures and strategies for effective and efficient implementation. Briefings, meetings, and e-mail updates kept all parties informed, and thorough analysis and evaluation of existing processes, proposed changes, and resulting impacts ensured effective and efficient implementation. An intranet site was established to provide reference material and status updates for employees and customers, and an initiative to automate the IAA agreement process was undertaken with the approval of DOT staff offices. Pilot tests of the new procedures were conducted with three customers, providing the opportunity to identify problems and best practices. Robust communication and a collaborative approach ensured that employees and customers were engaged, informed, and prepared when the policy took effect on October 1, 2007.

Customer Satisfaction

Round 3 of the Volpe Center's customer satisfaction monitoring was completed, with nearly a 60 percent response rate from all active customers. This represented 218 interviews, including 143 at the project level and 75 at the senior level. The raw data and results were used to:

- Improve individual products and services by customer
- Draft agency or agency office-level reports to share customer-specific findings and areas for improvement
- Identify projects for senior executive attention (i.e., Senior Management Review Board [SMRB] reviews)
- Respond to Volpe Center management inquiries (e.g., analyses of ease of access, perception of Volpe Center value, systems perspective)
- Assess customer trends (e.g., overall customer satisfaction of 8.3 on a scale of 1 to 10)
- Identify themes for corporate-level improvements, publish a communiqué, and share the "Round 3 Interview Results and Actions Summary Report" with customers and Center employees
- Develop customer plans and marketing opportunities
- Influence the draft of DOT 2300.8 Order to include a requirement for monthly project status reporting as a term and condition for doing business with the Volpe Center



The completion of Round 3 provided (1) an independent, credible assessment of the Volpe Center's customer satisfaction for the Center's customers and stakeholders, (2) actionable data for the Center's project teams, and (3) important customer trend data — one of the Volpe Center's key performance metrics.

Acquisition Initiatives

- **Workforce Initiatives.** The 1996 Clinger Cohen Act and Office of Federal Procurement Policy (OFPP) established career management, education, and training and experience requirements for contracting personnel (contracting officers and purchasing agents) in civilian agencies. Based on these requirements, DOT subsequently established department-wide training and education requirements for its acquisition workforce.

  The Services Acquisition Reform Act of 2003 (SARA) defined "acquisition" to include (along with traditional contracting functions) requirements definition, measurement of contract performance, and technical and management direction. In April 2005, OFPP issued Policy Letter 05-01, which provided guidelines for a government-wide acquisition

workforce for all civilian agencies. One of the principal functions of this policy was to officially expand the definition of the term "acquisition workforce" to include contracting officers' technical representatives (COTR) and program/project managers (P/PM). The policy also introduced new training standards for the acquisition workforce and created a Federal Acquisition Certification in Contracting (FAC-C) program.

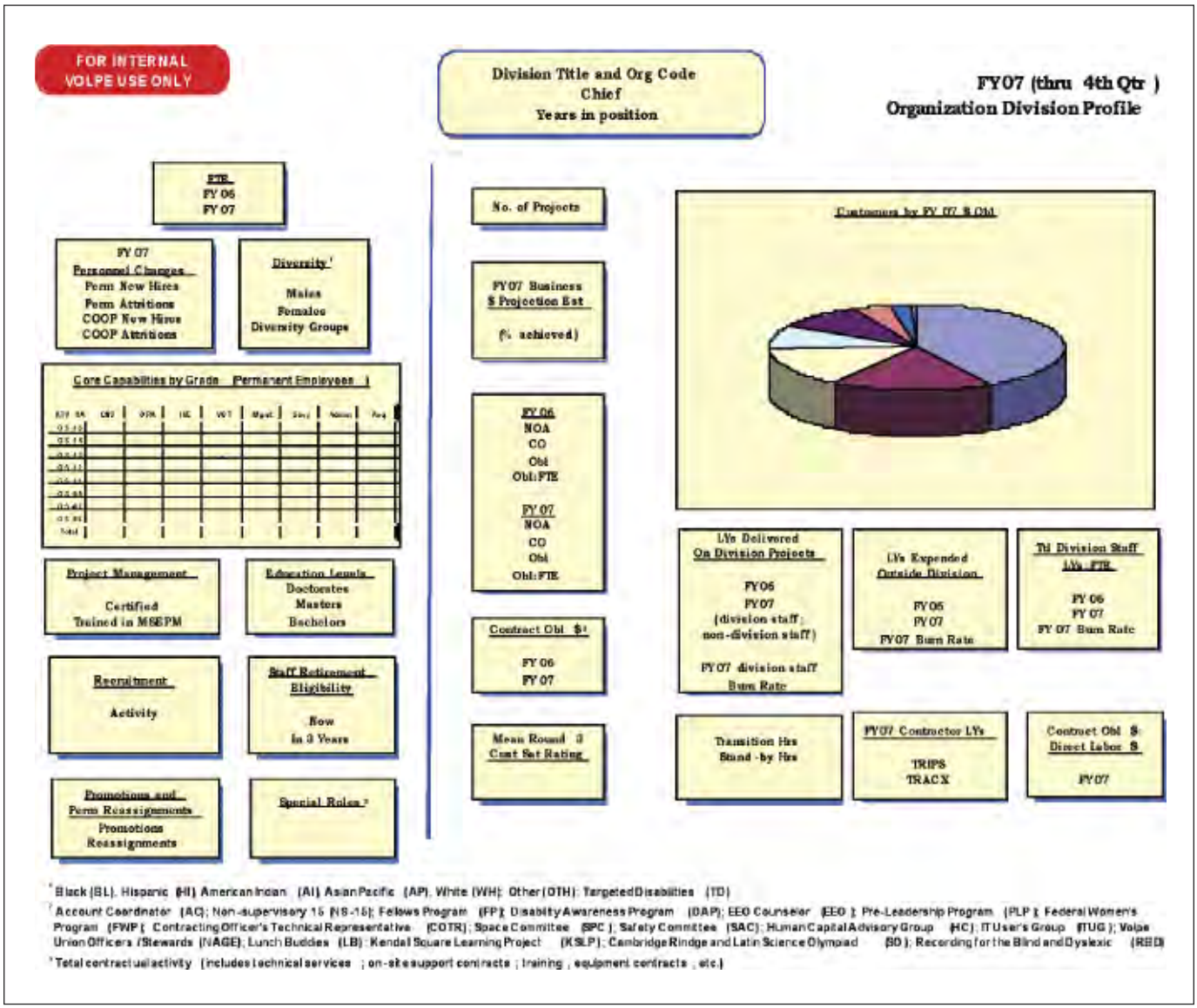
The intent of the FAC-C program is to create a certification program that reflects government-wide standards for education, training, experience, and core competencies in a variety of acquisition-related disciplines. It is designed to develop a professional, capable, and competent federal acquisition workforce by creating common training standards.

The Volpe Center has been extremely proactive regarding the training and development of its contracting workforce. The Center has a performance goal of 100 percent certification for contracting staff by the second quarter FY 2008. The DOT Performance Goal for certification in this area is 90 percent. The Volpe Center has provided notification regarding these new training standards and procedures to its COTRs and P/PMs and continues to work in partnership with Human Resources and DOT's Senior Procurement Executive's Office to implement the FAC-C program.

Enhancing the professional standing of the acquisition workforce will help to ensure that the goods and services are procured economically and efficiently, thereby safeguarding both public funds and public trust.

- **Revised Acquisition Handbook.** The federal government spends approximately 350 billion tax dollars each year on a wide range of goods and services. Accordingly, it is critical that federal acquisitions are executed in an efficient, effective, and accountable manner, maximizing the value of each dollar spent. However, systemic weaknesses continue to be identified in key areas of acquisition. As recently as September 2007, the DOT inspector general included "managing acquisition and contract operations more effectively to obtain quality goods and services at reasonable prices" as one of the nine top DOT management challenges for FY 2008. The framework developed by the Government Accountability Office (GAO) for assessing the acquisition function at federal agencies identifies policies and procedures as a primary cornerstone essential to an efficient, effective, and accountable acquisition process.

  Such a cornerstone had already been established at the Volpe Center in October 2003. At that time an internal directive, or order, titled "Acquisition Handbook," was issued to serve as a single vehicle for transmitting significant guidelines and functional responsibilities regarding the Center's procurement function to all members of its acquisition workforce. Links to a variety of guidance documents were also included in the order, to facilitate accessing many of the required documents needed to process a procurement. However, since that time, many changes have occurred that impact the processing of acquisitions at the Volpe Center. Accordingly, a major update to the order, including its links, has been issued that incorporates profound federal regulatory changes and



Framework for division profiles, developed as part of the Organizational Assessment.

various DOT policy initiatives, organizational changes, and electronic processing requirements. The latest version of the handbook will provide all members of the acquisition workforce with an invaluable tool to satisfy customers' procurement needs.

Volpe Center Reorganization Assessment

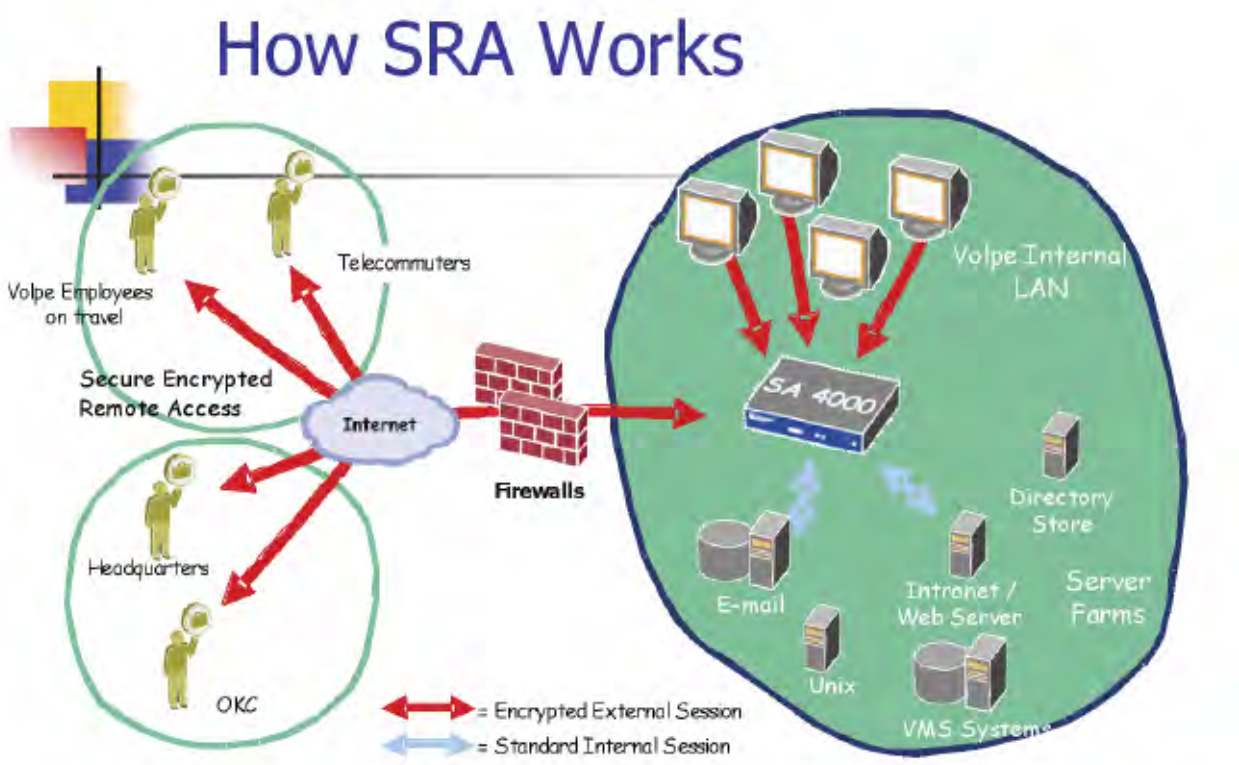
Following a recent reorganization of the Volpe Center, staff conducted an assessment of the effectiveness of the new organizational design and structure. The assessment consisted of a structured questionnaire that was used in interviews of the senior team, deputies, key staff, and union president as well as in division chief focus forums. The findings were published in a report that included recommendations and division profiles reflecting critical business metrics. These profiles, depicted in the framework above, were then issued on a quarterly basis and used extensively by management to analyze the overall health of divisions as well as each division's likelihood of business outlook success. Numerous enhancements were made each quarter in response to requests from the leadership team. In addition, an implementation plan was developed whereby five of the six study recommendations were implemented or handed off to Volpe Center Offices of Primary Interest (OPI) for action.

Onsite Contractor Support Service

The Volpe Center's staffing strategy uses a combination of federal and contractor employees to meet the broad range and quantity of skills needed to support projects. During FY 2007, the Volpe Center's Transportation Information Project Support (TRIPS) contract provided 179 labor years of information systems and information technology professionals capable of meeting programmatic requirements. The Transportation Research Analysis and Communications Expertise (TRACX) contract provided 72 labor years of operations research analysis and communications support services to the Volpe Center. Through the use of these onsite technical support service contracts, the Volpe Center was able to respond to the uncertain and changing requirements of customers by establishing a pool of easily accessed professional and technical personnel. As befits performance-based, cost-plus-award fee contracts, biannual performance evaluations were successfully conducted on each contract in FY 2007. The results of award-fee evaluations drive the contractor's profit and provide important incentives and motivation for top-quality performance. In FY 2007, annual assessments of contractor performance were also prepared in accordance with the Federal Acquisition Streamlining Act of 1994.

Information Technology Improvements

- **Novell Server Replacement and Data Migration.** In early FY 2007, the Volpe Center successfully completed the Novell Server Replacement and Data Migration Project. This project increased the available storage space to the Center's computer users by a factor of 10,000 (from 0.7 gigabytes to 7 terabytes). Unlike the Novell servers, these new Windows 2003 servers provide a safe, secure, and scaleable storage environment that meets current DOT security guidelines. The Novell migration project was an essential milestone that had to be completed before the follow-up Secure Remote Access (SRA) project could be implemented.
- **Secure Remote Access (SRA).** The Volpe Center recently implemented an SRA solution that provides global access to mission-critical data for its mobile workforce. The new system enables remote and mobile users to securely access, authenticate, and use centralized applications based on endpoint host checks and approved access levels for personnel and devices. Employees can use their existing user names and passwords and have their access levels monitored by the IT department. The connectivity occurs across public network infrastructures using secure technologies. Previously, remote access was achieved through software-based clients installed on the remote workstations. This approach was too time-consuming from a support standpoint, as users' home network environments are problematic. The new system requires only a computer's web browser (e.g., Microsoft Internet Explorer) and internet connectivity. Remote access helps the Center to meet environmental targets set by the government to reduce travel and provides employees with a more flexible work environment. Today, 6.6 percent of federal



Volpe Center's Secure Remote Access enables remote and mobile users to securely access, authenticate, and use centralized applications. (Graphic by Volpe Center staff)

employees telework. Telework lets federal agencies benefit from better business continuity for both standard and emergency operations. In addition, agencies find that the telework option helps them to recruit and retain better, happier employees and increases productivity by enabling after-hours work.

- **Financial Data Mart.** The Financial Data Mart (FDM) is a tool that makes project financial data easy to access. It is meant to assist project management staff in presenting and analyzing funds and expenses in a variety of ways. It is designed to reduce the clerical aspects of formulating project financial status. In FY 2007, an initial implementation (FDM 1.0) was released and evaluated by users. A plan to develop an expanded version of FDM was devised and implemented. The project team included Volpe Center staff throughout the direct and indirect divisions as well as contractors.

  Issues identified by FDM 1.0 users included:

  - The data were reorganized and supplemented with additional fields to provide project managers with more flexibility in reporting.
  - Additional mechanisms for organizing the data were implemented. These included several new date range functions.
  - A major effort was made to ensure that data matched manually prepared reports in use.

Security and Emergency Response Improvements

The Volpe Center's management goal is to provide a safe and secure work environment and ensure that all of its occupants are informed about how best to react or prepare for emergency situations. FY 2007 achievements are presented here:

- **Sustained Emergency Response Operations.** The Volpe Center has developed and continually reviews and revises its processes and procedures in addition to conducting regularly scheduled emergency evacuations to test its internal response assets and capabilities. This is a major step in ensuring that we can evacuate the Center's personnel safely during a crisis or an emergency, such as a fire or similar disaster. We have also trained approximately 140 personnel to act as CPR/AED first responders, floor monitors, and security and safety staff in their specific emergency management roles at the Center.
- The Volpe Center **Community Emergency Response Handbook** was developed in early 2007 under the Center's Sustained Emergency Response and Management Operations. The handbook is a comprehensive site-specific text that is intended to prepare Volpe Center occupants to react in a variety of emergency situations as well as to provide training for the Center's internal response. All processes and procedures will be reviewed on a regular basis, and lessons learned will be incorporated whenever practicable. It is available in print and on the Volpe Center intranet.
- **Sustained Personnel Security Operations.** The Volpe Center has reviewed approximately 1,500 federal, contractor, and tenant organizations' personnel and ensured that all employees who work at the Center have had the required background investigation associated with their assigned positions. This is a major step in attaining the goal of Homeland Security Presidential Directive (HSPD) #12, that all employees who work for the federal government have the required background investigation completed prior to beginning work. The Volpe Center also maintains with 100 percent certainty that all personnel have appropriate, verifiable background investigations in place for the work they are doing, based on their supervisor's assessment.

Property Improvements

FY 2007 saw some major property improvements, including fire alarm replacement, fire suppression, and elevator renovation. These capital improvements provide a safer and more productive work environment.

Improving Fire Safety

- In Phase II of the fire alarm replacement project, all new fire alarm devices such as smoke detectors, annunciators, and pull stations were installed. Extensive testing and documentation were performed to comply with National Fire Protection Association (NFPA) codes.
- The fire suppression installation in Building 3 included a complete sprinkler system

plus specialized systems for the Enhanced Traffic Management System (ETMS) Lab and Data Center. New ceilings were installed throughout, with new lighting in corridors. Every room in the building was affected, requiring extensive communication and coordination. Building 3 now possesses all the fire safety features of any modern low-rise office structure.

Elevator Renovation

The elevator renovation completely replaced the original mechanical systems with state-of-the-art digital controls. Elevator cars were modernized with new interiors and control panels. The result is a safer and more efficient vertical transportation system.

Volpe Center's Expanded Recycling Program

In conjunction with Earth Day, the Volpe Center kicked off its expanded recycling program. Members of the Volpe Center's Leadership Development Program formed a team to determine the feasibility of expanding the Center's recycling program. Since 1990, the Center's focus has been on white paper recycling only. With the launch of its expanded recycling program in FY 2007, the Center now recycles mixed paper, commingled containers (plastic, glass, aluminum), and cardboard on a regular basis. The Center's expanded recycling program was implemented at minimum cost and has resulted in reduced trash expense and a positive effect on the environment. It also aids the Center in complying with Executive Order 13423, calling upon all federal agencies to recycle materials to the maximum extent practicable. The success of the recycling program is directly attributable to the Center occupants' support and their willingness to "Go Green."

The Center's recycling program continues to seek future opportunities to expand recycling and enhance the Center's energy-saving initiatives through the formation of a "Green Team." Technical and administrative staff volunteer time once a month to share ideas and recommendations on how to enhance the Center's energy conservation, use renewable energy, and further educate Volpe Center occupants on recycling and ways to make a positive impact on the environment.

Volpe Center Customers

Thanks to Our Fiscal Year 2007 Customers

U.S. Department of Transportation

Federal Aviation Administration
Federal Highway Administration
Federal Motor Carrier Safety Administration
Federal Railroad Administration
Federal Transit Administration
Maritime Administration
National Highway Traffic Safety Administration
Office of the Secretary of Transportation
Pipeline and Hazardous Materials Safety Administration
Research and Innovative Technology Administration
  Transportation Safety Institute
Saint Lawrence Seaway Development Corporation
Surface Transportation Board

Other Federal

Central Intelligence Agency
Defense Threat Reduction Agency
Department of Agriculture
  U.S. Forest Service
Department of Commerce
  National Oceanic and Atmospheric Administration
Department of Defense
  U.S. Air Force
  U.S. Army
  U.S. Navy
Department of Health and Human Services
  Centers for Disease Control and Prevention
Department of Homeland Security
  Federal Emergency Management Agency
  Transportation Security Administration
  U.S. Coast Guard
Department of State
Department of the Interior
  Bureau of Indian Affairs
  National Park Service
Environmental Protection Agency
National Aeronautics and Space Administration
U.S. Postal Service

State and Local

California Department of Transportation
City of Baltimore, Department of Transportation
City of Boston, Massachusetts
City of Flagstaff, Arizona
City of St. George, Utah Municipal Airport
District of Columbia, Department of Transportation
Fairfax County, Virginia
Georgia Department of Transportation
Lower Manhattan Development Corporation
Maine Department of Transportation
Massachusetts Bay Transportation Authority
Massachusetts Port Authority
Tri-County Metropolitan Transportation,
  District of Oregon

Foreign Entities

Airservices Australia
Defence Science and Technology Laboratory (UK)
DFS Germany
NAV CANADA
United Kingdom Ministry of Defence

Other

Alliance of Automobile Manufacturers
American Concrete Pavement Association
American Public Transportation Association
American Trade Initiatives
INOVA Fairfax Hospital (Honda)
Sensis Corporation
Wake Forest University (Toyota)

DOT Secretary's Award Ceremony, December 20, 2006

Volpe Center Recipients

Individual Awards

Secretary's Award for Meritorious Achievement
Terrence M. Sheehan

Secretary's Award for Excellence
Carol A. Ferrante
Regina Y. Houston

Secretary's Award for EEO Affirmative Action
John P. O'Donnell

Secretary's Award for Volunteer Service
Patricia M. Gordon

Team Awards

Secretary's Partnering for Excellence Award
Corporate Average Fuel Economy Team:
Kevin A. Green
Joseph J. Mergel
Don H. Pickrell
Mark Shaulov
John E. Van Schalkwyk

Louisiana Recovery Assistance Team:
Eric J. Plosky
Matthew D. Rabkin
Gary T. Ritter

Volpe Center Technical Support Team for the Development of a National Strategy to Reduce Congestion on America's Transportation Network:
Ellen E. Bell
Richard R. John
Douglass B. Lee, Jr.
Don H. Pickrell

Secretary's Distinguished Service Certificate for Hurricanes Katrina and Rita

Frances B. Fisher
Gerard J. Flood
Robert J. Hallett, Jr.
Matthew B. Isaacs
David W. Jackson
Jonathan A. Jerome
Melissa M. Laube
Elizabeth C. Machek
Tashi G. Ngamdung
Eric J. Plosky
Carson Poe
Michelle A. Priante
Matthew D. Rabkin
Benjamin K. Rasmussen
Gary T. Ritter
Terrence M. Sheehan
Alison R. Shedd
David J. Spiller
William R. Sullivan

Department of Transportation 2006 Presidential Award for Management Excellence

Volpe National Transportation Systems Center
Competitive Sourcing
Government-Wide Management Initiative

Acronyms and Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
AB	Air Base
ACC-PD	American Chemistry Council–Plastics Division
ADS-B	Automatic Dependent Surveillance-Broadcast
AED	Automated External Defibrillator
AEDT	Aviation Environmental Design Tool
AFAS	Airfield Automation System
AFS	FAA Flight Standards Service
AFTIL	Airways Facilities Tower Integration Laboratory
A&I	Analysis and Information
AIAA	American Institute of Aeronautics and Astronautics
AIS	Automatic Identification System
AMPO	Association of Metropolitan Planning Organizations
ANG	Air National Guard
AOC	Area of Concern
AOR	Area of Responsibility
APTA	American Public Transportation Association
ASDE-X	Airport Surface Detection Equipment, Model X
ASDP	Advanced Signal Data Processing
ASI	Aviation Safety Inspector
AT	Air Transport
ATC	Air Traffic Control
ATCALS	Air Traffic Control and Landing Systems
ATCSCC	Air Traffic Control System Command Center
ATCT	Air Traffic Control Tower
ATMP	Air Tour Management Plan
ATO	Air Traffic Organization
ATOS	Air Transportation Oversight System
ATO-T	Air Traffic Organization, Terminal Services Unit
ATPPL	Alternative Transportation in Parks and Public Lands
AVSEC	Aviation Security Group
BAC	Blood Alcohol Concentration
BLM	Bureau of Land Management
BrAC	Breath Alcohol Concentration
C^3RS	Confidential Close Call Reporting System
CAEP	Committee for Aviation Environmental Protection
CAFE	Corporate Average Fuel Economy
CBTC	Communications-Based Train Control
CFR	Code of Federal Regulations
CM	Configuration Management
CMV	Commercial Motor Vehicle
CNS	Communications, Navigation, and Surveillance

CoDOT	Colorado Department of Transportation
COTR	Contracting Officer's Technical Representative
COTS	Commercial Off-the-Shelf
CPR	Cardiopulmonary Resuscitation
CSA 2010	Comprehensive Safety Analysis 2010
CTAN	Communications Tracking and Navigation
CVSP	Commercial Vehicle Safety Plan
DAMIS	Drug and Alcohol Management Information System
DASR	Digital Airport Surveillance Radar
DataQs	Data Quality System
DHS	Department of Homeland Security
DMRCN	Digital Microwave Radio Communications Network
DoD	Department of Defense
DOE	Department of Energy
DOI	Department of Interior
DOS	Department of State
DOT	Department of Transportation
DSTL	Defence Science Technology Laboratory
EAW	Expeditionary Air Warfare
EFS	Electronic Flight Strip
eGov	e-Government
eLMS	Electronic Learning Management System
EMIS	Enforcement Management Information System
eOPF	Electronic Official Personnel Folder
EPA	Environmental Protection Agency
ESC (USAF)	Electronic Systems Center
ESC (FAA)	Enterprise Service Center
ETA	Estimated Time of Arrival
ETMS	Enhanced Traffic Management System
ETVS	Enhanced Terminal Voice Switching
EUCOM	European Command
FAA	Federal Aviation Administration
FAC	Federal Acquisition Certification in Contracting
FDM	Financial Data Mart
FEBS	Federal Employee Benefits Statement
FedSTAR	Federal-State Tracking and Reporting
FEMA	Federal Emergency Management Agency
FFRDC	Federally Funded Research and Development Center
FHCS	Federal Human Capital Survey
FHWA	Federal Highway Administration
FIS-B	Flight Information Services-Broadcast
FLMA	Federal Land Management Agency
FMCSA	Federal Motor Carrier Safety Administration
FMVSS	Federal Motor Vehicle Safety Standard

FOC	Final Operating Capability
FRA	Federal Railroad Administration
FSIMS	Flight Standards Information Management System
FTA	Federal Transit Administration
FY	Fiscal Year
GAO	Government Accountability Office
GBS	Ground Broadcast Services
GBT	Ground-Based Transceiver
GDP	Ground Delay Program
GoMex	Gulf of Mexico
GPRA	Government Performance and Results Act
GPS	Global Positioning System
GS	Ground Stop
HAZMAT	Hazardous Materials
HCAG	Human Capital Advisory Group
HHG	Household Goods
HMEP	Hazardous Materials Emergency Preparedness
HR	Human Resources
HSGT	High-Speed Ground Transportation
HSPD	Homeland Security Presidential Directive
IAA	Intra-Agency Agreement
ICADTS	International Counsel on Alcohol, Drugs, and Traffic Safety
ICAO	International Civil Aviation Organization
INM	Integrated Noise Model
IOC	Initial Operating Capability
IPT	Integrated Product Team
IRR	Iraqi Republic Railways
IT	Information Technology
ITS	Intelligent Transportation Systems
ITWS	Integrated Terminal Weather System
JPDO	Joint Planning and Development Office
L&I	Licensing and Insurance
LIDAR	Light Detection and Ranging
LMCAT	Lower Manhattan Counter-Terrorism Advisory Team
LMCCC	Lower Manhattan Construction Command Center
LMDC	Lower Manhattan Development Corporation
LPR	License Plate Reader
LSP	Low-Stress Pipelines
MADD	Mothers Against Drunk Driving
MARAD	Maritime Administration
MCMIS	Motor Carrier Management Information System
MCSAP	Motor Carrier Safety Assistance Program
MDA	Maritime Domain Awareness
MIT	Miles-in-Trail

MOD	Ministry of Defence
MPO	Metropolitan Planning Organization
MSP	Master Security Plan
MSSIS	Maritime Safety and Security Information System
MTSA	Maritime Transportation Security Act
NAS	National Airspace System
NAIS	Nationwide Automatic Identification System
NASA	National Aeronautics and Space Administration
NASAC	Naval Air Station Atlantic City
NASPAS	National Airspace System Performance Analysis System
NCAP	New Crash Assessment Program
NCCDB	National Consumer Complaint Database
NCSA	National Center for Statistics and Analysis
NextGen	Next Generation Air Transportation System
NGRTC	Next Generation Rail Tank Car
NHTSA	National Highway Traffic Safety Administration
NJANG	New Jersey Air National Guard
NOA	New Obligation Authority
NPMS	National Pipeline Mapping Service
NPS	National Parks Service
NTSB	National Transportation Safety Board
OA	Operating Administration
OFPP	Office of Federal Procurement Policy
OHMS	Office of Hazardous Materials Safety
OMB	Office of Management and Budget
OMNI	Omni Contract
OPI	Office of Primary Interest
OPS	Office of Pipeline Safety
OTT	Operational and Technical Training
P3I	Pre-Planned Product Improvements
PACAF	Pacific Air Forces
PCB	Professional Capacity Building
PCIV	Plastics and Composite-Intensive Vehicle
PHMSA	Pipeline and Hazardous Materials Safety Administration
P/PM	Program/Project Manager
RAF	Royal Air Force
RAPCON	Radar Approach Control
R&D	Research and Development
RITA	Research and Innovative Technology Administration
ROW	Right-of-Way
S2EMTAP	Safety, Security, and Emergency Management Technical Assistance Program
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SAMO	Substance Abuse Management Oversight

SARA	Services Acquisition Reform Act
SAT	System Acceptance Test
SBIR	Small Business Innovation Research
SBS	Surveillance and Broadcast Services
SD	Situation Display
SEMTAP	Security Emergency Management Technical Assistance Program
SMART	Safety Monitoring and Reporting Tool
SMR	Strategic Movements Review
SMRB	Senior Management Review Board
SOA	Service-Oriented Architecture
SODAR	Sonic Detection and Ranging
SPAS	Safety Performance Analysis System
SPPS	State Pipeline Processing System
SRA	Secure Remote Access
SRMD	Safety Risk Management Document
STARS	Standard Terminal Automation Replacement System
STL	St. Louis International Airport
STS	Savannah Technical Staff
TAG	Transportation Assistance Group
TCWF	Terminal Convective Weather Forecast
TFM	Traffic Flow Management
TIDS	Tower Information Display System
TIS-B	Traffic Information Services-Broadcast
TMI	Traffic Management Initiative
TO	Technical Operation
TRACON	Terminal Radar Approach Control
TRACX	Transportation Analysis and Communications Expertise
TRB	Transportation Research Board
TRIPS	Transportation Information Project Support
TSA	Transportation Security Administration
TSD	Traffic Situation Display
TSO	Transportation Security Officer
TSWG	Technical Support Working Group
UAT	User Acceptance Test
UK/STC	United Kingdom's Strike Command
USAF	United States Air Force
USCG	United States Coast Guard
USDA	U.S. Department of Agriculture
USPS	United States Postal Service
WAM	Wide Area Multilateration
WTC	World Trade Center
XML	eXtensible Markup Language

U.S. Department of Transportation

Research and Innovative Technology Administration

Volpe National Transportation Systems Center
55 Broadway
Cambridge, MA 02142 1093
www.volpe.dot.gov

For More Information:
Lynn C. Murray, Director of Communications
Volpe National Transportation Systems Center
Phone: (617) 494 2224
Fax: (617) 494 2370
Email: MurrayL@volpe.dot.gov